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Flood Risk Assessment



2307-831 Newmarket Road, Royston, Hertfordshire

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DOCUMENT CONTROL SHEET

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1. INTRODUCTION

Project

This Flood Risk Assessment has been undertaken for Vistry Homes Ltd to inform and support a Hybrid application for residential development of up to 325 dwellings comprising: (a) full planning application for Phase 1 comprising 102 dwellings and associated infrastructure including access from Newmarket Road, emergency and pedestrian/cycle access from Burloes Hall Drive, internal highways, public open space, landscaping and drainage and (b) outline application for up to 223 dwellings and associated infrastructure with all matters reserved apart from primary means of access and emergency and pedestrian/cycle access from Burloes Hall Drive.

The development is to comprise of a mixture of detached, semidetached houses and flats, the proposals will include the new housing, parking, private and adoptable hardstanding on a site area of approximately 14.15Ha with the development to be accessed via a new bellmouth junction off Newmarket Road.

Aims and Objectives

The purpose of this assessment is to review the proposed development and to consider the risk to it of flooding, assessing the affect it may have on any existing flood flows and flood storage within adjacent floodplains.

The risks of flooding and potential impact of alterations to the existing flood flow and storage regime and surface run-off characteristics are considered within the scope and parameters set out in the National Planning Policy Framework (NPPF). Consideration is also given to the ODPM document “Preparing for Floods”.

The Environment Agency website, flood mapping was consulted during this assessment. (Please refer to the Chapter 2 for flood mapping data).

Site Location/Description

The site is located to the south of Newmarket Road, approximately 1km east of Royston, a town and civil parish in the District of North Hertfordshire and county of Hertfordshire in England. The site is approximately 14.15ha in size with a grid reference of 536909E, 240666N. The site is bound by Newmarket Road to the north and by trees on all boundaries. There are no watercourses near the site or significant vegetation at the site, except for an area of deciduous trees towards the south-eastern corner, which will be retained as part of the development.

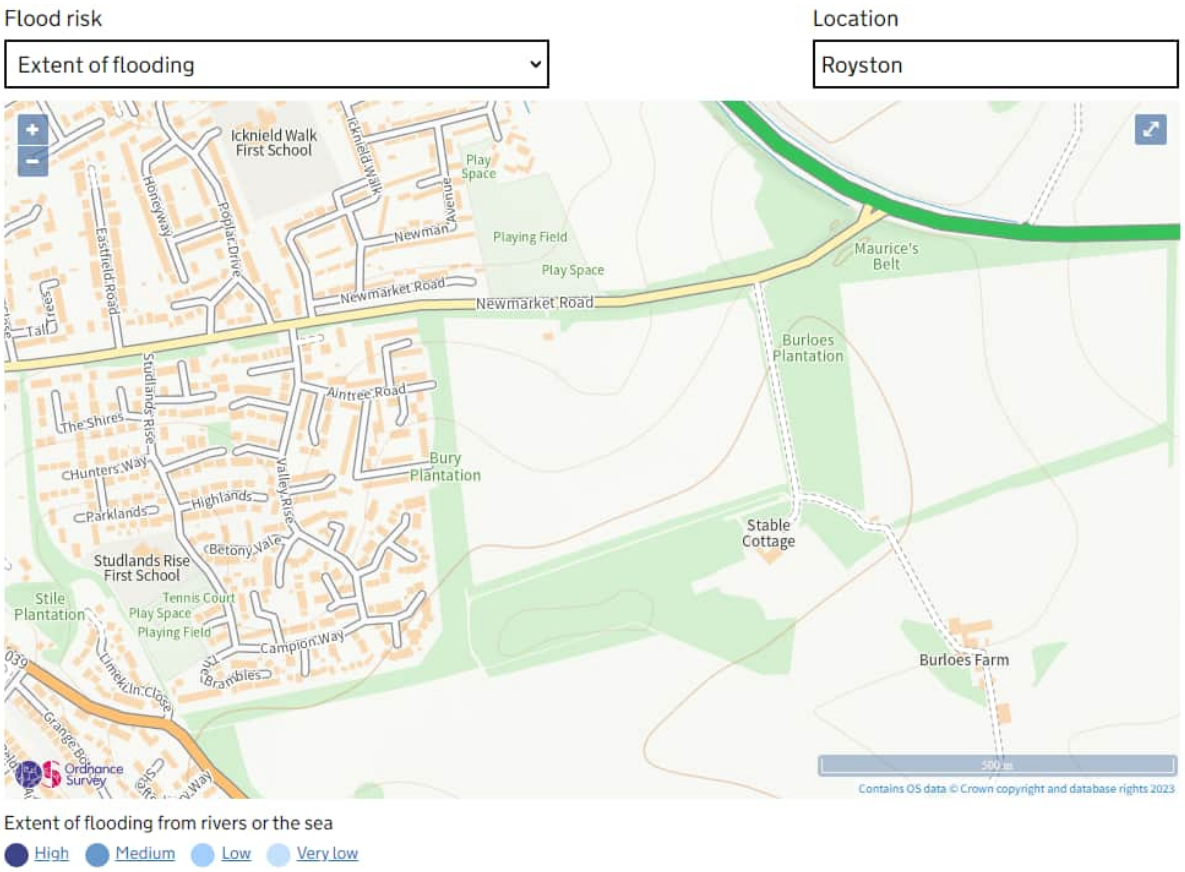
The site has steep topography with falls in a northeast direction from the southwest and northwest direction from the southeast converging to the low point located at the centre of the northern boundary, levels ranging from approximately 104.000m AOD to 73.700m AOD. Gradients are consistent in the region of 1in8 (12.5%) to 1in10 (10.0%), (Please refer to the Appendix for the Topographical Survey).

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2. FLOOD ANALYSIS

Flood Level

The Environment Agency flood mapping detailed below indicates that the site lies in Zone 1, outside any floodplain with <1in1000yr probability of river or sea flooding.



Flood Protection

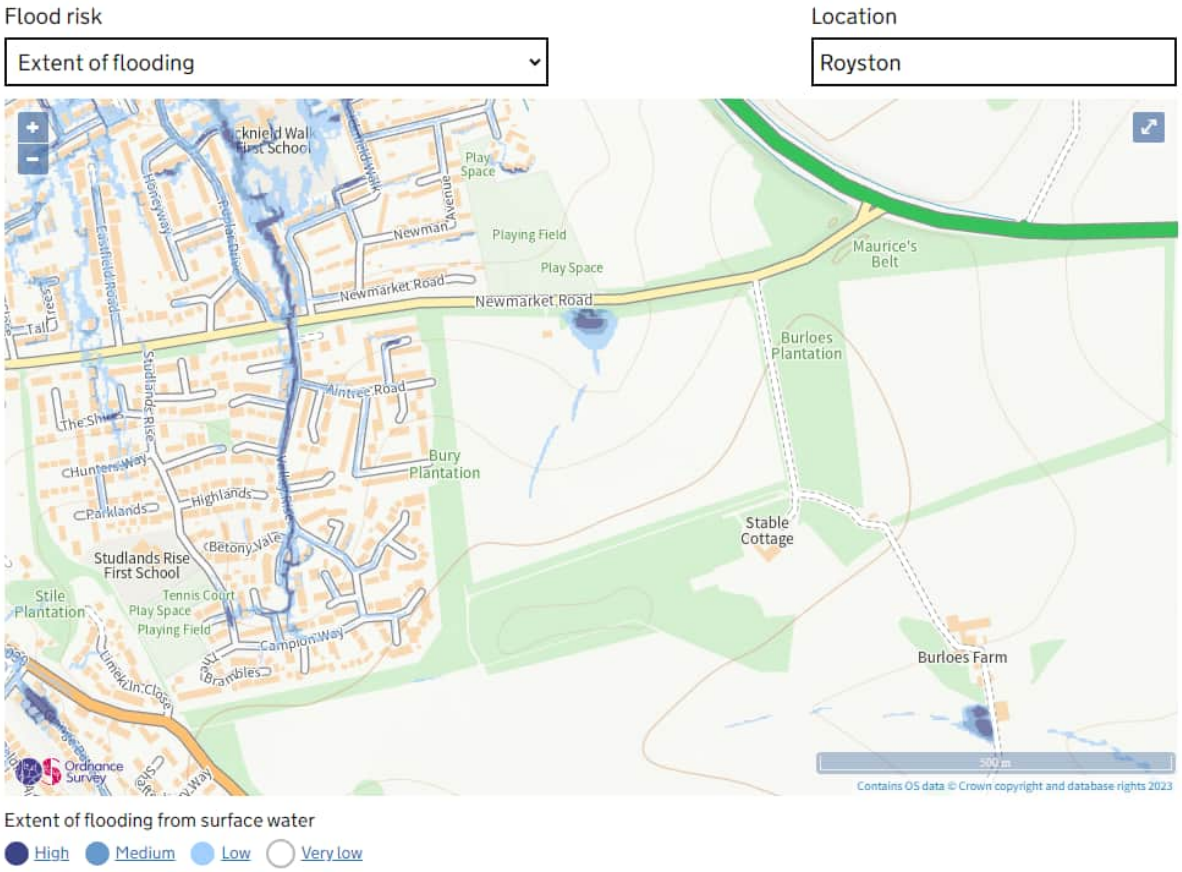
Although within flood-zone 1, consideration is also required of the flood risk presented from other potential sources such as overland water, groundwater, sewers and retained water features. The site has been assessed for these threats and the proposed levels and existing topography of the site, such that in the event of large storm events, surface water flows would not threaten life or property. A detailed list of the flood risks considered is as follows:

Groundwater: Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather: Ground Water flooding is not considered to be significant for this development due no ground water encountered in any boreholes conducted on site to a depth of 20m supported by local BGS archives suggest groundwater to be within the underlying Chalk Aquifer at approximately 53m below ground level.

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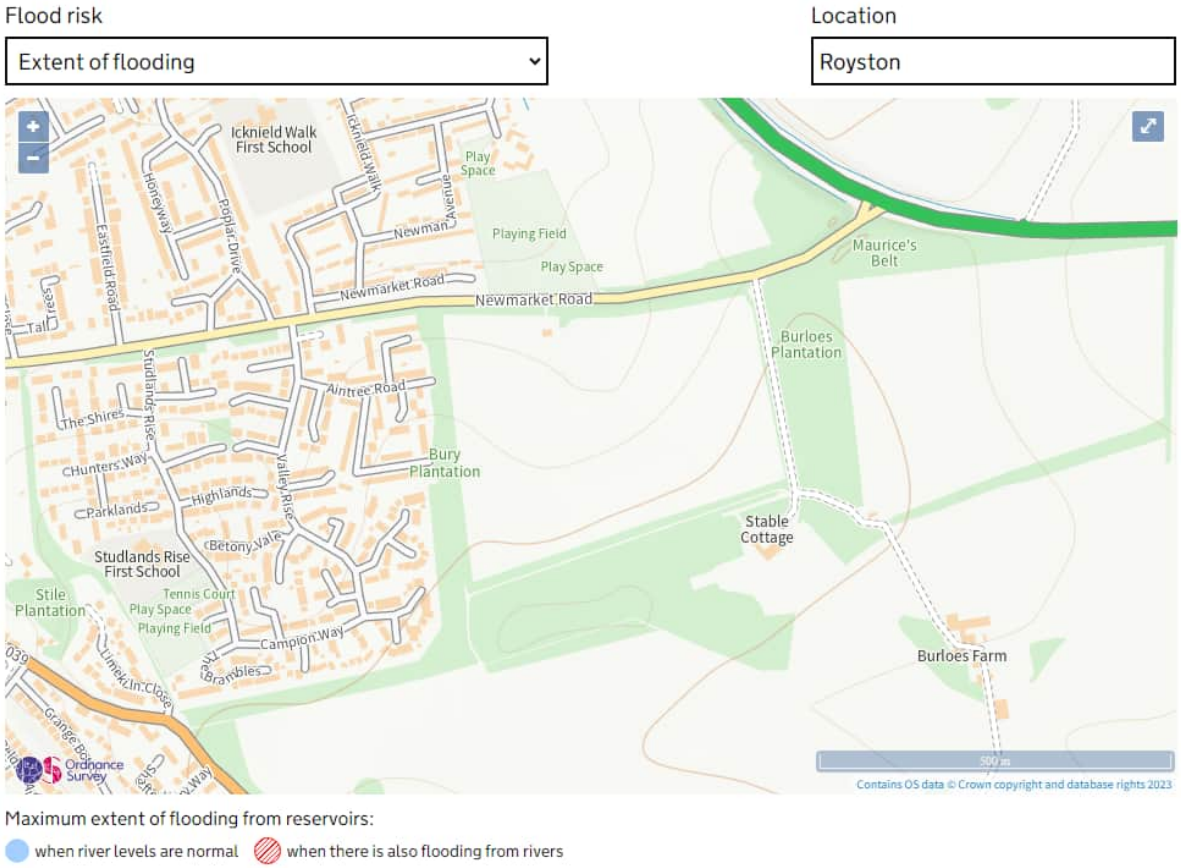
Sewers and highway drains: Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage: Should the proposed onsite sewers become blocked the proposed road levels and garden levels surrounding the buildings will be set lower than the proposed finished floor levels therefore ensuring that no threat to adjacent property.

Surface water: The net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered a drainage system: The below surface water mapping shows ponding at the low point of the site, where overland flows are naturally conveyed due to the steep topography and accumulate due to the road embankment on Newmarket Road whilst the water infiltrates the ground.



It is considered that the proposed development will manage and intercept the overland flows by attenuating up to 1in100year + 40% climate change and infiltrating at source via create soakaways, basins, swales, rain gardens and permeable paving sub-base, in addition a basin will be located at the low point and freeboard within the basin will provide an extra measure in capturing exceedance flows of over land flows therefore no risk from surface water flooding.

Infrastructure failure: canals, reservoirs, industrial processes, burst water mains or failed pumping stations': No infrastructure present to pose a threat as indicated on the mapping below.



Flood Storage

As above the 1% flood level, the proposed redevelopment is not considered to have any impact on existing floodplain storage.

Extreme Flood Events

Consideration is given to flood events over and above the 1in100yr event and exceedance flow routes detailed on exceedance flow route drawing (see Appendix) all flows will be directed away from properties with finished floor levels set to a minimum of 150mm above ground level, low spots will be design in the hard standing directed away from buildings, ponding will give prior warning if failure of the drainage system occurred.

The drainage strategy will detail all surface water run-off up to 1in100year storm plus 40% climate change will be contained in infiltration devices whilst it infiltrates the ground and although not used in design calculations there will be additional storage volume in the piped network, granular backfill of soakaways, freeboard in the basins and permeable paving, which can accommodate further run-off above the 1in100year storm plus 40% climate change.

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3. SURFACE AND FOUL WATER STRATEGY

Drainage and Site Analysis

From the trial pit and bore hole testing supplied by Geotechnical and Environmental Associates (see Appendix) the ground consists of made ground underlaid with New Pit Chalk Formation to maximum depth of 20m where the boreholes terminated. Infiltration testing has been conducted with soakage rates achieved ranging from 3.34 x 10^{-6} m/s to 5.15 x 10^{-4} m/s and shows the ground conditions exhibit good drainage characteristics with no ground water encountered, up to depths of 20m where the borehole terminated.

Following the hierarchy set out in NPPF the drainage strategy will be able to drain all surface water via infiltration mimicking the existing drainage regime for the site.

The NPPF states the hierarchy for discharge of surface water to be: -

1. Into the ground (infiltration)
2. To the surface water body
3. To the surface water sewer, highway drain, or another drainage system
4. To a combined sewer

As a current greenfield site there is presently 0m^2 of impermeable area, which post development will increase to approximately 56780m^2 with the existing drainage regime at present that surface water run-off infiltrates the ground, in line with the NPPF it is proposed to mimic this regime via the introduction of multiple SuDS infiltration devices.

There is an existing foul sewer on site taking flows from Burloes Hall draining to a septic tank in the southeast area of the site. As part of the development the septic tank will be removed and flows from Burloes Hall will be accepted by the new onsite foul gravity sewers.

Surface Water Strategy

The greenfield site is understood to presently drain entirely by infiltration. There is no evidence of any other form of surface water drainage near the site and the British Geological Society mapping and the ground investigation report indicates that the site is underlain by Chalk Formation.

In accordance with BRE 365, infiltration testing has been undertaken on site by Geotechnical and Environmental Associates. Results of the testing (see appendix) indicate that infiltration is reasonable to depths of 3.0m with results achieved between 3.34 x 10^{-6} m/s to 5.15 x 10^{-4} m/s (see appendix for trial pit locations). The report also confirms that a 10m offset is required for concentrated infiltration devices.

Therefore, infiltration devices such as infiltration basins, swales, filter strips, rain gardens and permeable pavement and crate soakaways are likely to form a solution to surface water drainage. The type of SuDS able to be used and their number may be limited due to the steep topography and requirement for 10m offsets. An evaluation of the types of SuDS features to used is detailed in the following table.

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SuDS Evaluation

Type of SuDS	Description	Assessment
Rainwater Harvesting	Rain gardens and water butts are considered a suitable type of harvesting system	Appropriate in this instance.
Green Roofs	Due to the roof pitches and greater loading, it is not considered a viable option for residential dwellings on this development. There is also a high maintenance requirement that would fall to the individual homeowners and therefore not sustainable.	Not appropriate in this instance.
Blue Roofs	Due to the higher structural loading and roof pitches, it is not considered a viable option for residential dwellings on this development. There is also a high maintenance requirement that would fall to the individual homeowners and therefore not sustainable.	Not appropriate in this instance.
Infiltration Basins	Due to the high permeability of the geology and that basins are an above ground SuDS feature these are a preferred method of discharge of surface water and will be incorporated into the development however the number may be limited due to the steep topography of the site resulting in a high land take and the geotechnical requirement of 10m offsets from buildings/structures.	Appropriate in this instance but limited in number.
Swales & Filter Strips	Swales and filter striped are both considered viable, however due to the topography incorporation site wide may be limited, in addition they will likely be required to be under-drained to ensure no exceedance.	Appropriate in this instance but limited in number.
Permeable paving	Permeable paving is considered one of the most appropriate methods for the development enabling source control, especially due to the 10m offset required for other methods of infiltration.	Appropriate in this instance across the site except for adoptable roads.
Infiltration Tanks	Whilst below ground SuDS are not a preferred option, the steep topography and requirement of 10m offsets is likely to limit the sites storage capacity and therefore these will be required.	Appropriate in this instance, however these are to be kept to a minimum as much as reasonably possible.
Proprietary Treatment Systems	Not expected to be required for the development.	

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The surface water strategy will be a combination of multiple infiltration methods, where roof areas will drain to basins, swales and filter strips and crate soakaways. Adoptable roads will drain to swales in the first instance, discharging to a piped network, subsequently conveying to a detention basin and infiltration crates below the basins. Private roads will mostly drain via permeable paving, but filter strips/swales will be used where the site topography allows.

The appended preliminary drainage strategy drawings (see appendix) illustrate how the required attenuation may be located within the development, which will be designed for a 1 in 100-year event plus a 40% allowance for climate change and an additional 10% for consideration of urban creep.

The strategy is therefore considered to provide a robust solution to surface water drainage for the proposed development with all water contained in such a way as to pose no threat to life or property. The proposed system can accommodate surface water from events up to and including the 1 in 100-year event plus a 40%, as per appended example calculations.

Phase 1 Surface Water Strategy

Phase 1 is approximately 5.9 ha in size of which 2.15ha will be impermeable and consist of adoptable roads, houses and private roads and parking. The remaining roads and parking will be permeable paving to drain via infiltration, roof areas will be conveyed to infiltration devices, namely a crate infiltration system in the northwest corner of the site, a basin located centrally with a crate system beneath, two further basins are located in the south of the phase and in addition a further basin will be located in the northeast corner of phase 1 with a crate system beneath.

The crate infiltration systems will be encased in a hydrocarbon wrap to provide additional treatment to the surface run-off prior to gradually release to the ground.

Access to the development will be from Newmarket Road via a new adoptable road to include a bus turning loop. The main road will drain to infiltration swales that will include rain gardens (subject to highway approval).

Drainage strategy drawings are appended in this report detailing how all surface water run-off is managed and construction details of all SuDS features and hydraulic calculations detailing for a 1 in 100-year event plus a 40% allowance for climate change and an additional 10% for consideration of urban creep.

Foul Water Strategy

An Anglian Water pre-development report has been prepared for the site reference 00005820 dated March 2015. The report confirms that the foul drainage from the proposed development is in the catchment of Royston Water Recycling Centre. At the time of the report the recycling centre had capacity to accept flows from the development but due to the time that has elapsed an updated predevelopment report will be required to confirm this is still the case.

The foul water will drain via a new adoptable gravity sewer network with final connection to an existing Anglia Water manhole 5801 off Newmarket Road at National grid reference (NGR) TL36564082.

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4. CONCLUSIONS AND RECOMMENDATIONS

The proposed new residential development has been assessed for the risk to the site from fluvial flooding in accordance with the guidelines of the NPPF. Assessment has also been made of the impact of the proposed development on the existing floodplain storage at this location, and of the risk of pluvial flooding from storm water contribution from the development exacerbating downstream flooding, as directed by the guidance.

The site has been found to lie within Flood Zone 1 and is therefore not considered to be at risk from fluvial flooding. Other sources of flooding have similarly been assessed and found to pose no threat to development on the site.

The proposals do not affect flood storage within the floodplain and the peak surface water runoff rate leaving the site will be captured via crate infiltration and attenuation system and therefore surface water drainage from the site will mimic the existing drainage regime.

The discharge of future surface water runoff from the site will not be increased as a result of the development but will provide a betterment in peak flows discharging from site, by attenuating and slowing the rate at which it infiltrates the ground by the use of infiltration devices.

It is considered from this assessment that the level of risk of flooding to and from the proposed development is of an acceptable level and in keeping with current policy.

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5. SUDS DESIGN AND MANAGEMENT

Water Quality, Amenity and Biodiversity

The approach to Sustainable Drainage Systems (SuDS) is to control water quantity, water quality, amenity, and biodiversity by incorporating multiple SuDS features into a drainage design and producing a management train it is possible to achieve enhancements in all areas.

All private hard standing is to be permeable paving to collect and clean surface run-off, with the addition of Catch pit manholes and trapped gullies to provide a pre-treatment stage for surface water run-off.

These combined measures produce a management train, which facilitates the capture, conveyance, and storage of surface water run-off, while delivering interception and pollution risk management.

The use of SUDS is proposed within the surface water drainage strategy for the proposed development of 325 new residential dwellings by Vistry Homes, in order to serve several functions:

- Control of runoff water rates and volumes, thereby reducing downstream flood risk
- Reducing pollutant concentrations and act as a buffer for accidental spills to improve runoff water quality.

The range of SUDs is described in this document and the recommended maintenance regimes to be applied to each feature and who it is envisaged will be responsible for implementing the maintenance.

SuDS Features and Maintenance Responsibilities

The proposed SuDS are as follows:

- **Permeable Paving** will be provided to the majority of private hardstanding where swales and filter strips are not viable, maintenance will be carried out by the onsite management company.
- **Detention/Infiltration Basins** – will be located in openspace areas where the required 10m offset is achievable and maintenance will be by the adopting water authority.
- **Soakaways** – will be located where the required 10m offset is achievable, maintenance will be carried out by the onsite management company or water auority if adoption is possible.
- **Rain Gardens** – Will be provide across the site, maintenance will be carried out by the onsite management company.
- **Swales** – will be located alongside adoptable roads to be maintained by the highway authority and private drives where possible, with maintenance falling to the onsite management company.
- **Under drained Filter Strip** – will be located by private drives where possible, with maintenance falling to the onsite management company.

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Maintenance of SuDS

Infiltration/Detention Basins

Infiltration Basins are flat bottomed, shallow landscaped depresions that store runoff allowing pollutants to settle and filter out before infiltration into the subsurface soils

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

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Pervious Pavements

Pervious pavements including permeable block paving, porous asphalt or gravel and allow rain to percolate through the surface into underlying drainage layers. They should be protected from silt, sand, compost, mulch etc. Permeable block paving and porous asphalt can be cleaned by suction brushing

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

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Soakaways

Soakaways are excavations that are filled with a void-forming material that allows the temporary sotorage of water before it soaks into the ground. They promote infiltration as an effective means of controlling and reducing run-off whilst supporting ground water recharge

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

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Swales

Swales are shallow, flat bottomed, vegetated and open channels designed to convey, treat and often attenuate surface water runoff. When incorporated into site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

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Filter Strips

Filter strips are uniformly graded and gently sloping strips of grass or other dense vegetation that are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration and infiltration (where acceptable).

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

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Filter Drains

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

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Rainwater Harvesting

Rainwater harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial, industrial and/or institutional properties.

- They can meet some of the building's water demand, delivering sustainability and climate resilience benefits.
- They can help reduce the volume of runoff from a site.
- They can help reduce the volume of attenuation storage required on the site.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

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Bioretention Systems

Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering Interception and can also provide:

- attractive landscape features that are self-irrigating and fertilising
- habitat and biodiversity
- cooling of the local microclimate due to evapotranspiration.

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

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Trees

Trees and their planting structures provide benefits to surface water management in the following ways:

- **Transpiration** – This is the process by which water, taken in from the soil by tree roots, is evaporated through the pores or stomata on the surface of leaves (Nisbet,

  2005). Trees draw large quantities of water from the soil, which can contribute to reducing runoff volumes (**Box 19.1**).

- **Interception** – Leaves, branches and trunk surfaces intercept (store and allow the water to evaporate) and absorb rainfall, reducing the amount of water that reaches the ground, delaying the onset and reducing the volume of runoff (**Box 19.1**).

- **Increased infiltration** – Root growth and decomposition increase soil infiltration capacity and rate, reducing runoff volumes.

- **Phytoremediation** – In the process of drawing water from the soil, trees also take up trace amounts of harmful chemicals, including metals, organic compounds, fuels and solvents that are present in the soil. Inside the tree, these chemicals can be transformed into less harmful substances, used as nutrients and/or stored in roots, stems and leaves.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

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SuDS Mitigation

To deliver adequate treatment, SuDS components should have a total pollution mitigation index for each contamination type that is greater than or equal to the pollution hazard index as detailed in the following tables from CIRIA SuDS Manual (C753) 2016

As the proposed development is for residential properties with associated roads and infrastructure the pollution hazard indices are taken from the below table from with the areas relevant highlighted.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

These index figures are compared to the SuDS mitigation for discharge to surface water, as detailed earlier in this report the surface water strategy is to have an infiltration basin, swale, filter strips and permeable paving, therefore the SuDS mitigation is as highlighted below. A factor of 0.5 is used for subsequent features for the reduced performance of secondary components.

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TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.8[4]	0.8	0.8
Proprietary treatment systems[5, 6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

As the Total SuDS mitigation index is greater the pollution hazard index for each component the SuDS mitigation is met inline with CIRIA SuDS Manual (C753) 2016

Management of surface water during construction

The requirement for management of surface water during construction will be highlighted to contractors at all stages of construction. Specific issues to be addressed and the methods that might be used are all detailed in the following chapter **Construction Surface Water Management Plan**.

The following chapter should be used as guidance for contractors at tender stage and they will be expected to produce method statements responding to their Plan and include allowance within their pricing to implement the agreed method statements.

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6. CONSTRUCTION SURFACE WATER MANAGEMENT PLAN

The construction of SuDS usually only requires the use of standard civil engineering and landscaping operations such as excavation, filling, grading, pipe-laying, chamber construction, topsoiling, seeding and planting. There are some specific process and programming considerations required for their application to SuDS construction, and these will be considered when programming the residential development.

The intention is to issue this Construction Surface Water Management Plan to the appointed builder with the requirement for method statements (MS) addressing the issues raised to be submitted for review by the Engineer. Only once the Engineer is satisfied that that all related items have been satisfied by the MS will works commence.

The construction surface water will therefore be managed in this way by this plan.

General construction issues relating to SuDS.

Programming

The programming of SuDS construction needs to be considered at all stages of the site construction process. Subsurface piped drainage networks are usually one of the first facilities to be constructed on a site. For SuDS, although the form of the drainage will be constructed during the earthworks phase, the final construction should not take place until the end of the development programme, unless adequate provision is made to remove any silt that is deposited during construction operations and to refurbish any areas that have been subject to over-compaction.

Method statements and pre-construction site planning operations will form an essential part of pre-construction activities to ensure successful completion of the SuDS.

The construction of swales, basins and ponds at an early stage in the construction can assist in managing runoff and help settle out the high volumes of sediments created during construction. However, complete reinstatement of these components will be required once construction is finished. The contract is likely to stipulate establishment of vegetation and sediment removal sometime after site works have been completed and before the start of the maintenance period.

Pollution and sediment control

Runoff from a construction site should not be allowed to enter SuDS or flow off site unless it has been allowed for in the design and specification. Construction runoff is heavily laden with sediment, which can build up in storage systems and pollute receiving waters.

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Skills

The contractor and all relevant operatives should have a general understanding of how SuDS work, and the purpose of the specific SuDS components being used on a site, to ensure that appropriate construction practice and component protection is used. "Toolbox Talks" for workers are a particularly effective way of increasing awareness of appropriate construction of SuDS.

Landscaping

Good landscape construction practices are fundamental to SuDS construction. As SuDS are normally surface systems, attention to detail and aesthetics should be given a high priority. The seasonal and physical requirements of planting and the requirements for establishing vegetation and preventing soil erosion should be given careful consideration. Appropriately skilled and experienced operatives are required with an understanding of all aspects of vegetation establishment. Adjacent ground levels to components should be designed to prevent any overland sediment wash-off during high intensity rainfall events, or groundwater seepage during particularly wet periods. Settlement of soils should be taken into consideration.

At Newmarket Road, Royston, the earthworks will be carried out with awareness of the final planned landscaping and be sensitive to it.

Erosion control

Before runoff is allowed to flow through vegetated SuDs, they should be fully stabilised by planting or temporary erosion protection. This will prevent erosion of the sides and base or the clogging of downstream components.

Construction programming for SuDS

Effective construction programming for SuDS is very important to:

Protect the receiving environment from runoff during construction.

Protect each SuDS component from damage during construction.

Protect the natural infiltration characteristics of the site soils and subsoils.

Deliver a surface water management system where runoff is conveyed and stored, as designed, without causing unacceptable erosion, channelling or sedimentation.

Promote the healthy establishment of required vegetation and habitats.

The following issues will be considered in developing the construction programme:

Sediment basins and traps should be installed before any major site earthworks/groundworks take place. Further sediment traps and silt fences should be installed as earthworks/groundworks progress, to keep sediment contained on site at appropriate locations.

Runoff control measures should be used in conjunction with sediment traps to divert water around planned earthworks areas and to remove silt. Surface water runoff from upstream should be diverted around areas to be disturbed before any earthworks/groundwork's operations. Any perimeter drains

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should be installed with stable outfalls before opening major areas up for development. Any additional facilities needed for runoff control should be installed as earthworks/groundworks take place.

The main runoff conveyance system with inlet and outlet protection measures is often installed early and used to convey surface water runoff through the development site without creating gullies or channels. Inlet protection for surface water drains should be installed as soon as the drain is functional, to trap sediment on site in shallow pools and to allow flood flows to safely enter the surface water drainage system. Outlet protection should be installed at the same time as the conveyance system to prevent damage to the receiving water body.

Clearing and earthworks/groundworks should only be started when adequate erosion and sediment control measures are in place. Once a development area is cleared, earthworks should follow immediately, so that protective ground cover can be re-established quickly. Areas should not be left bare and exposed for extended periods. Adjoining areas planned for development or those that are to be used for borrowing and disposal should be left undisturbed as long as possible, to serve as natural buffer zones. Runoff control is essential during the earthworks/groundwork's periods. Temporary diversions, slope drains, and inlet and outlet protection installed in a timely manner can be very effective in controlling erosion during this critical period of development.

Surface stabilisation measures should be applied to completed areas, channels, ditches and other disturbed areas after the land is cleared and profiled. Any disturbed area where active construction will not take place for more than 60 working days should be stabilised by temporary seeding and/or mulching or by other suitable means. Permanent stabilisation measures should be installed as soon as possible after final profiling. Temporary seeding and/or mulching may be necessary during extreme weather conditions, with permanent vegetation measures delayed until a more suitable installation time.

Sediment Control

Principles of sediment control

During a rainfall event, runoff normally builds up rapidly to a peak and then diminishes. Because the amount of sediment conveyed in runoff is dependent upon the velocity and volume of that runoff, sediment tends to be deposited as runoff rates decrease. The deposited sediments may be re-suspended with subsequent runoff – in this way, sediments are moved progressively downstream.

Sediment control techniques

Sediment controls used during construction include straw bale barriers, geotextile silt fences and sediment basins. All runoff leaving a disturbed area should pass through a sediment control system before it exists the site and is conveyed downstream.

Straw bales can be placed at the base of a slope to act as a sediment barrier. Straw bales are temporary in nature and may only perform for a period of weeks or months. Proper installation and maintenance is necessary to ensure their performance.

Pollution Control

Pollution prevention

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The main requirements are to control pollution loads from surface water runoff and pumped water from construction sites to ensure that risks to the environment are minimised. The safe storage of materials and fuels is also important so that if spills occur, they are contained (using berms, check ditches or other containment techniques) and do not cause mix with runoff and thus increase pollution risks.

Before mobilisation, the construction site layout should be planned to fully consider issues such as the location of stockpiles, fuel stores, storage areas, waste disposal, refuelling points and wash down areas. These should be in areas where they are least likely to affect receiving water bodies (including groundwater). Planning should also address subjects such as the diversion of watercourses, prevention of upstream runoff entering the site and the design of haul roads, including the use of road bridges over watercourses to stop vehicles fording streams and rivers.

An environmental pollution protection plan should also be put in place. The plan should include:

Location of foul drainage disposal routes

Location of surface water systems that discharge into watercourses.

Requirements for discharge and abstraction licences

Location of spillage kits

An action plan in the event of an environmental incident (including a list of relevant telephone contact numbers)

Construction pollution sources and controls

Sediment

Sediment is one of the major sources of construction site pollution. The following list indicates several sources and the measures that can be taken to help prevent pollution:

Excavated ground and exposed ground – The effect of having no vegetation and being recently disturbed allows for relatively low velocity runoff to erode the surface. To help prevent the pollution from entering a watercourse, silt fences, hay bales or stilling ponds should be placed downstream. To limit the volume of runoff reaching the exposed ground, runoff diversion or interception devices should be placed upstream.

Stockpiles – The effects of erosion on a stockpile will depend on the type of material being stored. Fine sand and topsoil stockpiles will be eroded far more readily than heavy granular materials. Stockpiles should be located away from a watercourse on site drainage system. Protective coverings will help prevent runoff stripping the stockpile.

Plant and wheel washing – Plant and wheel washing should take place in designated locations. The area should be tanked and should not be allowed to discharge into a watercourse or infiltrate groundwater, as the wastewater from these devices is highly contaminated with silts, sands and hydrocarbons. Some proprietary vehicle washing systems offer a recycling facility, which filters and settles solids, with the effluent being pumped back into the system. The solid waste materials from this proce3ss needs to be treated as contaminated waste due to the high hydrocarbon content.

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Haul roads – the runoff from haul roads can contain many suspended solids as well as hydrocarbons. Haul roads should be designed so that the length is kept to a minimum, while still serving its purpose. The gradient should be shallow to prevent increasing runoff velocity and, if possible, bunds and/or discrete ditches should be constructed to intercept the runoff. Haul roads should be sprayed regularly to keep down dust. If any section of a haul road is hard surfaced, then it should be swept on a regular basis to prevent the accumulation of dust and mud.

Disturbance of riverbeds or banks – Excavation of riverbanks or beds can generate silty water, as the excavated and exposed material is washed downstream. The amount of such excavation needs to be limited and, if undertaken, the water area downstream needs to be protected by booms.

De-watering operations – Groundwater discharge due to excavation activity is likely to be heavily polluted with suspended solids and should not be discharged directly directly into a watercourse. To help reduce the number of suspended solids within the runoff several techniques can be adopted:

Passing the discharge water over a grass area, but the discharge velocity must be monitored and kept sufficiently low to promote settlement.

Passing the discharge water through a temporary gravel strip.

Controlled use of skips and/or tanks to act as stilling basins.

Controlled use of stilling ponds.

Oils and hydrocarbons

The use of oils and hydrocarbons on construction sites creates an inherent risk of leakages and spillages, which could potentially lead to pollution incidents.

Simple measures can be taken to prevent oil and hydrocarbons becoming entrained in surface runoff, such as:

Appropriate maintenance of machinery and plant.

Drip trays.

Regular checking of machinery and plant for oil leaks.

Correct storage facilities.

Checking for signs of wear and tear on tanks.

Care with specific procedures when refuelling.

Designated areas for refuelling.

Emergency spill kit located near refuelling area.

Regular emptying of bunds.

Tanks located in secure areas to stop vandalism.

Booms installed on watercourses.

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7. APPENDIX A – DRAINAGE STRATEGY DRAWINGS – OUTLINE PERMISSION

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NEWMARKET ROAD

INFILTRATION TANK - 1.2M DEEP, 92.5M X 5.0M
DESIGNED FOR 1N100y+40%CC+10%UC
INFILTRATION RATE 7.6x10-5m/s (0.27360m/hr)
IMPERMEABLE AREA 0.509HA
TOP OF TANK, m
BASE OF TANK, m
HALF DRAIN 1N30 YEAR 100 MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

DETENTION BASIN 1 & INFILTRATION TANK BENEATH
DESIGNED FOR 1N100YR+40%CC+10%UC
INFILTRATION RATE 3.1x10-4m/s (1.116m/hr)
IMPERMEABLE AREA 2.143HA
BASIN
SIDE SLOPES, MAX 1:3
TOP OF BANK, 75.000m (AREA 1460m²)
1in100yr LEVEL, 74.696m
BASE INVERT LEVEL, 74.400m (AREA 1179m²)
INFILTRATION TANK
0.8M DEEP, 899M²
TOP OF TANK 73.400M
1IN30YR LEVEL, 72.982M
1IN2YR LEVEL, 72.731M
BASE OF TANK, 72.200M
HALF DRAIN 1IN30 YEAR 28 MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

Burloes Cottages

DETENTION BASIN 2 & INFILTRATION TANK BENEATH
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE -1.0x10-4m/s (0.432m/hr)
IMPERMEABLE AREA 0.345HA
BASIN
SIDE SLOPES, MAX 1:3
TOP OF BANK, 83.400m (AREA 951m²)
1in100yr LEVEL, 83.143m
BASE INVERT LEVEL, 82.940m (AREA 601m²)
INFILTRATION TANK
0.8M DEEP, 438.5M²
TOP OF TANK, 82.200M
1IN30YR LEVEL, 82.440M
1IN2YR LEVEL, 81.678M
BASE OF TANK, 81.400M
HALF DRAIN 1IN30 YEAR 250MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

CASCADING INFILTRATION BASIN 3
ACCEPTING ROOF AREA ONLY
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 1.44x10-4m/s (0.54m/hr)
IMPERMEABLE AREA 0.046HA
SIDE SLOPES, MAX 1:3
TOP OF BANK, 95.700m (AREA 162m²)
1in100yr LEVEL, 95.433m
BASE INVERT LEVEL, 95.100m (AREA 26m²)
HALF DRAIN 1IN30 YEAR 59 MINS

INFILTRATION BASIN 4
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 9.9x10-6m/s (0.03564m/hr)
IMPERMEABLE AREA 0.050HA
SIDE SLOPES, MAX 1:3
TOP OF BANK, 97.000m (AREA 264m²)
1in100yr LEVEL, 96.641m
BASE INVERT LEVEL, 96.400m (AREA 160m²)
HALF DRAIN 1IN30 YEAR 788 MINS

INFILTRATION BASIN 5
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 9.9x10-6m/s (0.03564m/hr)
IMPERMEABLE AREA 0.060HA
SIDE SLOPES, MAX 1:3
TOP OF BANK, 96.500m (AREA 260m²)
1in100yr LEVEL, 96.197m
BASE INVERT LEVEL, 95.900m (AREA 155m²)
HALF DRAIN 1IN30 YEAR 789 MINS

FOUL WATER TO DISCHARGE TO EXISTING ANGLIAN WATER FOUL MANHOLE FW5801 AS PER APPROVED AGREEMENTS SEWER RECKONING NPS-0126147 AND S104 NGA-0118387

INFILTRATION TANK - 1.2M DEEP, 92.5M X 5.0M
DESIGNED FOR 1IN100y+40%CC+10%UC
INFILTRATION RATE 7.6x10-5m/s (0.27360m/hr)
IMPERMEABLE AREA 0.509HA
TOP OF TANK, m
BASE OF TANK, m
HALF DRAIN 1IN30 YEAR 100 MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

INFORMAL STREET
LEAP
BUS SHELTER
Bury Plantation
Track
Stable Cottage
El Sub Sta
NEWMARKET ROAD

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1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED. ANY DISCREPANCIES ARE TO BE RECORDED AND REPORTED TO THE ENGINEERS IMMEDIATELY.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERS AND ARCHITECTS DRAWINGS AND THE SPECIFICATION.

3. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.

NOTES
1. AN ALLOWANCE OF 10% HAS BEEN ADDED TO IMPERMEABLE ROOF AREAS FOR THE CONSIDERATION OF URBAN CREEP.

2. THE SURFACE WATER NETWORK HAS BEEN DESIGNED TO ACCOMMODATE A 1IN100YR STORM EVENT TO INCLUDE 40% CLIMATE CHANGE.

3. ALL ADOPTABLE SURFACE WATER SEWERS WITHIN ADOPTABLE HIGHWAYS ARE TO BE A MINIMUM OF 225MM.

4. ALL SEWER WORKS FOR THE WATER AUTHORITY ARE TO BE IN ACCORDANCE WITH "SEWERAGE SECTOR GUIDANCE APPENDIX C" DESIGN AND CONSTRUCTION GUIDANCE VERSION 1.0 25TH OCTOBER 2019 AND ANY ADDENDUM THEREAFTER.

5. ALL PRIVATE CONNECTIONS TO ADOPTABLE SEWERS, SHOULD BE A MINIMUM OF 100MM DIAMETER (FOUL) & 150MM DIAMETER (SURFACE) MADE IN VITRIFIED CLAY CONNECTING SOFFIT TO SOFFIT.

6. THIS DRAWING IS FOR INTENDED FOR STRATEGY PURPOSES ONLY TO ASSIST AND INFORM IN OUTLINING THE INITIAL CONCEPTS AND FEASIBILITY OF THE SCHEME, ANY DETAILS OR INFORMATION ON THIS DRAWING ARE SUBJECT TO CHANGE.

SOAKAWAYS
1. THE PROPOSED SOAKAWAYS HAVE BEEN DESIGNED FOR A 1IN100 YEAR STORM PLUS 40% CLIMATE CHANGE.

2. THE PROPOSED SOAKAWAYS MUST BE LOCATED AT LEAST 10M AWAY FROM ANY BUILDING OR STRUCTURE & 5M AWAY FROM ADOPTED HIGHWAY.

3. ALL INFILTRATION DEVICES ARE DESIGN TO HALF DRAIN A 1IN30 YEAR STORM PLUS 35% CLIMATE CHANGE.

4. INFILTRATION DEVICES MUST BE PLACED WITHIN PERMEABLE STRATA.

DRAINAGE STRATEGY KEY

- SITE BOUNDARY- RED
- PRIVATE ROOFS AREA 21711m²
- PRIVATE HARDSTANDING AREA 1363m²
- PRIVATE INFILTRATION PERMEABLE PAVING AREA 15811m²
- ADOPTABLE STANDARD ROADS & FOOTWAYS AREA 14687m²
- ADOPTABLE STANDARD INFILTRATION PERMEABLE PAVING AREA 8781m²
- DRAINAGE EASEMENT
- ADOPTABLE SURFACE WATER - BLUE — Ø% 1.001 225/167
- ADOPTABLE FOUL WATER - BROWN — Ø% 1.001 150/100
- PRIVATE SURFACE
- ELECTRICITY EASEMENT

Rev	Revision Notes	Dwn	Rpvd	Date
E	REVISED TO NEW ARCH LAYOUT 15.07.25	JLM	KK	21.07.25
D	REVISED TO NEW ARCH LAYOUT 20.05.25	KM	KK	28.05.25
C	REVISED TO NEW ARCH LAYOUT 28.03.25	KM	KK	03.04.25
B	REVISED TO CLIENT COMMENTS 25.02.25	KM	KK	03.03.25
A	REVISED TO NEW ARCH LAYOUT 31.01.25	KM	KK	27.02.25

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smas worksafe consultant www.smasltd.com | SSIP | CQMS Safety Scheme

STRATEGY

Project:
NEWMARKET ROAD, ROYSTON
HERTFORDSHIRE

Drawing Title:
DRAINAGE STRATEGY

Client:		Date:
VISTRY HOMES		MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW

Scale: 1:500 (0m, 10m, 20m, 30m)

Project No: 2307-831 | Drawing No & Revision: ST001E | Size: A0

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NOTES
1. THE EXCEEDEDENCE FLOW ROUTES SHOWN ON THIS DRAWING DETAIL THE EXPECTED SURFACE WATER RUN-OFF FROM ANY PROPOSED IMPERMEABLE AREAS THAT ARE ABOVE THE DESIGN STORM DURATION AND INTENSITY.

EXCEEDENCE ROUTE KEY

SITE BOUNDARY - RED	
EXCEEDENCE FLOW ROUTE	

B

Rev	Revision Notes	Dwn	Rpvd	Date
D	REVISED TO NEW ARCHITECT LAYOUT 21.07.25	JL	KK	21.07.25
C	REVISED TO NEW ARCH LAYOUT 20.05.25	KM	KK	27.05.25
B	REVISED TO NEW ARCH LAYOUT 28.03.25	KM	KK	01.04.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	KM	KK	18.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON
HERTFORDSHIRE

Drawing Title:
EXCEEDENCE FLOW

Client:			Date:
VISTRY HOMES			MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW

Scale: 1:500 (10m 0m 10m 20m 30m)

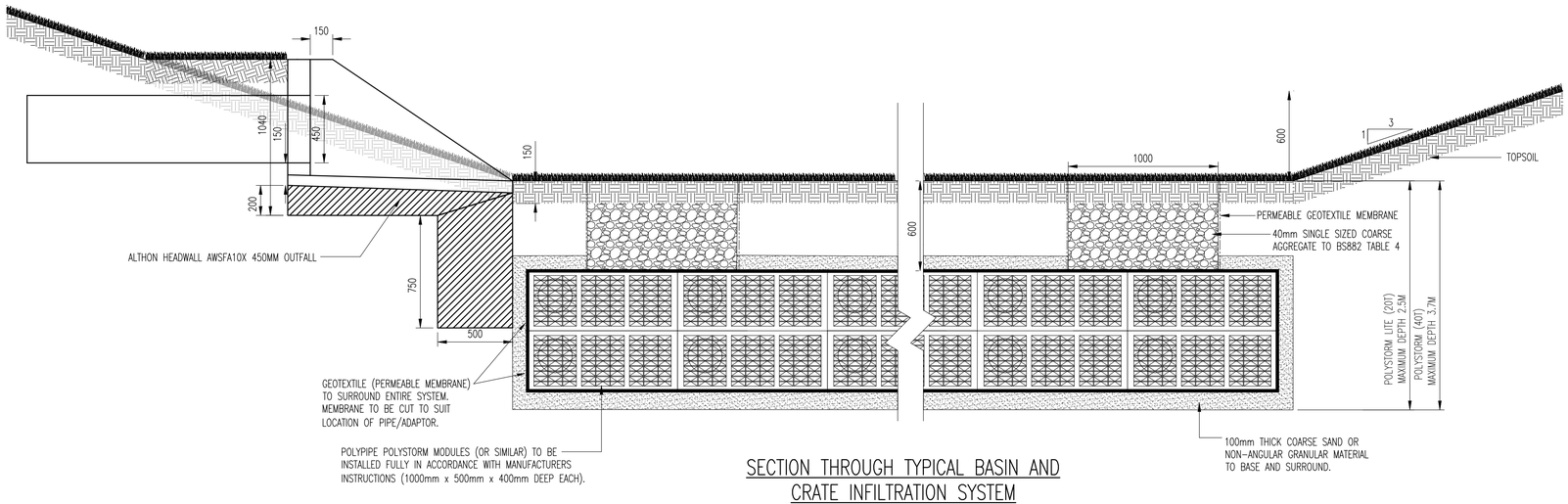
Project No:	Drawing No & Revision:	Size:
2307-831	ST002D	A0

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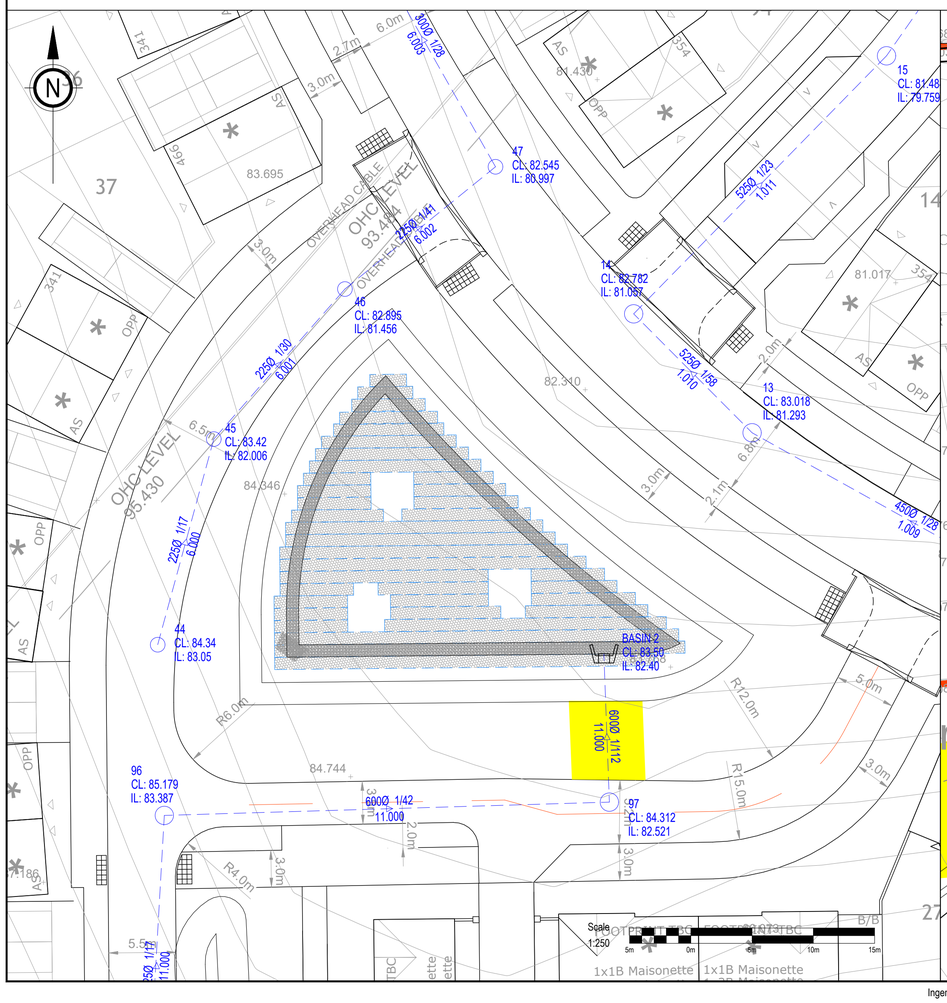
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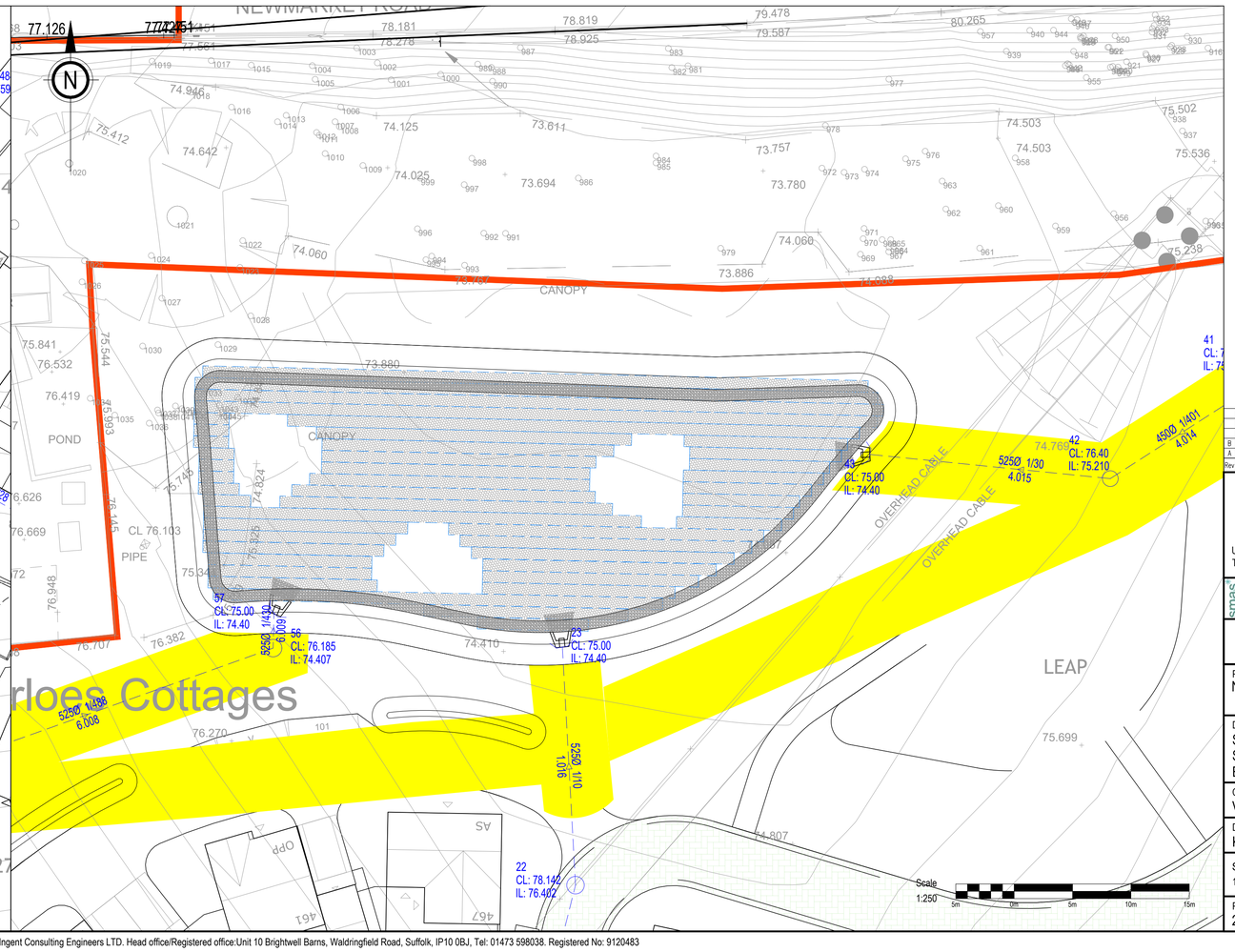
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SECTION THROUGH TYPICAL BASIN AND CRATE INFILTRATION SYSTEM





Rev	Revision Notes	Dwn	Apvd	Date
B	REVISED TO NEW ARCH LAYOUT 17.03.25	KM	KK	19.03.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	SJM	KK	21.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON

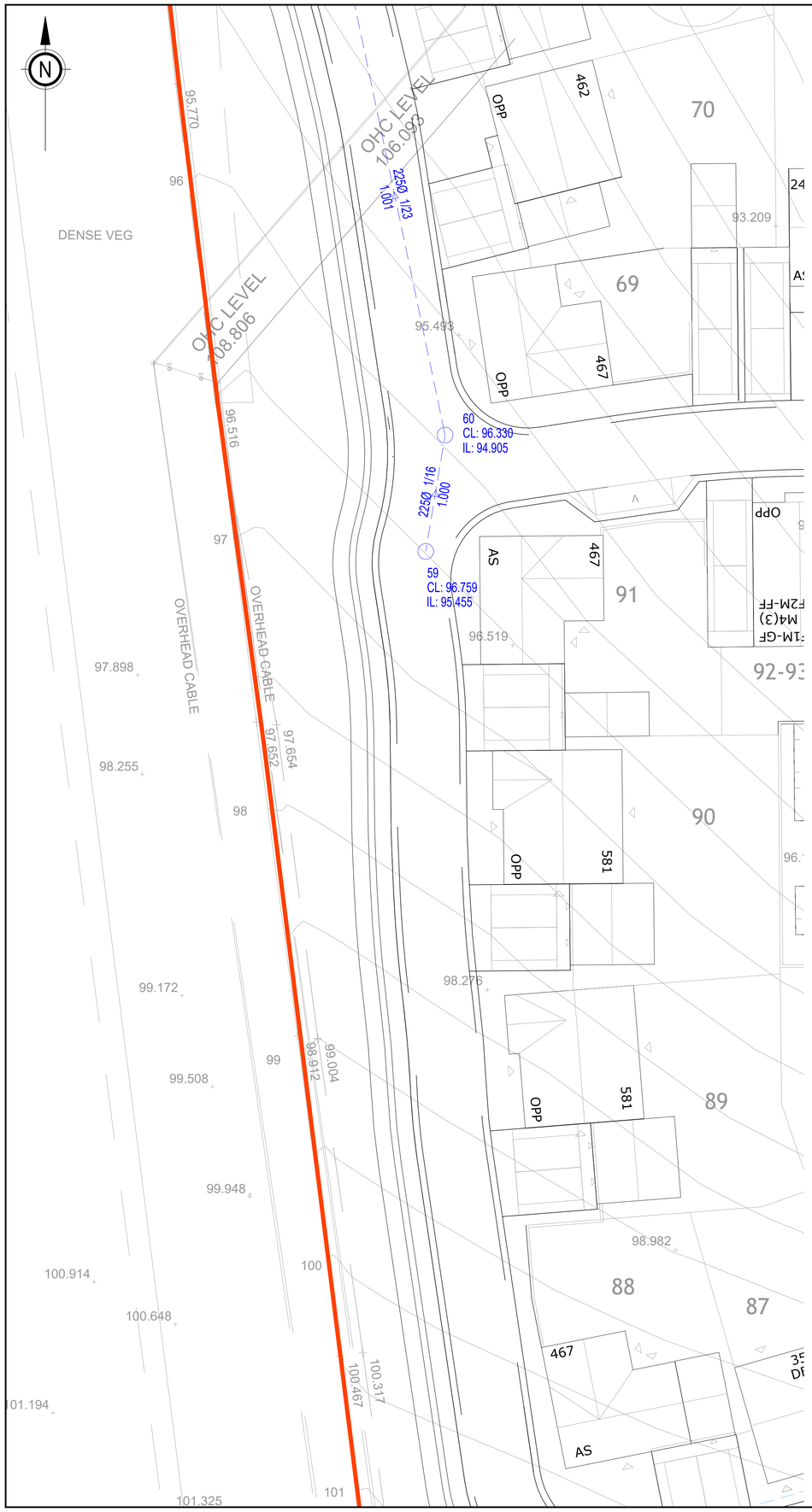
Drawing Title:
SUDS CONSTRUCTION DETAIL
SHEET 1 OF 2
BASINS

Client:			Date:
VISTRY			FEB 2025
Drawn: KM	Designed: KM	Checked: KK	Approved: KK

Scale: 1:20 (0.5m 0 0.5m 1m)

Project No:	Drawing No & Revision:	Size:
2307-831	ST003B	A1

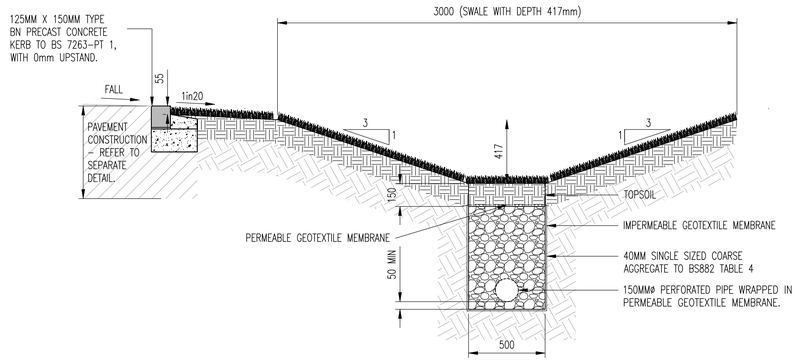
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CROSS-SECTION THROUGH UNDER-DRAINED SWALE
SCALE 1:20

Rev	Revision Notes	Dwn	Apvd	Date
B	REVISED TO NEW ARCH LAYOUT 17.03.25	KM	KK	19.03.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	SJM	KK	21.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON

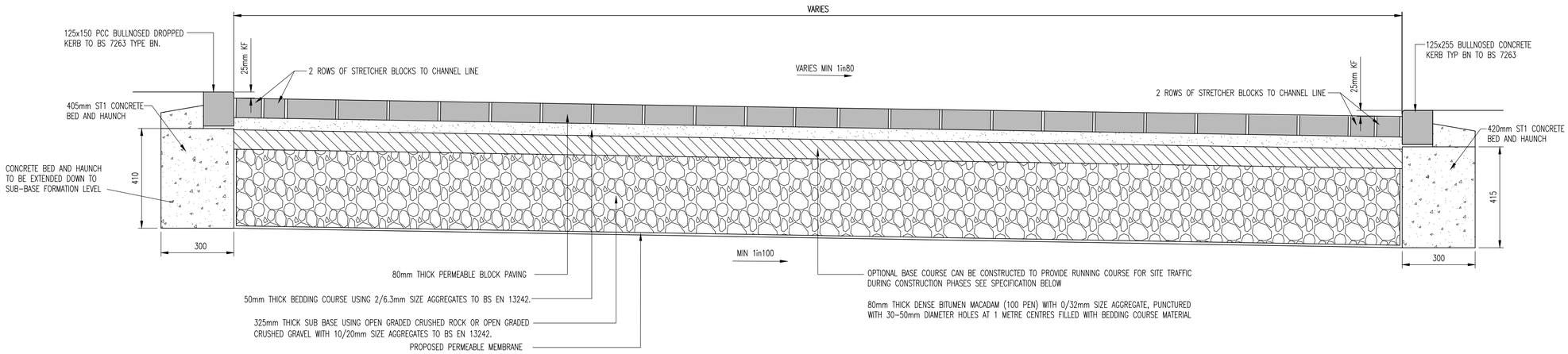
Drawing Title:
SWALE CONSTRUCTION DETAIL
SHEET 1 OF 2
SWALE

Client:			Date:
VISTRY			MAR 2024
Drawn: KM	Designed: KM	Checked: KK	Approved: KK

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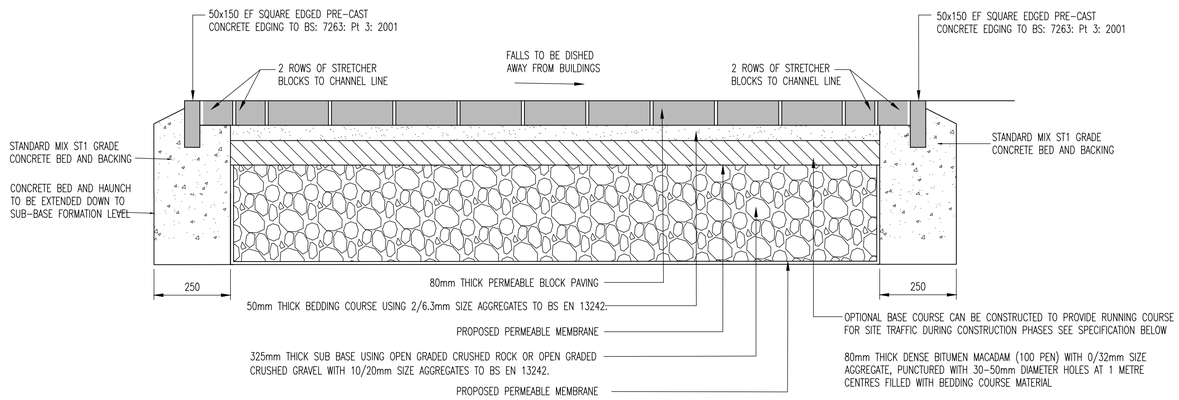
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2307-831	ST004B	A1

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PERMEABLE PAVING PRIVATE SHARED DRIVE/CARPAKING CONSTRUCTION DETAIL

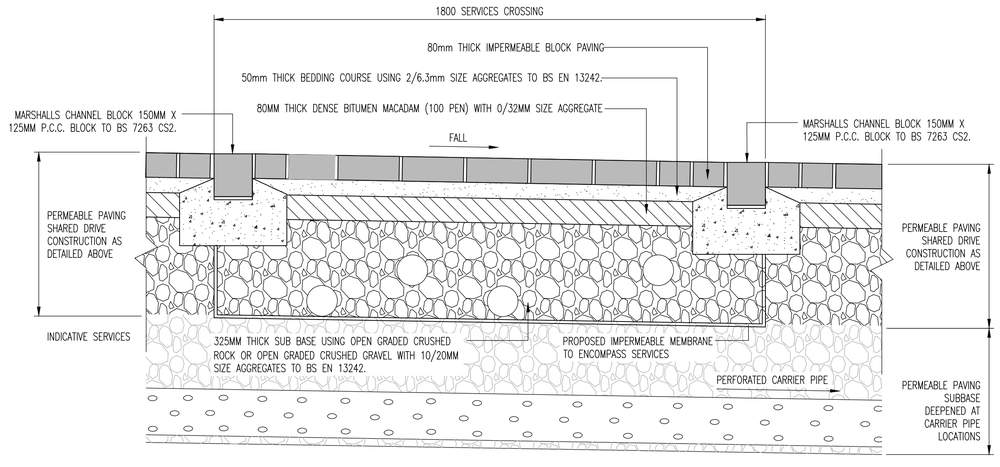
SCALE 1:10



PERMEABLE PAVING INDIVIDUAL PRIVATE DRIVE CONSTRUCTION DETAIL

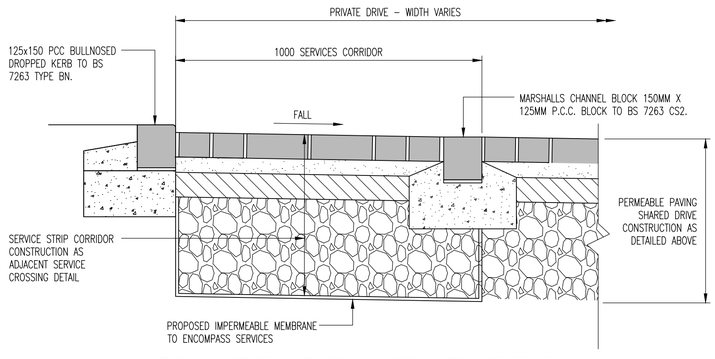
SCALE 1:10

NOTE:
SUB-BASE FORMATION LEVEL OF PERMEABLE PAVING TO HAVE NOMINAL FALL (1in100)



TYPICAL SECTION THROUGH SERVICES CROSSING

SCALE 1:10



TYPICAL SECTION THROUGH SERVICES CORRIDOR

SCALE 1:10

GENERAL

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERS AND ARCHITECTS DRAWINGS AND THE SPECIFICATION.

3. ALL WORK IS TO BE TO THE SATISFACTION OF THE ENGINEER AND LOCAL AUTHORITY BUILDING CONTROL.

4. THE CONTRACTOR IS RESPONSIBLE FOR AND MUST TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THE STABILITY OF THE WORKS AT ALL TIMES DURING CONSTRUCTION.

5. ALL WORKMANSHIP AND MATERIALS ARE TO BE TO CURRENT BRITISH STANDARDS.

6. ALL SERVICES ARE TO BE LOCATED AND PROTECTED AS NECESSARY BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.

7. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.

8. ALL HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH THE LOCAL AUTHORITIES DESIGN GUIDE AND SPECIFICATION.

9. PRIOR TO THE OCCUPATION OF THE FIRST DWELLING, STREET NAMEPLATES SHALL BE ERECTED IN ACCORDANCE WITH THE HIGHWAY AUTHORITY AND TO THE WORDING AGREED WITH THE PLANNING AUTHORITY.

10. DURING CONSTRUCTION WORKS ON SITE, ALL ROADS AND FOOTPATHS ARE TO BE SWEPT AND KEPT CLEAR OF OBSTRUCTIONS, THIS IS TO INCLUDE EXISTING HIGHWAYS AS APPROPRIATE TO ENSURE SAFE PASSAGE OF ALL ROAD USERS.

11. PROVISION SHALL BE MADE FOR THE INSTALLATION OF ALL MAINS SERVICES INCLUDING DUCTING PRIOR TO THE LAYING OF THE ROAD BASE-COURSE.

12. ALL ROAD MARKINGS AND SIGNS ARE TO BE IN ACCORDANCE WITH 'THE TRAFFIC SIGNS REGULATIONS AND DIRECTIONS' 2016.

FOR DETAILS AND SPECIFICATION FOR SOFT LANDSCAPING, GRAVEL, TIMBER EDGINGS, COBBLES, KNEE RAILS ETC. – REFER TO LANDSCAPE ARCHITECT

Rev	Revision Notes	Dwn	Apvd	Date

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STRATEGY

Project: NEWMARKET ROAD, ROYSTON HERTFORDSHIRE			
Drawing Title: PRIVATE ROAD CONSTRUCTION DETAILS PERMEABLE PAVING INFILTRATION			
Client: VISTRY HOMES			Date: MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW
Scale: As Shown			
Project No: 2307-831	Drawing No & Revision: ST005		Size: A1

8. APPENDIX A1 – DRAINAGE STRATEGY DRAWINGS – PHASE 1 RESERVED MATTERS

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NEWMARKET ROAD

INFILTRATION TANK – 1.2M DEEP, 92.5M X 5.0M
DESIGNED FOR 1IN100yr+40%CC+10%UC
INFILTRATION RATE 7.6x10-5m/s (0.27360m/hr)
IMPERMEABLE AREA 0.509HA
TOP OF TANK. m
BASE OF TANK. m
HALF DRAIN 1IN30 YEAR 100 MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

DETENTION BASIN 1 & INFILTRATION TANK BENEATH
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 3.1x10-4m/s (1.116m/hr)
IMPERMEABLE AREA 2.143HA
BASIN
SIDE SLOPES. MAX 1:3
TOP OF BANK. 75.000m (AREA 1460m²)
1in100yr LEVEL. 74.696m
BASE INVERT LEVEL. 74.400m (AREA 1179m²)
INFILTRATION TANK
0.8M DEEP, 899M²
TOP OF TANK 73.400M
1IN30YR LEVEL. 72.862M
1IN2YR LEVEL. 72.771M
BASE OF TANK 72.200M
HALF DRAIN 1IN30 YEAR 28 MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

Burloes Cottages

INFORMAL STREET

LEAP

R6.0m

R4.0m

BUS SHELTER

CANOPY

DENSE VEG

Track

TREES

DETENTION BASIN 2 & INFILTRATION TANK BENEATH
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 1.2x10-4m/s (0.432m/hr)
IMPERMEABLE AREA 0.965HA
BASIN
SIDE SLOPES. MAX 1:3
TOP OF BANK. 83.400m (AREA 951m²)
1in100yr LEVEL. 83.143M
BASE INVERT LEVEL. 82.400m (AREA 601m²)
INFILTRATION TANK
0.8M DEEP, 436.5M²
TOP OF TANK 82.200M
1IN30YR LEVEL. 82.460M
1IN2YR LEVEL. 81.676M
BASE OF TANK 81.400M
HALF DRAIN 1IN30 YEAR 260MINS
NOTE TANK TO BE ENCASED IN A HYDRO-CARBON WRAP

CASCADING INFILTRATION BASIN 3
ACCEPTING ROOF AREA ONLY
DESIGNED FOR 1IN100YR+40%CC+10%UC
INFILTRATION RATE 1.0x10-4m/s (0.54m/hr)
IMPERMEABLE AREA 0.046HA
SIDE SLOPES. MAX 1:3
TOP OF BANK. 95.700m (AREA 162m²)
1in100yr LEVEL. 95.433m
BASE INVERT LEVEL. 95.100m (AREA 26m²)
HALF DRAIN 1IN30 YEAR 59 MINS

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NOTES

1. AN ALLOWANCE OF 10% HAS BEEN ADDED TO IMPERMEABLE ROOF AREAS FOR THE CONSIDERATION OF URBAN CREEP.

2. THE SURFACE WATER NETWORK HAS BEEN DESIGNED TO ACCOMMODATE A 1IN100YR STORM EVENT TO INCLUDE 40% CLIMATE CHANGE.

3. ALL ADOPTABLE SURFACE WATER SEWERS WITHIN ADOPTABLE HIGHWAYS ARE TO BE A MINIMUM OF 225MM.

4. ALL SEWER WORKS FOR THE WATER AUTHORITY ARE TO BE IN ACCORDANCE WITH 'SEWERAGE SECTOR GUIDANCE APPENDIX C' DESIGN AND CONSTRUCTION GUIDANCE VERSION 1.0 25TH OCTOBER 2019 AND ANY ADDENDUM THEREAFTER.

5. ALL PRIVATE CONNECTIONS TO ADOPTABLE SEWERS SHOULD BE A MINIMUM OF 100MM DIAMETER (FOUL) & 150MM DIAMETER (SURFACE) MADE IN VITRIFIED CLAY CONNECTING SOFFIT TO SOFFIT.

6. THIS DRAWING IS FOR INTENDED FOR STRATEGY PURPOSES ONLY TO ASSIST AND INFORM IN OUTLINING THE INITIAL CONCEPTS AND FEASIBILITY OF THE SCHEME, ANY DETAILS OR INFORMATION ON THIS DRAWING ARE SUBJECT TO CHANGE.

SOAKAWAYS

1. THE PROPOSED SOAKAWAYS HAVE BEEN DESIGNED FOR A 1IN100 YEAR STORM PLUS 40% CLIMATE CHANGE.

2. THE PROPOSED SOAKAWAYS MUST BE LOCATED AT LEAST 10M AWAY FROM ANY BUILDING OR STRUCTURE & 5M AWAY FROM ADOPTED HIGHWAY.

3. ALL INFILTRATION DEVICES ARE DESIGN TO HALF DRAIN A 1IN30 YEAR STORM PLUS 35% CLIMATE CHANGE.

4. INFILTRATION DEVICES MUST BE PLACED WITHIN PERMEABLE STRATA.

DRAINAGE STRATEGY KEY

SITE BOUNDARY- RED	
PHASE 1 BOUNDARY- BLUE	
PRIVATE ROOFS AREA 7785m²	
PRIVATE HARDSTANDING AREA 684m²	
PRIVATE INFILTRATION PERMEABLE PAVING AREA 5282m²	
ADOPTABLE STANDARD ROADS & FOOTWAYS AREA 7754m²	
ADOPTABLE STANDARD INFILTRATION PERMEABLE PAVING AREA 3835m²	
DRAINAGE EASEMENT	
ADOPTABLE SURFACE WATER - BLUE	PN 1.001 225/167
ADOPTABLE FOUL WATER - BROWN	PN 1.001 150/150
PRIVATE SURFACE	
ELECTRICITY EASEMENT	

Rev	Revision Notes	Dwn	Apvd	Date
C	REVISED TO NEW ARCH LAYOUT 15.07.25	SJM	KK	21.07.25
B	REVISED TO NEW ARCH LAYOUT 20.05.25	SJM	KK	22.05.25
A	REVISED TO NEW ARCH LAYOUT 04.12.24	KM	KK	17.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON
HERTFORDSHIRE

Drawing Title:
DRAINAGE STRATEGY
PHASE 1

Client:			Date:
VISTRY HOMES			MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW

Scale: 1:500 (10m 0m 10m 20m 30m)

Project No:	Drawing No & Revision:	Size:
2307-831	ST100C	A1

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NOTES
1. THE EXCEEDEDENCE FLOW ROUTES SHOWN ON THIS DRAWING DETAIL THE EXPECTED SURFACE WATER RUN-OFF FROM ANY PROPOSED IMPERMEABLE AREAS THAT ARE ABOVE THE DESIGN STORM DURATION AND INTENSITY.

EXCEEDENCE ROUTE KEY

SITE BOUNDARY - RED	
EXCEEDENCE FLOW ROUTE	

B

Rev	Revision Notes	Dwn	Rpvd	Date
D	REVISED TO NEW ARCHITECT LAYOUT 21.07.25	JL	KK	21.07.25
C	REVISED TO NEW ARCH LAYOUT 20.05.25	KM	KK	27.05.25
B	REVISED TO NEW ARCH LAYOUT 28.03.25	KM	KK	01.04.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	KM	KK	18.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON
HERTFORDSHIRE

Drawing Title:
EXCEEDENCE FLOW

Client:			Date:
VISTRY HOMES			MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW

Scale: 1:500 (10m 0m 10m 20m 30m)

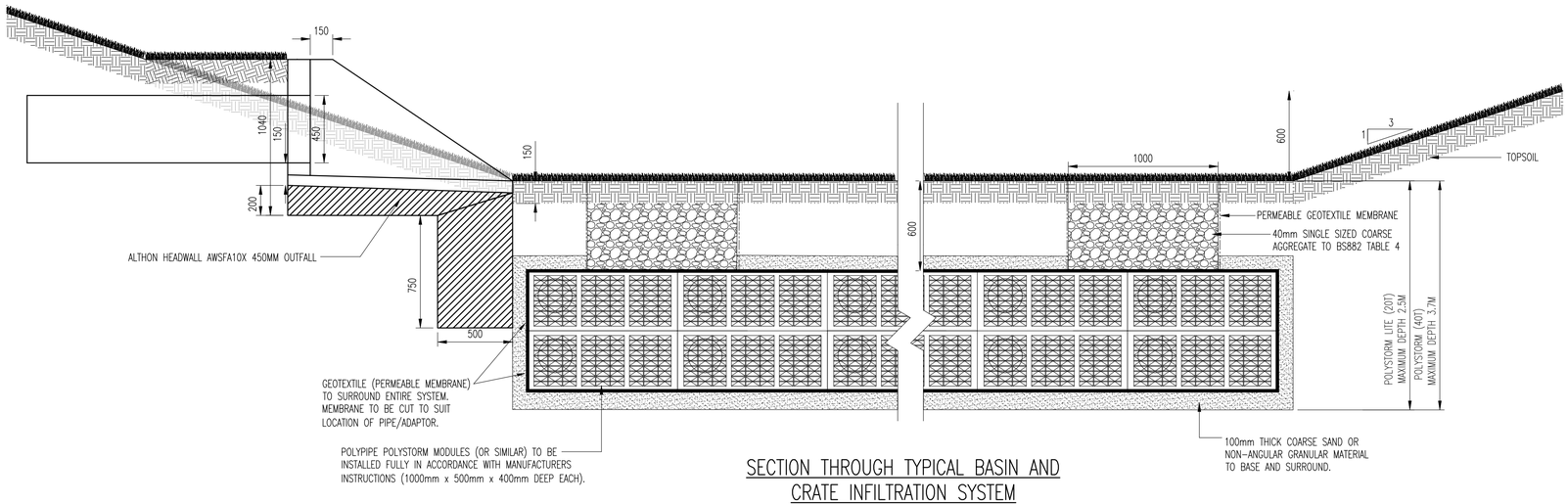
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2307-831	ST002D	A0

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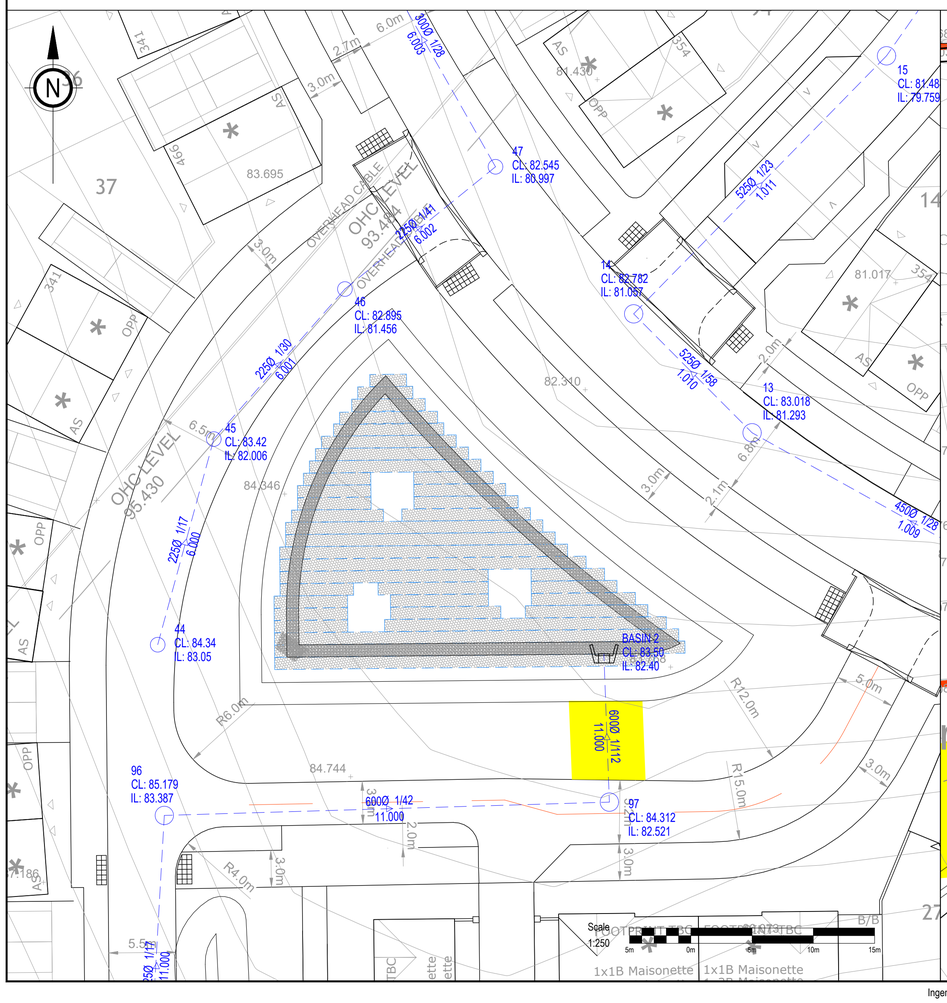
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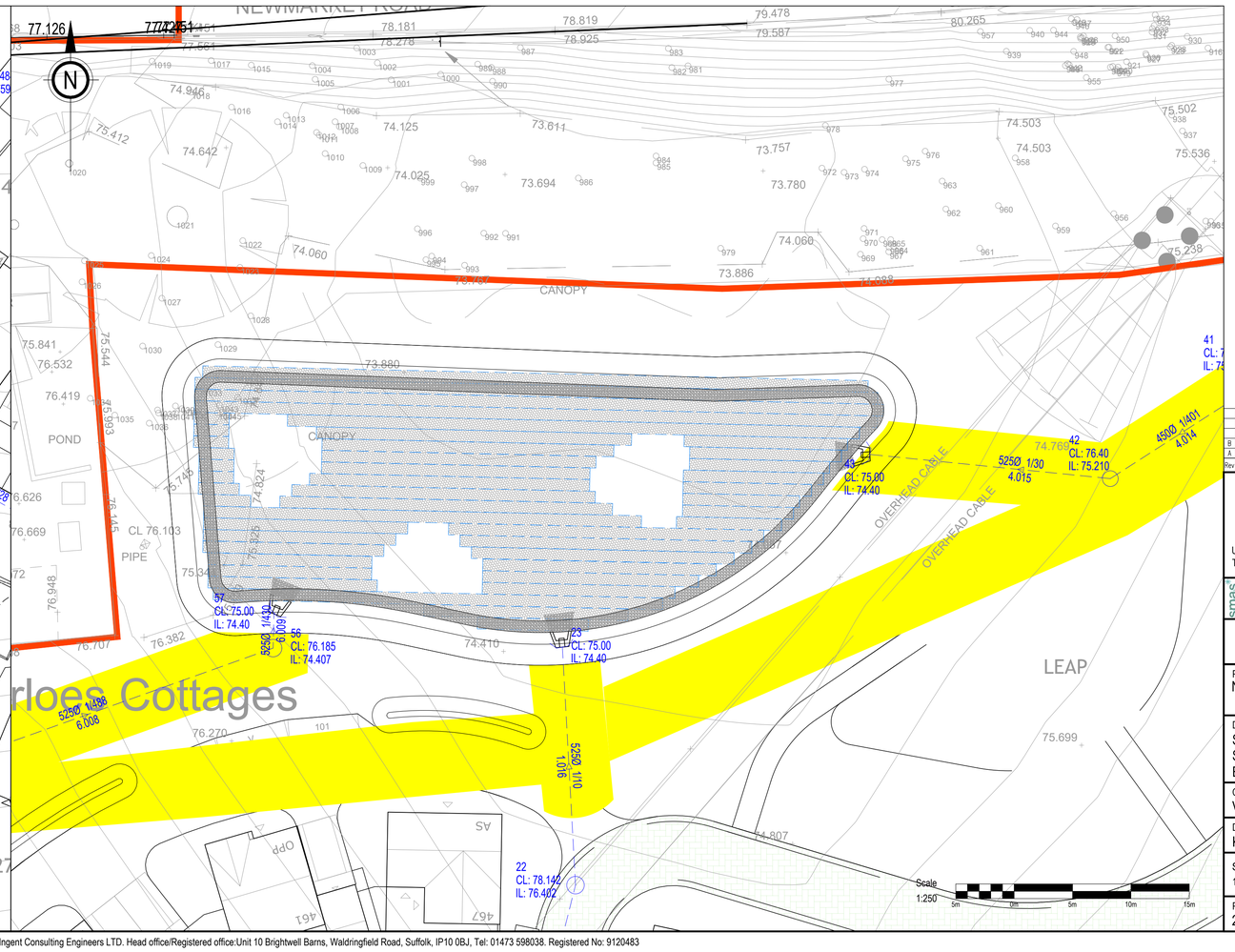
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SECTION THROUGH TYPICAL BASIN AND CRATE INFILTRATION SYSTEM





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B	REVISED TO NEW ARCH LAYOUT 17.03.25	KM	KK	19.03.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	SJM	KK	21.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON

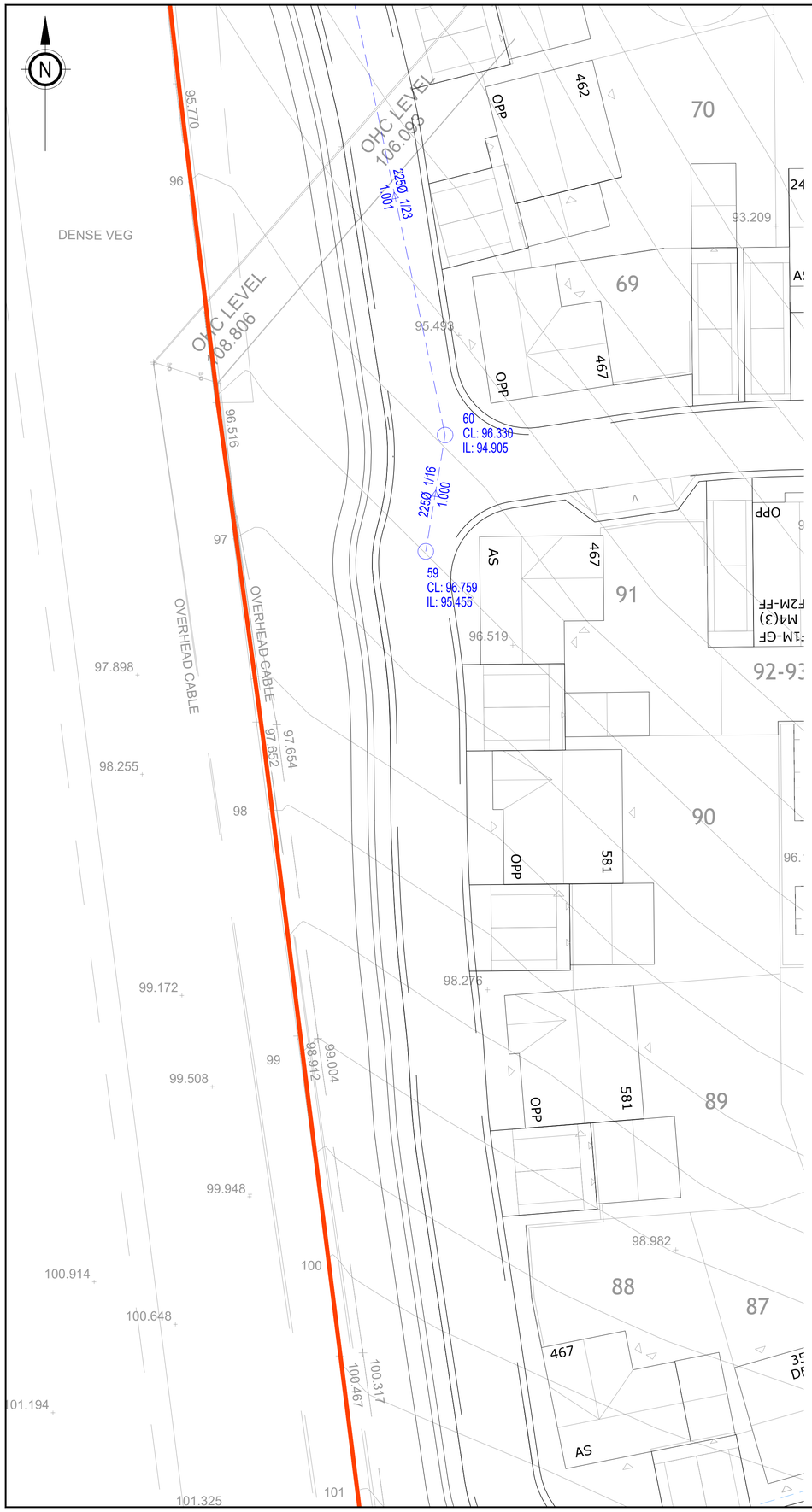
Drawing Title:
SUDS CONSTRUCTION DETAIL
SHEET 1 OF 2
BASINS

Client:			Date:
VISTRY			FEB 2025
Drawn: KM	Designed: KM	Checked: KK	Approved: KK

Scale: 1:20 (0.5m 0 0.5m 1m)

Project No:	Drawing No & Revision:	Size:
2307-831	ST003B	A1

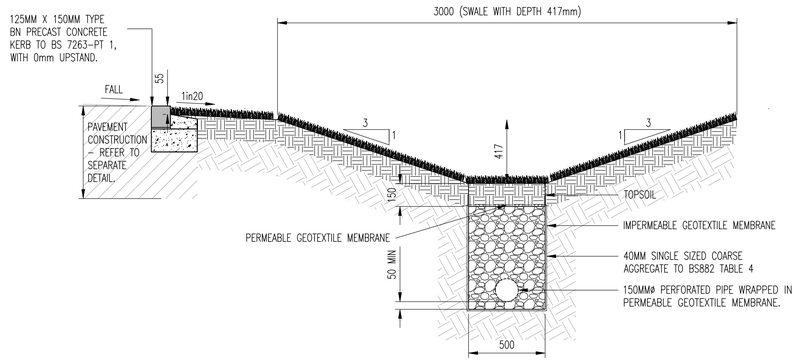
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CROSS-SECTION THROUGH UNDER-DRAINED SWALE
SCALE 1:20

Rev	Revision Notes	Dwn	Apvd	Date
B	REVISED TO NEW ARCH LAYOUT 17.03.25	KM	KK	19.03.25
A	REVISED TO NEW ARCH LAYOUT 23.01.25	SJM	KK	21.02.25

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STRATEGY

Project:
NEWMARKET ROAD, ROYSTON

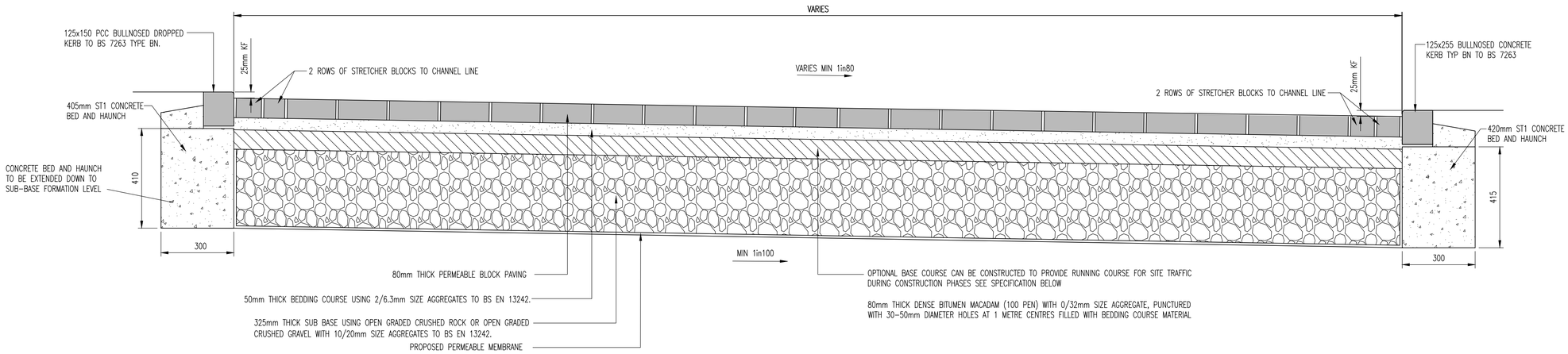
Drawing Title:
SWALE CONSTRUCTION DETAIL
SHEET 1 OF 2
SWALE

Client:			Date:
VISTRY			MAR 2024
Drawn: KM	Designed: KM	Checked: KK	Approved: KK

Scale: 1:20 (0.5m 0m 0.5m 1m)

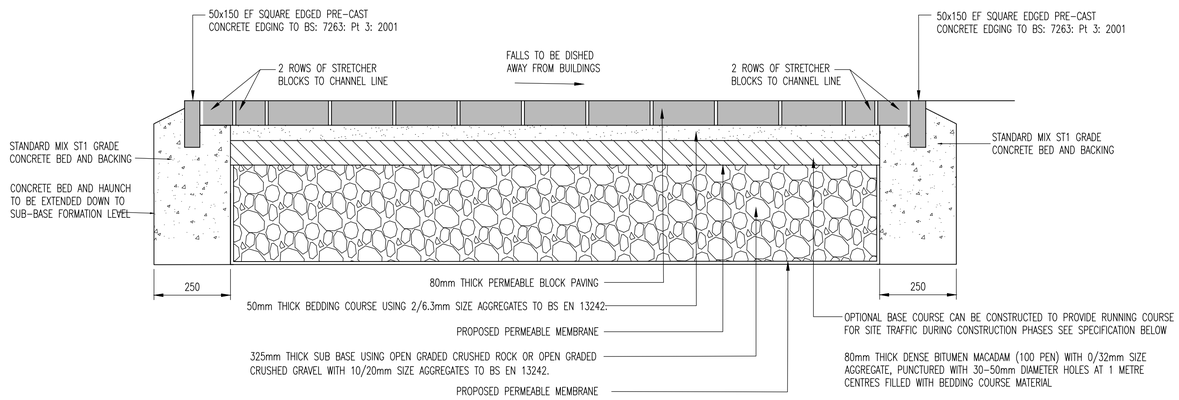
Project No:	Drawing No & Revision:	Size:
2307-831	ST004B	A1

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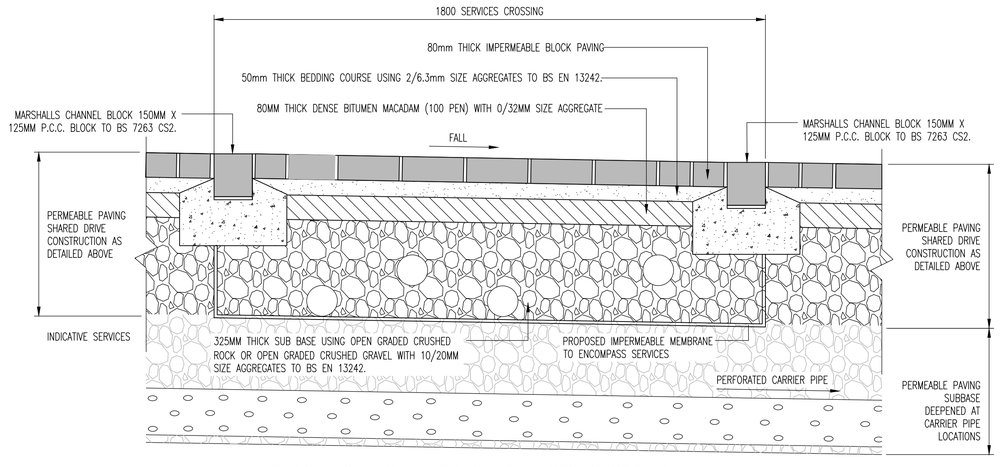
SCALE 1:10



PERMEABLE PAVING INDIVIDUAL PRIVATE DRIVE CONSTRUCTION DETAIL

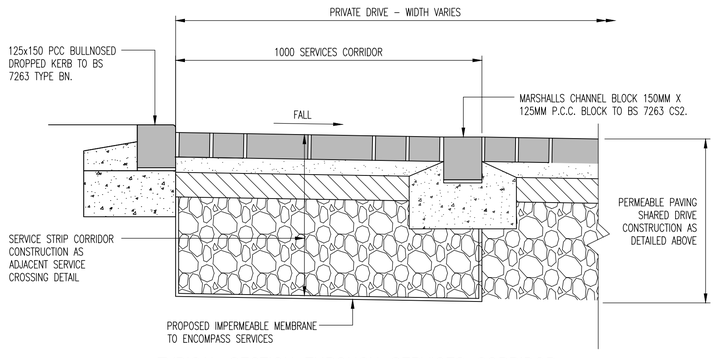
SCALE 1:10

NOTE:
SUB-BASE FORMATION LEVEL OF PERMEABLE PAVING TO HAVE NOMINAL FALL (1in100)



TYPICAL SECTION THROUGH SERVICES CROSSING

SCALE 1:10



TYPICAL SECTION THROUGH SERVICES CORRIDOR

SCALE 1:10

GENERAL

1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. ANY DISCREPANCIES ARE TO BE RECORDED AND REPORTED TO THE ENGINEERS IMMEDIATELY.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERS AND ARCHITECTS DRAWINGS AND THE SPECIFICATION.

3. ALL WORK IS TO BE TO THE SATISFACTION OF THE ENGINEER AND LOCAL AUTHORITY BUILDING CONTROL.

4. THE CONTRACTOR IS RESPONSIBLE FOR AND MUST TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THE STABILITY OF THE WORKS AT ALL TIMES DURING CONSTRUCTION.

5. ALL WORKMANSHIP AND MATERIALS ARE TO BE TO CURRENT BRITISH STANDARDS.

6. ALL SERVICES ARE TO BE LOCATED AND PROTECTED AS NECESSARY BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.

7. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.

8. ALL HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH THE LOCAL AUTHORITIES DESIGN GUIDE AND SPECIFICATION.

9. PRIOR TO THE OCCUPATION OF THE FIRST DWELLING, STREET NAMEPLATES SHALL BE ERECTED IN ACCORDANCE WITH THE HIGHWAY AUTHORITY AND TO THE WORDING AGREED WITH THE PLANNING AUTHORITY.

10. DURING CONSTRUCTION WORKS ON SITE, ALL ROADS AND FOOTPATHS ARE TO BE SWEPT AND KEPT CLEAR OF OBSTRUCTIONS, THIS IS TO INCLUDE EXISTING HIGHWAYS AS APPROPRIATE TO ENSURE SAFE PASSAGE OF ALL ROAD USERS.

11. PROVISION SHALL BE MADE FOR THE INSTALLATION OF ALL MAINS SERVICES INCLUDING DUCTING PRIOR TO THE LAYING OF THE ROAD BASE-COURSE.

12. ALL ROAD MARKINGS AND SIGNS ARE TO BE IN ACCORDANCE WITH 'THE TRAFFIC SIGNS REGULATIONS AND DIRECTIONS' 2016.

FOR DETAILS AND SPECIFICATION FOR SOFT LANDSCAPING, GRAVEL, TIMBER EDGINGS, COBBLES, KNEE RAILS ETC. – REFER TO LANDSCAPE ARCHITECT

Rev	Revision Notes	Dwn	Apvd	Date

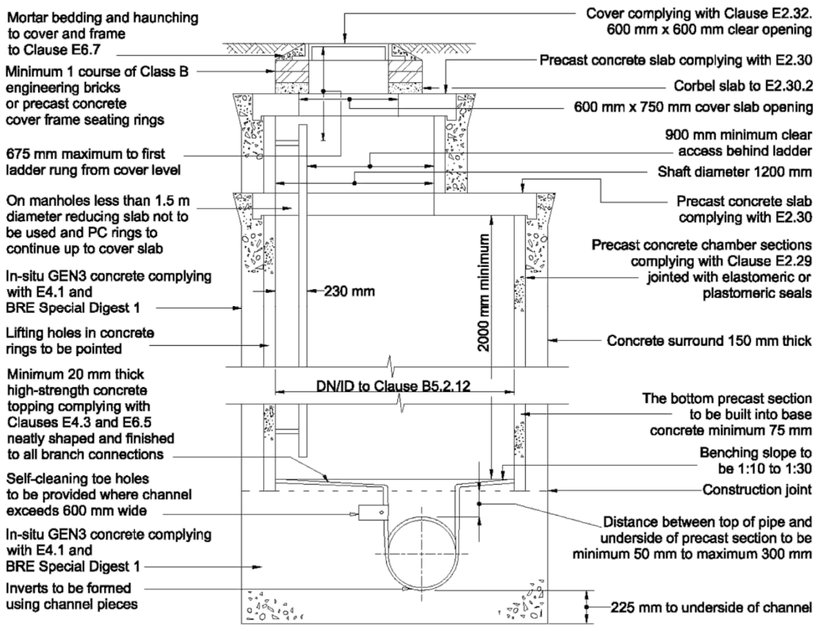
INGENT CONSULTING ENGINEERS
Unit 1a Greenwood Court, Skyliner Way, Bury St Edmunds, IP32 7GY.
Tel: 01284 245024 ---- www.ingent.co.uk ---- email: info@ingent.co.uk

STRATEGY

Project: NEWMARKET ROAD, ROYSTON HERTFORDSHIRE			
Drawing Title: PRIVATE ROAD CONSTRUCTION DETAILS PERMEABLE PAVING INFILTRATION			
Client: VISTRY HOMES			Date: MAR 2024
Drawn: KK	Designed: KK	Checked: RGW	Approved: RGW
Scale: As Shown			
Project No: 2307-831	Drawing No & Revision: ST005		Size: A1

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Figure B 5
Typical manhole detail – Type A1
Depth from cover level to soffit of pipe 3 m to 6 m with ladder and reducing slab
Rigid material construction with concrete surround



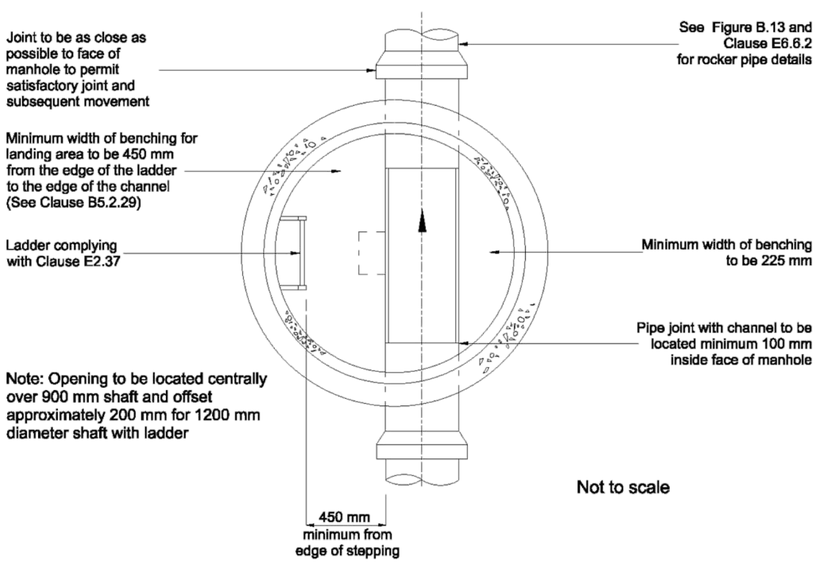
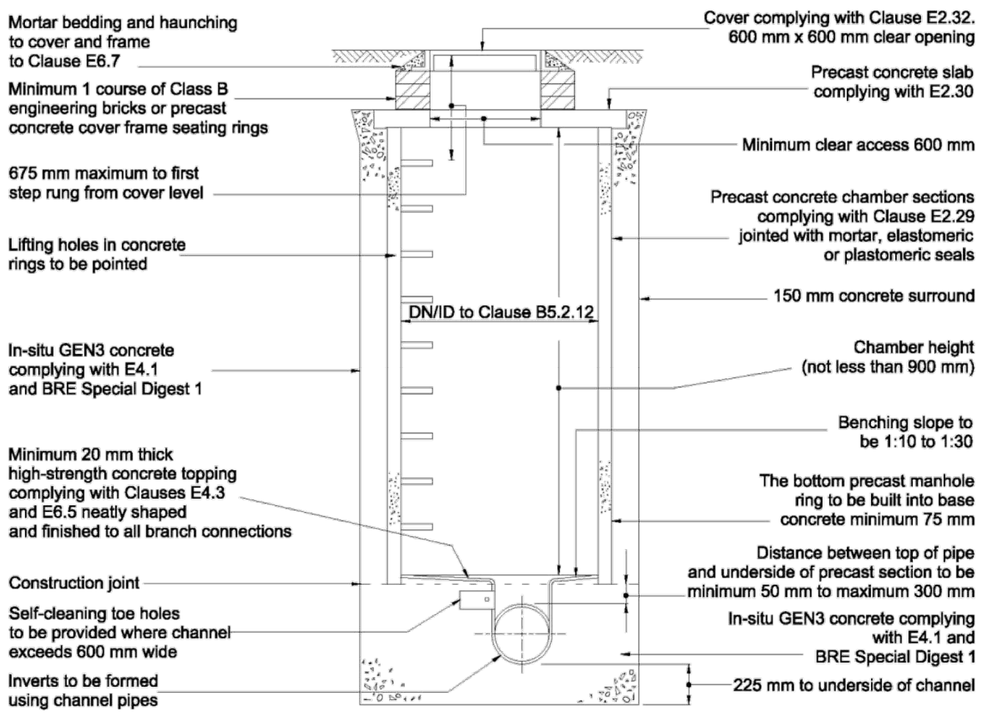
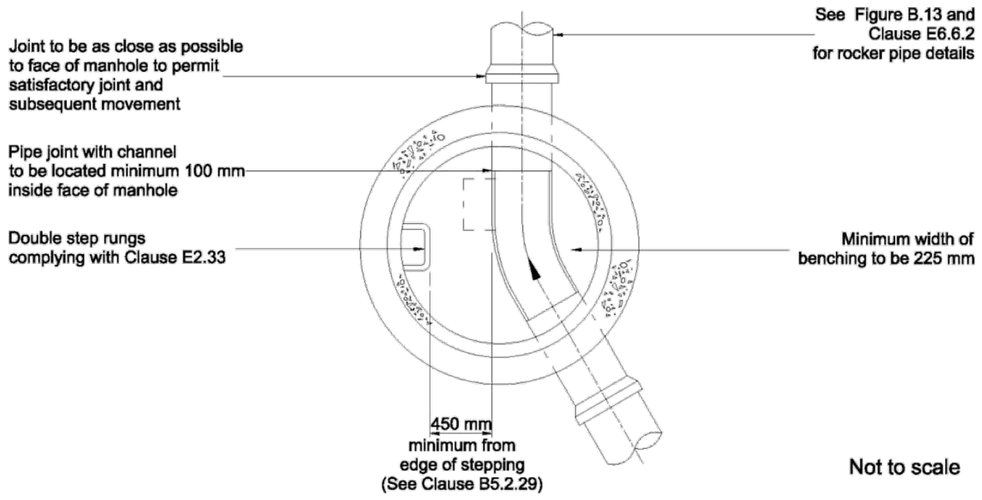


Figure B 10
Typical manhole detail – Type B
Depth from cover level to soffit of pipe 1.5 m to 3 m
Alternative rigid material construction with concrete surround





GENERAL
1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED. ANY DISCREPANCIES ARE TO BE RECORDED AND REPORTED TO THE ENGINEERS IMMEDIATELY.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERS AND ARCHITECTS DRAWINGS AND THE SPECIFICATION.

3. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.

4. ALL WORK ARE TO BE TO THE SATISFACTION OF THE ENGINEER AND WATER AUTHORITY.

5. THE CONTRACTOR IS RESPONSIBLE FOR AND MUST TAKE ALL NECESSARY PRECAUTIONS TO ENSURE THE STABILITY OF THE WORKS AT ALL TIMES DURING CONSTRUCTION.

6. ALL WORKMANSHIP AND MATERIALS ARE TO BE TO CURRENT BRITISH STANDARDS.

7. ALL SERVICES ARE TO BE LOCATED AND PROTECTED AS NECESSARY BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF THE WORKS.

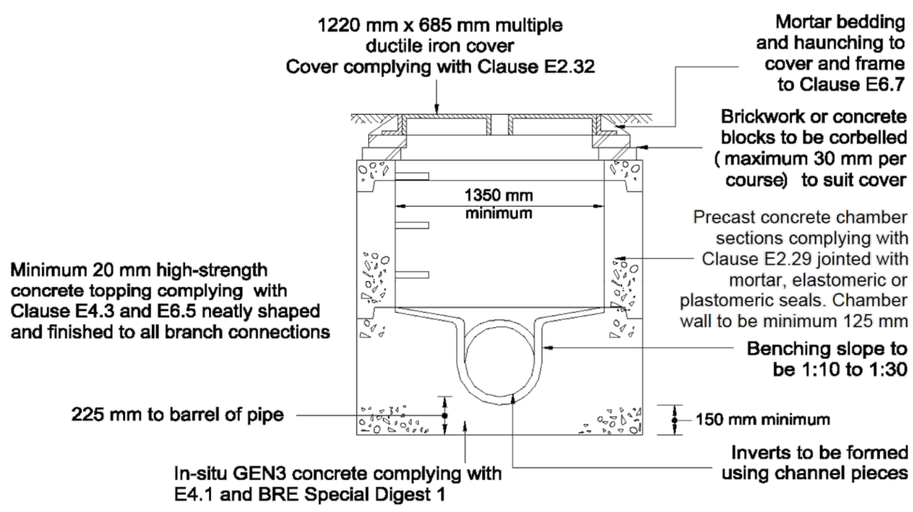
8. ALL HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH THE LOCAL AUTHORITIES DESIGN GUIDE AND SPECIFICATION.

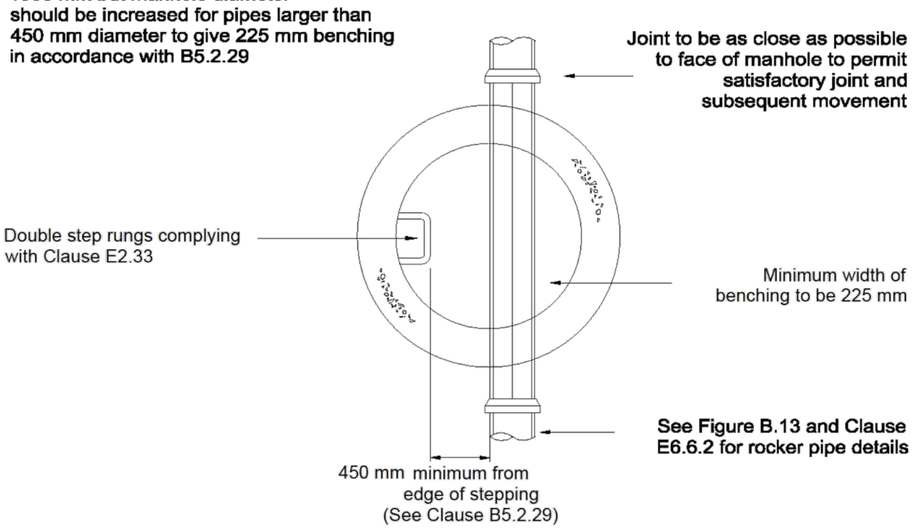
NOTES
1. ALL SEWER WORKS FOR THE WATER AUTHORITY ARE TO BE IN ACCORDANCE WITH 'SEWERAGE SECTOR GUIDANCE APPENDIX C' DESIGN AND CONSTRUCTION GUIDANCE VERSION 1.0 25TH OCTOBER 2019 AND ANY ADDENDUM THEREAFTER.

2. ALL PRIVATE CONNECTIONS TO ADOPTABLE SEWERS SHOULD BE A MINIMUM OF 100MM DIAMETER (FOUL) & 150MM DIAMETER (SURFACE) MADE IN VITRIFIED CLAY, CONNECTING SOFFIT TO SOFFIT.

3. NO TREES ARE TO BE PLANTED WITHIN 3M OF ANY ADOPTABLE SEWER AND TREE PITS/ROOT BARRIER ARE TO BE USED WHERE TREES ARE WITHIN 3–6M AS SPECIFIED BY THE WATER AUTHORITY.

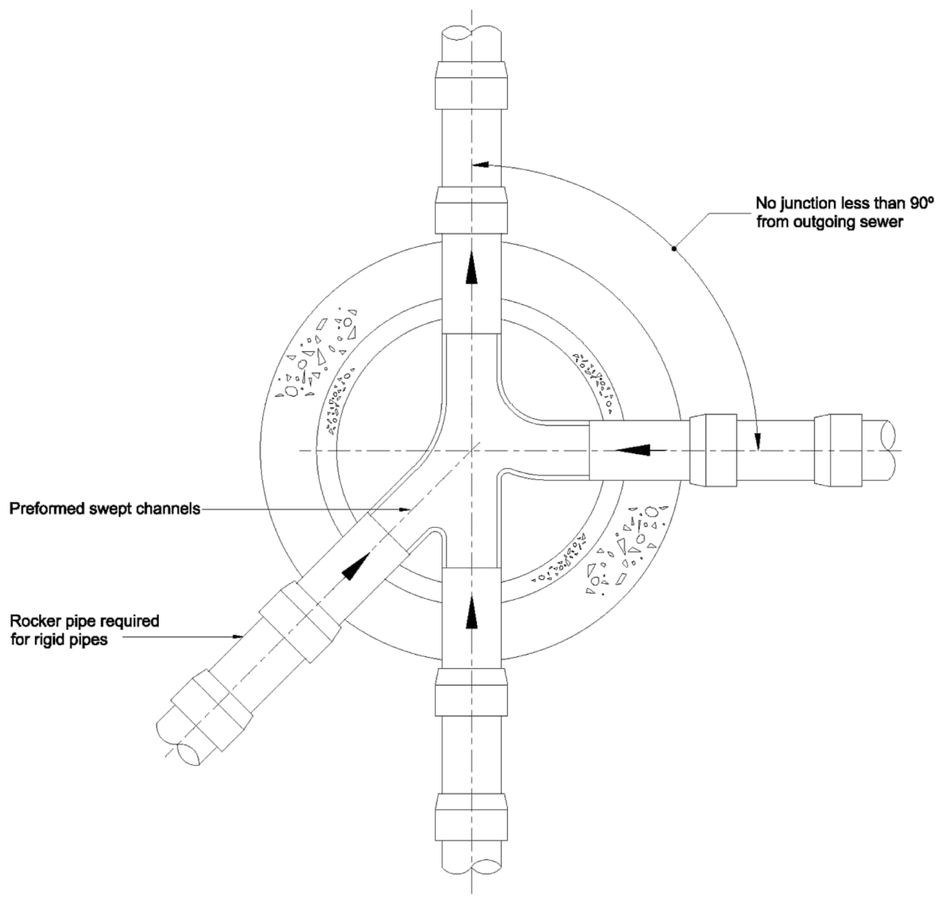
Figure B 15
Typical manhole detail – Type C
Depth from cover level to soffit of pipe less than 1.5 m
Maximum pipe size 450 mm diameter
Rigid material construction





Note: The use of precast concrete chamber units to E2.29 with 150 mm GEN3 in-situ concrete complying with E4.1 and BRE Special Digest 1 in place of brickwork construction is permitted.

Figure B 13
Typical arrangement of pipe junctions within manhole



Sectional Plan

Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

All pipes entering the bottom of the manhole to have soffits level.

NOTE
ALL MANHOLE COVERS AND FRAMES SHOULD COMPLY WITH THE REQUIREMENTS OF BS7903: 1997 BS EN 124 AND CD534. FRAMES SHOULD BE 150MM DEEP..

Figure B 27
Protection of pipes laid at shallow depths

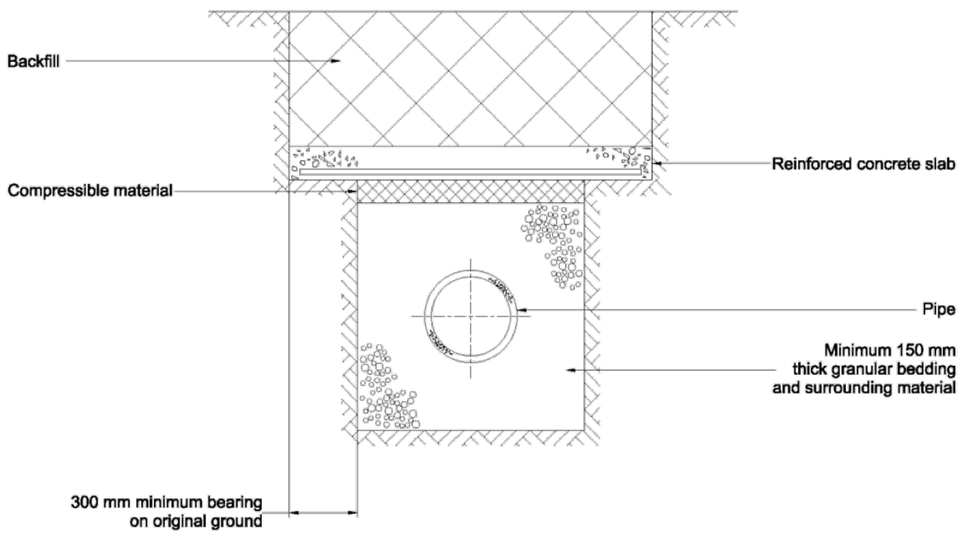
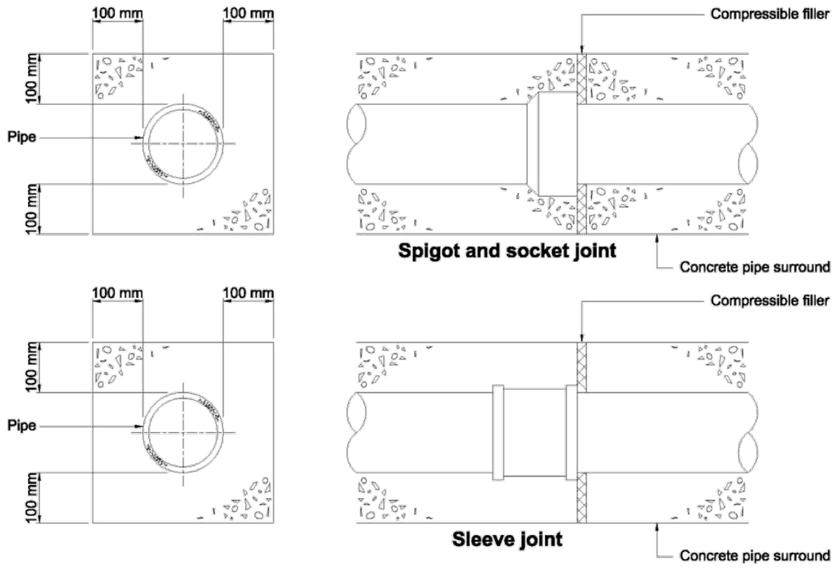


Figure B 28
Joints for encased pipes

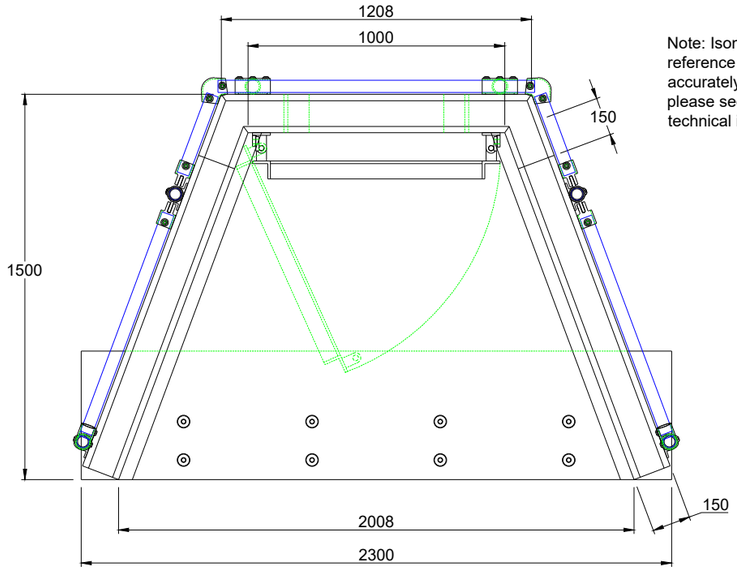


Rev	Revision Notes	Dwn	Apvd	Date

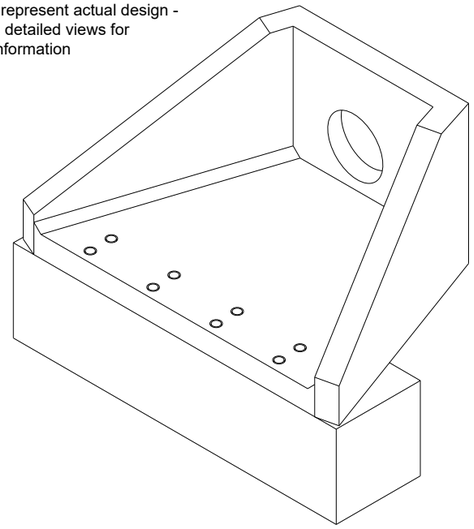
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Tel: 01284 245024 ---- www.ingent.co.uk ---- email: info@ingent.co.uk

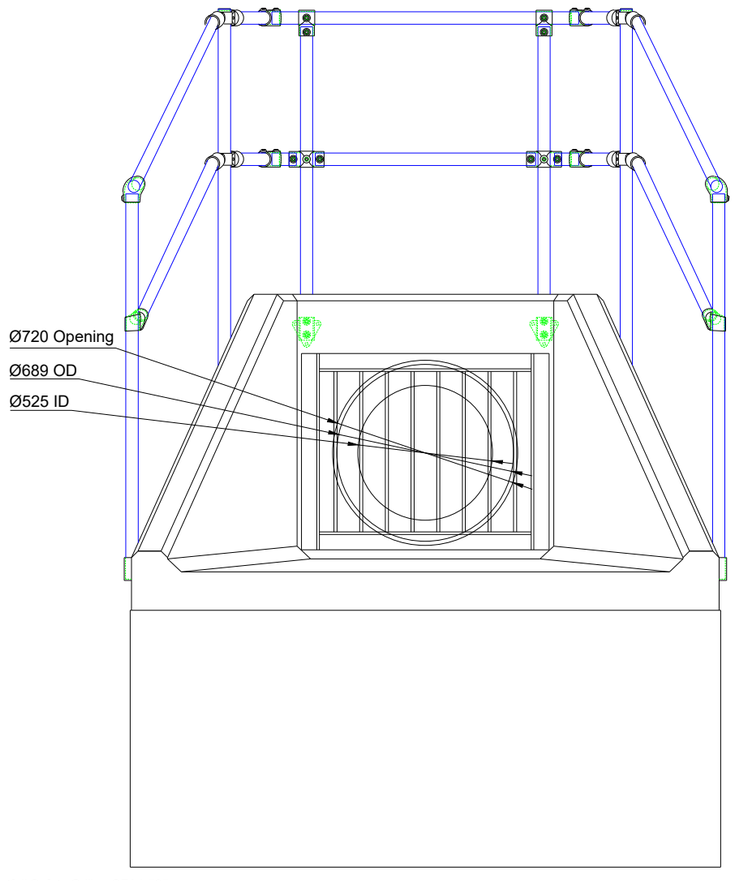
STRATEGY

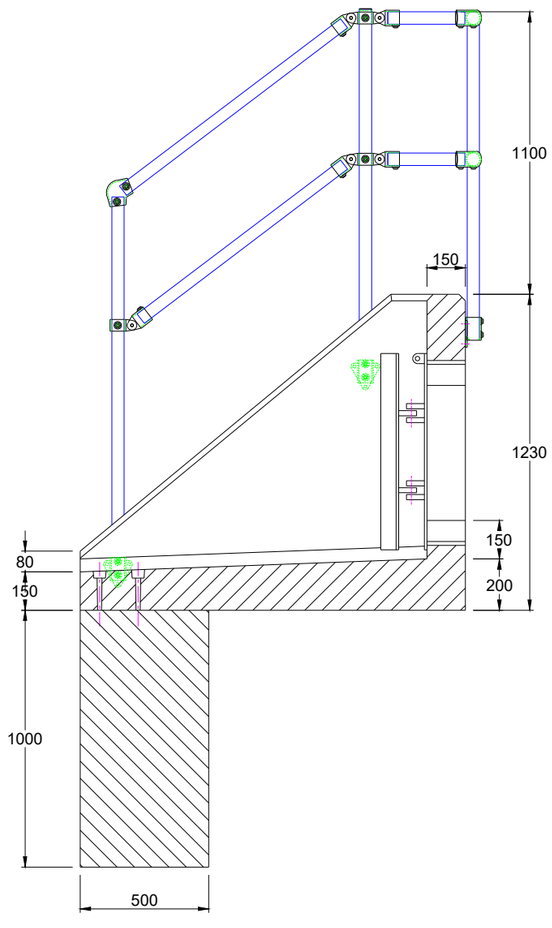
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Drawing Title: S104 WORKS STANDARD DRAWINGS	
Client: VISTRY HOMES	Date: MAR 2024
Drawn: KK / Designed: KK / Checked: RGW / Approved: RGW	
Scale: Not to Scale	
Project No: 2307-831	Drawing No & Revision: ST106 / Size: A1



Note: Isometric drawing is for reference only, details may not accurately represent actual design - please see detailed views for technical information







Sewers for Adoption / Sewers for Scotland Outfall Safety Grille - SFA1 525

1. In accordance with Figure C.6 Typical Outfall Safety Grille - *for outfalls of 350mm diameter of greater* - Sewers for Adoption 7th Edition
2. Material Grade is to be: BS EN 10025 S275
3. All mild steel to be hot dipped galvanized after fabrication
4. Galvanizing to BS EN: 1461
5. Welding to BS EN 1011-2:2001
6. Hinged on one side with padlock facility
7. Weight Approx: 70kg

DO NOT SCALE DRAWING

NOTES:

- All dimensions in mm
- All measurements ± 1mm

Specification Information
- Opening in back wall cast to suit outside diameter of the pipework
- Invert level of pipe can be set to your specification

Headwall Installation
Units should be bedded on minimum 200mm thick well compacted Class 6A* selected well graded granular material.
*Manual of contract documents for Highway Works: Volume (MCHW1) specification for Highway Works, Series 600 (Nov.09).
Sit the headwall level or with a slight fall 1:50 from pipe to spill mouth.

Handling
A. Weight of concrete is based on 2.4 tonne/m³+5% is recommended for sizing lifting equipment.
B. All lifting points shall be used as specified below
C. Unit to be lifted as per lifting diagram

Concrete
A. Mix ref: Self-compacting DC4/DS4 Mix
B. Lifting strength based on 2 cubes = 20N/mm²
C. Characteristic 28 day cube strength = 50N/mm²
D. Concrete provides Design Chemical Class 4 (DC4) to special Digest 1, Table F2.

Reinforcement
A. Reinforcement to BS EN 13369
B. Scheduling, dimensioning, bending & cutting to BS8666
C. Cage to be machine tied with steel wire

Manufacture
A. Manufacture to BS EN 15258:2008 precast concrete products - Retaining wall elements, Factory Production Control certificate number: 0086-CPR-650448 & BS EN 13369
B. Tolerances to BS EN 13369 clause 4.3.1.1
C. Finishing:

	Top	Sides	Base	Rear of back wall
Class	A	A	A	Self - Levelled

D. Marking: Units shall be indelibly marked to show:
- Mould reference code
- De-mould date
- Job reference number & unique product number
- Unit weight (kg)

Design
A. Concrete design to EC2
B. Althon have designed the concrete units only, the site conditions should be assessed for suitability by the scheme designer
C. Units are designed to withstand a vertical live load surcharge of 10kN/M²
D. Weight of soil = 18kN/M²
E. Angle of internal friction = 30 Deg.
F. Design Life: >120 years

Min Cover	Cover Block Size (mm)	Min Cover Size (mm)	Max Cover Size (mm)
All Faces	55	50	60

Exposure Classification	Exposure induced by Carbonation	Corrosion induced by Chloride	Freeze/thaw attack	Chemical attack
All Faces	XC3/4	XD3	XF4	XA3

Fabrication Specification
A. Manufacture IAW EN 1090-2 EXC CLASS 1
B. Material grade is to be: BS EN 10025 S275
C. Welding carried out IAW EN 1090-2 PARA 7.5.4 - 7.5.18
D. All fillet and butt welds to have a minimum throat thickness of 6mm & joints to be fully welded where possible.
E. Ensure vertical flats are fully welded both sides where possible.
F. All sharp edges and burrs are to be removed.
G. Remove all weld splatter.
H. Holes by punching are permitted with reaming.
I. Galvanising is carried out after fabrication to BS EN:ISO 1461

Handrail Specification
A. Kee Klamp® Galvanised Size 8 Fittings
B. Size 8 48.3mm OD 3.2mm Wall Thickness Galvanised Medium Duty Tube to BS EN 10255
C. 360N/m Design Load at stated in BS 8118, BS 6180, BS 6399 & BS 7818, Civil Engineering Specification for the Water Industry (CESWI) 7th Edition Clause 2.60 Handrails & Balusters & The Engineering Equipment and Materials Users' Association (EEMUA) Publication 105 7th Edition Factory Stairways, Ladders and Handrails
D. Other design loads available on request

REV NO	DATE	DESCRIPTION

Althon

ADDRESS: ALTHON LIMITED
VULCAN ROAD SOUTH
NORWICH
NR6 6AF

TEL: 01603 488700
FAX: 01603 488598
EMAIL: sales@althon.co.uk
WEBSITE: www.althon.co.uk

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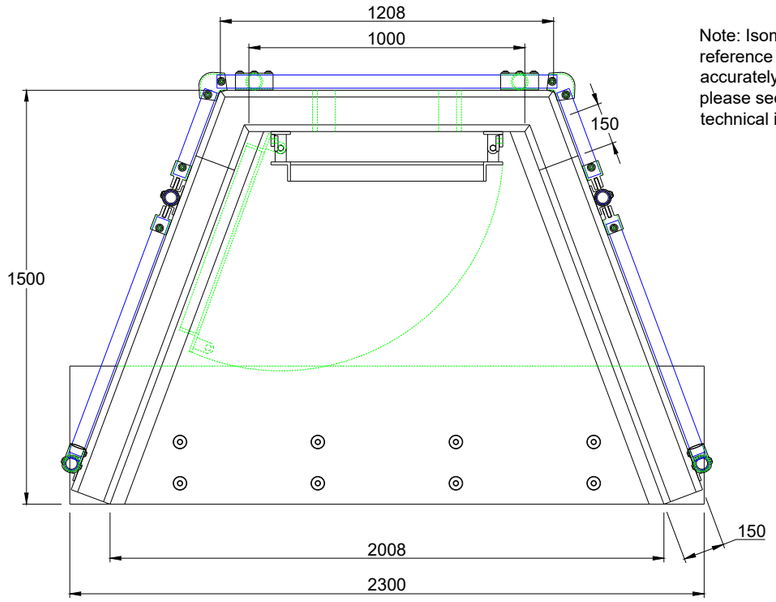
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SCALE:	PAPER:	SHEET NO:	DATE:
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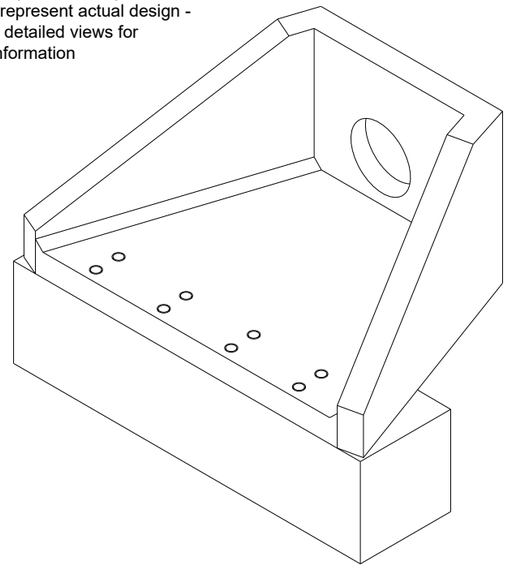
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TOE WEIGHT: 2760kg

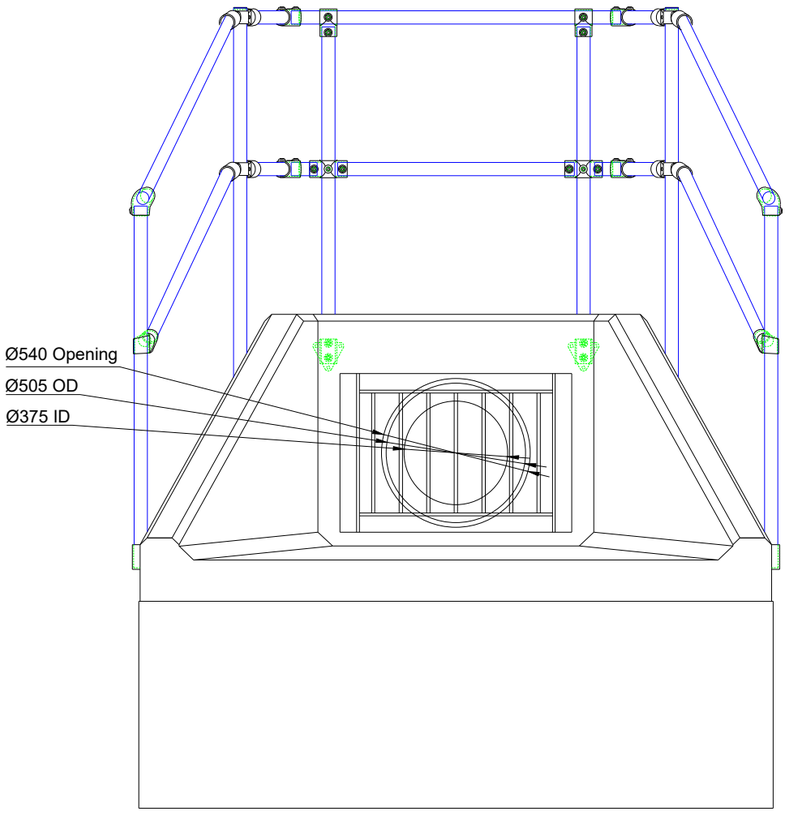
PRODUCT NAME: SFA10Y

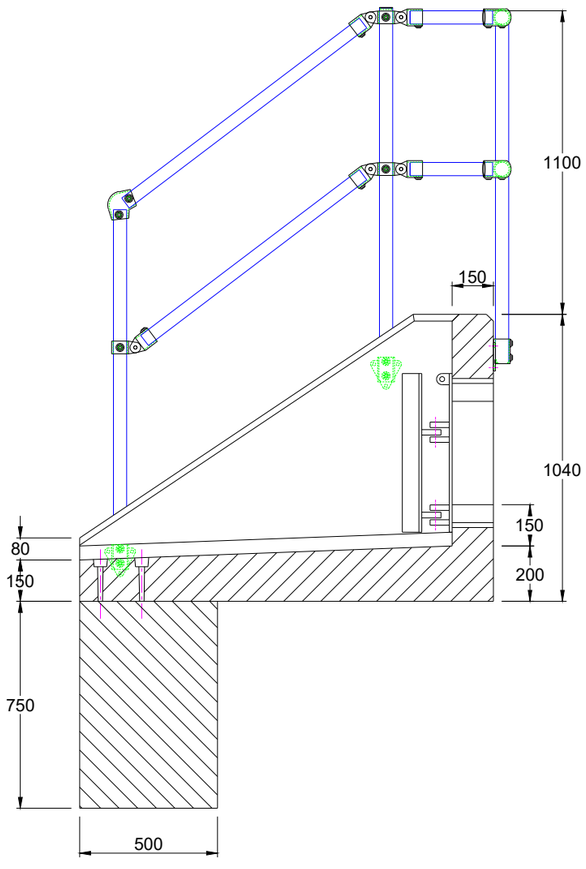
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Note: Isometric drawing is for reference only, details may not accurately represent actual design - please see detailed views for technical information







Sewers for Adoption / Sewers for Scotland Outfall Safety Grille - SFA1 375

1. In accordance with Figure C.6 Typical Outfall Safety Grille - *for outfalls of 350mm diameter of greater* - Sewers for Adoption 7th Edition
2. Material Grade is to be: BS EN 10025 S275
3. All mild steel to be hot dipped galvanized after fabrication
4. Galvanizing to BS EN: 1461
5. Welding to BS EN 1011-2:2001
6. Hinged on one side with padlock facility
7. Weight Approx: 50kg

DO NOT SCALE DRAWING

NOTES:

- All dimensions in mm
- All measurements ± 1mm

Specification Information
- Opening in back wall cast to suit outside diameter of the pipework
- Invert level of pipe can be set to your specification

Headwall Installation
Units should be bedded on minimum 200mm thick well compacted Class 6A* selected well graded granular material.
*Manual of contract documents for Highway Works: Volume (MCHW1) specification for Highway Works, Series 600 (Nov.09).
Sit the headwall level or with a slight fall 1:50 from pipe to spill mouth.

Handling
A. Weight of concrete is based on 2.4 tonne/m³+5% is recommended for sizing lifting equipment.
B. All lifting points shall be used as specified below
C. Unit to be lifted as per lifting diagram

Concrete
A. Mix ref: Self-compacting DC4/DS4 Mix
B. Lifting strength based on 2 cubes = 20N/mm²
C. Characteristic 28 day cube strength = 50N/mm²
D. Concrete provides Design Chemical Class 4 (DC4) to special Digest 1, Table F2.

Reinforcement
A. Reinforcement to BS EN 13369
B. Scheduling, dimensioning, bending & cutting to BS8666
C. Cage to be machine tied with steel wire

Manufacture
A. Manufacture to BS EN 15258:2008 precast concrete products - Retaining wall elements, Factory Production Control certificate number: 0086-CPR-650448 & BS EN 13369
B. Tolerances to BS EN 13369 clause 4.3.1.1
C. Finishing:

	Top	Sides	Base	Rear of back wall
Class	A	A	A	Self - Levelled

D. Marking: Units shall be indelibly marked to show:
- Mould reference code
- De-mould date
- Job reference number & unique product number
- Unit weight (kg)

Design
A. Concrete design to EC2
B. Althon have designed the concrete units only, the site conditions should be assessed for suitability by the scheme designer
C. Units are designed to withstand a vertical live load surcharge of 10kN/M²
D. Weight of soil = 18kN/M²
E. Angle of internal friction = 30 Deg.
F. Design Life: >120 years

Min Cover	Cover Block Size (mm)	Min Cover Size (mm)	Max Cover Size (mm)
All Faces	55	50	60

Exposure Classification	Exposure induced by Carbonation	Corrosion induced by Chloride	Freeze/thaw attack	Chemical attack
All Faces	XC3/4	XD3	XF4	XA3

Fabrication Specification
A. Manufacture IAW EN 1090-2 EXC CLASS 1
B. Material grade is to be: BS EN 10025 S275
C. Welding carried out IAW EN 1090-2 PARA 7.5.4 - 7.5.18
D. All fillet and butt welds to have a minimum throat thickness of 6mm & joints to be fully welded where possible.
E. Ensure vertical flats are fully welded both sides where possible.
F. All sharp edges and burrs are to be removed.
G. Remove all weld splatter.
H. Holes by punching are permitted with reaming.
I. Galvanising is carried out after fabrication to BS EN:ISO 1461

Handrail Specification
A. Kee Klamp® Galvanised Size 8 Fittings
B. Size 8 48.3mm OD 3.2mm Wall Thickness Galvanised Medium Duty Tube to BS EN 10255
C. 360N/m Design Load at stated in BS 8118, BS 6180, BS 6399 & BS 7818, Civil Engineering Specification for the Water Industry (CESWI) 7th Edition Clause 2.60 Handrails & Balusters & The Engineering Equipment and Materials Users' Association (EEMUA) Publication 105 7th Edition Factory Stairways, Ladders and Handrails
D. Other design loads available on request

REV NO	DATE	DESCRIPTION

Althon

ADDRESS: ALTHON LIMITED
VULCAN ROAD SOUTH
NORWICH
NR6 6AF

TEL: 01603 488700
FAX: 01603 488598
EMAIL: sales@althon.co.uk
WEBSITE: www.althon.co.uk

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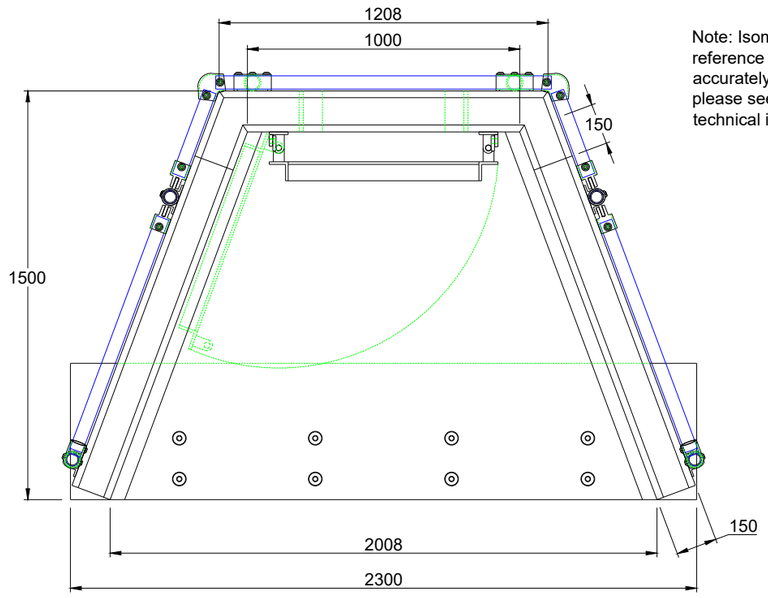
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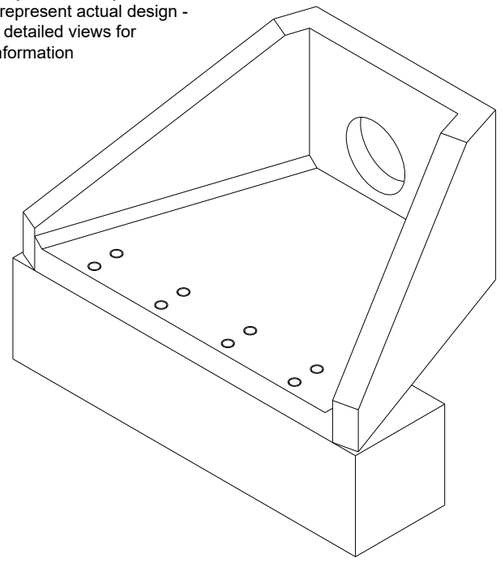
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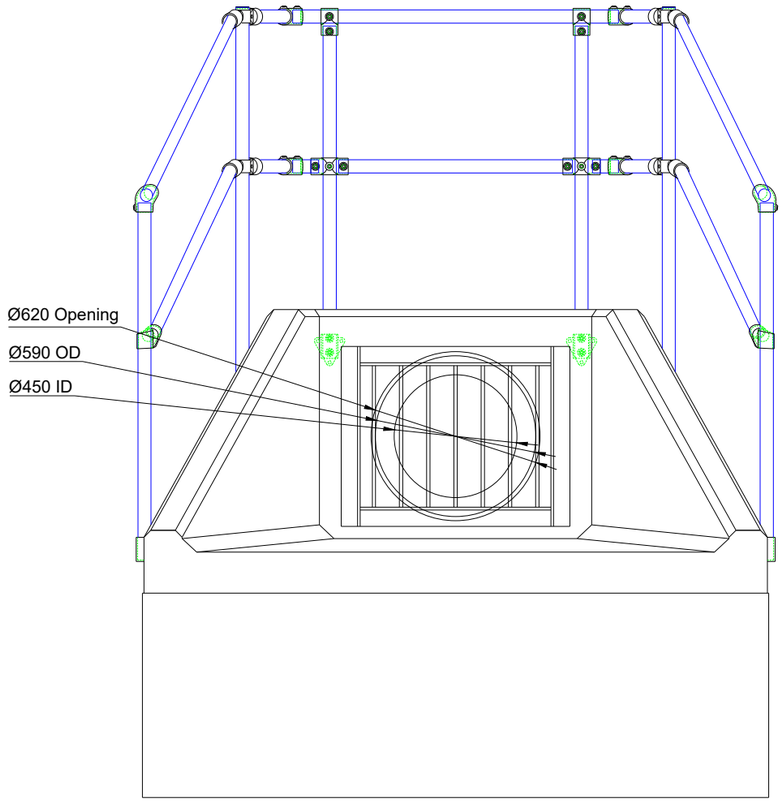
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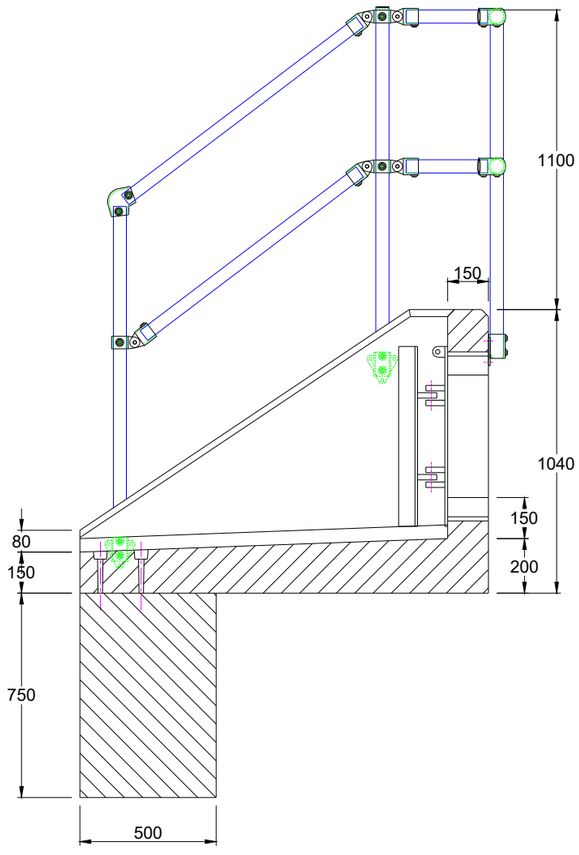
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Note: Isometric drawing is for reference only, details may not accurately represent actual design - please see detailed views for technical information







Sewers for Adoption / Sewers for Scotland Outfall Safety Grille - SFA1 450

1. In accordance with Figure C.6 Typical Outfall Safety Grille - *for outfalls of 350mm diameter of greater* - Sewers for Adoption 7th Edition
2. Material Grade is to be: BS EN 10025 S275
3. All mild steel to be hot dipped galvanized after fabrication
4. Galvanizing to BS EN: 1461
5. Welding to BS EN 1011-2:2001
6. Hinged on one side with padlock facility
7. Weight Approx: 55kg

DO NOT SCALE DRAWING

NOTES:

- All dimensions in mm
- All measurements ± 1mm

Specification Information
- Opening in back wall cast to suit outside diameter of the pipework
- Invert level of pipe can be set to your specification

Headwall Installation
Units should be bedded on minimum 200mm thick well compacted Class 6A* selected well graded granular material.
*Manual of contract documents for Highway Works: Volume (MCHW1) specification for Highway Works, Series 600 (Nov.09).
Sit the headwall level or with a slight fall 1:50 from pipe to spill mouth.

Handling
A. Weight of concrete is based on 2.4 tonne/m³+5% is recommended for sizing lifting equipment.
B. All lifting points shall be used as specified below
C. Unit to be lifted as per lifting diagram

Concrete
A. Mix ref: Self-compacting DC4/DS4 Mix
B. Lifting strength based on 2 cubes = 20N/mm²
C. Characteristic 28 day cube strength = 50N/mm²
D. Concrete provides Design Chemical Class 4 (DC4) to special Digest 1, Table F2.

Reinforcement
A. Reinforcement to BS EN 13369
B. Scheduling, dimensioning, bending & cutting to BS8666
C. Cage to be machine tied with steel wire

Manufacture
A. Manufacture to BS EN 15258:2008 precast concrete products - Retaining wall elements, Factory Production Control certificate number: 0086-CPR-650448 & BS EN 13369
B. Tolerances to BS EN 13369 clause 4.3.1.1
C. Finishing:

	Top	Sides	Base	Rear of back wall
Class	A	A	A	Self - Levelled

D. Marking: Units shall be indelibly marked to show:
- Mould reference code
- De-mould date
- Job reference number & unique product number
- Unit weight (kg)

Design
A. Concrete design to EC2
B. Althon have designed the concrete units only, the site conditions should be assessed for suitability by the scheme designer
C. Units are designed to withstand a vertical live load surcharge of 10kN/M²
D. Weight of soil = 18kN/M²
E. Angle of internal friction = 30 Deg.
F. Design Life: >120 years

Min Cover	Cover Block Size (mm)	Min Cover Size (mm)	Max Cover Size (mm)
All Faces	55	50	60

Exposure Classification	Exposure induced by Carbonation	Corrosion induced by Chloride	Freeze/thaw attack	Chemical attack
All Faces	XC3/4	XD3	XF4	XA3

Fabrication Specification
A. Manufacture IAW EN 1090-2 EXC CLASS 1
B. Material grade is to be: BS EN 10025 S275
C. Welding carried out IAW EN 1090-2 PARA 7.5.4 - 7.5.18
D. All fillet and butt welds to have a minimum throat thickness of 6mm & joints to be fully welded where possible.
E. Ensure vertical flats are fully welded both sides where possible.
F. All sharp edges and burrs are to be removed.
G. Remove all weld splatter.
H. Holes by punching are permitted with reaming.
I. Galvanising is carried out after fabrication to BS EN:ISO 1461

Handrail Specification
A. Kee Klamp® Galvanised Size 8 Fittings
B. Size 8 48.3mm OD 3.2mm Wall Thickness Galvanised Medium Duty Tube to BS EN 10255
C. 360N/m Design Load at stated in BS 8118, BS 6180, BS 6399 & BS 7818, Civil Engineering Specification for the Water Industry (CESWI) 7th Edition Clause 2.60 Handrails & Balusters & The Engineering Equipment and Materials Users' Association (EEMUA) Publication 105 7th Edition Factory Stairways, Ladders and Handrails
D. Other design loads available on request

REV NO	DATE	DESCRIPTION

Althon

ADDRESS: ALTHON LIMITED
VULCAN ROAD SOUTH
NORWICH
NR6 6AF

TEL: 01603 488700
FAX: 01603 488598
EMAIL: sales@althon.co.uk
WEBSITE: www.althon.co.uk

PROPRIETARY & CONFIDENTIAL

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DRAWING TITLE / PROJECT:

CLIENT: Anglian Water

SCALE:	PAPER:	SHEET NO:	DATE:
NTS	A3	01 OF 01	18 - 09 - 19

HEADWALL WEIGHT: 2000kg
TOE WEIGHT: 2070kg

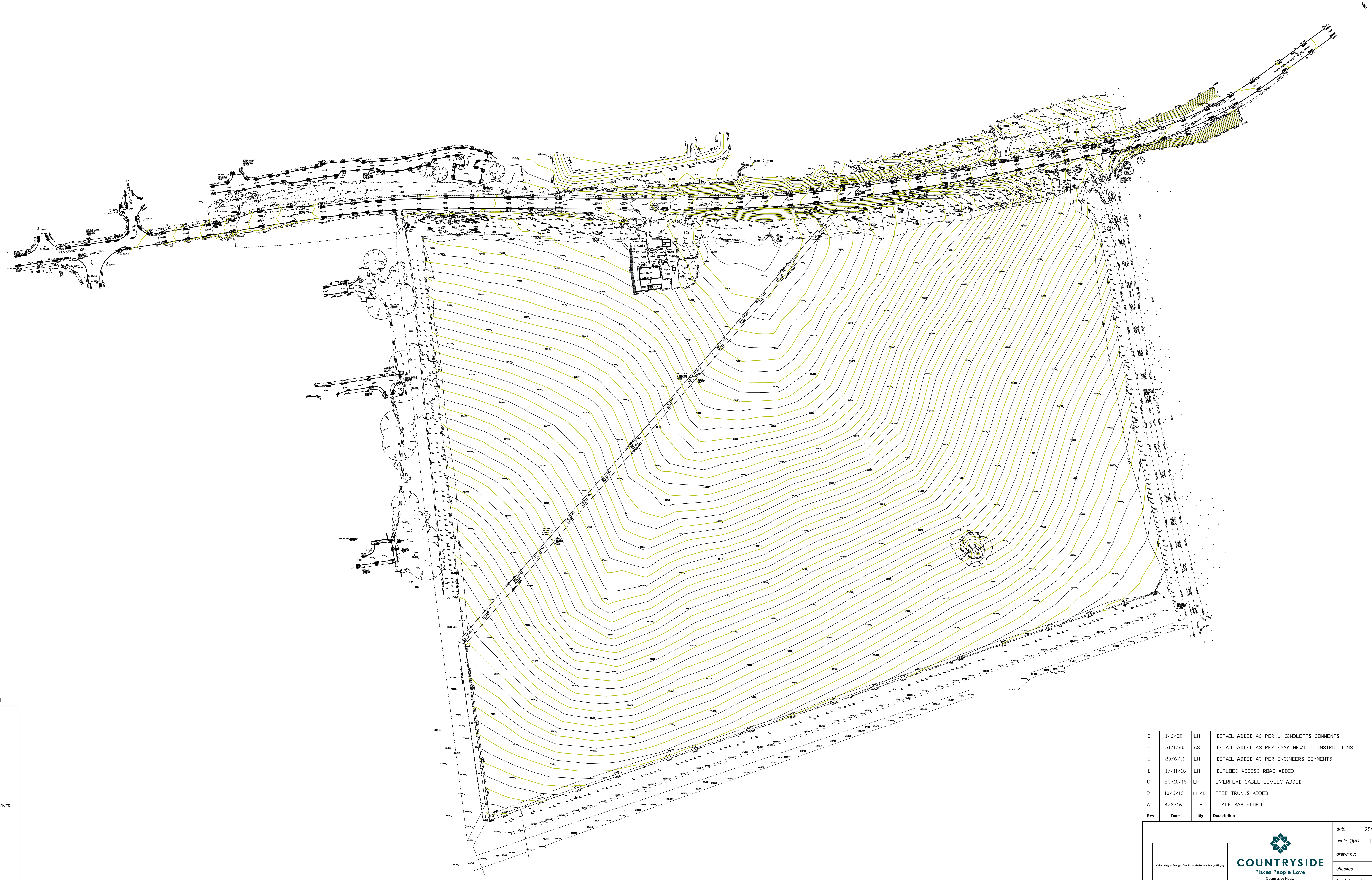
PRODUCT NAME: SFA10X

DRAWING No: ALT-AW-I10X-450-750-01

9. APPENDIX B – TOPOGRAGHICAL SURVEY

Ingent Consulting Engineers Ltd. Registered office: Unit 10 Brightwell Barns Waldringfield Road Brightwell Suffolk IP10 0BJ. Registered No: 9119667 England

N



1:1250 @ A1

0 100 200

NOTE:
SURVEY CONTROL DERIVED FROM GPS WITH A SCALE FACTOR OF 1

LEGEND

- SURVEY STATION
- UNDEFINED COVER
- GULLY
- WASH OUT
- SIGN POST
- LAMP COLUMN
- STOP COCK
- FIRE HYDRANT
- TREE
- UNIDENTIFIED ROUND COVER
- TELEGRAPH POLE
- KERB BACK
- BACK OF FOOTPATH
- DROPPED KERB
- WALL
- POST & WIRE FENCE
- GATE
- VEGETATION EDGE
- TOP OF BANK
- BOTT OF BANK
- C.B. FENCE

Rev	Date	By	Description	Chk'd
G	1/6/20	LH	DETAIL ADDED AS PER J. GIMBLETTS COMMENTS	
F	31/1/20	AS	DETAIL ADDED AS PER EMMA HEWITTS INSTRUCTIONS	
E	20/6/16	LH	DETAIL ADDED AS PER ENGINEERS COMMENTS	
D	17/11/16	LH	BURLOES ACCESS ROAD ADDED	
C	25/10/16	LH	OVERHEAD CABLE LEVELS ADDED	
B	10/6/16	LH/DL	TREE TRUNKS ADDED	
A	4/2/16	LH	SCALE BAR ADDED	

M:\Planning & Design Templates\bsi-and-ukas_2012.jpg

FS 53054 ISO 9001:2008
EMS 61920 ISO 14001:2004

COUNTRYSIDE
Places People Love

Countryside House
The Drive, Brentwood
Essex, CM13 3AT
01277 260000
countryside-properties.com

date: 25/02/15
scale: @A1 1/1250
drawn by: LH
checked:

I Information
PL Planning
T Tender
C Construction
P Preliminary

project: NEWMARKET ROAD ROYSTON

drawing: TOPOGRAPHICAL SURVEY

drawing no: SURV1943

sheet no: Sheet 1 of 1

rev: G

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10. APPENDIX C – HYDRALIC CALCULATIONS

Ingent Consulting Engineers Ltd. Registered office: Unit 10 Brightwell Barns Waldringfield Road Brightwell Suffolk IP10 0BJ. Registered No: 9119667 England

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	KIERAN KINCAID
Site name:	Newmarket Road
Site location:	Royston

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.04732° N
Longitude:	0.00452° W
Reference:	2679319669
Date:	Mar 04 2025 09:25

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	14.77

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

Hydrological characteristics

	Default	Edited
SAAR (mm):	588	588
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

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OK, I AGREE MORE INFO

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	2.02	2.02
1 in 1 year (l/s):	1.76	1.76
1 in 30 years (l/s):	4.96	4.96
1 in 100 year (l/s):	7.2	7.2
1 in 200 years (l/s):	8.52	8.52

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	x
Return Period (years)	2	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	9.999		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	150.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.034	5.00	99.702	1200	537135.192	240663.626	1.866
2	0.072	5.00	95.361	1200	537081.220	240626.764	1.425
3			94.173	1200	537064.863	240613.040	1.500
4	0.036	5.00	92.069	1200	537033.747	240649.050	1.500
5	0.068	5.00	91.707	1200	537057.281	240690.741	1.425
6	0.062	5.00	91.111	1200	537035.703	240672.100	1.500
7	0.041	5.00	91.441	1350	537023.486	240660.378	2.050
8	0.031	5.00	91.502	1350	537002.982	240649.119	2.169
9	0.088	5.00	90.500	1350	536982.438	240638.264	1.650
10	0.060	5.00	88.467	1350	536951.539	240629.995	1.650
11	0.070	5.00	86.101	1350	536913.972	240627.506	1.650
12	0.070	5.00	84.094	1350	536882.965	240634.212	1.650
13	0.034	5.00	83.018	1500	536856.747	240648.825	1.725
14	0.023	5.00	82.782	1500	536847.080	240658.529	1.725
15	0.023	5.00	81.484	1500	536867.719	240679.583	1.725
16	0.023	5.00	80.656	1500	536878.216	240694.585	1.725
17	0.057	5.00	81.535	1200	536961.892	240695.342	1.851
18	0.051	5.00	81.136	1200	536943.462	240690.569	1.640
19	0.077	5.00	80.787	1200	536922.689	240691.947	1.500
20	0.059	5.00	80.015	1500	536884.846	240707.631	1.725
21	0.052	5.00	78.680	1500	536892.028	240736.530	1.725
22	0.160	5.00	78.127	1500	536895.017	240748.417	1.725
23			75.000		536893.893	240768.797	0.600
24	0.042	5.00	96.104	1200	537118.929	240744.369	1.425
25	0.031	5.00	96.749	1200	537122.640	240734.510	2.133
26	0.049	5.00	95.468	1200	537105.286	240725.944	1.425
27	0.050	5.00	93.265	1200	537079.548	240707.764	1.848
28	0.016	5.00	91.718	1200	537066.487	240725.670	2.223
29			90.636	1200	537062.762	240740.306	2.400
30	0.026	5.00	89.627	1200	537064.730	240754.143	2.556
31	0.021	5.00	87.167	1200	537075.147	240787.553	3.012
32			86.497	1200	537074.616	240797.492	3.171
33	0.027	5.00	86.094	1350	537071.972	240803.949	3.424
34			85.452	1350	537061.469	240804.180	3.657
35	0.037	5.00	82.003	1350	537039.837	240801.986	1.575
36	0.048	5.00	83.000	1200	536993.526	240713.997	1.425
37	0.066	5.00	83.449	1200	537008.657	240736.320	2.108
38	0.062	5.00	82.159	1200	537011.861	240758.511	1.500
39	0.031	5.00	79.800	1350	537007.510	240798.078	2.275
40	0.048	5.00	77.190	1350	536974.292	240794.518	1.892
41			77.650	1350	536950.335	240793.896	2.411
42			77.300	1500	536942.176	240785.576	2.165
43			75.000		536920.228	240785.296	0.600
44	0.034	5.00	84.350	1200	536807.184	240632.358	1.300
45	0.044	5.00	83.431	1200	536812.102	240648.747	1.425

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
46	0.023	5.00	82.881	1200	536823.232	240661.835	1.425
47	0.023	5.00	82.497	1200	536834.242	240672.920	1.500
48	0.064	5.00	81.941	1200	536824.000	240691.335	1.787
49	0.023	5.00	80.717	1200	536816.705	240716.655	2.759
50	0.033	5.00	79.621	1200	536815.468	240738.388	3.477
51	0.023	5.00	76.270	1350	536816.649	240806.310	1.552
52	0.023	5.00	78.046	1350	536815.377	240769.842	3.418
54	0.039	5.00	78.687	1500	536815.551	240756.973	4.166
55			78.392	1500	536836.950	240757.212	3.915
56			76.185	1500	536869.118	240768.713	1.778
57			75.000		536869.189	240771.724	0.600
BASIN 1			75.000		536889.803	240791.374	2.400
58_OUT			75.000	1500	536890.995	240797.263	2.400
59	0.046	5.00	96.755	1200	536731.467	240523.032	1.300
60			96.330	1200	536732.945	240531.918	1.425
61	0.032	5.00	94.708	1200	536725.248	240568.563	1.425
62	0.014	5.00	93.671	1200	536720.487	240592.618	1.425
63	0.017	5.00	92.460	1200	536724.314	240614.426	1.425
64			91.196	1200	536722.142	240633.522	1.425
65	0.017	5.00	90.301	1200	536717.925	240646.049	1.425
66	0.031	5.00	86.985	1200	536710.767	240694.930	1.500
67	0.023	5.00	86.141	1200	536709.830	240706.531	1.500
68	0.023	5.00	85.228	1200	536710.726	240719.456	1.500
69	0.014	5.00	83.200	1200	536701.661	240755.492	1.500
70			81.800	1200	536697.408	240781.679	2.250
71			79.300	1200	536697.729	240798.448	1.150
72	0.059	5.00	83.865	1200	536736.010	240728.539	1.965
73	0.055	5.00	81.837	1350	536773.134	240736.279	1.300
74	0.100	5.00	82.851	1350	536754.343	240734.613	2.373
75	0.009	5.00	82.042	1350	536752.649	240752.818	2.202
76	0.069	5.00	80.348	1350	536751.667	240787.860	3.348
77			79.300	1350	536751.762	240797.787	2.450
77_OUT			79.300	1350	536797.529	240798.177	2.550
78		5.00	100.505	1200	536743.950	240444.907	1.505
79			100.228	1200	536767.613	240450.203	2.440
80			98.785	1200	536796.534	240461.996	2.559
81	0.117	5.00	97.708	1200	536827.219	240472.259	2.686
82	0.023	5.00	94.350	1200	536816.277	240506.210	2.376
83	0.042	5.00	93.075	1200	536814.108	240519.131	2.193
84	0.089	5.00	92.280	1200	536803.785	240533.102	1.425
85	0.046	5.00	91.652	1350	536814.586	240533.702	1.575
86	0.023	5.00	90.663	1350	536816.407	240543.734	1.436
87	0.046	5.00	89.517	1350	536819.762	240554.652	1.242
88	0.076	5.00	94.907	1200	536980.283	240574.364	1.425
89	0.073	5.00	93.572	1200	536928.033	240559.094	1.500
90	0.093	5.00	91.759	1200	536868.400	240554.463	1.500
91	0.075	5.00	90.041	1500	536839.829	240554.331	1.725
92	0.036	5.00	88.983	1500	536825.207	240562.491	1.653
93	0.023	5.00	88.243	1500	536816.410	240570.701	1.725
94	0.023	5.00	87.297	1500	536808.983	240584.232	1.725

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
95	0.091	5.00	86.646	1500	536807.457	240594.507	1.940
96	0.023	5.00	85.187	1500	536807.491	240618.535	1.800
97	0.052	5.00	84.321	1500	536844.841	240619.089	1.800
BASIN 2			83.500	1500	536844.648	240630.774	1.100
98_OUT			83.400	1500	536834.494	240641.278	1.000
BASIN 3	0.046		95.700		536810.619	240475.928	0.600
BASIN 4	0.050		97.000		537075.871	240560.584	0.600
BASIN 5	0.055		96.500		537085.856	240583.325	0.600

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	65.359	0.600	97.836	93.936	3.900	16.8	225	5.34	51.3
1.001	2	3	21.352	0.600	93.936	92.748	1.188	18.0	225	5.45	50.9
1.002	3	4	47.591	0.600	92.673	90.569	2.104	22.6	300	5.69	50.0
1.003	4	7	15.284	0.600	90.569	89.541	1.028	14.9	300	5.76	49.8
2.000	5	6	28.515	0.600	90.282	89.686	0.596	47.8	225	5.25	51.7
2.001	6	7	16.931	0.600	89.611	89.541	0.070	241.9	300	5.53	50.6
1.004	7	8	23.392	0.600	89.391	89.333	0.058	403.3	450	6.14	48.3
1.005	8	9	23.235	0.600	89.333	88.850	0.483	48.1	450	6.27	47.9
1.006	9	10	31.986	0.600	88.850	86.817	2.033	15.7	450	6.38	47.5
1.007	10	11	37.649	0.600	86.817	84.451	2.366	15.9	450	6.50	47.0
1.008	11	12	31.724	0.600	84.451	82.444	2.007	15.8	450	6.60	46.7
1.009	12	13	30.015	0.600	82.444	81.368	1.076	27.9	450	6.73	46.2
1.010	13	14	13.697	0.600	81.293	81.057	0.236	58.0	525	6.81	45.9
1.011	14	15	29.483	0.600	81.057	79.759	1.298	22.7	525	6.92	45.5
1.012	15	16	18.310	0.600	79.759	78.931	0.828	22.1	525	6.98	45.3
1.013	16	20	14.634	0.600	78.931	78.290	0.641	22.8	525	7.03	45.1
3.000	17	18	19.038	0.600	79.684	79.571	0.113	168.5	225	5.32	51.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.212	127.7	6.3	1.641	1.200	0.034	0.0	34	1.686
1.001	3.101	123.3	19.5	1.200	1.200	0.106	0.0	60	2.280
1.002	3.319	234.6	19.2	1.200	1.200	0.106	0.0	58	2.031
1.003	4.097	289.6	25.6	1.200	1.600	0.142	0.0	59	2.552
2.000	1.895	75.4	12.7	1.200	1.200	0.068	0.0	62	1.415
2.001	1.006	71.1	23.8	1.200	1.600	0.130	0.0	119	0.908
1.004	1.006	160.0	54.6	1.600	1.719	0.313	0.0	181	0.913
1.005	2.936	467.0	59.6	1.719	1.200	0.344	0.0	108	2.044
1.006	5.145	818.2	74.2	1.200	1.200	0.432	0.0	90	3.241
1.007	5.115	813.6	83.6	1.200	1.200	0.492	0.0	96	3.346
1.008	5.133	816.3	94.9	1.200	1.200	0.562	0.0	102	3.477
1.009	3.860	614.0	105.5	1.200	1.200	0.632	0.0	125	2.918
1.010	2.944	637.3	110.5	1.200	1.200	0.666	0.0	147	2.233
1.011	4.713	1020.4	113.3	1.200	1.200	0.689	0.0	117	3.155
1.012	4.777	1034.2	116.6	1.200	1.200	0.712	0.0	118	3.214
1.013	4.701	1017.8	119.8	1.200	1.200	0.735	0.0	120	3.201
3.000	1.004	39.9	10.6	1.626	1.340	0.057	0.0	79	0.850

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.001	18	19	20.819	0.600	79.496	79.287	0.209	99.6	300	5.54	50.6
3.002	19	20	40.964	0.600	79.287	78.515	0.772	53.1	300	5.85	49.4
1.014	20	21	29.778	0.600	78.290	76.955	1.335	22.3	525	7.14	44.8
1.015	21	22	12.257	0.600	76.955	76.402	0.553	22.2	525	7.18	44.7
1.016	22	23	20.411	0.600	76.402	74.400	2.002	10.2	525	7.23	44.5
1.017	23	BASIN 1	22.944	0.600	74.400	72.600	1.800	12.7	525	7.29	43.9
4.000	24	25	10.534	0.600	94.679	94.616	0.063	167.2	225	5.17	52.0
4.001	25	26	19.353	0.600	94.616	94.043	0.573	33.8	225	5.32	51.4
4.002	26	27	31.511	0.600	94.043	91.417	2.626	12.0	225	5.46	50.9
4.003	27	28	22.163	0.600	91.417	89.570	1.847	12.0	225	5.55	50.5
4.004	28	29	15.103	0.600	89.495	88.236	1.259	12.0	300	5.61	50.3
4.005	29	30	13.976	0.600	88.236	87.071	1.165	12.0	300	5.66	50.1
4.006	30	31	34.996	0.600	87.071	84.155	2.916	12.0	300	5.79	49.7
4.007	31	32	9.953	0.600	84.155	83.326	0.829	12.0	300	5.82	49.5
4.008	32	33	6.977	0.600	83.326	82.745	0.581	12.0	300	5.85	49.4
4.009	33	34	10.506	0.600	82.670	81.795	0.875	12.0	375	5.88	49.3
4.010	34	35	21.743	0.600	81.795	80.428	1.367	15.9	375	5.96	49.0
4.011	35	39	32.562	0.600	80.428	77.600	2.828	11.5	375	6.06	48.6
5.000	36	37	26.968	0.600	81.575	81.416	0.159	169.6	225	5.45	50.9
5.001	37	38	22.421	0.600	81.341	80.659	0.682	32.9	300	5.58	50.4
5.002	38	39	39.806	0.600	80.659	77.675	2.984	13.3	300	5.74	49.8
4.012	39	40	33.408	0.600	77.525	75.298	2.227	15.0	450	6.17	48.2
4.013	40	41	23.965	0.600	75.298	75.239	0.059	406.2	450	6.57	46.8
4.014	41	42	11.653	0.600	75.239	75.210	0.029	401.8	450	6.76	46.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.001	1.575	111.3	19.7	1.340	1.200	0.108	0.0	85	1.199
3.002	2.163	152.9	33.0	1.200	1.200	0.185	0.0	94	1.735
1.014	4.757	1029.7	158.5	1.200	1.200	0.979	0.0	138	3.495
1.015	4.772	1033.0	166.6	1.200	1.200	1.031	0.0	141	3.547
1.016	7.042	1524.4	191.5	1.200	0.075	1.191	0.0	124	4.886
1.017	6.296	1363.0	189.0	0.075	1.875	1.191	0.0	130	4.486
4.000	1.008	40.1	7.9	1.200	1.908	0.042	0.0	67	0.785
4.001	2.258	89.8	13.6	1.908	1.200	0.073	0.0	58	1.633
4.002	3.798	151.0	22.4	1.200	1.623	0.122	0.0	58	2.748
4.003	3.798	151.0	31.4	1.623	1.923	0.172	0.0	69	3.007
4.004	4.563	322.5	34.2	1.923	2.100	0.188	0.0	65	3.001
4.005	4.563	322.5	34.0	2.100	2.256	0.188	0.0	65	3.000
4.006	4.562	322.5	38.4	2.256	2.712	0.214	0.0	69	3.105
4.007	4.561	322.4	42.0	2.712	2.871	0.235	0.0	72	3.178
4.008	4.561	322.4	42.0	2.871	3.049	0.235	0.0	72	3.177
4.009	5.253	580.1	46.7	3.049	3.282	0.262	0.0	71	3.208
4.010	4.562	503.8	46.4	3.282	1.200	0.262	0.0	76	2.883
4.011	5.364	592.4	52.5	1.200	1.825	0.299	0.0	74	3.353
5.000	1.001	39.8	8.8	1.200	1.808	0.048	0.0	72	0.807
5.001	2.751	194.5	20.8	1.808	1.200	0.114	0.0	66	1.817
5.002	4.326	305.8	31.7	1.200	1.825	0.176	0.0	65	2.830
4.012	5.269	838.0	88.1	1.825	1.442	0.506	0.0	97	3.465
4.013	1.002	159.4	93.7	1.442	1.961	0.554	0.0	248	1.041
4.014	1.008	160.3	92.3	1.961	1.640	0.554	0.0	245	1.041

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.015	42	43	21.950	0.600	75.135	74.400	0.735	29.9	525	6.85	45.8
4.016	43	BASIN 1	31.026	0.600	74.400	72.600	1.800	17.2	525	6.94	46.4
6.000	44	45	17.111	0.600	83.050	82.006	1.044	16.4	225	5.09	52.3
6.001	45	46	17.181	0.600	82.006	81.456	0.550	31.2	225	5.21	51.8
6.002	46	47	15.624	0.600	81.456	81.072	0.384	40.7	225	5.34	51.4
6.003	47	48	21.072	0.600	80.997	80.154	0.843	25.0	300	5.45	50.9
6.004	48	49	26.350	0.600	80.154	77.958	2.196	12.0	300	5.54	50.6
6.005	49	50	21.768	0.600	77.958	76.144	1.814	12.0	300	5.62	50.3
6.006	50	54	18.585	0.600	76.144	74.746	1.398	13.3	300	5.69	50.0
7.000	51	52	36.490	0.600	74.718	74.628	0.090	405.4	450	5.61	50.3
7.001	52	54	12.870	0.600	74.628	74.596	0.032	402.2	450	5.82	49.5
6.007	54	55	21.400	0.600	74.521	74.477	0.044	486.4	525	6.17	48.2
6.008	55	56	34.162	0.600	74.477	74.407	0.070	488.0	525	6.74	46.2
6.009	56	57	3.012	0.600	74.407	74.400	0.007	430.3	525	6.78	46.2
6.010	57	BASIN 1	28.479	0.600	74.400	72.600	1.800	15.8	525	6.87	45.7
1.018	BASIN 1	58_OUT	6.008	0.600	72.600	72.600	0.000	0.0	525	7.39	43.6
8.000	59	60	9.008	0.600	95.455	94.905	0.550	16.4	225	5.05	52.5
8.001	60	61	37.445	0.600	94.905	93.283	1.622	23.1	225	5.27	51.6
8.002	61	62	24.522	0.600	93.283	92.246	1.037	23.6	225	5.43	51.0
8.003	62	63	22.141	0.600	92.246	91.035	1.211	18.3	225	5.55	50.6
8.004	63	64	19.219	0.600	91.035	89.771	1.264	15.2	225	5.64	50.2
8.005	64	65	13.218	0.600	89.771	88.876	0.895	14.8	225	5.71	50.0
8.006	65	66	49.402	0.600	88.876	85.560	3.316	14.9	225	5.95	49.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.015	4.109	889.5	91.7	1.640	0.075	0.554	0.0	113	2.695
4.016	5.413	1171.7	92.9	0.075	1.875	0.554	0.0	99	3.296
6.000	3.248	129.1	6.4	1.075	1.200	0.034	0.0	34	1.705
6.001	2.349	93.4	14.6	1.200	1.200	0.078	0.0	60	1.727
6.002	2.056	81.8	18.8	1.200	1.200	0.101	0.0	73	1.681
6.003	3.157	223.2	22.8	1.200	1.487	0.124	0.0	64	2.053
6.004	4.562	322.5	34.4	1.487	2.459	0.188	0.0	65	3.000
6.005	4.562	322.5	38.4	2.459	3.177	0.211	0.0	69	3.105
6.006	4.334	306.3	44.1	3.177	3.641	0.244	0.0	76	3.113
7.000	1.003	159.6	4.2	1.102	2.968	0.023	0.0	50	0.438
7.001	1.007	160.2	8.2	2.968	3.641	0.046	0.0	69	0.539
6.007	1.009	218.4	57.3	3.641	3.390	0.329	0.0	183	0.855
6.008	1.007	218.0	54.9	3.390	1.253	0.329	0.0	179	0.844
6.009	1.073	232.3	54.9	1.253	0.075	0.329	0.0	173	0.885
6.010	5.650	1223.1	54.3	0.075	1.875	0.329	0.0	74	2.908
1.018	1.000	216.5	326.8	1.875	1.875	2.074	0.0	0	∞
8.000	3.249	129.2	8.7	1.075	1.200	0.046	0.0	39	1.862
8.001	2.734	108.7	8.6	1.200	1.200	0.046	0.0	43	1.649
8.002	2.702	107.4	14.4	1.200	1.200	0.078	0.0	55	1.887
8.003	3.074	122.2	16.8	1.200	1.200	0.092	0.0	56	2.167
8.004	3.372	134.1	19.8	1.200	1.200	0.109	0.0	58	2.440
8.005	3.422	136.1	19.7	1.200	1.200	0.109	0.0	58	2.455
8.006	3.407	135.5	22.4	1.200	1.200	0.126	0.0	62	2.546

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
8.007	66	67	11.639	0.600	85.485	84.641	0.844	13.8	300	5.99	48.9
8.008	67	68	12.956	0.600	84.641	83.728	0.913	14.2	300	6.04	48.7
8.009	68	69	37.159	0.600	83.728	81.700	2.028	18.3	300	6.21	48.1
8.010	69	70	26.530	0.600	81.700	79.550	2.150	12.3	300	6.31	47.7
8.011	70	71	16.772	0.600	79.550	78.150	1.400	12.0	300	6.37	47.5
8.012	71	77	54.037	0.600	78.150	76.925	1.225	44.1	300	6.75	46.1
9.000	72	74	19.313	0.600	81.900	80.628	1.272	15.2	225	5.10	52.3
10.000	73	74	18.865	0.600	80.537	80.478	0.059	319.7	375	5.31	51.5
9.001	74	75	18.284	0.600	80.478	79.840	0.638	28.7	375	5.40	51.1
9.002	75	76	35.056	0.600	79.840	77.000	2.840	12.3	375	5.51	50.7
9.003	76	77	9.927	0.600	77.000	76.925	0.075	132.4	375	5.62	50.3
8.013	77	77_OUT	45.769	0.600	76.850	76.750	0.100	457.7	375	7.66	43.2
11.000	78	79	24.248	0.600	99.000	97.788	1.212	20.0	100	5.23	51.7
11.001	79	80	31.233	0.600	97.788	96.226	1.562	20.0	100	5.53	50.6
11.002	80	81	32.356	0.600	96.226	95.147	1.079	30.0	100	5.91	49.2
11.003	81	82	35.671	0.600	95.022	92.049	2.973	12.0	225	6.07	48.6
11.004	82	83	13.102	0.600	91.974	90.882	1.092	12.0	300	6.12	48.4
11.005	83	85	14.579	0.600	90.882	90.152	0.730	20.0	300	6.19	48.2
12.000	84	85	10.818	0.600	90.855	90.227	0.628	17.2	225	5.06	52.4
11.006	85	86	10.196	0.600	90.077	89.227	0.850	12.0	375	6.22	48.1
11.007	86	87	11.422	0.600	89.227	88.275	0.952	12.0	375	6.26	47.9
11.008	87	92	9.545	0.600	88.275	87.480	0.795	12.0	375	6.29	47.8
13.000	88	89	54.436	0.600	93.482	92.147	1.335	40.8	225	5.44	51.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
8.007	4.255	300.8	27.7	1.200	1.200	0.157	0.0	61	2.695
8.008	4.194	296.5	31.7	1.200	1.200	0.180	0.0	66	2.772
8.009	3.690	260.8	35.3	1.200	1.200	0.203	0.0	74	2.604
8.010	4.499	318.0	37.4	1.200	1.950	0.217	0.0	69	3.048
8.011	4.566	322.8	37.3	1.950	0.850	0.217	0.0	68	3.078
8.012	2.373	167.8	36.2	0.850	2.075	0.217	0.0	94	1.904
9.000	3.375	134.2	11.2	1.740	1.998	0.059	0.0	44	2.061
10.000	1.008	111.3	10.2	0.925	1.998	0.055	0.0	77	0.637
9.001	3.395	375.0	39.5	1.998	1.827	0.214	0.0	82	2.238
9.002	5.180	572.1	40.9	1.827	2.973	0.223	0.0	67	3.048
9.003	1.573	173.7	53.1	2.973	2.000	0.292	0.0	142	1.388
8.013	0.840	92.8	79.5	2.075	2.175	0.509	0.0	268	0.940
11.000	1.734	13.6	0.0	1.405	2.340	0.000	0.0	0	0.000
11.001	1.734	13.6	0.0	2.340	2.459	0.000	0.0	0	0.000
11.002	1.414	11.1	0.0	2.459	2.461	0.000	0.0	0	0.000
11.003	3.798	151.0	20.5	2.461	2.076	0.117	0.0	56	2.679
11.004	4.563	322.5	24.5	2.076	1.893	0.140	0.0	55	2.726
11.005	3.533	249.8	31.7	1.893	1.200	0.182	0.0	72	2.450
12.000	3.168	125.9	16.9	1.200	1.200	0.089	0.0	55	2.213
11.006	5.255	580.4	55.1	1.200	1.061	0.317	0.0	77	3.358
11.007	5.255	580.3	58.9	1.061	0.867	0.340	0.0	80	3.430
11.008	5.253	580.1	66.7	0.867	1.128	0.386	0.0	85	3.551
13.000	2.054	81.7	14.0	1.200	1.200	0.076	0.0	63	1.546

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
13.001	89	90	59.813	0.600	92.072	90.259	1.813	33.0	300	5.80	49.6
13.002	90	91	28.571	0.600	90.259	88.541	1.718	16.6	300	5.93	49.1
13.003	91	92	16.745	0.600	88.316	87.330	0.986	17.0	525	5.98	48.9
11.009	92	93	12.033	0.600	87.330	86.518	0.812	14.8	525	6.32	47.7
11.010	93	94	15.435	0.600	86.518	85.572	0.946	16.3	525	6.37	47.5
11.011	94	95	10.388	0.600	85.572	84.706	0.866	12.0	525	6.39	47.4
11.012	95	96	24.028	0.600	84.706	83.462	1.244	19.3	525	6.47	47.1
11.013	96	97	37.354	0.600	83.387	82.521	0.866	43.1	600	6.64	46.4
11.014	97	BASIN 2	11.687	0.600	82.521	82.400	0.121	96.6	600	6.72	46.1
11.015	BASIN 2	98_OUT	14.610	0.600	82.400	82.400	0.000	0.0	600	6.96	45.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
13.001	2.746	194.1	26.7	1.200	1.200	0.149	0.0	75	1.946
13.002	3.873	273.8	42.9	1.200	1.200	0.242	0.0	80	2.851
13.003	5.453	1180.5	56.0	1.200	1.128	0.317	0.0	77	2.864
11.009	5.839	1263.9	127.4	1.128	1.200	0.739	0.0	111	3.802
11.010	5.564	1204.4	130.8	1.200	1.200	0.762	0.0	116	3.707
11.011	6.491	1405.2	134.5	1.200	1.415	0.785	0.0	108	4.172
11.012	5.113	1106.7	149.1	1.415	1.200	0.876	0.0	129	3.618
11.013	3.714	1050.2	150.8	1.200	1.200	0.899	0.0	152	2.676
11.014	2.478	700.6	158.4	1.200	0.500	0.951	0.0	192	2.020
11.015	1.000	282.7	155.3	0.500	0.400	0.951	0.0	0	∞

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	65.359	16.8	225	Circular	99.702	97.836	1.641	95.361	93.936	1.200
1.001	21.352	18.0	225	Circular	95.361	93.936	1.200	94.173	92.748	1.200
1.002	47.591	22.6	300	Circular	94.173	92.673	1.200	92.069	90.569	1.200
1.003	15.284	14.9	300	Circular	92.069	90.569	1.200	91.441	89.541	1.600
2.000	28.515	47.8	225	Circular	91.707	90.282	1.200	91.111	89.686	1.200
2.001	16.931	241.9	300	Circular	91.111	89.611	1.200	91.441	89.541	1.600
1.004	23.392	403.3	450	Circular	91.441	89.391	1.600	91.502	89.333	1.719
1.005	23.235	48.1	450	Circular	91.502	89.333	1.719	90.500	88.850	1.200
1.006	31.986	15.7	450	Circular	90.500	88.850	1.200	88.467	86.817	1.200
1.007	37.649	15.9	450	Circular	88.467	86.817	1.200	86.101	84.451	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	7	1350	Manhole	Adoptable
2.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
2.001	6	1200	Manhole	Adoptable	7	1350	Manhole	Adoptable
1.004	7	1350	Manhole	Adoptable	8	1350	Manhole	Adoptable
1.005	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
1.006	9	1350	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.007	10	1350	Manhole	Adoptable	11	1350	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.008	31.724	15.8	450	Circular	86.101	84.451	1.200	84.094	82.444	1.200
1.009	30.015	27.9	450	Circular	84.094	82.444	1.200	83.018	81.368	1.200
1.010	13.697	58.0	525	Circular	83.018	81.293	1.200	82.782	81.057	1.200
1.011	29.483	22.7	525	Circular	82.782	81.057	1.200	81.484	79.759	1.200
1.012	18.310	22.1	525	Circular	81.484	79.759	1.200	80.656	78.931	1.200
1.013	14.634	22.8	525	Circular	80.656	78.931	1.200	80.015	78.290	1.200
3.000	19.038	168.5	225	Circular	81.535	79.684	1.626	81.136	79.571	1.340
3.001	20.819	99.6	300	Circular	81.136	79.496	1.340	80.787	79.287	1.200
3.002	40.964	53.1	300	Circular	80.787	79.287	1.200	80.015	78.515	1.200
1.014	29.778	22.3	525	Circular	80.015	78.290	1.200	78.680	76.955	1.200
1.015	12.257	22.2	525	Circular	78.680	76.955	1.200	78.127	76.402	1.200
1.016	20.411	10.2	525	Circular	78.127	76.402	1.200	75.000	74.400	0.075
1.017	22.944	12.7	525	Circular	75.000	74.400	0.075	75.000	72.600	1.875
4.000	10.534	167.2	225	Circular	96.104	94.679	1.200	96.749	94.616	1.908
4.001	19.353	33.8	225	Circular	96.749	94.616	1.908	95.468	94.043	1.200
4.002	31.511	12.0	225	Circular	95.468	94.043	1.200	93.265	91.417	1.623
4.003	22.163	12.0	225	Circular	93.265	91.417	1.623	91.718	89.570	1.923
4.004	15.103	12.0	300	Circular	91.718	89.495	1.923	90.636	88.236	2.100
4.005	13.976	12.0	300	Circular	90.636	88.236	2.100	89.627	87.071	2.256
4.006	34.996	12.0	300	Circular	89.627	87.071	2.256	87.167	84.155	2.712
4.007	9.953	12.0	300	Circular	87.167	84.155	2.712	86.497	83.326	2.871
4.008	6.977	12.0	300	Circular	86.497	83.326	2.871	86.094	82.745	3.049
4.009	10.506	12.0	375	Circular	86.094	82.670	3.049	85.452	81.795	3.282
4.010	21.743	15.9	375	Circular	85.452	81.795	3.282	82.003	80.428	1.200
4.011	32.562	11.5	375	Circular	82.003	80.428	1.200	79.800	77.600	1.825

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.008	11	1350	Manhole	Adoptable	12	1350	Manhole	Adoptable
1.009	12	1350	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.010	13	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
1.011	14	1500	Manhole	Adoptable	15	1500	Manhole	Adoptable
1.012	15	1500	Manhole	Adoptable	16	1500	Manhole	Adoptable
1.013	16	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
3.000	17	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
3.001	18	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
3.002	19	1200	Manhole	Adoptable	20	1500	Manhole	Adoptable
1.014	20	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
1.015	21	1500	Manhole	Adoptable	22	1500	Manhole	Adoptable
1.016	22	1500	Manhole	Adoptable	23		Junction	
1.017	23		Junction		BASIN 1		Junction	
4.000	24	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
4.001	25	1200	Manhole	Adoptable	26	1200	Manhole	Adoptable
4.002	26	1200	Manhole	Adoptable	27	1200	Manhole	Adoptable
4.003	27	1200	Manhole	Adoptable	28	1200	Manhole	Adoptable
4.004	28	1200	Manhole	Adoptable	29	1200	Manhole	Adoptable
4.005	29	1200	Manhole	Adoptable	30	1200	Manhole	Adoptable
4.006	30	1200	Manhole	Adoptable	31	1200	Manhole	Adoptable
4.007	31	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
4.008	32	1200	Manhole	Adoptable	33	1350	Manhole	Adoptable
4.009	33	1350	Manhole	Adoptable	34	1350	Manhole	Adoptable
4.010	34	1350	Manhole	Adoptable	35	1350	Manhole	Adoptable
4.011	35	1350	Manhole	Adoptable	39	1350	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	26.968	169.6	225	Circular	83.000	81.575	1.200	83.449	81.416	1.808
5.001	22.421	32.9	300	Circular	83.449	81.341	1.808	82.159	80.659	1.200
5.002	39.806	13.3	300	Circular	82.159	80.659	1.200	79.800	77.675	1.825
4.012	33.408	15.0	450	Circular	79.800	77.525	1.825	77.190	75.298	1.442
4.013	23.965	406.2	450	Circular	77.190	75.298	1.442	77.650	75.239	1.961
4.014	11.653	401.8	450	Circular	77.650	75.239	1.961	77.300	75.210	1.640
4.015	21.950	29.9	525	Circular	77.300	75.135	1.640	75.000	74.400	0.075
4.016	31.026	17.2	525	Circular	75.000	74.400	0.075	75.000	72.600	1.875
6.000	17.111	16.4	225	Circular	84.350	83.050	1.075	83.431	82.006	1.200
6.001	17.181	31.2	225	Circular	83.431	82.006	1.200	82.881	81.456	1.200
6.002	15.624	40.7	225	Circular	82.881	81.456	1.200	82.497	81.072	1.200
6.003	21.072	25.0	300	Circular	82.497	80.997	1.200	81.941	80.154	1.487
6.004	26.350	12.0	300	Circular	81.941	80.154	1.487	80.717	77.958	2.459
6.005	21.768	12.0	300	Circular	80.717	77.958	2.459	79.621	76.144	3.177
6.006	18.585	13.3	300	Circular	79.621	76.144	3.177	78.687	74.746	3.641
7.000	36.490	405.4	450	Circular	76.270	74.718	1.102	78.046	74.628	2.968
7.001	12.870	402.2	450	Circular	78.046	74.628	2.968	78.687	74.596	3.641
6.007	21.400	486.4	525	Circular	78.687	74.521	3.641	78.392	74.477	3.390
6.008	34.162	488.0	525	Circular	78.392	74.477	3.390	76.185	74.407	1.253
6.009	3.012	430.3	525	Circular	76.185	74.407	1.253	75.000	74.400	0.075
6.010	28.479	15.8	525	Circular	75.000	74.400	0.075	75.000	72.600	1.875
1.018	6.008	0.0	525	Circular	75.000	72.600	1.875	75.000	72.600	1.875
8.000	9.008	16.4	225	Circular	96.755	95.455	1.075	96.330	94.905	1.200
8.001	37.445	23.1	225	Circular	96.330	94.905	1.200	94.708	93.283	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	36	1200	Manhole	Adoptable	37	1200	Manhole	Adoptable
5.001	37	1200	Manhole	Adoptable	38	1200	Manhole	Adoptable
5.002	38	1200	Manhole	Adoptable	39	1350	Manhole	Adoptable
4.012	39	1350	Manhole	Adoptable	40	1350	Manhole	Adoptable
4.013	40	1350	Manhole	Adoptable	41	1350	Manhole	Adoptable
4.014	41	1350	Manhole	Adoptable	42	1500	Manhole	Adoptable
4.015	42	1500	Manhole	Adoptable	43		Junction	
4.016	43		Junction		BASIN 1		Junction	
6.000	44	1200	Manhole	Adoptable	45	1200	Manhole	Adoptable
6.001	45	1200	Manhole	Adoptable	46	1200	Manhole	Adoptable
6.002	46	1200	Manhole	Adoptable	47	1200	Manhole	Adoptable
6.003	47	1200	Manhole	Adoptable	48	1200	Manhole	Adoptable
6.004	48	1200	Manhole	Adoptable	49	1200	Manhole	Adoptable
6.005	49	1200	Manhole	Adoptable	50	1200	Manhole	Adoptable
6.006	50	1200	Manhole	Adoptable	54	1500	Manhole	Adoptable
7.000	51	1350	Manhole	Adoptable	52	1350	Manhole	Adoptable
7.001	52	1350	Manhole	Adoptable	54	1500	Manhole	Adoptable
6.007	54	1500	Manhole	Adoptable	55	1500	Manhole	Adoptable
6.008	55	1500	Manhole	Adoptable	56	1500	Manhole	Adoptable
6.009	56	1500	Manhole	Adoptable	57		Junction	
6.010	57		Junction		BASIN 1		Junction	
1.018	BASIN 1		Junction		58_OUT	1500	Manhole	Adoptable
8.000	59	1200	Manhole	Adoptable	60	1200	Manhole	Adoptable
8.001	60	1200	Manhole	Adoptable	61	1200	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
8.002	24.522	23.6	225	Circular	94.708	93.283	1.200	93.671	92.246	1.200
8.003	22.141	18.3	225	Circular	93.671	92.246	1.200	92.460	91.035	1.200
8.004	19.219	15.2	225	Circular	92.460	91.035	1.200	91.196	89.771	1.200
8.005	13.218	14.8	225	Circular	91.196	89.771	1.200	90.301	88.876	1.200
8.006	49.402	14.9	225	Circular	90.301	88.876	1.200	86.985	85.560	1.200
8.007	11.639	13.8	300	Circular	86.985	85.485	1.200	86.141	84.641	1.200
8.008	12.956	14.2	300	Circular	86.141	84.641	1.200	85.228	83.728	1.200
8.009	37.159	18.3	300	Circular	85.228	83.728	1.200	83.200	81.700	1.200
8.010	26.530	12.3	300	Circular	83.200	81.700	1.200	81.800	79.550	1.950
8.011	16.772	12.0	300	Circular	81.800	79.550	1.950	79.300	78.150	0.850
8.012	54.037	44.1	300	Circular	79.300	78.150	0.850	79.300	76.925	2.075
9.000	19.313	15.2	225	Circular	83.865	81.900	1.740	82.851	80.628	1.998
10.000	18.865	319.7	375	Circular	81.837	80.537	0.925	82.851	80.478	1.998
9.001	18.284	28.7	375	Circular	82.851	80.478	1.998	82.042	79.840	1.827
9.002	35.056	12.3	375	Circular	82.042	79.840	1.827	80.348	77.000	2.973
9.003	9.927	132.4	375	Circular	80.348	77.000	2.973	79.300	76.925	2.000
8.013	45.769	457.7	375	Circular	79.300	76.850	2.075	79.300	76.750	2.175
11.000	24.248	20.0	100	Circular	100.505	99.000	1.405	100.228	97.788	2.340
11.001	31.233	20.0	100	Circular	100.228	97.788	2.340	98.785	96.226	2.459
11.002	32.356	30.0	100	Circular	98.785	96.226	2.459	97.708	95.147	2.461
11.003	35.671	12.0	225	Circular	97.708	95.022	2.461	94.350	92.049	2.076
11.004	13.102	12.0	300	Circular	94.350	91.974	2.076	93.075	90.882	1.893
11.005	14.579	20.0	300	Circular	93.075	90.882	1.893	91.652	90.152	1.200
12.000	10.818	17.2	225	Circular	92.280	90.855	1.200	91.652	90.227	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
8.002	61	1200	Manhole	Adoptable	62	1200	Manhole	Adoptable
8.003	62	1200	Manhole	Adoptable	63	1200	Manhole	Adoptable
8.004	63	1200	Manhole	Adoptable	64	1200	Manhole	Adoptable
8.005	64	1200	Manhole	Adoptable	65	1200	Manhole	Adoptable
8.006	65	1200	Manhole	Adoptable	66	1200	Manhole	Adoptable
8.007	66	1200	Manhole	Adoptable	67	1200	Manhole	Adoptable
8.008	67	1200	Manhole	Adoptable	68	1200	Manhole	Adoptable
8.009	68	1200	Manhole	Adoptable	69	1200	Manhole	Adoptable
8.010	69	1200	Manhole	Adoptable	70	1200	Manhole	Adoptable
8.011	70	1200	Manhole	Adoptable	71	1200	Manhole	Adoptable
8.012	71	1200	Manhole	Adoptable	77	1350	Manhole	Adoptable
9.000	72	1200	Manhole	Adoptable	74	1350	Manhole	Adoptable
10.000	73	1350	Manhole	Adoptable	74	1350	Manhole	Adoptable
9.001	74	1350	Manhole	Adoptable	75	1350	Manhole	Adoptable
9.002	75	1350	Manhole	Adoptable	76	1350	Manhole	Adoptable
9.003	76	1350	Manhole	Adoptable	77	1350	Manhole	Adoptable
8.013	77	1350	Manhole	Adoptable	77_OUT	1350	Manhole	Adoptable
11.000	78	1200	Manhole	Adoptable	79	1200	Manhole	Adoptable
11.001	79	1200	Manhole	Adoptable	80	1200	Manhole	Adoptable
11.002	80	1200	Manhole	Adoptable	81	1200	Manhole	Adoptable
11.003	81	1200	Manhole	Adoptable	82	1200	Manhole	Adoptable
11.004	82	1200	Manhole	Adoptable	83	1200	Manhole	Adoptable
11.005	83	1200	Manhole	Adoptable	85	1350	Manhole	Adoptable
12.000	84	1200	Manhole	Adoptable	85	1350	Manhole	Adoptable

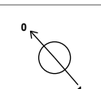
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
11.006	10.196	12.0	375	Circular	91.652	90.077	1.200	90.663	89.227	1.061
11.007	11.422	12.0	375	Circular	90.663	89.227	1.061	89.517	88.275	0.867
11.008	9.545	12.0	375	Circular	89.517	88.275	0.867	88.983	87.480	1.128
13.000	54.436	40.8	225	Circular	94.907	93.482	1.200	93.572	92.147	1.200
13.001	59.813	33.0	300	Circular	93.572	92.072	1.200	91.759	90.259	1.200
13.002	28.571	16.6	300	Circular	91.759	90.259	1.200	90.041	88.541	1.200
13.003	16.745	17.0	525	Circular	90.041	88.316	1.200	88.983	87.330	1.128
11.009	12.033	14.8	525	Circular	88.983	87.330	1.128	88.243	86.518	1.200
11.010	15.435	16.3	525	Circular	88.243	86.518	1.200	87.297	85.572	1.200
11.011	10.388	12.0	525	Circular	87.297	85.572	1.200	86.646	84.706	1.415
11.012	24.028	19.3	525	Circular	86.646	84.706	1.415	85.187	83.462	1.200
11.013	37.354	43.1	600	Circular	85.187	83.387	1.200	84.321	82.521	1.200
11.014	11.687	96.6	600	Circular	84.321	82.521	1.200	83.500	82.400	0.500
11.015	14.610	0.0	600	Circular	83.500	82.400	0.500	83.400	82.400	0.400

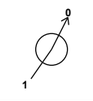
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
11.006	85	1350	Manhole	Adoptable	86	1350	Manhole	Adoptable
11.007	86	1350	Manhole	Adoptable	87	1350	Manhole	Adoptable
11.008	87	1350	Manhole	Adoptable	92	1500	Manhole	Adoptable
13.000	88	1200	Manhole	Adoptable	89	1200	Manhole	Adoptable
13.001	89	1200	Manhole	Adoptable	90	1200	Manhole	Adoptable
13.002	90	1200	Manhole	Adoptable	91	1500	Manhole	Adoptable
13.003	91	1500	Manhole	Adoptable	92	1500	Manhole	Adoptable
11.009	92	1500	Manhole	Adoptable	93	1500	Manhole	Adoptable
11.010	93	1500	Manhole	Adoptable	94	1500	Manhole	Adoptable
11.011	94	1500	Manhole	Adoptable	95	1500	Manhole	Adoptable
11.012	95	1500	Manhole	Adoptable	96	1500	Manhole	Adoptable
11.013	96	1500	Manhole	Adoptable	97	1500	Manhole	Adoptable
11.014	97	1500	Manhole	Adoptable	BASIN 2	1500	Manhole	Adoptable
11.015	BASIN 2	1500	Manhole	Adoptable	98_OUT	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	537135.192	240663.626	99.702	1.866	1200	 0	1.000	97.836	225
2	537081.220	240626.764	95.361	1.425	1200	 1	1.000	93.936	225
						0	1.001	93.936	225
3	537064.863	240613.040	94.173	1.500	1200	 1	1.001	92.748	225
						0	1.002	92.673	300
4	537033.747	240649.050	92.069	1.500	1200	 1	1.002	90.569	300
						0	1.003	90.569	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
5	537057.281	240690.741	91.707	1.425	1200				
						0	2.000	90.282	225
6	537035.703	240672.100	91.111	1.500	1200				
						1	2.000	89.686	225
						0	2.001	89.611	300
7	537023.486	240660.378	91.441	2.050	1350				
						1	2.001	89.541	300
						2	1.003	89.541	300
						0	1.004	89.391	450
8	537002.982	240649.119	91.502	2.169	1350				
						1	1.004	89.333	450
						0	1.005	89.333	450
9	536982.438	240638.264	90.500	1.650	1350				
						1	1.005	88.850	450
						0	1.006	88.850	450
10	536951.539	240629.995	88.467	1.650	1350				
						1	1.006	86.817	450
						0	1.007	86.817	450
11	536913.972	240627.506	86.101	1.650	1350				
						1	1.007	84.451	450
						0	1.008	84.451	450
12	536882.965	240634.212	84.094	1.650	1350				
						1	1.008	82.444	450
						0	1.009	82.444	450
13	536856.747	240648.825	83.018	1.725	1500				
						1	1.009	81.368	450
						0	1.010	81.293	525
14	536847.080	240658.529	82.782	1.725	1500				
						1	1.010	81.057	525
						0	1.011	81.057	525
15	536867.719	240679.583	81.484	1.725	1500				
						1	1.011	79.759	525
						0	1.012	79.759	525
16	536878.216	240694.585	80.656	1.725	1500				
						1	1.012	78.931	525
						0	1.013	78.931	525
17	536961.892	240695.342	81.535	1.851	1200				
						0	3.000	79.684	225

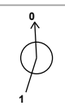
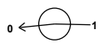
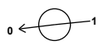
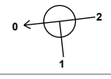
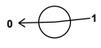
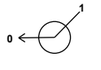
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
18	536943.462	240690.569	81.136	1.640	1200	1	3.000	79.571	225
						0	3.001	79.496	300
19	536922.689	240691.947	80.787	1.500	1200	1	3.001	79.287	300
						0	3.002	79.287	300
20	536884.846	240707.631	80.015	1.725	1500	1	3.002	78.515	300
						2	1.013	78.290	525
						0	1.014	78.290	525
21	536892.028	240736.530	78.680	1.725	1500	1	1.014	76.955	525
						0	1.015	76.955	525
22	536895.017	240748.417	78.127	1.725	1500	1	1.015	76.402	525
						0	1.016	76.402	525
23	536893.893	240768.797	75.000	0.600		1	1.016	74.400	525
						0	1.017	74.400	525
24	537118.929	240744.369	96.104	1.425	1200	0	4.000	94.679	225
25	537122.640	240734.510	96.749	2.133	1200	1	4.000	94.616	225
						0	4.001	94.616	225
26	537105.286	240725.944	95.468	1.425	1200	1	4.001	94.043	225
						0	4.002	94.043	225
27	537079.548	240707.764	93.265	1.848	1200	1	4.002	91.417	225
						0	4.003	91.417	225
28	537066.487	240725.670	91.718	2.223	1200	1	4.003	89.570	225
						0	4.004	89.495	300
29	537062.762	240740.306	90.636	2.400	1200	1	4.004	88.236	300
						0	4.005	88.236	300
30	537064.730	240754.143	89.627	2.556	1200	1	4.005	87.071	300
						0	4.006	87.071	300

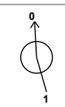
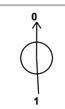
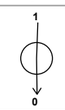
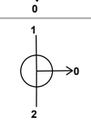
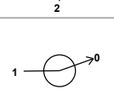
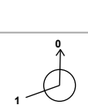
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
31	537075.147	240787.553	87.167	3.012	1200	 1	4.006	84.155	300
						0	4.007	84.155	300
32	537074.616	240797.492	86.497	3.171	1200	 1	4.007	83.326	300
						0	4.008	83.326	300
33	537071.972	240803.949	86.094	3.424	1350	 1	4.008	82.745	300
						0	4.009	82.670	375
34	537061.469	240804.180	85.452	3.657	1350	 1	4.009	81.795	375
						0	4.010	81.795	375
35	537039.837	240801.986	82.003	1.575	1350	 1	4.010	80.428	375
						0	4.011	80.428	375
36	536993.526	240713.997	83.000	1.425	1200				
						0	5.000	81.575	225
37	537008.657	240736.320	83.449	2.108	1200	 1	5.000	81.416	225
						0	5.001	81.341	300
38	537011.861	240758.511	82.159	1.500	1200	 1	5.001	80.659	300
						0	5.002	80.659	300
39	537007.510	240798.078	79.800	2.275	1350	1	5.002	77.675	300
						 2	4.011	77.600	375
						0	4.012	77.525	450
40	536974.292	240794.518	77.190	1.892	1350	 1	4.012	75.298	450
						0	4.013	75.298	450
41	536950.335	240793.896	77.650	2.411	1350	 1	4.013	75.239	450
						0	4.014	75.239	450
42	536942.176	240785.576	77.300	2.165	1500	 1	4.014	75.210	450
						0	4.015	75.135	525
43	536920.228	240785.296	75.000	0.600		 1	4.015	74.400	525
						0	4.016	74.400	525

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
44	536807.184	240632.358	84.350	1.300	1200				
						0	6.000	83.050	225
45	536812.102	240648.747	83.431	1.425	1200	1	6.000	82.006	225
									
						0	6.001	82.006	225
46	536823.232	240661.835	82.881	1.425	1200	1	6.001	81.456	225
									
						0	6.002	81.456	225
47	536834.242	240672.920	82.497	1.500	1200	1	6.002	81.072	225
									
						0	6.003	80.997	300
48	536824.000	240691.335	81.941	1.787	1200	1	6.003	80.154	300
									
						0	6.004	80.154	300
49	536816.705	240716.655	80.717	2.759	1200	1	6.004	77.958	300
									
						0	6.005	77.958	300
50	536815.468	240738.388	79.621	3.477	1200	1	6.005	76.144	300
									
						0	6.006	76.144	300
51	536816.649	240806.310	76.270	1.552	1350				
						0	7.000	74.718	450
52	536815.377	240769.842	78.046	3.418	1350	1	7.000	74.628	450
									
						0	7.001	74.628	450
54	536815.551	240756.973	78.687	4.166	1500	1	7.001	74.596	450
						2	6.006	74.746	300
									
						0	6.007	74.521	525
55	536836.950	240757.212	78.392	3.915	1500	1	6.007	74.477	525
									
						0	6.008	74.477	525
56	536869.118	240768.713	76.185	1.778	1500	1	6.008	74.407	525
									
						0	6.009	74.407	525
57	536869.189	240771.724	75.000	0.600		1	6.009	74.400	525
									
						0	6.010	74.400	525

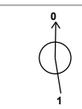
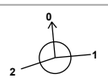
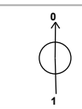
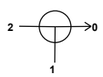
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
BASIN 1	536889.803	240791.374	75.000	2.400		1	6.010	72.600	525
						2	4.016	72.600	525
						3	1.017	72.600	525
						0	1.018	72.600	525
58_OUT	536890.995	240797.263	75.000	2.400	1500	1	1.018	72.600	525
59	536731.467	240523.032	96.755	1.300	1200	0	8.000	95.455	225
60	536732.945	240531.918	96.330	1.425	1200	1	8.000	94.905	225
						0	8.001	94.905	225
61	536725.248	240568.563	94.708	1.425	1200	1	8.001	93.283	225
						0	8.002	93.283	225
62	536720.487	240592.618	93.671	1.425	1200	1	8.002	92.246	225
						0	8.003	92.246	225
63	536724.314	240614.426	92.460	1.425	1200	1	8.003	91.035	225
						0	8.004	91.035	225
64	536722.142	240633.522	91.196	1.425	1200	1	8.004	89.771	225
						0	8.005	89.771	225
65	536717.925	240646.049	90.301	1.425	1200	1	8.005	88.876	225
						0	8.006	88.876	225
66	536710.767	240694.930	86.985	1.500	1200	1	8.006	85.560	225
						0	8.007	85.485	300
67	536709.830	240706.531	86.141	1.500	1200	1	8.007	84.641	300
						0	8.008	84.641	300
68	536710.726	240719.456	85.228	1.500	1200	1	8.008	83.728	300
						0	8.009	83.728	300
69	536701.661	240755.492	83.200	1.500	1200	1	8.009	81.700	300
						0	8.010	81.700	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
70	536697.408	240781.679	81.800	2.250	1200	 1	8.010	79.550	300
						0	8.011	79.550	300
71	536697.729	240798.448	79.300	1.150	1200	1	8.011	78.150	300
						 0	8.012	78.150	300
72	536736.010	240728.539	83.865	1.965	1200	 0	9.000	81.900	225
73	536773.134	240736.279	81.837	1.300	1350	 0	10.000	80.537	375
74	536754.343	240734.613	82.851	2.373	1350	 1	10.000	80.478	375
						2	9.000	80.628	225
						0	9.001	80.478	375
75	536752.649	240752.818	82.042	2.202	1350	1	9.001	79.840	375
						 0	9.002	79.840	375
76	536751.667	240787.860	80.348	3.348	1350	 1	9.002	77.000	375
						0	9.003	77.000	375
77	536751.762	240797.787	79.300	2.450	1350	1	9.003	76.925	375
						2	8.012	76.925	300
						 0	8.013	76.850	375
77_OUT	536797.529	240798.177	79.300	2.550	1350	1	8.013	76.750	375
									
78	536743.950	240444.907	100.505	1.505	1200	 0	11.000	99.000	100
79	536767.613	240450.203	100.228	2.440	1200	1	11.000	97.788	100
						 0	11.001	97.788	100
80	536796.534	240461.996	98.785	2.559	1200	1	11.001	96.226	100
						 0	11.002	96.226	100
81	536827.219	240472.259	97.708	2.686	1200	 1	11.002	95.147	100
						0	11.003	95.022	225

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
82	536816.277	240506.210	94.350	2.376	1200	1	11.003	92.049	225
						0	11.004	91.974	300
83	536814.108	240519.131	93.075	2.193	1200	1	11.004	90.882	300
						0	11.005	90.882	300
84	536803.785	240533.102	92.280	1.425	1200				
						0	12.000	90.855	225
85	536814.586	240533.702	91.652	1.575	1350	1	12.000	90.227	225
						2	11.005	90.152	300
						0	11.006	90.077	375
86	536816.407	240543.734	90.663	1.436	1350	1	11.006	89.227	375
						0	11.007	89.227	375
87	536819.762	240554.652	89.517	1.242	1350	1	11.007	88.275	375
						0	11.008	88.275	375
88	536980.283	240574.364	94.907	1.425	1200				
						0	13.000	93.482	225
89	536928.033	240559.094	93.572	1.500	1200	1	13.000	92.147	225
						0	13.001	92.072	300
90	536868.400	240554.463	91.759	1.500	1200	1	13.001	90.259	300
						0	13.002	90.259	300
91	536839.829	240554.331	90.041	1.725	1500	1	13.002	88.541	300
						0	13.003	88.316	525
92	536825.207	240562.491	88.983	1.653	1500	1	13.003	87.330	525
						2	11.008	87.480	375
						0	11.009	87.330	525
93	536816.410	240570.701	88.243	1.725	1500	1	11.009	86.518	525
						0	11.010	86.518	525
94	536808.983	240584.232	87.297	1.725	1500	1	11.010	85.572	525
						0	11.011	85.572	525

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
95	536807.457	240594.507	86.646	1.940	1500	1	11.011	84.706	525
						0	11.012	84.706	525
96	536807.491	240618.535	85.187	1.800	1500	1	11.012	83.462	525
						0	11.013	83.387	600
97	536844.841	240619.089	84.321	1.800	1500	1	11.013	82.521	600
						0	11.014	82.521	600
BASIN 2	536844.648	240630.774	83.500	1.100	1500	1	11.014	82.400	600
						0	11.015	82.400	600
98_OUT	536834.494	240641.278	83.400	1.000	1500	1	11.015	82.400	600
BASIN 3	536810.619	240475.928	95.700	0.600					
BASIN 4	537075.871	240560.584	97.000	0.600					
BASIN 5	537085.856	240583.325	96.500	0.600					

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Skip Steady State	x	Additional Storage (m³/ha)	0.0	Check Discharge Volume	✓
Summer CV	1.000	Analysis Speed	Normal	Drain Down Time (mins)	240	Check Discharge Rate(s)	x	100 year 360 minute (m³)	

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	30	0	0	0	100	40	10	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Positively Drained Area (ha)		SPR	0.10	Return Period (years)	100	Storm Duration (mins)	360	PR	
Greenfield Method	FSR/FEH	Soil Index	1	CWI		Climate Change (%)	0	Betterment (%)	0	Runoff Volume (m³)	

Node 77_OUT Online Weir Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	79.000	Width (m)	1.000	Discharge Coefficient	0.590

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Node 98_OUT Online Weir Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 83.395 | Width (m) 83.400 | Discharge Coefficient 0.590

Node 58_OUT Online Weir Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 74.995 | Width (m) 1.000 | Discharge Coefficient 0.590

Node 98_OUT Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 5.0 | Porosity 1.00 | Invert Level (m) 82.400 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	601.0	601.0	0.800	805.1	805.1

Node 98_OUT Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.43200 | Side Inf Coefficient (m/hr) 0.43200 | Safety Factor 5.0 | Porosity 0.95 | Invert Level (m) 81.400 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	473.0	473.0	0.800	473.0	473.0	0.801	0.0	473.0

Node 77 Soakaway Storage Structure

Base Inf Coefficient (m/hr) 0.27360 | Side Inf Coefficient (m/hr) 0.27360 | Safety Factor 5.0 | Porosity 0.95 | Invert Level (m) 76.850 | Time to half empty (mins) | Pit Width (m) 5.000 | Pit Length (m) 92.500 | Depth (m) 1.200 | Inf Depth (m) | Number Required 1

Node BASIN 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 1.11600 | Side Inf Coefficient (m/hr) 1.11600 | Safety Factor 5.0 | Porosity 0.95 | Invert Level (m) 72.600 | Time to half empty (mins) 246

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1137.0	1137.0	0.800	1137.0	1137.0	0.801	0.0	1137.0

Node BASIN 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Side Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Porosity 1.00 | Invert Level (m) 74.400 | Time to half empty (mins) 52

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1179.0	0.0	0.600	1460.0	0.0	0.601	0.0	0.0

Node BASIN 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.54000 | Side Inf Coefficient (m/hr) 0.54000 | Safety Factor 3.0 | Porosity 1.00 | Invert Level (m) 95.100 | Time to half empty (mins) 59

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	26.0	26.0	0.600	162.0	162.0	0.601	0.0	162.0

Node BASIN 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.03564 | Side Inf Coefficient (m/hr) 0.03564 | Safety Factor 3.0 | Porosity 1.00 | Invert Level (m) 96.400 | Time to half empty (mins) 788

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	160.0	160.0	0.600	264.0	264.0	0.601	0.0	264.0

Node BASIN 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.03564 | Side Inf Coefficient (m/hr) 0.03564 | Safety Factor 3.0 | Porosity 1.00 | Invert Level (m) 95.900 | Time to half empty (mins) 789

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	155.0	155.0	0.600	260.0	260.0	0.601	0.0	260.0

Other (defaults)

Entry Loss (manhole) 0.250 | Exit Loss (manhole) 0.250 | Entry Loss (junction) 0.000 | Exit Loss (junction) 0.000 | Apply Recommended Losses x | Flood Risk (m) 0.300

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Results for 2 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	97.868	0.032	5.6	0.0360	0.0000	OK
15 minute summer	2	10	93.994	0.058	17.4	0.0660	0.0000	OK
15 minute summer	3	11	92.728	0.055	17.1	0.0617	0.0000	OK
15 minute summer	4	11	90.628	0.059	22.9	0.0671	0.0000	OK
15 minute summer	5	10	90.342	0.060	11.3	0.0675	0.0000	OK
15 minute summer	6	10	89.729	0.118	21.4	0.1337	0.0000	OK
15 minute summer	7	11	89.557	0.166	50.5	0.2381	0.0000	OK
15 minute summer	8	11	89.446	0.113	55.8	0.1610	0.0000	OK
15 minute summer	9	11	88.940	0.090	69.9	0.1282	0.0000	OK
15 minute summer	10	11	86.913	0.096	79.6	0.1373	0.0000	OK
15 minute summer	11	11	84.551	0.100	90.9	0.1431	0.0000	OK
15 minute summer	12	11	82.574	0.130	102.0	0.1857	0.0000	OK
15 minute summer	13	11	81.458	0.165	107.4	0.2909	0.0000	OK
15 minute summer	14	11	81.177	0.120	111.0	0.2118	0.0000	OK
15 minute summer	15	11	79.883	0.124	114.5	0.2198	0.0000	OK
15 minute summer	16	11	79.060	0.129	117.9	0.2278	0.0000	OK
15 minute summer	17	10	79.761	0.077	9.5	0.0866	0.0000	OK
15 minute summer	18	10	79.579	0.083	17.8	0.0939	0.0000	OK
15 minute summer	19	11	79.379	0.092	30.5	0.1040	0.0000	OK
15 minute summer	20	11	78.431	0.141	157.0	0.2483	0.0000	OK
15 minute summer	21	11	77.120	0.165	164.9	0.2924	0.0000	OK
15 minute summer	22	11	76.526	0.124	189.7	0.2195	0.0000	OK
15 minute summer	23	11	74.550	0.150	189.4	0.0000	0.0000	OK
15 minute summer	24	10	94.745	0.066	7.0	0.0748	0.0000	OK
15 minute summer	25	10	94.673	0.057	12.0	0.0646	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	5.5	0.979	0.043	0.3780	
15 minute summer	2	1.001	3	17.1	2.151	0.139	0.1701	
15 minute summer	3	1.002	4	17.1	1.846	0.073	0.4419	
15 minute summer	4	1.003	7	23.0	2.407	0.079	0.1459	
15 minute summer	5	2.000	6	11.1	1.347	0.148	0.2357	
15 minute summer	6	2.001	7	21.1	0.860	0.297	0.4175	
15 minute summer	7	1.004	8	50.9	1.218	0.318	0.9845	
15 minute summer	8	1.005	9	56.0	2.111	0.120	0.6189	
15 minute summer	9	1.006	10	70.1	2.982	0.086	0.7519	
15 minute summer	10	1.007	11	79.8	3.139	0.098	0.9570	
15 minute summer	11	1.008	12	90.9	2.854	0.111	1.0144	
15 minute summer	12	1.009	13	102.0	2.812	0.166	1.0892	
15 minute summer	13	1.010	14	107.4	2.277	0.169	0.6497	
15 minute summer	14	1.011	15	110.9	2.917	0.109	1.1212	
15 minute summer	15	1.012	16	114.3	2.855	0.111	0.7333	
15 minute summer	16	1.013	20	117.6	2.701	0.116	0.6397	
15 minute summer	17	3.000	18	9.3	0.807	0.233	0.2199	
15 minute summer	18	3.001	19	17.7	1.038	0.159	0.3545	
15 minute summer	19	3.002	20	30.1	1.677	0.197	0.7353	
15 minute summer	20	1.014	21	156.8	3.001	0.152	1.5576	
15 minute summer	21	1.015	22	164.4	3.398	0.159	0.5957	
15 minute summer	22	1.016	23	189.4	4.256	0.124	0.9163	
15 minute summer	23	1.017	BASIN 1	189.6	7.184	0.139	0.6938	
15 minute summer	24	4.000	25	6.9	0.787	0.173	0.0928	
15 minute summer	25	4.001	26	11.9	1.548	0.133	0.1491	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	26	10	94.098	0.055	20.0	0.0622	0.0000	OK
15 minute summer	27	10	91.485	0.068	28.2	0.0767	0.0000	OK
15 minute summer	28	10	89.560	0.065	30.6	0.0732	0.0000	OK
15 minute summer	29	10	88.300	0.064	30.5	0.0729	0.0000	OK
15 minute summer	30	11	87.137	0.066	34.7	0.0747	0.0000	OK
15 minute summer	31	11	84.229	0.074	38.0	0.0832	0.0000	OK
15 minute summer	32	11	83.404	0.078	38.2	0.0881	0.0000	OK
15 minute summer	33	11	82.742	0.072	42.6	0.1032	0.0000	OK
15 minute summer	34	11	81.871	0.076	42.6	0.1088	0.0000	OK
15 minute summer	35	11	80.502	0.074	48.6	0.1060	0.0000	OK
15 minute summer	36	10	81.644	0.069	8.0	0.0779	0.0000	OK
15 minute summer	37	10	81.405	0.064	18.6	0.0726	0.0000	OK
15 minute summer	38	10	80.722	0.063	28.8	0.0708	0.0000	OK
15 minute summer	39	11	77.619	0.094	82.0	0.1342	0.0000	OK
15 minute summer	40	11	75.558	0.260	89.7	0.3715	0.0000	OK
15 minute summer	41	11	75.483	0.244	89.1	0.3489	0.0000	OK
15 minute summer	42	12	75.249	0.114	88.0	0.2014	0.0000	OK
15 minute summer	43	11	74.507	0.107	88.0	0.0000	0.0000	OK
15 minute summer	44	10	83.082	0.032	5.6	0.0360	0.0000	OK
15 minute summer	45	10	82.062	0.056	12.9	0.0634	0.0000	OK
15 minute summer	46	10	81.528	0.072	16.6	0.0811	0.0000	OK
15 minute summer	47	10	81.059	0.062	20.2	0.0703	0.0000	OK
15 minute summer	48	10	80.217	0.063	30.7	0.0713	0.0000	OK
15 minute summer	49	10	78.024	0.066	34.3	0.0746	0.0000	OK
15 minute summer	50	11	76.220	0.076	39.6	0.0857	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	26	4.002	27	19.9	2.272	0.132	0.2767	
15 minute summer	27	4.003	28	27.9	2.850	0.185	0.2172	
15 minute summer	28	4.004	29	30.5	2.749	0.095	0.1678	
15 minute summer	29	4.005	30	30.4	2.703	0.094	0.1574	
15 minute summer	30	4.006	31	34.7	2.796	0.108	0.4345	
15 minute summer	31	4.007	32	38.2	2.739	0.118	0.1387	
15 minute summer	32	4.008	33	38.3	2.860	0.119	0.0934	
15 minute summer	33	4.009	34	42.6	2.775	0.073	0.1615	
15 minute summer	34	4.010	35	42.7	2.728	0.085	0.3405	
15 minute summer	35	4.011	39	48.7	3.236	0.082	0.4902	
15 minute summer	36	5.000	37	7.8	0.774	0.195	0.2713	
15 minute summer	37	5.001	38	18.5	1.710	0.095	0.2429	
15 minute summer	38	5.002	39	28.4	2.710	0.093	0.4173	
15 minute summer	39	4.012	40	82.1	1.449	0.098	1.9809	
15 minute summer	40	4.013	41	89.1	0.977	0.559	2.1853	
15 minute summer	41	4.014	42	88.0	1.116	0.549	0.9219	
15 minute summer	42	4.015	43	88.0	2.709	0.099	0.7251	
15 minute summer	43	4.016	BASIN 1	89.2	4.714	0.076	0.6861	
15 minute summer	44	6.000	45	5.6	1.025	0.043	0.0951	
15 minute summer	45	6.001	46	12.8	1.382	0.137	0.1596	
15 minute summer	46	6.002	47	16.4	1.565	0.201	0.1639	
15 minute summer	47	6.003	48	20.1	1.895	0.090	0.2241	
15 minute summer	48	6.004	49	30.5	2.752	0.095	0.2924	
15 minute summer	49	6.005	50	34.1	2.689	0.106	0.2765	
15 minute summer	50	6.006	54	39.4	2.923	0.129	0.2506	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	51	11	74.764	0.046	3.8	0.0664	0.0000	OK
15 minute summer	52	11	74.712	0.084	7.4	0.1207	0.0000	OK
15 minute summer	54	11	74.707	0.186	52.6	0.3290	0.0000	OK
15 minute summer	55	11	74.656	0.179	52.4	0.3164	0.0000	OK
15 minute summer	56	12	74.572	0.165	51.6	0.2910	0.0000	OK
15 minute summer	57	11	74.477	0.077	51.8	0.0000	0.0000	OK
120 minute summer	BASIN 1	78	72.710	0.110	171.7	119.2315	0.0000	OK
120 minute summer	58_OUT	78	72.710	0.110	0.3	0.1951	0.0000	OK
15 minute summer	59	10	95.493	0.038	7.6	0.0429	0.0000	OK
15 minute summer	60	10	94.945	0.040	7.6	0.0452	0.0000	OK
15 minute summer	61	10	93.336	0.053	12.8	0.0600	0.0000	OK
15 minute summer	62	10	92.300	0.054	15.0	0.0606	0.0000	OK
15 minute summer	63	11	91.092	0.057	17.6	0.0640	0.0000	OK
15 minute summer	64	11	89.827	0.056	17.7	0.0637	0.0000	OK
15 minute summer	65	11	88.936	0.060	20.4	0.0676	0.0000	OK
15 minute summer	66	11	85.546	0.061	25.4	0.0689	0.0000	OK
15 minute summer	67	11	84.706	0.065	29.0	0.0732	0.0000	OK
15 minute summer	68	11	83.801	0.073	32.6	0.0831	0.0000	OK
15 minute summer	69	11	81.769	0.069	34.8	0.0779	0.0000	OK
15 minute summer	70	11	79.616	0.066	34.9	0.0748	0.0000	OK
15 minute summer	71	11	78.243	0.093	34.8	0.1055	0.0000	OK
15 minute summer	72	10	81.942	0.042	9.8	0.0474	0.0000	OK
15 minute summer	73	10	80.610	0.073	9.1	0.1044	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	51	7.000	52	3.7	0.316	0.023	0.5307	
15 minute summer	52	7.001	54	7.5	0.445	0.047	0.3277	
15 minute summer	54	6.007	55	52.4	0.785	0.240	1.4277	
15 minute summer	55	6.008	56	51.6	0.844	0.237	2.0914	
15 minute summer	56	6.009	57	51.8	1.392	0.223	0.1161	
15 minute summer	57	6.010	BASIN 1	52.2	3.784	0.043	0.5098	
120 minute summer	BASIN 1	1.018	58_OUT	0.3	0.059	0.001	0.1979	
120 minute summer	BASIN 1	Infiltration		70.5				
120 minute summer	58_OUT	Weir		0.0				0.0
15 minute summer	59	8.000	60	7.6	1.656	0.059	0.0412	
15 minute summer	60	8.001	61	7.5	1.271	0.069	0.2222	
15 minute summer	61	8.002	62	12.7	1.766	0.118	0.1759	
15 minute summer	62	8.003	63	14.9	1.984	0.122	0.1664	
15 minute summer	63	8.004	64	17.7	2.272	0.132	0.1495	
15 minute summer	64	8.005	65	17.7	2.191	0.130	0.1070	
15 minute summer	65	8.006	66	20.5	2.452	0.151	0.4124	
15 minute summer	66	8.007	67	25.4	2.377	0.084	0.1243	
15 minute summer	67	8.008	68	29.0	2.370	0.098	0.1587	
15 minute summer	68	8.009	69	32.6	2.557	0.125	0.4745	
15 minute summer	69	8.010	70	34.9	2.944	0.110	0.3141	
15 minute summer	70	8.011	71	34.8	2.344	0.108	0.2528	
15 minute summer	71	8.012	77	34.2	1.867	0.204	0.9907	
15 minute summer	72	9.000	74	9.7	1.945	0.072	0.0965	
15 minute summer	73	10.000	74	9.0	0.542	0.081	0.3143	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	74	10	80.562	0.084	35.3	0.1197	0.0000	OK
15 minute summer	75	10	79.903	0.063	36.6	0.0908	0.0000	OK
15 minute summer	76	11	77.148	0.148	47.7	0.2112	0.0000	OK
240 minute summer	77	164	76.975	0.125	28.9	55.2396	0.0000	OK
240 minute summer	77_OUT	160	76.976	0.226	0.6	0.3237	0.0000	OK
15 minute summer	78	1	99.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	79	1	97.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	80	1	96.226	0.000	0.0	0.0000	0.0000	OK
15 minute summer	81	10	95.077	0.055	19.4	0.0623	0.0000	OK
15 minute summer	82	10	92.028	0.054	23.0	0.0610	0.0000	OK
15 minute summer	83	10	90.956	0.074	30.0	0.0834	0.0000	OK
15 minute summer	84	10	90.910	0.055	14.8	0.0619	0.0000	OK
15 minute summer	85	10	90.158	0.081	52.1	0.1159	0.0000	OK
15 minute summer	86	10	89.309	0.082	55.8	0.1170	0.0000	OK
15 minute summer	87	10	88.367	0.092	63.2	0.1319	0.0000	OK
15 minute summer	88	10	93.541	0.059	12.6	0.0672	0.0000	OK
15 minute summer	89	11	92.143	0.071	24.3	0.0800	0.0000	OK
15 minute summer	90	11	90.338	0.079	39.4	0.0890	0.0000	OK
15 minute summer	91	11	88.389	0.073	51.0	0.1295	0.0000	OK
15 minute summer	92	10	87.448	0.118	119.8	0.2087	0.0000	OK
15 minute summer	93	10	86.641	0.123	123.1	0.2166	0.0000	OK
15 minute summer	94	11	85.686	0.114	126.7	0.2021	0.0000	OK
15 minute summer	95	11	84.841	0.135	141.3	0.2378	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	74	9.001	75	35.1	2.305	0.093	0.2795	
15 minute summer	75	9.002	76	36.3	1.435	0.063	0.9189	
15 minute summer	76	9.003	77	47.4	1.269	0.273	0.3713	
240 minute summer	77	8.013	77_OUT	0.6	0.120	0.007	2.3255	
240 minute summer	77	Infiltration		7.4				
240 minute summer	77_OUT	Weir		0.0				0.0
15 minute summer	78	11.000	79	0.0	0.000	0.000	0.0000	
15 minute summer	79	11.001	80	0.0	0.000	0.000	0.0000	
15 minute summer	80	11.002	81	0.0	0.000	0.000	0.0000	
15 minute summer	81	11.003	82	19.2	2.593	0.127	0.2645	
15 minute summer	82	11.004	83	23.0	2.102	0.071	0.1441	
15 minute summer	83	11.005	85	29.7	2.312	0.119	0.1877	
15 minute summer	84	12.000	85	14.7	2.056	0.117	0.0775	
15 minute summer	85	11.006	86	52.0	2.958	0.090	0.1792	
15 minute summer	86	11.007	87	55.6	2.877	0.096	0.2209	
15 minute summer	87	11.008	92	62.9	3.238	0.108	0.1856	
15 minute summer	88	13.000	89	12.2	1.480	0.150	0.4506	
15 minute summer	89	13.001	90	24.0	1.760	0.124	0.8178	
15 minute summer	90	13.002	91	39.0	2.721	0.143	0.4101	
15 minute summer	91	13.003	92	51.0	1.909	0.043	0.4556	
15 minute summer	92	11.009	93	119.3	3.208	0.094	0.4482	
15 minute summer	93	11.010	94	123.1	3.380	0.102	0.5621	
15 minute summer	94	11.011	95	127.0	3.250	0.090	0.4065	
15 minute summer	95	11.012	96	142.0	3.430	0.128	0.9956	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	96	11	83.535	0.148	145.6	0.2618	0.0000	OK
15 minute summer	97	11	82.772	0.251	154.3	0.4438	0.0000	OK
15 minute summer	BASIN 2	11	82.729	0.329	154.5	0.5815	0.0000	OK
240 minute summer	98_OUT	168	81.642	-0.758	54.0	108.5677	0.0000	OK
120 minute summer	BASIN 3	76	95.183	0.083	3.8	2.9442	0.0000	OK
360 minute summer	BASIN 4	240	96.448	0.048	2.3	7.9522	0.0000	OK
360 minute summer	BASIN 5	248	95.955	0.055	2.5	8.8146	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	96	11.013	97	146.1	1.805	0.139	3.0960	
15 minute summer	97	11.014	BASIN 2	154.5	1.145	0.221	1.5776	
15 minute summer	BASIN 2	11.015	98_OUT	153.9	1.138	0.544	1.9764	
240 minute summer	98_OUT	Weir		0.0				0.0
240 minute summer	98_OUT	Infiltration		11.4				
120 minute summer	BASIN 3	Infiltration		1.7				
360 minute summer	BASIN 4	Infiltration		0.5				
360 minute summer	BASIN 5	Infiltration		0.5				

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	97.891	0.055	16.9	0.0620	0.0000	OK
15 minute summer	2	10	94.044	0.108	52.5	0.1221	0.0000	OK
15 minute summer	3	10	92.770	0.097	51.8	0.1093	0.0000	OK
15 minute summer	4	10	90.668	0.099	69.3	0.1119	0.0000	OK
15 minute summer	5	10	90.387	0.105	33.8	0.1183	0.0000	OK
15 minute summer	6	10	89.845	0.234	64.4	0.2649	0.0000	OK
15 minute summer	7	10	89.694	0.303	152.5	0.4339	0.0000	OK
15 minute summer	8	11	89.540	0.207	166.9	0.2968	0.0000	OK
15 minute summer	9	11	89.011	0.161	209.5	0.2301	0.0000	OK
15 minute summer	10	11	86.990	0.173	238.8	0.2477	0.0000	OK
15 minute summer	11	11	84.631	0.180	272.8	0.2583	0.0000	OK
15 minute summer	12	11	82.689	0.245	306.8	0.3505	0.0000	OK
15 minute summer	13	11	81.611	0.318	323.4	0.5618	0.0000	OK
15 minute summer	14	11	81.278	0.221	334.8	0.3899	0.0000	OK
15 minute summer	15	11	79.995	0.236	346.2	0.4167	0.0000	OK
15 minute summer	16	11	79.183	0.252	358.1	0.4457	0.0000	OK
15 minute summer	17	10	79.832	0.148	28.3	0.1672	0.0000	OK
15 minute summer	18	10	79.654	0.158	53.3	0.1788	0.0000	OK
15 minute summer	19	10	79.461	0.174	91.2	0.1967	0.0000	OK
15 minute summer	20	11	78.559	0.269	476.9	0.4746	0.0000	OK
15 minute summer	21	11	77.292	0.337	502.8	0.5951	0.0000	OK
15 minute summer	22	11	76.638	0.236	578.7	0.4166	0.0000	OK
15 minute summer	23	10	74.654	0.254	578.4	0.0000	0.0000	OK
15 minute summer	24	10	94.801	0.122	20.9	0.1383	0.0000	OK
15 minute summer	25	10	94.721	0.105	36.2	0.1190	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	16.7	1.293	0.131	0.8590	
15 minute summer	2	1.001	3	51.8	2.868	0.420	0.3856	
15 minute summer	3	1.002	4	51.4	2.589	0.219	0.9478	
15 minute summer	4	1.003	7	68.9	2.833	0.238	0.4311	
15 minute summer	5	2.000	6	33.6	1.489	0.446	0.6857	
15 minute summer	6	2.001	7	63.2	1.173	0.888	0.9123	
15 minute summer	7	1.004	8	152.2	1.646	0.951	2.1588	
15 minute summer	8	1.005	9	167.9	2.753	0.359	1.4192	
15 minute summer	9	1.006	10	210.3	3.933	0.257	1.7108	
15 minute summer	10	1.007	11	239.6	4.149	0.295	2.1750	
15 minute summer	11	1.008	12	273.6	3.711	0.335	2.3405	
15 minute summer	12	1.009	13	307.3	3.504	0.501	2.6329	
15 minute summer	13	1.010	14	323.9	2.906	0.508	1.5260	
15 minute summer	14	1.011	15	335.3	3.725	0.329	2.6542	
15 minute summer	15	1.012	16	347.2	3.535	0.336	1.7990	
15 minute summer	16	1.013	20	359.0	3.372	0.353	1.5631	
15 minute summer	17	3.000	18	27.9	1.056	0.698	0.5037	
15 minute summer	18	3.001	19	52.9	1.324	0.476	0.8326	
15 minute summer	19	3.002	20	89.9	2.210	0.588	1.6697	
15 minute summer	20	1.014	21	478.1	3.710	0.464	3.8325	
15 minute summer	21	1.015	22	502.8	4.178	0.487	1.4724	
15 minute summer	22	1.016	23	578.4	6.034	0.379	1.9863	
15 minute summer	23	1.017	BASIN 1	580.2	8.562	0.426	2.0642	
15 minute summer	24	4.000	25	20.8	1.032	0.518	0.2119	
15 minute summer	25	4.001	26	35.9	2.064	0.400	0.3370	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	26	10	94.141	0.098	60.3	0.1110	0.0000	OK
15 minute summer	27	10	91.546	0.129	84.9	0.1461	0.0000	OK
15 minute summer	28	10	89.613	0.118	92.3	0.1335	0.0000	OK
15 minute summer	29	10	88.355	0.119	92.1	0.1345	0.0000	OK
15 minute summer	30	10	87.189	0.118	104.7	0.1332	0.0000	OK
15 minute summer	31	10	84.293	0.138	114.7	0.1565	0.0000	OK
15 minute summer	32	11	83.478	0.152	114.2	0.1721	0.0000	OK
15 minute summer	33	11	82.803	0.133	127.4	0.1906	0.0000	OK
15 minute summer	34	11	81.932	0.137	127.6	0.1963	0.0000	OK
15 minute summer	35	11	80.561	0.133	145.5	0.1899	0.0000	OK
15 minute summer	36	10	81.705	0.130	23.9	0.1467	0.0000	OK
15 minute summer	37	10	81.457	0.116	56.2	0.1316	0.0000	OK
15 minute summer	38	10	80.771	0.112	86.8	0.1271	0.0000	OK
15 minute summer	39	11	77.689	0.164	245.8	0.2353	0.0000	OK
15 minute summer	40	11	76.001	0.703	268.9	1.0063	0.0000	SURCHARGED
15 minute summer	41	11	75.758	0.519	270.5	0.7421	0.0000	SURCHARGED
15 minute summer	42	11	75.345	0.210	270.8	0.3718	0.0000	OK
15 minute summer	43	10	74.576	0.176	270.8	0.0000	0.0000	OK
15 minute summer	44	10	83.105	0.055	16.9	0.0619	0.0000	OK
15 minute summer	45	10	82.109	0.103	38.7	0.1161	0.0000	OK
15 minute summer	46	10	81.595	0.139	49.9	0.1572	0.0000	OK
15 minute summer	47	10	81.109	0.112	60.8	0.1269	0.0000	OK
15 minute summer	48	10	80.267	0.113	92.4	0.1280	0.0000	OK
15 minute summer	49	10	78.077	0.119	103.5	0.1351	0.0000	OK
15 minute summer	50	10	76.286	0.142	119.5	0.1607	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	26	4.002	27	60.0	2.988	0.398	0.6331	
15 minute summer	27	4.003	28	84.3	3.749	0.558	0.4982	
15 minute summer	28	4.004	29	92.1	3.563	0.286	0.3904	
15 minute summer	29	4.005	30	91.8	3.559	0.285	0.3606	
15 minute summer	30	4.006	31	104.3	3.637	0.323	1.0041	
15 minute summer	31	4.007	32	114.2	3.385	0.354	0.3360	
15 minute summer	32	4.008	33	114.6	3.646	0.356	0.2194	
15 minute summer	33	4.009	34	127.6	3.569	0.220	0.3756	
15 minute summer	34	4.010	35	128.0	3.590	0.254	0.7753	
15 minute summer	35	4.011	39	146.2	4.359	0.247	1.0921	
15 minute summer	36	5.000	37	23.4	1.026	0.589	0.6182	
15 minute summer	37	5.001	38	56.0	2.272	0.288	0.5527	
15 minute summer	38	5.002	39	86.0	3.669	0.281	0.9326	
15 minute summer	39	4.012	40	246.1	1.978	0.294	3.5216	
15 minute summer	40	4.013	41	270.5	1.707	1.697	3.7971	
15 minute summer	41	4.014	42	270.8	1.736	1.689	1.7252	
15 minute summer	42	4.015	43	270.8	3.830	0.304	1.5547	
15 minute summer	43	4.016	BASIN 1	273.3	5.493	0.233	2.5628	
15 minute summer	44	6.000	45	16.8	1.363	0.130	0.2145	
15 minute summer	45	6.001	46	38.5	1.773	0.412	0.3726	
15 minute summer	46	6.002	47	49.4	2.040	0.604	0.3785	
15 minute summer	47	6.003	48	60.6	2.512	0.272	0.5093	
15 minute summer	48	6.004	49	92.1	3.649	0.285	0.6649	
15 minute summer	49	6.005	50	103.1	3.514	0.320	0.6421	
15 minute summer	50	6.006	54	118.8	3.855	0.388	0.5871	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	51	11	74.881	0.163	11.4	0.2334	0.0000	OK
15 minute summer	52	11	74.883	0.255	22.4	0.3656	0.0000	OK
15 minute summer	54	11	74.882	0.361	159.1	0.6380	0.0000	OK
15 minute summer	55	11	74.816	0.339	157.6	0.5986	0.0000	OK
15 minute winter	56	12	74.697	0.290	143.0	0.5118	0.0000	OK
15 minute summer	57	12	74.525	0.125	149.8	0.0000	0.0000	OK
120 minute summer	BASIN 1	92	73.052	0.452	441.7	488.2267	0.0000	OK
120 minute summer	58_OUT	92	73.052	0.452	1.1	0.7987	0.0000	OK
15 minute summer	59	10	95.523	0.068	22.9	0.0772	0.0000	OK
15 minute summer	60	10	94.974	0.069	22.8	0.0785	0.0000	OK
15 minute summer	61	10	93.379	0.096	38.6	0.1086	0.0000	OK
15 minute summer	62	10	92.344	0.098	45.2	0.1103	0.0000	OK
15 minute summer	63	10	91.139	0.104	53.4	0.1172	0.0000	OK
15 minute summer	64	10	89.875	0.104	53.1	0.1181	0.0000	OK
15 minute summer	65	11	88.985	0.109	61.4	0.1235	0.0000	OK
15 minute summer	66	11	85.596	0.111	76.4	0.1259	0.0000	OK
15 minute summer	67	11	84.761	0.120	87.4	0.1355	0.0000	OK
15 minute summer	68	11	83.862	0.134	98.5	0.1510	0.0000	OK
15 minute summer	69	11	81.826	0.126	105.4	0.1422	0.0000	OK
15 minute summer	70	11	79.668	0.118	105.6	0.1339	0.0000	OK
15 minute summer	71	11	78.329	0.179	105.7	0.2030	0.0000	OK
15 minute summer	72	10	81.974	0.074	29.3	0.0841	0.0000	OK
15 minute summer	73	10	80.673	0.136	27.3	0.1951	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	51	7.000	52	13.1	0.314	0.082	2.6395	
15 minute summer	52	7.001	54	29.0	0.448	0.181	1.2816	
15 minute summer	54	6.007	55	157.6	1.031	0.722	3.2705	
15 minute summer	55	6.008	56	154.4	1.180	0.708	4.5123	
15 minute winter	56	6.009	57	143.2	1.843	0.616	0.2392	
15 minute summer	57	6.010	BASIN 1	156.8	4.051	0.128	2.2771	
120 minute summer	BASIN 1	1.018	58_OUT	1.1	0.104	0.005	1.1883	
120 minute summer	BASIN 1	Infiltration		70.5				
120 minute summer	58_OUT	Weir		0.0				0.0
15 minute summer	59	8.000	60	22.8	2.224	0.177	0.0925	
15 minute summer	60	8.001	61	22.7	1.714	0.208	0.4968	
15 minute summer	61	8.002	62	38.2	2.343	0.356	0.4000	
15 minute summer	62	8.003	63	44.9	2.619	0.368	0.3799	
15 minute summer	63	8.004	64	53.1	2.964	0.396	0.3445	
15 minute summer	64	8.005	65	53.1	2.870	0.390	0.2450	
15 minute summer	65	8.006	66	61.7	3.295	0.456	0.9252	
15 minute summer	66	8.007	67	76.5	3.060	0.254	0.2911	
15 minute summer	67	8.008	68	87.6	3.099	0.295	0.3663	
15 minute summer	68	8.009	69	98.8	3.390	0.379	1.0828	
15 minute summer	69	8.010	70	105.6	3.926	0.332	0.7137	
15 minute summer	70	8.011	71	105.7	3.049	0.328	0.5852	
15 minute summer	71	8.012	77	105.5	2.474	0.629	2.3058	
15 minute summer	72	9.000	74	29.1	2.633	0.217	0.2138	
15 minute summer	73	10.000	74	27.0	0.691	0.243	0.7418	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	74	10	80.632	0.154	105.9	0.2199	0.0000	OK
15 minute summer	75	10	79.950	0.110	109.8	0.1571	0.0000	OK
15 minute summer	76	10	77.297	0.297	143.7	0.4243	0.0000	OK
180 minute winter	77	176	77.226	0.376	55.8	165.7289	0.0000	SURCHARGED
180 minute winter	77_OUT	176	77.226	0.476	1.9	0.6807	0.0000	OK
15 minute summer	78	1	99.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	79	1	97.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	80	1	96.226	0.000	0.0	0.0000	0.0000	OK
15 minute summer	81	10	95.122	0.100	58.2	0.1129	0.0000	OK
15 minute summer	82	10	92.069	0.095	69.2	0.1076	0.0000	OK
15 minute summer	83	10	91.020	0.138	90.0	0.1561	0.0000	OK
15 minute summer	84	10	90.957	0.102	44.2	0.1149	0.0000	OK
15 minute summer	85	10	90.229	0.152	156.4	0.2174	0.0000	OK
15 minute summer	86	10	89.380	0.153	167.6	0.2185	0.0000	OK
15 minute summer	87	10	88.454	0.179	190.1	0.2560	0.0000	OK
15 minute summer	88	10	93.591	0.109	37.8	0.1230	0.0000	OK
15 minute summer	89	10	92.198	0.126	73.3	0.1431	0.0000	OK
15 minute summer	90	10	90.405	0.146	118.9	0.1654	0.0000	OK
15 minute summer	91	10	88.443	0.127	154.7	0.2239	0.0000	OK
15 minute summer	92	10	87.558	0.228	361.7	0.4027	0.0000	OK
15 minute summer	93	10	86.750	0.232	371.9	0.4103	0.0000	OK
15 minute summer	94	10	85.795	0.223	382.2	0.3939	0.0000	OK
15 minute summer	95	10	84.962	0.256	426.4	0.4529	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	74	9.001	75	105.3	3.053	0.281	0.6337	
15 minute summer	75	9.002	76	109.4	1.797	0.191	2.1089	
15 minute summer	76	9.003	77	141.8	1.646	0.816	0.8542	
180 minute winter	77	8.013	77_OUT	1.9	0.183	0.020	5.0465	
180 minute winter	77	Infiltration		8.1				
180 minute winter	77_OUT	Weir		0.0				0.0
15 minute summer	78	11.000	79	0.0	0.000	0.000	0.0000	
15 minute summer	79	11.001	80	0.0	0.000	0.000	0.0000	
15 minute summer	80	11.002	81	0.0	0.000	0.000	0.0000	
15 minute summer	81	11.003	82	57.8	3.488	0.383	0.5911	
15 minute summer	82	11.004	83	69.1	2.731	0.214	0.3328	
15 minute summer	83	11.005	85	89.5	3.043	0.358	0.4288	
15 minute summer	84	12.000	85	44.0	2.710	0.350	0.1758	
15 minute summer	85	11.006	86	156.2	3.720	0.269	0.4281	
15 minute summer	86	11.007	87	167.2	3.560	0.288	0.5367	
15 minute summer	87	11.008	92	189.4	4.152	0.326	0.4358	
15 minute summer	88	13.000	89	37.0	1.988	0.454	1.0149	
15 minute summer	89	13.001	90	72.7	2.337	0.375	1.8630	
15 minute summer	90	13.002	91	117.4	3.613	0.429	0.9303	
15 minute summer	91	13.003	92	154.4	2.421	0.131	1.0874	
15 minute summer	92	11.009	93	360.5	3.970	0.285	1.0944	
15 minute summer	93	11.010	94	370.8	4.145	0.308	1.3840	
15 minute summer	94	11.011	95	381.2	3.982	0.271	0.9969	
15 minute summer	95	11.012	96	425.5	4.463	0.384	2.2927	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	96	10	83.672	0.285	436.4	0.5033	0.0000	OK
15 minute summer	97	11	83.149	0.628	469.2	1.1105	0.0000	SURCHARGED
15 minute summer	BASIN 2	11	83.030	0.630	464.2	1.1138	0.0000	SURCHARGED
240 minute winter	98_OUT	236	82.169	-0.231	84.9	345.7723	0.0000	OK
120 minute summer	BASIN 3	80	95.296	0.196	9.8	9.4734	0.0000	OK
240 minute winter	BASIN 4	232	96.519	0.119	4.5	20.3378	0.0000	OK
240 minute winter	BASIN 5	236	96.037	0.137	4.9	22.8029	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	96	11.013	97	443.3	2.031	0.422	7.7223	
15 minute summer	97	11.014	BASIN 2	464.2	1.648	0.663	3.2920	
15 minute summer	BASIN 2	11.015	98_OUT	464.7	1.742	1.644	3.7056	
240 minute winter	98_OUT	Weir		0.0				0.0
240 minute winter	98_OUT	Infiltration		11.4				
120 minute summer	BASIN 3	Infiltration		3.1				
240 minute winter	BASIN 4	Infiltration		0.6				
240 minute winter	BASIN 5	Infiltration		0.6				

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	97.914	0.078	33.2	0.0878	0.0000	OK
15 minute summer	2	10	94.110	0.174	103.3	0.1969	0.0000	OK
15 minute summer	3	10	92.812	0.139	101.7	0.1576	0.0000	OK
15 minute summer	4	11	90.724	0.155	136.5	0.1749	0.0000	OK
15 minute summer	5	11	90.808	0.526	66.5	0.5951	0.0000	SURCHARGED
15 minute summer	6	11	90.280	0.669	123.6	0.7565	0.0000	SURCHARGED
15 minute summer	7	11	89.986	0.595	297.2	0.8511	0.0000	SURCHARGED
15 minute summer	8	11	89.657	0.324	327.6	0.4643	0.0000	OK
15 minute summer	9	11	89.092	0.242	410.9	0.3461	0.0000	OK
15 minute summer	10	10	87.075	0.258	467.7	0.3687	0.0000	OK
15 minute summer	11	11	84.754	0.303	534.9	0.4335	0.0000	OK
15 minute summer	12	11	83.295	0.851	598.5	1.2184	0.0000	SURCHARGED
15 minute summer	13	11	81.905	0.612	625.2	1.0809	0.0000	SURCHARGED
15 minute summer	14	11	81.394	0.337	645.3	0.5963	0.0000	OK
15 minute summer	15	12	80.216	0.457	667.0	0.8071	0.0000	OK
15 minute summer	16	12	79.730	0.799	675.6	1.4116	0.0000	SURCHARGED
15 minute summer	17	11	80.581	0.897	55.7	1.0150	0.0000	SURCHARGED
15 minute summer	18	11	80.359	0.863	99.1	0.9763	0.0000	SURCHARGED
15 minute summer	19	11	80.159	0.872	168.4	0.9859	0.0000	SURCHARGED
15 minute summer	20	12	79.191	0.901	879.2	1.5921	0.0000	SURCHARGED
15 minute summer	21	12	77.785	0.830	921.2	1.4665	0.0000	SURCHARGED
15 minute summer	22	11	76.758	0.356	1056.8	0.6287	0.0000	OK
120 minute summer	23	110	74.817	0.417	497.3	0.0000	0.0000	OK
15 minute summer	24	10	94.885	0.206	41.0	0.2329	0.0000	OK
15 minute summer	25	10	94.783	0.167	70.9	0.1883	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	32.9	1.454	0.258	1.4738	
15 minute summer	2	1.001	3	101.7	3.280	0.825	0.6622	
15 minute summer	3	1.002	4	101.3	2.976	0.432	1.6285	
15 minute summer	4	1.003	7	135.7	2.766	0.469	0.8178	
15 minute summer	5	2.000	6	64.7	1.626	0.858	1.1341	
15 minute summer	6	2.001	7	123.3	1.751	1.733	1.1923	
15 minute summer	7	1.004	8	298.7	1.972	1.867	3.2846	
15 minute summer	8	1.005	9	328.9	3.132	0.704	2.4300	
15 minute summer	9	1.006	10	411.8	4.573	0.503	2.8809	
15 minute summer	10	1.007	11	469.6	4.720	0.577	3.8936	
15 minute summer	11	1.008	12	533.2	4.049	0.653	4.3133	
15 minute summer	12	1.009	13	593.5	3.746	0.967	4.7557	
15 minute summer	13	1.010	14	623.9	3.242	0.979	2.4839	
15 minute summer	14	1.011	15	645.6	4.075	0.633	5.0062	
15 minute summer	15	1.012	16	658.0	3.689	0.636	3.8038	
15 minute summer	16	1.013	20	679.1	3.517	0.667	3.1614	
15 minute summer	17	3.000	18	50.0	1.272	1.252	0.7572	
15 minute summer	18	3.001	19	94.4	1.424	0.848	1.4661	
15 minute summer	19	3.002	20	162.1	2.302	1.060	2.8847	
15 minute summer	20	1.014	21	881.4	4.080	0.856	6.4330	
15 minute summer	21	1.015	22	922.7	4.560	0.893	2.2786	
15 minute summer	22	1.016	23	1056.0	6.977	0.693	3.0969	
120 minute summer	23	1.017	BASIN 1	497.2	5.278	0.365	4.5867	
15 minute summer	24	4.000	25	40.7	1.170	1.014	0.3666	
15 minute summer	25	4.001	26	70.7	2.339	0.787	0.5879	

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	26	11	94.204	0.161	118.5	0.1819	0.0000	OK
15 minute summer	27	11	92.272	0.855	165.5	0.9672	0.0000	SURCHARGED
15 minute summer	28	11	89.670	0.175	173.4	0.1983	0.0000	OK
15 minute summer	29	11	88.415	0.179	173.3	0.2019	0.0000	OK
15 minute summer	30	11	87.242	0.171	197.3	0.1932	0.0000	OK
15 minute summer	31	11	84.375	0.220	216.8	0.2485	0.0000	OK
15 minute summer	32	11	83.577	0.251	216.2	0.2835	0.0000	OK
15 minute summer	33	11	82.870	0.200	241.0	0.2856	0.0000	OK
15 minute summer	34	11	82.000	0.205	240.8	0.2933	0.0000	OK
15 minute summer	35	11	80.605	0.177	275.2	0.2534	0.0000	OK
15 minute summer	36	10	81.831	0.256	46.9	0.2897	0.0000	SURCHARGED
15 minute summer	37	10	81.517	0.176	109.8	0.1994	0.0000	OK
15 minute summer	38	10	80.822	0.163	169.9	0.1844	0.0000	OK
15 minute summer	39	11	77.900	0.375	470.2	0.5371	0.0000	OK
15 minute summer	40	11	77.071	1.773	512.9	2.5369	0.0000	FLOOD RISK
15 minute summer	41	11	76.199	0.960	509.3	1.3741	0.0000	SURCHARGED
15 minute summer	42	11	75.443	0.308	508.5	0.5445	0.0000	OK
120 minute winter	43	112	74.714	0.314	159.2	0.0000	0.0000	OK
15 minute summer	44	10	83.127	0.077	33.2	0.0875	0.0000	OK
15 minute summer	45	11	82.387	0.381	76.1	0.4304	0.0000	SURCHARGED
15 minute summer	46	11	81.947	0.491	94.3	0.5556	0.0000	SURCHARGED
15 minute summer	47	11	81.163	0.166	115.7	0.1875	0.0000	OK
15 minute summer	48	11	80.320	0.166	175.4	0.1881	0.0000	OK
15 minute summer	49	10	78.138	0.180	197.1	0.2035	0.0000	OK
15 minute summer	50	11	76.361	0.217	229.3	0.2455	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	26	4.002	27	116.6	3.222	0.772	1.1050	
15 minute summer	27	4.003	28	158.5	4.080	1.050	0.8813	
15 minute summer	28	4.004	29	173.3	4.011	0.537	0.6528	
15 minute summer	29	4.005	30	173.1	4.070	0.537	0.5948	
15 minute summer	30	4.006	31	197.2	4.064	0.611	1.6921	
15 minute summer	31	4.007	32	216.2	3.650	0.671	0.5881	
15 minute summer	32	4.008	33	215.8	4.012	0.669	0.3709	
15 minute summer	33	4.009	34	240.8	3.974	0.415	0.6366	
15 minute summer	34	4.010	35	240.7	4.269	0.478	1.2260	
15 minute summer	35	4.011	39	275.3	4.808	0.465	2.3737	
15 minute summer	36	5.000	37	45.6	1.170	1.145	0.9918	
15 minute summer	37	5.001	38	109.4	2.707	0.562	0.9208	
15 minute summer	38	5.002	39	169.7	4.217	0.555	1.8662	
15 minute summer	39	4.012	40	468.2	2.984	0.559	5.0064	
15 minute summer	40	4.013	41	509.3	3.215	3.195	3.7971	
15 minute summer	41	4.014	42	508.5	3.210	3.173	1.8277	
15 minute summer	42	4.015	43	507.8	4.493	0.571	2.4800	
120 minute winter	43	4.016	BASIN 1	159.2	3.478	0.136	5.4380	
15 minute summer	44	6.000	45	33.1	1.472	0.256	0.4436	
15 minute summer	45	6.001	46	72.9	1.886	0.780	0.6833	
15 minute summer	46	6.002	47	94.3	2.370	1.153	0.6214	
15 minute summer	47	6.003	48	115.7	2.897	0.518	0.8428	
15 minute summer	48	6.004	49	175.7	4.184	0.545	1.1066	
15 minute summer	49	6.005	50	197.2	4.052	0.612	1.0721	
15 minute summer	50	6.006	54	228.4	4.044	0.746	1.1616	

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	51	11	75.178	0.460	23.5	0.6586	0.0000	SURCHARGED
15 minute summer	52	11	75.173	0.545	45.6	0.7796	0.0000	SURCHARGED
15 minute summer	54	11	75.168	0.647	310.7	1.1434	0.0000	SURCHARGED
15 minute summer	55	11	75.028	0.551	311.4	0.9731	0.0000	SURCHARGED
15 minute summer	56	11	74.828	0.421	309.6	0.7444	0.0000	OK
120 minute winter	57	116	74.684	0.284	94.2	0.0000	0.0000	OK
120 minute winter	BASIN 1	118	74.684	2.084	595.9	1218.3650	0.0000	SURCHARGED
120 minute winter	58_OUT	118	74.684	2.084	38.1	3.6816	0.0000	OK
15 minute summer	59	10	95.556	0.101	45.0	0.1148	0.0000	OK
15 minute summer	60	10	95.005	0.100	44.9	0.1129	0.0000	OK
15 minute summer	61	10	93.430	0.147	75.9	0.1668	0.0000	OK
15 minute summer	62	10	92.397	0.151	88.9	0.1704	0.0000	OK
15 minute summer	63	10	91.198	0.163	105.0	0.1846	0.0000	OK
15 minute summer	64	10	89.939	0.168	104.5	0.1897	0.0000	OK
15 minute summer	65	11	89.051	0.175	120.6	0.1977	0.0000	OK
15 minute summer	66	11	85.655	0.170	150.1	0.1927	0.0000	OK
15 minute summer	67	11	84.827	0.186	171.7	0.2104	0.0000	OK
15 minute summer	68	11	83.938	0.210	193.5	0.2376	0.0000	OK
15 minute summer	69	10	81.889	0.189	206.8	0.2136	0.0000	OK
15 minute summer	70	12	79.850	0.300	208.7	0.3391	0.0000	OK
15 minute summer	71	11	79.143	0.993	203.7	1.1231	0.0000	FLOOD RISK
15 minute summer	72	10	82.010	0.110	57.7	0.1243	0.0000	OK
15 minute summer	73	10	80.752	0.215	53.8	0.3076	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	51	7.000	52	24.9	0.322	0.156	5.7816	
15 minute summer	52	7.001	54	51.1	0.475	0.319	2.0392	
15 minute summer	54	6.007	55	311.4	1.442	1.426	4.6231	
15 minute summer	55	6.008	56	309.6	1.483	1.420	6.8624	
15 minute summer	56	6.009	57	378.3	2.972	1.629	0.3767	
120 minute winter	57	6.010	BASIN 1	94.2	2.888	0.077	4.7764	
120 minute winter	BASIN 1	1.018	58_OUT	38.1	0.176	0.176	1.2979	
120 minute winter	BASIN 1	Infiltration		70.5				
120 minute winter	58_OUT	Weir		0.0				0.0
15 minute summer	59	8.000	60	44.9	2.613	0.348	0.1548	
15 minute summer	60	8.001	61	44.6	1.997	0.410	0.8345	
15 minute summer	61	8.002	62	75.2	2.696	0.701	0.6844	
15 minute summer	62	8.003	63	88.4	2.994	0.723	0.6543	
15 minute summer	63	8.004	64	104.5	3.340	0.779	0.6016	
15 minute summer	64	8.005	65	104.3	3.234	0.767	0.4278	
15 minute summer	65	8.006	66	121.2	3.774	0.895	1.5864	
15 minute summer	66	8.007	67	150.3	3.447	0.500	0.5073	
15 minute summer	67	8.008	68	172.1	3.495	0.580	0.6388	
15 minute summer	68	8.009	69	193.7	4.009	0.743	1.8267	
15 minute summer	69	8.010	70	208.7	4.345	0.656	1.4587	
15 minute summer	70	8.011	71	203.7	3.356	0.631	1.1806	
15 minute summer	71	8.012	77	198.8	2.824	1.185	3.8051	
15 minute summer	72	9.000	74	57.4	3.121	0.428	0.3553	
15 minute summer	73	10.000	74	53.2	0.772	0.478	1.3075	

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	74	10	80.715	0.237	208.3	0.3388	0.0000	OK
15 minute summer	75	10	79.997	0.157	216.1	0.2251	0.0000	OK
240 minute winter	76	236	77.712	0.712	50.5	1.0186	0.0000	SURCHARGED
240 minute winter	77	236	77.712	0.862	86.2	379.8627	0.0000	SURCHARGED
240 minute winter	77_OUT	236	77.712	0.962	1.9	1.3763	0.0000	OK
15 minute summer	78	1	99.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	79	1	97.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	80	1	96.226	0.000	0.0	0.0000	0.0000	OK
15 minute summer	81	10	95.176	0.154	114.3	0.1746	0.0000	OK
15 minute summer	82	10	92.116	0.142	135.9	0.1609	0.0000	OK
15 minute summer	83	10	91.103	0.221	176.7	0.2505	0.0000	OK
15 minute summer	84	10	91.017	0.162	87.0	0.1831	0.0000	OK
15 minute summer	85	10	90.317	0.240	307.4	0.3430	0.0000	OK
15 minute summer	86	10	89.470	0.243	329.4	0.3474	0.0000	OK
15 minute summer	87	10	88.572	0.297	373.6	0.4245	0.0000	OK
15 minute summer	88	10	93.655	0.173	74.3	0.1960	0.0000	OK
15 minute summer	89	10	92.263	0.191	144.1	0.2164	0.0000	OK
15 minute summer	90	10	90.498	0.239	234.0	0.2702	0.0000	OK
15 minute summer	91	10	88.506	0.190	304.0	0.3364	0.0000	OK
15 minute summer	92	10	87.702	0.372	711.3	0.6565	0.0000	OK
15 minute summer	93	11	86.960	0.442	731.0	0.7811	0.0000	OK
15 minute summer	94	11	86.362	0.790	747.7	1.3953	0.0000	SURCHARGED
15 minute summer	95	11	85.815	1.109	829.3	1.9593	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	74	9.001	75	207.3	3.536	0.553	1.0707	
15 minute summer	75	9.002	76	215.4	2.396	0.377	2.7014	
240 minute winter	76	9.003	77	48.9	1.120	0.281	1.0949	
240 minute winter	77	8.013	77_OUT	1.9	0.227	0.021	5.0482	
240 minute winter	77	Infiltration		9.6				
240 minute winter	77_OUT	Weir		0.0				0.0
15 minute summer	78	11.000	79	0.0	0.000	0.000	0.0000	
15 minute summer	79	11.001	80	0.0	0.000	0.000	0.0000	
15 minute summer	80	11.002	81	0.0	0.000	0.000	0.0310	
15 minute summer	81	11.003	82	113.4	4.053	0.751	0.9981	
15 minute summer	82	11.004	83	135.7	3.038	0.421	0.5808	
15 minute summer	83	11.005	85	175.7	3.473	0.703	0.7357	
15 minute summer	84	12.000	85	86.7	3.105	0.688	0.3014	
15 minute summer	85	11.006	86	306.9	4.097	0.529	0.7638	
15 minute summer	86	11.007	87	328.6	3.877	0.566	0.9651	
15 minute summer	87	11.008	92	372.7	4.600	0.642	0.7696	
15 minute summer	88	13.000	89	72.8	2.289	0.891	1.7360	
15 minute summer	89	13.001	90	143.1	2.647	0.737	3.2179	
15 minute summer	90	13.002	91	230.7	4.110	0.843	1.6058	
15 minute summer	91	13.003	92	303.4	2.611	0.257	1.9590	
15 minute summer	92	11.009	93	708.5	4.320	0.561	2.1382	
15 minute summer	93	11.010	94	725.2	4.408	0.602	3.1650	
15 minute summer	94	11.011	95	744.5	4.415	0.530	2.2441	
15 minute summer	95	11.012	96	828.6	4.509	0.749	5.1908	

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 96.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	96	11	84.737	1.350	850.0	2.3855	0.0000	SURCHARGED
15 minute summer	97	11	83.938	1.417	897.6	2.5041	0.0000	SURCHARGED
15 minute summer	BASIN 2	11	83.482	1.082	897.0	1.9115	0.0000	FLOOD RISK
240 minute winter	98_OUT	240	83.059	0.659	163.9	812.2952	0.0000	OK
120 minute summer	BASIN 3	82	95.433	0.333	19.2	21.1957	0.0000	OK
360 minute winter	BASIN 4	352	96.641	0.241	6.3	43.5607	0.0000	OK
360 minute winter	BASIN 5	352	96.172	0.272	6.9	48.7083	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	96	11.013	97	849.1	3.015	0.809	10.5218	
15 minute summer	97	11.014	BASIN 2	897.0	3.185	1.280	3.2920	
15 minute summer	BASIN 2	11.015	98_OUT	896.7	3.184	3.171	4.0733	
240 minute winter	98_OUT	Weir		0.0				0.0
240 minute winter	98_OUT	Infiltration		11.4				
120 minute summer	BASIN 3	Infiltration		4.8				
360 minute winter	BASIN 4	Infiltration		0.6				
360 minute winter	BASIN 5	Infiltration		0.7				

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Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	x
Return Period (years)	2	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	9.999		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	150.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
1-8	0.056	100.000	536772.623	240787.102	0.475
9-17	0.062	100.000	536703.282	240731.322	0.425
18-55	0.189	100.000	536766.204	240662.478	0.425
58-75	0.081	100.000	536791.553	240552.536	0.425
77-93	0.100	100.000	536769.256	240504.034	0.425
94-105	0.043	100.000	536842.807	240738.261	0.425
ADOPTABLE ROAD 2	0.039	100.000	536756.326	240720.509	0.475
ADOPTABLE ROAD 3	0.041	100.000	536752.649	240752.818	0.475
ADOPTABLE ROAD 6	0.050	100.000	536782.325	240593.736	0.475
ADOPTABLE ROAD 8	0.050	100.000	536796.037	240533.162	0.475
ADOPTABLE ROAD 9	0.050	100.000	536767.613	240450.203	0.475
107-118	0.052	100.000	536934.239	240716.412	0.425
119-128	0.044	100.000	536987.138	240758.919	0.425
129-157	0.129	100.000	536939.127	240663.022	0.425
158-181	0.128	100.000	537025.644	240704.848	0.425
182-195	0.093	100.000	537092.198	240757.361	0.425
196-221	0.096	100.000	537085.352	240668.216	0.425
223-234	0.064	100.000	537127.731	240616.497	0.425
235-267	0.117	100.000	536926.074	240586.520	0.425
268-287	0.111	100.000	536925.636	240598.775	0.425
288-295	0.066	100.000	536842.291	240528.469	0.425
296-308	0.063	100.000	536952.175	240533.506	0.425
309-325	0.077	100.000	536931.137	240538.098	0.425
ADOPTABLE ROAD 4	0.179	100.000	537016.796	240533.089	0.425
ADOPTABLE ROAD 11	0.100	100.000	537068.035	240612.876	0.425
ADOPTABLE ROAD 12	0.062	100.000	537102.445	240642.305	0.425
ADOPTABLE ROAD 80	0.179	100.000	537032.171	240540.931	0.425
ADOPTABLE ROAD 98	0.065	100.000	537067.490	240769.805	0.425
98-102 SWALE	0.061	100.000	536835.666	240740.868	0.867
ADOPTABLE ROAD 9 SWALE	0.149	100.000	536705.609	240698.591	0.417
ADOPTABLE ROAD 4 SWALE	0.036	100.000	536804.871	240592.275	0.750

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Skip Steady State	x	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Analysis Speed	Normal	Drain Down Time (mins)	240	Check Discharge Rate(s)	x		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	30	0	0	0	100	40	10	0

Node 1-8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.54000	Porosity	0.30	Time to half empty (mins)	9	Length (m)	65.000	Depth (m)	0.325		

Node 9-17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.28080	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.28080	Porosity	0.30	Time to half empty (mins)	12	Length (m)	62.000	Depth (m)	0.325		

Node 18-55 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.56880	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.56880	Porosity	0.30	Time to half empty (mins)	5	Length (m)	189.000	Depth (m)	0.325		

Node 58-75 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03456	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03456	Porosity	0.30	Time to half empty (mins)	97	Length (m)	81.000	Depth (m)	0.325		

Node 77-93 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.54000	Porosity	0.30	Time to half empty (mins)	6	Length (m)	100.000	Depth (m)	0.325		

Node 94-105 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.54000	Porosity	0.30	Time to half empty (mins)	6	Length (m)	43.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.81300	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.81300	Porosity	0.30	Time to half empty (mins)	6	Length (m)	66.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.27000	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.27000	Porosity	0.30	Time to half empty (mins)	17	Length (m)	70.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.54000	Porosity	0.30	Time to half empty (mins)	9	Length (m)	86.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03456	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03456	Porosity	0.30	Time to half empty (mins)	134	Length (m)	86.000	Depth (m)	0.325		

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Node ADOPTABLE ROAD 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.81300	Safety Factor	3.0	Invert Level (m)	99.525	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.81300	Porosity	0.30	Time to half empty (mins)	4	Length (m)	255.000	Depth (m)	0.325		

Node 107-118 Carpark Storage Structure

Base Inf Coefficient (m/hr)	1.11600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	1.11600	Porosity	0.30	Time to half empty (mins)	3	Length (m)	52.000	Depth (m)	0.325		

Node 119-128 Carpark Storage Structure

Base Inf Coefficient (m/hr)	1.11600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	1.11600	Porosity	0.30	Time to half empty (mins)	1	Length (m)	440.000	Depth (m)	0.325		

Node 129-157 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.11600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.11600	Porosity	0.30	Time to half empty (mins)	29	Length (m)	129.000	Depth (m)	0.325		

Node 158-181 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.11600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.11600	Porosity	0.30	Time to half empty (mins)	29	Length (m)	129.000	Depth (m)	0.325		

Node 182-195 Carpark Storage Structure

Base Inf Coefficient (m/hr)	3.09600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	3.09600	Porosity	0.30	Time to half empty (mins)	1	Length (m)	93.000	Depth (m)	0.325		

Node 196-221 Carpark Storage Structure

Base Inf Coefficient (m/hr)	1.00800	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	1.00800	Porosity	0.30	Time to half empty (mins)	3	Length (m)	96.000	Depth (m)	0.325		

Node 223-234 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03564	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03564	Porosity	0.30	Time to half empty (mins)	94	Length (m)	64.000	Depth (m)	0.350		

Node 235-267 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.93600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.93600	Porosity	0.30	Time to half empty (mins)	4	Length (m)	117.000	Depth (m)	0.325		

Node 268-287 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.31680	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.31680	Porosity	0.30	Time to half empty (mins)	11	Length (m)	111.000	Depth (m)	0.325		

Node 288-295 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03456	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03456	Porosity	0.30	Time to half empty (mins)	97	Length (m)	66.000	Depth (m)	0.325		

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Node 296-308 Carpark Storage Structure

Base Inf Coefficient (m/hr)	2.05200	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	2.05200	Porosity	0.30	Time to half empty (mins)	2	Length (m)	63.000	Depth (m)	0.325		

Node 309-325 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.93600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	10.000	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.93600	Porosity	0.30	Time to half empty (mins)	4	Length (m)	77.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.93600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.93600	Porosity	0.30	Time to half empty (mins)	2	Length (m)	308.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03564	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03564	Porosity	0.30	Time to half empty (mins)	88	Length (m)	171.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03564	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.03564	Porosity	0.30	Time to half empty (mins)	93	Length (m)	108.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 80 Carpark Storage Structure

Base Inf Coefficient (m/hr)	1.11600	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	1.11600	Porosity	0.30	Time to half empty (mins)	2	Length (m)	308.000	Depth (m)	0.325		

Node ADOPTABLE ROAD 98 Carpark Storage Structure

Base Inf Coefficient (m/hr)	1.98000	Safety Factor	3.0	Invert Level (m)	99.575	Width (m)	5.800	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	1.98000	Porosity	0.30	Time to half empty (mins)	2	Length (m)	112.000	Depth (m)	0.325		

Node 98-102 SWALE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Side Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Porosity	1.00	Invert Level (m)	99.583	Time to half empty (mins)	31

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	18.0	18.0	0.417	121.0	121.0

Node ADOPTABLE ROAD 4 SWALE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03456	Side Inf Coefficient (m/hr)	0.03456	Safety Factor	3.0	Porosity	1.00	Invert Level (m)	99.250	Time to half empty (mins)	1313

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	28.0	28.0	0.750	199.0	199.0

Node ADOPTABLE ROAD 9 SWALE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Side Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Porosity	1.00	Invert Level (m)	99.583	Time to half empty (mins)	19

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	129.0	195.0	0.417	785.0	1383.0

Node 98-102 SWALE Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.54000	Safety Factor	3.0	Invert Level (m)	99.133	Width (m)	0.500	Slope (1:X)	500.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.54000	Porosity	0.30	Time to half empty (mins)	11	Length (m)	9.100	Depth (m)	0.400		

Other (defaults)

Entry Loss (manhole)	0.250	Exit Loss (manhole)	0.250	Entry Loss (junction)	0.000	Exit Loss (junction)	0.000	Apply Recommended Losses	x	Flood Risk (m)	0.300

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1-8	12	99.556	0.031	9.3	0.7085	0.0000	OK
15 minute summer	9-17	13	99.621	0.046	10.3	1.6187	0.0000	OK
15 minute summer	18-55	12	99.654	0.079	31.4	4.0263	0.0000	OK
180 minute summer	58-75	120	99.677	0.102	5.4	7.8276	0.0000	OK
15 minute summer	77-93	12	99.624	0.049	16.6	1.7818	0.0000	OK
15 minute summer	94-105	12	99.599	0.024	7.1	0.4462	0.0000	OK
15 minute summer	ADOPTABLE ROAD 2	11	99.552	0.027	6.5	0.3129	0.0000	OK
15 minute summer	ADOPTABLE ROAD 3	13	99.576	0.051	6.8	1.1560	0.0000	OK
15 minute summer	ADOPTABLE ROAD 6	12	99.568	0.043	8.3	0.8196	0.0000	OK
180 minute summer	ADOPTABLE ROAD 8	120	99.631	0.106	3.3	4.8862	0.0000	OK
15 minute summer	ADOPTABLE ROAD 9	11	99.560	0.035	8.3	0.3406	0.0000	OK
15 minute summer	107-118	11	99.591	0.016	8.6	0.1927	0.0000	OK
15 minute summer	119-128	10	99.589	0.014	7.3	0.0548	0.0000	OK
120 minute summer	129-157	74	99.671	0.096	10.8	6.9454	0.0000	OK
120 minute summer	158-181	74	99.671	0.096	10.7	6.8784	0.0000	OK
15 minute summer	182-195	10	99.586	0.011	15.4	0.0851	0.0000	OK
15 minute summer	196-221	11	99.606	0.031	15.9	0.7238	0.0000	OK
180 minute summer	223-234	116	99.663	0.088	4.3	5.7489	0.0000	OK
15 minute summer	235-267	11	99.614	0.039	19.4	1.1312	0.0000	OK
15 minute summer	268-287	13	99.641	0.066	18.4	3.2879	0.0000	OK
180 minute summer	288-295	116	99.665	0.090	4.4	6.1043	0.0000	OK
15 minute summer	296-308	10	99.586	0.011	10.5	0.0890	0.0000	OK
15 minute summer	309-325	11	99.602	0.027	12.8	0.5508	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	1-8	Infiltration	7.7
15 minute summer	9-17	Infiltration	6.1
15 minute summer	18-55	Infiltration	21.2
180 minute summer	58-75	Infiltration	1.7
15 minute summer	77-93	Infiltration	12.3
15 minute summer	94-105	Infiltration	6.1
15 minute summer	ADOPTABLE ROAD 2	Infiltration	5.9
15 minute summer	ADOPTABLE ROAD 3	Infiltration	3.8
15 minute summer	ADOPTABLE ROAD 6	Infiltration	6.3
180 minute summer	ADOPTABLE ROAD 8	Infiltration	1.0
15 minute summer	ADOPTABLE ROAD 9	Infiltration	7.7
15 minute summer	107-118	Infiltration	8.3
15 minute summer	119-128	Infiltration	7.2
120 minute summer	129-157	Infiltration	5.3
120 minute summer	158-181	Infiltration	5.2
15 minute summer	182-195	Infiltration	15.3
15 minute summer	196-221	Infiltration	14.6
180 minute summer	223-234	Infiltration	1.5
15 minute summer	235-267	Infiltration	16.9
15 minute summer	268-287	Infiltration	9.8
180 minute summer	288-295	Infiltration	1.5
15 minute summer	296-308	Infiltration	10.4
15 minute summer	309-325	Infiltration	11.8

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ADOPTABLE ROAD 4	12	99.671	0.096	29.7	2.1225	0.0000	OK
240 minute summer	ADOPTABLE ROAD 11	156	99.739	0.164	5.8	11.1689	0.0000	OK
180 minute summer	ADOPTABLE ROAD 12	120	99.695	0.120	4.1	6.3074	0.0000	OK
15 minute summer	ADOPTABLE ROAD 80	11	99.660	0.085	29.7	1.6593	0.0000	OK
15 minute summer	ADOPTABLE ROAD 98	10	99.595	0.019	10.8	0.1672	0.0000	OK
120 minute summer	98-102 SWALE	76	99.688	0.555	5.1	3.8128	0.0000	OK
30 minute summer	ADOPTABLE ROAD 9 SWALE	22	99.627	0.044	21.2	7.1066	0.0000	OK
480 minute winter	ADOPTABLE ROAD 4 SWALE	432	99.403	0.153	0.9	6.9405	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	ADOPTABLE ROAD 4	Infiltration	25.0
240 minute summer	ADOPTABLE ROAD 11	Infiltration	1.7
180 minute summer	ADOPTABLE ROAD 12	Infiltration	1.2
15 minute summer	ADOPTABLE ROAD 80	Infiltration	26.3
15 minute summer	ADOPTABLE ROAD 98	Infiltration	10.5
120 minute summer	98-102 SWALE	Infiltration	1.7
120 minute summer	98-102 SWALE	Infiltration	0.6
30 minute summer	ADOPTABLE ROAD 9 SWALE	Infiltration	8.5
480 minute winter	ADOPTABLE ROAD 4 SWALE	Infiltration	0.2

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1-8	12	99.596	0.071	27.8	3.8056	0.0000	OK
15 minute summer	9-17	13	99.671	0.096	30.8	6.8678	0.0000	OK
15 minute summer	18-55	13	99.744	0.169	93.9	18.3835	0.0000	OK
180 minute summer	58-75	128	99.750	0.175	13.0	22.8474	0.0000	OK
15 minute summer	77-93	13	99.682	0.107	49.7	8.6143	0.0000	OK
15 minute summer	94-105	12	99.634	0.059	21.4	2.6014	0.0000	OK
15 minute summer	ADOPTABLE ROAD 2	12	99.592	0.067	19.4	1.9426	0.0000	OK
30 minute summer	ADOPTABLE ROAD 3	22	99.630	0.105	17.9	4.8030	0.0000	OK
15 minute summer	ADOPTABLE ROAD 6	13	99.621	0.096	24.9	4.0515	0.0000	OK
180 minute summer	ADOPTABLE ROAD 8	128	99.706	0.180	8.0	14.1490	0.0000	OK
15 minute summer	ADOPTABLE ROAD 9	12	99.613	0.088	24.9	2.1720	0.0000	OK
15 minute summer	107-118	11	99.619	0.044	25.9	1.4458	0.0000	OK
15 minute summer	119-128	11	99.616	0.041	21.9	0.4633	0.0000	OK
60 minute summer	129-157	43	99.756	0.181	40.7	24.5500	0.0000	OK
60 minute summer	158-181	43	99.755	0.180	40.4	24.3575	0.0000	OK
15 minute summer	182-195	11	99.606	0.031	46.2	0.7262	0.0000	OK
15 minute summer	196-221	12	99.653	0.078	47.7	4.5860	0.0000	OK
120 minute summer	223-234	90	99.730	0.155	13.7	17.5307	0.0000	OK
15 minute summer	235-267	12	99.670	0.095	58.2	6.7080	0.0000	OK
30 minute summer	268-287	22	99.709	0.134	48.3	13.5428	0.0000	OK
120 minute summer	288-295	92	99.733	0.158	14.1	18.2491	0.0000	OK
15 minute summer	296-308	11	99.607	0.032	31.3	0.7502	0.0000	OK
15 minute summer	309-325	12	99.644	0.069	38.3	3.5368	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	1-8	Infiltration	18.0
15 minute summer	9-17	Infiltration	12.6
15 minute summer	18-55	Infiltration	45.8
180 minute summer	58-75	Infiltration	2.6
15 minute summer	77-93	Infiltration	27.3
15 minute summer	94-105	Infiltration	14.8
15 minute summer	ADOPTABLE ROAD 2	Infiltration	14.8
30 minute summer	ADOPTABLE ROAD 3	Infiltration	7.8
15 minute summer	ADOPTABLE ROAD 6	Infiltration	14.3
180 minute summer	ADOPTABLE ROAD 8	Infiltration	1.7
15 minute summer	ADOPTABLE ROAD 9	Infiltration	20.0
15 minute summer	107-118	Infiltration	22.8
15 minute summer	119-128	Infiltration	21.2
60 minute summer	129-157	Infiltration	10.0
60 minute summer	158-181	Infiltration	9.9
15 minute summer	182-195	Infiltration	44.8
15 minute summer	196-221	Infiltration	37.0
120 minute summer	223-234	Infiltration	2.2
15 minute summer	235-267	Infiltration	41.7
30 minute summer	268-287	Infiltration	20.1
120 minute summer	288-295	Infiltration	2.2
15 minute summer	296-308	Infiltration	30.2
15 minute summer	309-325	Infiltration	30.1

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ADOPTABLE ROAD 4	12	99.800	0.225	88.9	11.5947	0.0000	OK
180 minute summer	ADOPTABLE ROAD 11	132	99.848	0.273	16.0	30.8076	0.0000	OK
180 minute summer	ADOPTABLE ROAD 12	128	99.778	0.203	9.9	17.9054	0.0000	OK
15 minute summer	ADOPTABLE ROAD 80	12	99.782	0.207	88.9	9.8209	0.0000	OK
15 minute summer	ADOPTABLE ROAD 98	11	99.631	0.056	32.3	1.3470	0.0000	OK
120 minute summer	98-102 SWALE	78	99.828	0.695	13.1	12.3807	0.0000	OK
30 minute summer	ADOPTABLE ROAD 9 SWALE	23	99.694	0.111	64.9	24.1153	0.0000	OK
360 minute winter	ADOPTABLE ROAD 4 SWALE	344	99.527	0.277	2.4	16.4672	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	ADOPTABLE ROAD 4	Infiltration	59.5
180 minute summer	ADOPTABLE ROAD 11	Infiltration	2.8
180 minute summer	ADOPTABLE ROAD 12	Infiltration	2.0
15 minute summer	ADOPTABLE ROAD 80	Infiltration	65.2
15 minute summer	ADOPTABLE ROAD 98	Infiltration	30.0
120 minute summer	98-102 SWALE	Infiltration	3.6
120 minute summer	98-102 SWALE	Infiltration	0.6
30 minute summer	ADOPTABLE ROAD 9 SWALE	Infiltration	19.7
360 minute winter	ADOPTABLE ROAD 4 SWALE	Infiltration	0.3

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1-8	13	99.639	0.114	54.7	9.8293	0.0000	OK
30 minute summer	9-17	23	99.729	0.154	53.6	17.1163	0.0000	OK
30 minute summer	18-55	22	99.836	0.261	163.2	43.9787	0.0000	OK
180 minute winter	58-75	172	99.875	0.300	17.3	53.2324	0.0000	OK
15 minute summer	77-93	13	99.742	0.167	97.6	20.8848	0.0000	OK
15 minute summer	94-105	13	99.673	0.098	42.0	7.0749	0.0000	OK
15 minute summer	ADOPTABLE ROAD 2	12	99.635	0.110	38.1	5.2521	0.0000	OK
30 minute summer	ADOPTABLE ROAD 3	23	99.691	0.166	35.4	11.7303	0.0000	OK
15 minute summer	ADOPTABLE ROAD 6	13	99.676	0.151	48.9	9.9819	0.0000	OK
180 minute winter	ADOPTABLE ROAD 8	172	99.829	0.304	10.7	32.6629	0.0000	OK
15 minute summer	ADOPTABLE ROAD 9	12	99.673	0.148	48.9	6.0532	0.0000	OK
15 minute summer	107-118	12	99.652	0.077	50.8	4.5043	0.0000	OK
15 minute summer	119-128	11	99.652	0.077	43.0	1.6337	0.0000	OK
60 minute summer	129-157	46	99.848	0.273	81.3	55.6269	0.0000	OK
60 minute summer	158-181	46	99.846	0.271	80.7	55.0927	0.0000	OK
15 minute summer	182-195	11	99.635	0.060	90.8	2.7035	0.0000	OK
15 minute summer	196-221	12	99.704	0.129	93.7	12.5566	0.0000	OK
180 minute summer	223-234	156	99.852	0.277	19.9	40.9824	0.0000	OK
15 minute summer	235-267	13	99.729	0.154	114.2	17.7320	0.0000	OK
30 minute summer	268-287	23	99.781	0.206	95.8	31.9690	0.0000	OK
180 minute winter	288-295	172	99.857	0.282	14.1	42.7904	0.0000	OK
15 minute summer	296-308	11	99.634	0.059	61.6	2.6419	0.0000	OK
15 minute summer	309-325	12	99.689	0.114	75.2	9.7922	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	1-8	Infiltration	29.0
30 minute summer	9-17	Infiltration	16.5
30 minute summer	18-55	Infiltration	71.0
180 minute winter	58-75	Infiltration	2.7
15 minute summer	77-93	Infiltration	42.6
15 minute summer	94-105	Infiltration	21.8
15 minute summer	ADOPTABLE ROAD 2	Infiltration	24.5
30 minute summer	ADOPTABLE ROAD 3	Infiltration	10.5
15 minute summer	ADOPTABLE ROAD 6	Infiltration	22.6
180 minute winter	ADOPTABLE ROAD 8	Infiltration	1.7
15 minute summer	ADOPTABLE ROAD 9	Infiltration	33.8
15 minute summer	107-118	Infiltration	40.4
15 minute summer	119-128	Infiltration	40.3
60 minute summer	129-157	Infiltration	14.3
60 minute summer	158-181	Infiltration	14.3
15 minute summer	182-195	Infiltration	86.8
15 minute summer	196-221	Infiltration	61.5
180 minute summer	223-234	Infiltration	2.2
15 minute summer	235-267	Infiltration	68.1
30 minute summer	268-287	Infiltration	31.0
180 minute winter	288-295	Infiltration	2.2
15 minute summer	296-308	Infiltration	56.8
15 minute summer	309-325	Infiltration	50.3

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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ADOPTABLE ROAD 4	13	99.937	0.362	174.8	30.0398	0.0000	OK
180 minute winter	ADOPTABLE ROAD 11	172	99.983	0.408	21.4	67.0295	0.0000	OK
180 minute winter	ADOPTABLE ROAD 12	168	99.898	0.323	13.2	40.3418	0.0000	OK
15 minute summer	ADOPTABLE ROAD 80	13	99.912	0.337	174.8	26.0667	0.0000	OK
15 minute summer	ADOPTABLE ROAD 98	12	99.674	0.099	63.5	4.2569	0.0000	OK
120 minute summer	98-102 SWALE	82	99.986	0.853	25.5	27.8093	0.0000	OK
30 minute summer	ADOPTABLE ROAD 9 SWALE	24	99.770	0.187	128.6	51.4824	0.0000	OK
360 minute winter	ADOPTABLE ROAD 4 SWALE	352	99.683	0.433	4.5	33.5123	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
15 minute summer	ADOPTABLE ROAD 4	Infiltration	97.1
180 minute winter	ADOPTABLE ROAD 11	Infiltration	3.5
180 minute winter	ADOPTABLE ROAD 12	Infiltration	2.2
15 minute summer	ADOPTABLE ROAD 80	Infiltration	107.2
15 minute summer	ADOPTABLE ROAD 98	Infiltration	54.1
120 minute summer	98-102 SWALE	Infiltration	5.8
120 minute summer	98-102 SWALE	Infiltration	0.6
30 minute summer	ADOPTABLE ROAD 9 SWALE	Infiltration	31.9
360 minute winter	ADOPTABLE ROAD 4 SWALE	Infiltration	0.4

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11. APPENDIX D –ANGLIAN WATER PREDEVELOPMENT REPORT

Ingent Consulting Engineers Ltd. Registered office: Unit 10 Brightwell Barns Waldringfield Road Brightwell Suffolk IP10 0BJ. Registered No: 9119667 England

GROWTH PLANNING
AND EQUIVALENCE

love every drop
anglianwater

Pre-Planning Assessment Report

Newmarket Road, Royston

Section 1: Proposed Development

Thank you for submitting a pre-planning enquiry. This has been produced for Ardent Consulting Engineers. Your reference number is **00005820**. If you have any questions upon receipt of this report, please contact Olivia Powter on 01733 414690 or email planningliaison@anglianwater.co.uk.

The response within this report has been based on the following information which was submitted as part of your application:

List of Planned Developments	
Type of Development	No. Of Units
C3 Dwellings	300

The anticipated residential build rate is:

Year	2015	2016	2017	2018
Build Rate	50	100	100	50

- The grid reference for the site is TL3692240642.
- The site currently does not have planning permission and is located on a Greenfield site.

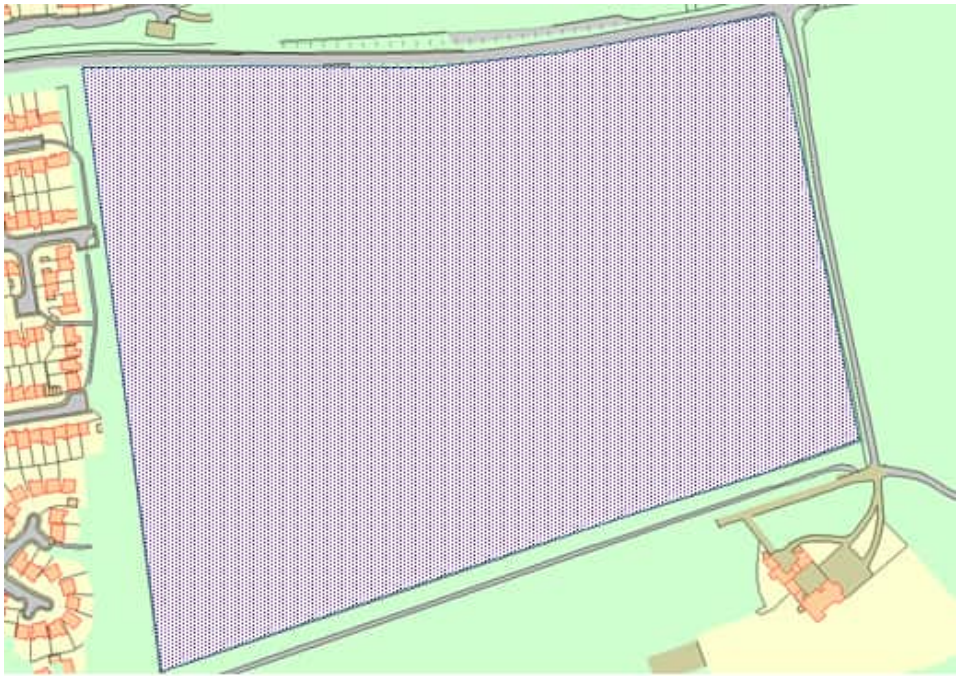


Figure 1: Location of proposed development

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2: Assets Affected

Our records indicate that there are no public water mains or public sewers or other assets owned by Anglian Water within the boundary or overlapping your development site. However, it is recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3: Water Recycling Services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and influent quality arising from your development.

Water Recycling Centre

The foul drainage from the proposed development is in the catchment of Royston Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used Water Network

Anglian Water has assessed the impact of gravity flows unfortunately, a desktop study has indicated that a gravity connection to your preferred connection point is likely to be difficult to achieve. We have therefore assessed a pumped solution and can confirm that there is capacity to manhole 5801 off Newmarket Road at National grid reference (NGR) TL36564082.

Surface Water Disposal

We note that you have not requested a surface water connection therefore an assessment has not been made on this occasion.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website at www.anglianwater.co.uk/developers/sewer-connection/suds.aspx. We will adopt features located in public open space that are designed and constructed, in conjunction with the future SuDs Approving Body, to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

Our preference is that the Local Authority is requested to adopt in the first instance as duty will pass to them in future legislation. Consequently as part of your submission, evidence will need to be provided to show that you have approached the local authority. If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website at:
http://www.anglianwater.co.uk/_assets/media/SuDS_Adoption_Form_2012.pdf

The proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the future SuDS Approving Body for the area, the Environment Agency, the Internal Drainage Board.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

It has been assumed that the onsite used water network will be provided under a section 104 Water Industry Act application. It is recommended that you also budget for both infrastructure charges and connection costs. The 2014/15 charges are:

Infrastructure Charge	£345.00 per connection
S104 Supervision and inspection costs	2.5% of estimated construction costs
S104 Survey costs	10% of estimated construction costs

Section 4: Map of Proposed Connection Points

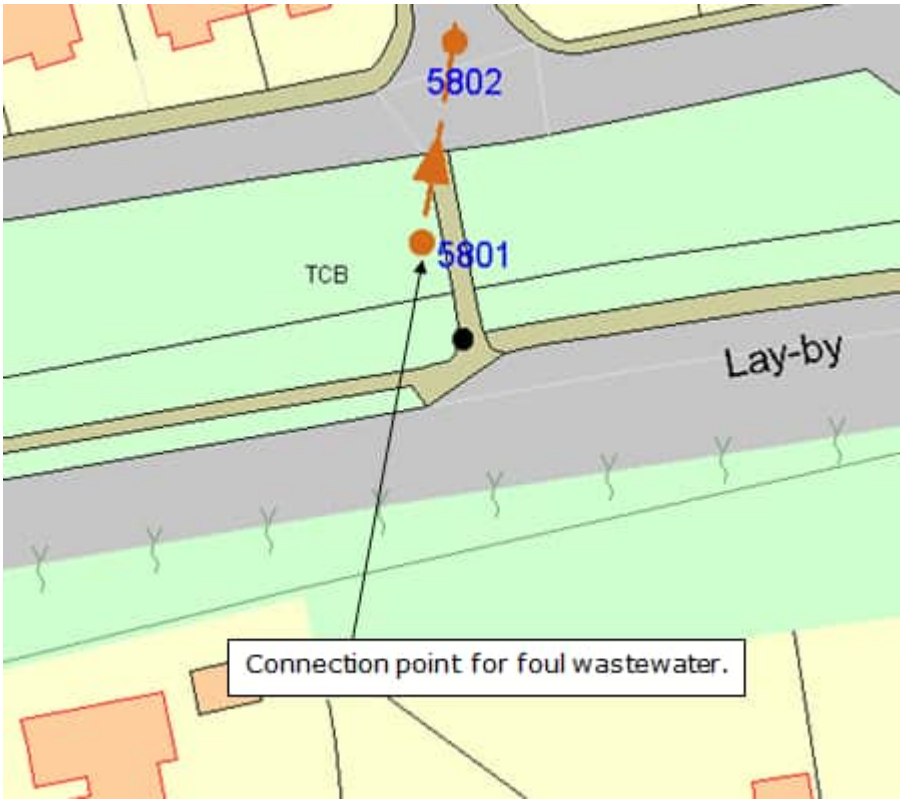


Figure 1: Showing your used water point of connection at manhole 5801

Water

Water Industry Act – Key Water Sections:

- Section 41: This provides you with the right to requisition a new water main for domestic purposes to connect your site to the public water network.
- Section 45: This provides you with the right to have a connection for domestic purposes from a building or part of a building to the public water main.
- Section 51A: This provides you with the right to provide the water main or service connection yourself and for us to vest them into our company.
- Section 55: This applies where you request a supply of water for non domestic premises.
- Section 185: This provides you with the right to make a reasonable request to have a public water main, sewer or public lateral drain removed or altered, at your expense. Details on how to make an application and the s185 form is available on our website at http://www.anglianwater.co.uk20/developers or via our Developer Services team on 08457 60 66 087.

Details on how you can make a formal application for a new water main, new connection or diversion are available on from our Developer Services team on 08457 60 66 087 or via our website at www.anglianwater.co.uk/developers

If you have any other queries on the rights to requisition or connect your housing to the public water and sewerage infrastructure then please contact our developer services team at: Developer Services, Anglian Water, PO Box 495, Huntingdon, PE29 6YY or Telephone: 0845 60 66 087 or Email: developerservices@anglianwater.co.uk

Water pressure and flow rate: The water pressure and consistency that we must meet for your site is laid out in the Water Industry Act (1991). This states that we must supply a flow rate of 9 litres per minute at a pressure of 10 metres of head to the external stop tap. If your water pressure requirements exceed this then you will need to provide and maintain any booster requirements to the development site.

Self Lay of Water Mains: A list of accredited Self Lay Organisations can be found at www.lloydsregister.co.uk/schemes/WIRS/providers-list.aspx.

Used Water

Water Industry Act – Key Used Water Sections:

- Section 98: This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

- Section 102: This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.
- Section 104: This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.
- Section 106: This provides you with the right to have your constructed sewer connected to the public sewer.
- Section 185: This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website at www.anglianwater.co.uk/developers or via our Developer Services team on 08457 60 66 087.

Sustainable Drainage Systems:
Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. Therefore our preferred method of surface water disposal is through the use of Sustainable Drainage Systems (SuDS). SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website at http://anglianwater.co.uk/developers/sewer-connection/suds.aspx. We also recommend that you contact the future SuDS Approving Body (SAB) for the area to discuss your application.

Private Sewer Transfers: Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

- Surface water sewers and lateral drains that did not discharge to the public sewer, e.g. those that discharged to a watercourse.
- Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.
- Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

Encroachment: Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are

planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website at http://anglianwater.co.uk/developers/encroachment.aspx

Locating our assets: Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from www.digdat.co.uk. All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge. We have more information on our website at: www.anglianwater.co.uk/developers/our-assets/

Summary of charges: A summary of this year's water and used water connection and infrastructure charges can be found at
http://www.anglianwater.co.uk/developers/charges/

Disclaimer: The information provided within this report is based on the best data currently recorded, recorded within the last 12 months or provided by a third party. The position must be regarded as approximate. If there is further development in the area or for other reasons the position may change.

The accuracy of this report is therefore not guaranteed and does not obviate the need to make additional appropriate searches, inspections and enquiries. You are advised therefore to renew your enquiry should there be a delay in submitting your application for water supply/sewer connection to re-confirm the situation.

Any cost calculations provided within the report are estimated only and may be subject to change.

The responses made in this report are based on the presumption that your proposed development obtains planning permission. Whilst this report has been prepared to help assess the viability of your proposal, it must not be considered in isolation. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework (NPPF). As a spatial planning statutory consultee, we assist planning authorities in the preparation of a sustainable local plan on the basis of capacity within our water and water recycling (formerly referred to as wastewater) infrastructure. Consequently, any infrastructure needs identified in this report must only be considered in the context of up to date, adopted or emerging local plans. Where local plans are absent, silent or out of date these needs should be considered against the definition of sustainability set out in the NPPF as a whole.

No liability whatsoever including liability for negligence is accepted by Anglian Water Services Limited for any error or inaccuracy or omission including the failure to accurately record or record at all, the location of any water main, discharge pipe, sewer, or drain or disposal main or any item of apparatus.

12. APPENDIX E – GEOTECHNICAL DATA

Ingent Consulting Engineers Ltd. Registered office: Unit 10 Brightwell Barns Waldringfield Road Brightwell Suffolk IP10 0BJ. Registered No: 9119667 England

DESK STUDY & GROUND INVESTIGATION REPORT

Newmarket Road
Royston
Hertfordshire

Client: Countryside Properties

J16202

January 2017






GEA Geotechnical & Environmental Associates

Document Control

Project title	Newmarket Road, Royston, Herts, SG8 7NJ	**Project ref**	J16202
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Issue No	Status	Amendment Details	Date	Approved for Issue
1	Final		30 November 2016	
2	Final		18 January 2017	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

☑	Hertfordshire	tel 01727 824666	mail@gea-ltd.co.uk
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Geotechnical & Environmental Associates Limited (GEA) disclaims any responsibility to the Client and others in respect of any matters outside the scope of this work. This report has been prepared with reasonable skill, care and diligence within the terms of the contract with the Client and taking account of the manpower, resources, investigation and testing devoted to it in agreement with the Client. This report is confidential to the Client and GEA accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known, unless formally agreed beforehand. Any such party relies upon the report at their own risk. This report may provide advice based on an interpretation of legislation, guidance notes and codes of practice. GEA does not however provide legal advice and if specific legal advice is required a lawyer should be consulted.

This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a site investigation carried out by Geotechnical and Environmental Associates Limited (GEA) on the instructions of Countryside Properties PLC with respect to the redevelopment of the site through the construction of two-storey to three-storey residential units. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions and hydrogeology, to assess the extent of any contamination and to provide information to assist with the design of foundations.

SITE HISTORY

The earliest map studied, dated 1878, shows the site to have been undeveloped and surrounded by trees on all sides except to the north where it fronted onto an unnamed road. Between 1903 and 1921 several larger properties were built in the area, including Burloes's Hall approximately 80 m to the southeast, and Icknield Bury, approximately 50 m to the west. A building is shown to the north of the site and was later named Burloes Cottages on the 1971 map. By 1971, an electrical sub-station had been built approximately 20 m to the southeast of the site, whilst the existing residential developments had been constructed to the north and west. Between 1977 and 1984 the junction between the new A505 and Newmarket Road had been constructed, and later, between 1984 and 1989 the residential development to the west was extended to represent its existing condition. The site and surrounding area have since remained unchanged.

GROUND CONDITIONS

Beneath a moderate thickness of made ground, the New Pit Chalk Formation was encountered to the maximum depth of the investigation, of 20.00 m. The made ground ranged in thickness from 0.20 m to 0.70 m, with the thickness apparently increasing towards the north and northeast of the site. It comprised brown silty sand with variable amounts of chalk and flint gravel and fragments of shell, brick, concrete, metal, ash, coal and tile. Within the trial pits the New Pit Chalk Formation consisted of an initially structureless chalk (Grade Dm, becoming Dc) over very weak, low density structured white chalk (Grade C5) with patches of structureless chalk (Grades Dm / Dc); fissures were initially very closely spaced and infilled with brown clay and comminuted chalk, becoming closely spaced and clean (Grade B3) with depth to 3.30 m. Scattered flint gravel and cobbles were noted throughout the chalk.

Groundwater was not encountered. Contamination testing of a number of samples of made ground has not measured any elevated concentrations of contaminants.

Soakage testing has indicated soakage rates of 3.34×10^{-6} m/s to 5.15×10^{-4} m/s.

RECOMMENDATIONS

Spread foundations bearing on the initial low density Grade Dm chalk at a minimum depth of 0.75 m may be designed to apply a net allowable bearing pressure of 200 kN/m^2. A slightly higher bearing pressure of 225 kN/m^2 may be applied on the low density Grade Dc chalk.

Groundwater is unlikely to be encountered in the foundation excavations.

Contamination testing has revealed no elevated levels of contamination within the samples of made ground tested and as such no remedial action is considered necessary.

As the laboratory testing has indicated that the chalk is of low density to the full depth investigated in the trial pits, shallow soakaways would need to be located at a minimum distance of 10 m from any foundations. It is considered that soakaways with a 5 m lateral offset and an impermeable plain well screen over the upper 5 m below nearest foundation levels, will provide sufficient assurance.

A cut and fill earthworks scheme is proposed across site and it is considered that generally the chalk encountered, based on the guidance from CIRIA C574 is suitable as fill material, although it may not be economical to use Class CDs material as embankment fill.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Countryside Properties PLC to carry out a desk study and ground investigation at Newmarket Road, Royston, SG8 7NJ.

1.1 Proposed Development

It is understood that it is proposed to construct a number of new two-storey to three-storey residential units. A limited programme of earthworks will be required as part of the development.

This report is specific to the proposed development and the advice herein should be reviewed once the development proposals are finalised.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site with respect to previous contaminative uses;
- to determine the ground conditions and their engineering properties;
- to provide advice with respect to the design of shallow foundations;
- to provide advice with respect to the design of soakaways;
- to provide information to assist in the design of road pavements and hardstandings;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database;
- a review of readily available geology maps; and
- a walkover survey of the site carried out in conjunction with the fieldwork.

In the light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- three cable percussion boreholes advanced to depths of 15.0 m and 20.0 m;
- falling head tests carried out in each borehole at depths of 5 m, 6.5 m, 10 m, 15 m and 20 m;
- five opendrive sampler boreholes advanced to a depth of 5.0 m by means of a Terrier rig;
- standard penetration tests (SPTs) carried out at regular intervals within the borehole to provide quantitative data on the strength of the soils;
- twelve trial pits advanced to depths of between 0.9 and 3.3 m to investigate the soakage potential of the chalk across the site;
- ten shallow trial pits advanced to depths of between 0.1 m and 0.4 m to allow recovery of samples of made ground for the purpose of topsoil testing;
- testing of selected soil and rock samples for contamination and geotechnical purposes; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11[1] and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment.

The exploratory methods adopted in this investigation have been selected on the basis of the constraints of the site, including but not limited to access and space limitations, together with any budgetary or timing constraints. Where it has not been possible to reasonably use an EC7 compliant investigation technique a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon GEA's engineering experience, local precedent where applicable and relevant published information.

1.4 Limitations

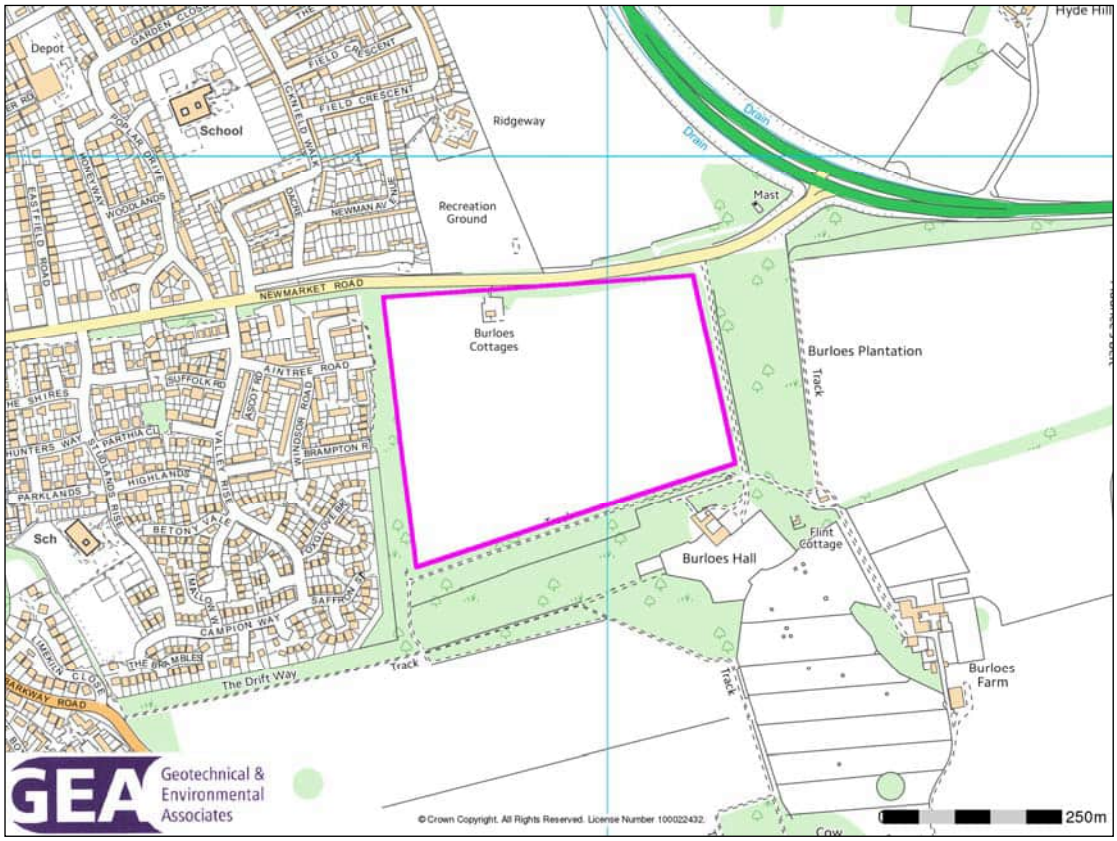
The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted and the number of locations where the ground was sampled. No liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

1 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004

2.0 THE SITE

2.1 Site Description

The site is located to the east of Royston, Hertfordshire, approximately 1.40 km southeast of Royston railway station. It is bounded to the north by Newmarket Road, to the east and south by tree plantations and to the west by residential housing, behind a row of trees. The site may additionally be located by National Grid Reference 536927, 240663, and is shown on the map extract below.



The site slopes downwards towards the north at an angle of approximately 5°, falling from approximately 105 m OD on the southern boundary to 75 m OD on the northern boundary. It is roughly rectangular in shape, measuring approximately 450 m east west by 320 m north south. The site is surrounded by mature and semi-mature deciduous trees with a small group of sycamore trees present towards the southeastern corner of the site. There is a pair of semi-detached houses, with associated gardens, encroaching into the northern site boundary.

Access to the site is via the access track to the southeastern corner of the field.

2.2 Site History

The site history has been researched by reference to internet sources and historical Ordnance Survey (OS) maps obtained from the Envirocheck database.

The earliest map studied, dated 1878, shows the site to have comprised part of an open field, with an unnamed road and embankment bordering the site to the north and Burloes's Plantation immediately to the east. Burloes's Farm was present approximately 500 m to the southeast of the site.

The site and immediate surrounding area remained essentially unchanged until some time between 1903 and 1921, when a pair of semi-detached houses is shown to the north, in the centre of the site, which was later named Burloes Cottages, and are assumed to be the existing buildings. An unnamed road was also built to the east of the site, leading to the newly constructed Burloes's Hall, approximately 80 m to the southeast of the site. Icknield Bury had also been constructed around 50 m to the west of the site. By 1938, the unnamed road to the north of the site had been renamed the A505.

By 1971, Icknield Bury had been demolished with the northwest of the site showing increased level of development, which continued until 1973, when residential development is shown to have extended up to the northern half of the western site boundary. An electrical sub-station had been built approximately 20 m to the southeast of the site.

On the map dated 1983 the A505 is shown to have been renamed as Newmarket Road. The current arrangement of the A505 and junction to Newmarket Road is shown approximately 250 m to the northeast of the site.
By 1987, the development to the west of the site extended along the entire western boundary continuing until 1989, when the site and surrounding area are shown to have remained essentially unchanged.

2.3 Other Information

A search of public registers and databases has been made via the Envirocheck database and relevant extracts from the search are appended. Full results of the search can be provided if required.

The Envirocheck report has indicated that no landfill sites, waste management, transfer, treatment or disposal sites are located within 1 km of the site. There are no records of environmental controls or incidents that are likely to have an adverse impact on the site.

No pollution incidents to controlled waters have been recorded within 1 km of the site.

Reference to records compiled by the Health Protection Agency (formerly the National Radiological Protection Board) indicates that the site falls within an area where less than 1% of homes are affected by radon emissions and therefore radon protective measures will not be necessary.

The site is listed as being within a nitrate vulnerable zone, but does not have any other sensitive land uses.

2.4 Geology

The British Geological Survey (BGS) map (Sheet 204) of the area indicates that the site is underlain by the New Pit Chalk Formation from the surface. Head Deposits overlie the chalk in the centre of the north of the site.

The Envirocheck report states that there is a very low potential for ground dissolution stability hazards, and the potential for collapsible ground stability hazards is very low. The potential for landslide stability hazards is low. The nearest recorded man-made cavity is approximately 547 m to the southwest of the site, which is expected to be a historical lime kiln, potentially a chalk mine. There are no recorded natural cavities within 1 km of the site.

2.5 Hydrology and Hydrogeology

The Head Deposits are classified as a Secondary Undifferentiated Aquifer, which refers to the variable characteristics of the drift deposits. The New Pit Chalk Formation is classified as a Principal Aquifer, rather than its former classification as a major aquifer, referring to rock layers or drift deposits with high intergranular and/or fracture permeability that has a high level of water storage and may support water supply and/or river base flow.
There are no listed water abstractions within 140 m of the site.

The site is located within the total catchment (Zone III) of Groundwater Source Protection Zone, as defined by the Environment Agency. The site has a limited potential for groundwater flooding to occur, and is not indicated as being at risk of flooding from rivers and the sea.

The nearest surface water feature is located approximately 186 m to the northeast of the site.

Groundwater is likely to be present at depth within the New Pit Chalk Formation and a BGS borehole located approximately 150 m southeast of the site found groundwater at a depth of approximately 53.00 m (38 m OD).

The site has limited potential for groundwater flooding.

2.6 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a “suitable for use” approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.6.1 Source

The desk study findings indicate the site not to have had a potentially contaminative history as it has remained largely undeveloped since prior to 1878, except for Burloes Cottages to the north of the site.

There are no recorded landfill sites within 1 km of the site and there is therefore not a risk of hazardous ground gas.

2.6.2 Receptor

The proposed development of the site for residential purposes will result in the end users representing relatively high sensitivity receptors. The Principal Aquifer below the site is also a sensitive receptor. Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are likely to come into contact with any contaminants present in the soils during construction works.

2.6.3 Pathway

The presence of the permeable New Pit Chalk Formation would allow the migration of contaminated groundwater through the shallow soils to the deep principal aquifer. Within the site, end users may come into contact with any contaminants present within the made ground in areas of soft landscaping and gardens. Buried services may be exposed to any contaminants present within the soil through direct contact and site workers will come into contact with the

soils during construction works. There is thus considered to be a medium to high potential for a contaminant pathway to be present between any potential contaminant source and a target for the particular contaminant.

2.6.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a LOW risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, three cable percussion boreholes were advanced to depths of 15.00 m and 20.00 m and five opendrive sampler boreholes were advanced to a depth of 5.00 m using a Terrier rig. Additionally, twelve trial pits were excavated to depths of between 0.90 m and 3.30 m in order to provide additional coverage of the site. Soakage tests were conducted within the cable percussion boreholes and within a number of trial pits.

During boring, disturbed samples were obtained from the boreholes for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were carried out at regular intervals to provide additional quantitative data on the strength of soils encountered.

A selection of the samples recovered from the boreholes was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for contamination testing.

All of the above work was carried out under the supervision of a geotechnical engineer from GEA.

The borehole and trial pit records are appended, together with a site plan indicating the exploratory positions. The National Grid Reference and Ordnance Datum (OD) levels on the borehole and trial pit records were measured using a hand held GPS.

3.1 Sampling Strategy

The trial pit and borehole locations were agreed with the client.

Five samples of the made ground have been tested for the presence of contamination. The analytical suite of testing was selected to identify hydrocarbon contamination resulting from the former use of the site and a range of typical industrial contaminants for the purposes of general coverage. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

The geotechnical testing included moisture content, intact dry density and saturated moisture content on selected samples of chalk.

4.0 GROUND CONDITIONS

The investigation has generally confirmed the expected ground conditions in that, beneath a limited thickness of made ground, the New Pit Chalk Formation was encountered to the full depth of investigation. However, the investigation has not encountered the Head Deposits that are indicated on the geology map in the north of the site.

4.1 Made Ground

The made ground comprised brown silty sand with variable amounts of chalk and flint gravel and fragments of shell, brick, concrete, metal, ash, coal and tile, extending to depths of between 0.2 m and 0.70 m.

Apart from the presence of fragments of extraneous material noted above, no visual or olfactory evidence of contamination was observed during the fieldwork. Five samples of the made ground have been analysed for a range of contaminants as a precautionary measure and the results are detailed within Section 4.4.

4.2 New Pit Chalk Formation

On the basis of the inspection of the trial pits, the chalk has been classified in accordance with CIRIA Report C574 (2002), *Engineering in Chalk.*

Within the trial pits the New Pit Chalk initially comprised a structureless chalk, assessed as Grade Dm, becoming Grade Dc, over very weak, low density, white chalk with orange-brown staining and occasional black specks, which extended to the full depth of the investigation, of 20.00 m. Initially the fissures were very closely spaced and infilled with brown clay and comminuted chalk, becoming closely spaced and clean. Scattered flint gravel and cobbles were encountered, as well as partings of brown silty clay. The grade of the chalk was recorded as corresponding to Grades C5 changing to B3 with depth.

The boreholes proved the chalk to a depth of 20.00 m (68.00 m OD) and recovered it as Grade Dm / Dc with layers of Grade C5, although the sampling will have resulted in disturbance of the material and the recovered samples will not be indicative of the insitu condition.

The results of intact dry density tests indicate the chalk to be of low to medium density with results ranging between 1.39 Mg/m^3 and 1.55 Mg/m^3. Natural moisture content results range between 27 % and 31 % whilst saturated moisture content ranges between 24 % and 34 %.

No evidence of any solution features or other anomalous ground conditions associated with chalk dissolution have been encountered during the investigation and the presence of such features is not expected.

4.3 Groundwater

Groundwater was not encountered in any of the excavations and is likely to be at depth within the chalk.

4.4 Soil Contamination

The table below sets out the values measured within the five samples analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	BH1 0.30 m	BH2 0.30 m	BH3 0.30 m	BH4 0.40 m	BH5 0.20 m
pH	8.3	8.1	8.5	8.5	8.4
Arsenic	2.0	3.1	4.2	1.6	4.6
Cadmium	0.5	0.5	0.5	0.5	0.7
Chromium	10	10	7.4	5.0	7.4
Lead	21	16	17	13	13
Mercury	44	31	30	26	29
Selenium	0.9	< 0.3	< 0.3	0.6	0.7
Copper	6.2	7.9	6.5	5.7	7.8
Nickel	< 1.0	< 1.0	1.6	< 1.0	2.1
Zinc	31	35	29	27	36
Total Cyanide	< 1	< 1	< 1	< 1	< 1
Total Phenols	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total PAH	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60
Sulphide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzo(a)pyrene	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
TPH	12.5	17.1	15.7	8.1	10.7
Total Organic Carbon %	2.1	2.4	2.5	1.8	2.4

Note: Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report

The results of the chemical analyses have not indicated any of the samples tested to contain elevated concentrations of contaminants.

4.5 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[2] Soil Guideline Value where available, or is a Generic Screening Value calculated using the CLEA UK Version 1.06[3] software assuming a residential end use with plant uptake, or is based on the DEFRA Category 4 Screening values[4]. The key generic assumptions for this end use are as follows;

[2] *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.
[3] Contaminated Land Exposure Assessment (CLEA) Software Version 1.06 Environment Agency 2009
[4] CL:AIRE (2013) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Final Project Report SP1010 and DEFRA (2014) *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination* Policy Companion Document SP1010

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be young female children aged zero to six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a two to three-storey small terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

The results of the chemical analyses have indicated the samples tested contain low concentrations of all the tested contaminants.

The significance of these results is considered further in Part 2 of the report.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to the proposed development.

5.0 INTRODUCTION

It is understood that it is proposed to construct new two to three-storey residential units. Loads are anticipated to be light.

A limited programme of earthworks will be required as part of the development.

6.0 GROUND MODEL

The desk study has revealed that the site has not had a potentially contaminative historical use as it has not been developed since prior to 1878, and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows:

- below a relatively consistent thickness of made ground, the New Pit Chalk Formation is present which extends to the maximum depth of the investigation, of 20.00 m (68.00 m OD);
- the made ground comprises brown silty sand with variable amounts of chalk and flint gravel and fragments of shell, brick, concrete, metal, ash, coal and tile to a maximum depth of 0.70 m;
- the New Pit Chalk initially consists of a structureless chalk, assessed as Grade Dm, becoming Dc, over very weak, low density structured white chalk (Grade C5) with partings of structureless chalk (Grades Dm / Dc), fissures are initially very closely spaced and infilled with a brown clay and comminuted chalk, becoming closely spaced and clean (Grade B3) at a depth of about 3 m. Scattered flint gravel and cobbles are present throughout the chalk; and
- groundwater was not encountered and is expected to be at depth within the chalk.

7.0 ADVICE AND RECOMMENDATIONS

The chalk encountered at shallow depth should provide a suitable bearing stratum for spread foundations supporting the anticipated light loads.

A cut and fill exercise is proposed, to create level building areas across this sloping site. It is understood that new levels have not been finalised, but levels may alter by around 1.5 m to 2.0 m.

7.1 Earthworks

The excavation and handling of chalk can be problematic and the selected contractor should be experienced in working with the material, as the structure of the chalk can rapidly

deteriorate upon exposure to the elements. The earthworks should be carried out during dry conditions, in order to minimise the disruption to the chalk fabric as light rainfall may cause instability within the chalk.

Excavation of the New Pit Chalk at this site can be undertaken using a face shovel, although excavation is anticipated to be feasible with smaller plant at shallow depths.

Following the site strip of the made ground and superficial deposits, much of the material that will be removed by the proposed earthworks will comprise New Pit Chalk. It should be possible to excavate temporary cut faces at angles of approximately 75°. This cut angle may not protect against minor spalling of the chalk and the cut slopes should be left open for as short a period as possible. It would be prudent to conduct daily inspection of all cut faces by a qualified engineer. Vehicle movements at the top of unsupported cut faces should be minimised. Alternatively, the structured chalk could be cut back at a flatter angle of about 33° to ensure stability and avoid spalling and the unstructured chalk cut back at 26°.

Temporary weather protection layers above the sub-formation on the top of the chalk fill and above chalk or sub-formations in cut should either be constructed or left with a minimum thickness of 600 mm if they are to be in place throughout the winter.

Detailed specification of the requirements for excavating, transporting and compacting the chalk is outside the scope of this report and will need be considered in more detail once the proposals have been finalised. On the basis of the intact dry density (IDD) and natural moisture content (NMC) results, and with reference to CIRIA C574, and specifically Table 5.5, the chalk can be classified as Classes CDs to CCs. This material can be compacted using Compaction Method 4 in accordance with Table 6/4 of the Manual of Contract Documents for Highway Works Vol 1 Specification for Highway Works (MCHW1), although the use of material classified as Class CDs may not be economical in general embankment fill.

CIRIA C574 recommends that a face shovel be used in order to excavate the chalk and that temporary instability should be expected, or at best is probable; it further concludes that working the chalk in rainy conditions should be avoided. However, there are various other criteria that need to be taken into account in the selection of method of excavation, transporting and compacting of chalk. Further consideration should be given to these aspects once the proposals have been finalised.

On completion of a portion of the compaction, it would be prudent to excavate a number of trial pits through the excavated material to check the quality of the compaction.

7.2 Spread Foundations

Spread foundations bearing on the initial low density Grade Dm chalk at a minimum depth of 0.75 m may be designed to apply a net allowable bearing pressure of 200 kN/m^2. A slightly higher bearing pressure of 225 kN/m^2 may be applied on the low density Grade Dc chalk. These values incorporate an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

If Head Deposits are encountered in the north of the site, as indicated by the geology map of the area, additional investigation should be carried out to determine the bearing characteristics of the material.

7.3 Shallow Excavations

On the basis of the trial pit findings it is considered likely that it will be feasible to form relatively shallow excavations through the made ground terminating within the New Pit Chalk Formation without the requirement for lateral support in the short term.

However, if deeper excavations are considered or if excavations are to remain open for prolonged periods it is recommended that provision be made for battered side slopes or lateral support. Where personnel are required to enter excavations, a risk assessment should be carried out and temporary lateral support or battering of the excavation sides should be considered, in order to comply with normal safety requirements.

The investigation has indicated that groundwater will not be encountered within shallow excavations.

7.4 Piled Foundations

For the ground conditions at this site, driven or bored piles could be adopted. Driven piles would have the advantage of minimising the spoil that is generated, but consideration would need to be given to the effects of noise and vibrations on neighbouring sites. Some form of bored pile may therefore be more appropriate. Conventional rotary augered piles may be suitable, although temporary casing would need to be installed through the chalk fill Alternatively, bored piles installed using continuous flight auger (cfa) techniques would be an appropriate type.

The following parameters, based upon the guidance provided by CIRIA[5,6] for piles in chalk, are considered suitable for the preliminary design of straight-shafted bored piles installed using cfa techniques. The design has principally been based on the ground conditions encountered within Borehole Nos 6, 7 and 8.

The following table of ultimate coefficients may be used for the preliminary design of bored piles, which have been based on the SPT / depth and level graph in the appendix.

Stratum	Depths m	kN / m^2
Ultimate Skin Friction		
Made Ground	Ground level to 0.7	Ignore
Chalk	0.7 to 15.0	Increasing linearly from 5 to 135
Ultimate End Bearing		
Chalk	10.0 to 15.0	Increasing linearly from 4400 to 6200

In the absence of pile tests, a factor of safety of 3.0 should be applied to the above coefficients or 1.5 to Ultimate Shaft Friction and 3.5 to Ultimate End Bearing, whichever gives the lower bound safe theoretical working loads.

5 *Engineering in Chalk* CIRIAC574 (2002)
6 *Shaft Friction of cfa piles in chalk*. CIRIA Project Report 86 (2003)

Pile diameter mm	Depth Below Ground Level m	Safe Working Load* kN
300	10	250
	15	500
450	10	470
	15	900

** care should be taken not to exceed the values given for base resistance of low density and medium / high density chalk in accordance with CIRIA C574*

The above examples are not intended to constitute any form of recommendation with regard to pile size or type, but merely serve to illustrate the use of the above coefficients. Specialist piling contractors should be consulted with regard to the design of an appropriate piling scheme and the need for additional deeper investigation. Their attention should be drawn to the presence of potential flint layers within the Chalk. These pile designs are based on in-situ ground conditions and as a result do not account for the placement of fill. Once the depths of fill on site have been confirmed a more comprehensive design should be completed.

Care should be taken in the construction of cfa piles in these types of soils. Careful control of concrete pressures and drilling rate will be required to maintain the pile shaft integrity in the made ground. In addition, as with any situation where bored piles are constructed in chalk, consideration will need to be given to the possibility of variations in the level and quality of the chalk and the possibility of undetected significant variations between borehole positions.

Prospective contractors should be consulted to determine how they intend to control and monitor the pile installation and with regard to their experience in similar ground conditions. The contractors should be provided with all of the exploratory data. Consideration may need to be given on the depths of fill and their influence on negative skin friction.

7.5 Ground Floor Slabs

Following the site strip, it should generally be possible to adopt ground bearing floor slabs, bearing on the chalk. Where chalk is exposed at formation level, ground floor slabs of unheated or poorly insulated buildings should be constructed over a layer of well compacted, free draining material of at least 300 mm thickness. In heated, well insulated buildings, ground floor slabs can be constructed directly on chalk although should not be exposed during construction for more than five consecutive days if the mean daily air temperature is below freezing.

Chalk is frost susceptible, and to avoid damage from frost action, the depth of the underside of the foundation should be at least 600 mm below finished ground level. This depth should also be used when construction is undertaken during cold weather. Alternatively, precautions should be taken to avoid freezing of the ground.

If ground bearing floor slabs are to be placed on areas of compacted material it should be ensured that a suitable degree of compaction is specified.

7.6 Retaining Walls

The following parameters are suggested for the design of permanent retaining walls.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion ($c' - kN/m^2$)	Effective Friction Angle (ϕ' – degrees)
Made ground	1800	Zero	22
Unstructured Chalk	1800	Zero	30
Structured Chalk	1800	Zero	35

Groundwater is unlikely to be encountered within the excavations.

7.7 Disposal of Surface Water

In order to provide an indication of the suitability of shallow soakaways for the disposal of surface water, soakage tests were carried out in the cable percussion boreholes and in a number of the trial pits. The results of the soakage tests are summarised below.

Borehole or Trial Pit No	Excavation Depth (m)	Infiltration rate (m/s)
BH6	5	9.81×10^{-6}
	10	3.51×10^{-5}
	15	3.34×10^{-6}
	20	5.15×10^{-4}
BH7	6.5	1.81×10^{-5}
	10	1.13×10^{-4}
	15	5.21×10^{-5}
BH8	5	3.07×10^{-5}
	10	3.20×10^{-5}
	15	9.39×10^{-5}
	20	3.87×10^{-5}
TP1	1	5.1×10^{-6}
TP2	0.9	3.5×10^{-5}
TP3	1.2	2.0×10^{-5}
TP5	2.4	4.4×10^{-5}
TP6	2.5	3.0×10^{-5}
TP7	2.9	2.9×10^{-4}

The tests yielded soakage rates of 3.34×10^{-6} m/s to 5.15×10^{-4} m/s; these assessments are based on the linear portion of the graph, unless otherwise stated.

7.7.1 Shallow Soakaways

The use of shallow soakaways is a viable option, but as the chalk has been identified as having a low density, soakaways would need to be located at a minimum distance of 10 m away from new and existing foundations. This is not a practical requirement on a development of this type and consideration has therefore been given to the use of deep bored soakaways.

7.7.2 Deep Bored Soakaways

In order to allow soakaways to be located closer to foundations, consideration is being given to the use of deep bored soakaways. It is understood that currently two options of deep bored soakaway design are being considered; each design adopts an impermeable chamber within the upper 5 m of chalk nearest to proposed foundations. The two proposed options are:

- a 2.4 m diameter chamber at 2.5 m effective depth, with a 15 m deep borehole; and
- a 3.0 m diameter chamber at 3.0 m effective depth, with a 20 m deep borehole.

The laboratory results have identified the chalk as having a low density to the full depth of the investigation, of 20.00 m. CIRIA guidance suggests that in low density chalk, soakaways should be located at least 10 m away from foundations but it is understood that meeting this criterion will be very difficult on a housing development of this type. On the basis that the density of the chalk is in part medium density and elsewhere generally at the upper end of the low density classification, it is considered that soakaways located with a 5 m lateral offset and an impermeable plain well screen over the upper 5 m measured from below nearest foundation levels, will provide sufficient assurance.

Following discussions with the drainage engineer it is understood that a design value of 3.2×10^{-5} m/s has been adopted as the design soakage rate for the site, with a factor of safety of 3. Based on the evidence provided by the drainage engineer it is understood that both soakaway designs are sufficient to accommodate a 1 in 100 year storm event with a 40 % climate change allowance.

Although it is considered that the design of the soakaways is adequate, it is likely that the effectiveness of some soakaways will be better than others, due to lateral and vertical variations of the fissures in the New Pit Chalk. Consideration could therefore be given to the linking of any proposed soakaways such that, should a low rate of soakage be occurring in one bore, the overflow from that chamber could pass to another chamber with a better soakage rate, so that advantage can be taken of those with the greatest outflow performance. It would be prudent to perform soakage testing within each soakaway to confirm its drainage potential.

The chalk stratum is considered to be an important aquifer and as such consultation should be carried out with the Environment Agency when planning soakaway installations. It is a usual requirement that at least a 1.0 m thick attenuation zone be maintained between the base of any soakaway and the groundwater surface.

7.7.3 Permeable Paving

The use of unlined permeable paving should not pose an issue to shallow foundations, assuming that it replicates current surface drainage conditions, although it would be prudent to maximise the distance, where possible, from foundations and ensure that the system avoids a concentrated ingress of water into the chalk. A sub-base thickness of 450 mm should be adopted in order to protect against frost action.

7.8 Pavement Design

Formation level for the proposed roads and hardstanding is currently unknown, however the results of the geotechnical testing indicate however that the shallow chalk should be regarded as frost susceptible, such that a minimum construction thickness of 450 mm may be required in accordance with CIRIA C574. A CBR value of 2% is appropriate for highly weathered in-

situ chalk and 8% on recompacted chalk, although if compacted well, achieving a maximum air voids ratio of 10%, a higher CBR value of 15% may be achieved. It would however be prudent to consult the Local Authority in this regard to determine local practice.

Prior to construction it would be prudent to proof roll formation level and infill any soft spots with suitably compacted granular material.

7.9 Topsoil Testing

Topsoil testing, to determine the suitability to re-use the in-situ topsoil within areas of soft landscaping, is currently in hand and will be reported separately.

7.10 Effect of Sulphates

Chemical analyses have revealed relatively low concentrations of soluble sulphate and mildly alkaline pH in accordance with Class DS-1 conditions of Table C1 of BRE Special Digest 1:SD Third Edition (2005). The measured pH values of the samples show that an ACEC class of AC-1 would be appropriate for the site. This assumes a mobile water condition at the site. The guidelines contained in the digest should be followed in the design of foundation concrete.

7.11 Contamination Risk Assessment

The desk study findings indicate that the site has not had a potentially contaminative history as it has apparently not been developed. The chemical analyses have revealed no elevated concentrations of contaminants within the samples tested.

The made ground across the site was noted to contain fragments of extraneous material, including ash and coal, which can potentially contain high concentrations of metals. This could potentially be the source of the lead contamination. However it is not likely to be in a soluble form and as such should not pose a risk to groundwater or adjacent sites.

It is recommended that any topsoil being imported onto site and used in soft landscaping that will be utilised for plant growth be tested and validated in accordance with NHBC guidelines prior to being installed.

Site workers should follow standard good practice when handling any soil. The method of site working should be in accordance with guidelines set out by HSE and CIRIA[7] and the requirements of the Local Authority Environmental Health Officer.

7.12 Waste Disposal

Under the European Waste Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste classification is a staged process and this investigation represents the preliminary sampling exercise of that process. Once the extent and location of the waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis

7 CIRIA (1996) *A guide for safe working on contaminated sites* - Report 132, Construction Industry Research and Information Association

indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[8] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[9] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the standard rate of £84.40 per tonne (about £150 per m^3) or at the lower rate of £2.65 per tonne (roughly £5 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the Environment Agency it is considered likely that the soils encountered during this ground investigation, as represented by the five chemical analyses carried out, would be generally classified as follows;

Soil Type	Waste Classification (Waste Code)	WAC Testing Required Prior to Landfill Disposal?	Comments
Made Ground	Non-hazardous (17 05 04)	No	
New Pit Chalk Formation	Inert	Should not be required but confirm with receiving landfill	

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[10] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

8 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
9 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2
10 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

8.0 OUTSTANDING RISKS AND ISSUES

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work may be required.

The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the ground conditions based on the discrete points at which the ground was sampled, but the ground conditions should be subject to review as the work proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

If during ground works any visual or olfactory evidence of contamination is identified it is recommended that further investigation be carried out and that the risk assessment is reviewed.

The geology map of the area indicates the presence of Head Deposits in the northern part of the site, although these have not been encountered by this investigation. If encountered, these soils are likely to predominantly comprise clay and may require foundations to be deepened. Further inspection by a geotechnical engineer is recommended if these soils are found to be present.

These areas of doubt should be drawn to the attention of prospective contractors and further investigation will be required or sufficient contingency should be provided to cover the outstanding risk.

APPENDIX

Borehole Records

Trial Pit Records

Soakage Test Results

Geotechnical Test Results

SPT / Depth Graph

Chemical Analyses (Soil)

Envirocheck Extracts

Historical Maps

Site Plan

GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Number** **BH1**
Excavation Method Opendrive Sampler	**Dimensions**	**Ground Level (mOD)** 82.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 536705 E 240745 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND (brown silty sand with occasional rootlets, fragments of brick, chalk, flint, coal and shells and ash)		
0.30	E			81.60	0.40	CHALK: recovered as structureless white with specks of orange staining with scattered flint and occasional partings of brown silty clay.		
1.00-1.45 1.00	SPT N=28 D		4,7/5,6,7,10			Black specks between 1.00 - 1.20 m Damp from 1.10 - 3.00 m		
						Flint cobble		
2.00-2.45 2.00	SPT N=32 D		7,10/10,9,6,7					
					(5.05)			
3.00-3.35 3.00	SPT 50/200 D		5,10/10,11,15,14					
4.00-4.45 4.00	SPT N=30 D		7,9/9,8,7,6					
5.00-5.45 5.00	SPT N=33 D		8,9/7,7,9,10					
				76.55	5.45	Complete at 5.45m		

Remarks Groundwater was not encountered	**Scale (approx)** 1:50	**Logged By** LB
	Figure No. J16202.BH1	

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Number** **BH2**
Excavation Method Opendrive Window Sampler	**Dimensions**	**Ground Level (mOD)** 112.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 536748 E 240466 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	E				(0.55)	MADE GROUND (brown silty gravelly sand with rootlets, rare shell fragments, and coal fragments, gravel of chalk and flint is fine to medium, angular to rounded)		
				111.45	0.55			
1.00-1.45 1.00	SPT N=12 D		3,3/3,3,3,3			CHALK: recovered as structureless white with specks of orange staining with scattered flint and occasional partings of brown silty clay.		
2.00-2.45 2.00	SPT N=19 D		3,5/4,5,5,5					
3.00-3.45 3.00	SPT N=17 D		1,2/4,4,4,5		(4.90)	Flint cobble		
4.00-4.45 4.00	SPT N=27 D		3,4/6,7,7,7					
5.00-5.45 5.00	SPT N=23 D		2,3/5,5,5,8					
				106.55	5.45	Complete at 5.45m		

Remarks
Groundwater was not encountered

Scale (approx)	Logged By
1:50	LB

Figure No.
J16202.BH2

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Number** **BH3**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Opendrive Window Sampler		89.00	Countryside Properties PLC	J16202
	Location 536988 E 240638 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND (brown silty clayey sand with fragments of flint, chalk, ash and coal)		
0.30	E			88.60	0.40			
1.00-1.45 1.00	SPT N=15 D		2,2/3,4,4,4			CHALK: recovered as structureless white with specks of orange staining with scattered flint and occasional partings of brown silty clay. Becoming damp, low density from 1.10 m		
2.00-2.45 2.00	SPT N=15 D		2,3/4,3,3,5					
					(5.05)			
3.00-3.45 3.00	SPT N=11 D		2,3/1,3,3,4					
4.00-4.45 4.00	SPT N=18 D		2,2/3,3,5,7					
5.00-5.45 5.00	SPT N=40 D		5,6/7,9,12,12					
				83.55	5.45	Complete at 5.45m		

Remarks	**Scale (approx)**	**Logged By**
	1:50	JD
	Figure No.	J16202.BH3

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Number** **BH4**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Opendrive Window Sampler		88.00	Countryside Properties PLC	J16202
	Location 537076 E 240823 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	E				(0.70)	MADE GROUND (brown sandy silt with gravel of chalk and flint, fine to medium, rootlets and wood fragments)		
				87.30	0.70			
1.00-1.45 1.00	SPT N=18 D		5,5/5,4,5,4			CHALK: recovered as structureless white with specks of orange staining with scattered flint and occasional partings of brown silty clay.		
2.00-2.45 2.00	SPT N=12 D		2,2/2,3,3,4					
3.00-3.45 3.00	SPT N=10 D		2,2/3,3,2,2		(4.75)			
4.00-4.45 4.00	SPT N=16 D		3,3/3,5,4,4					
5.00-5.45 5.00	SPT N=18 D		4,5/4,4,5,5					
				82.55	5.45	Complete at 5.45m		

Remarks
Groundwater was not encountered

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH4

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Number** **BH5**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Opendrive Sampler		106.00	Countryside Properties PLC	J16202
	Location 537076 E 240823 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						MADE GROUND (brown sandy silt with gravel of chalk and flint, fine to medium, rootlets and wood fragments)		
0.40	E				(0.70)			
				105.30	0.70	CHALK: recovered as structureless white with specks of orange staining with scattered flint and occasional partings of brown silty clay.		
1.00-1.45 1.00	SPT N=23 D		4,4/5,5,7,6					
2.00-2.45 2.00	SPT N=21 D		4,5/5,5,5,6					
3.00-3.45 3.00	SPT N=16 D		2,2/3,4,4,5		(4.75)			
4.00-4.45 4.00	SPT N=17 D		3,2/3,4,5,5					
5.00-5.45 5.00	SPT N=23 D		3,4/4,5,6,8					
				100.55	5.45	Complete at 5.45m		

Remarks
Groundwater was not encountered

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH4

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH6**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 1.50m	104.00	Countryside Properties PLC	J16202
	Location 537100 E 240571 N	**Dates** 17/11/2016- 22/11/2016	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					103.70 103.50	(0.30) 0.30 (0.20) 0.50	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal, ash, coal, and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine) CHALK: recovered as chalk fragments		
1.00-1.45 1.00-1.45	SPT N=6 D1			1,2/1,2,1,2			CHALK: recovered as structureless CHALK composed of offwhite and greyish white, with orange staining, sandy gravelly silt. Gravel is very weak to weak, low density, offwhite with frequent orange staining and occasional black specks, subangular to subrounded, with scattered flint gravel		
2.00-2.45 2.00-2.45	SPT N=10 D2			2,1/2,3,2,3					
3.00-3.45 3.00-3.45	SPT N=8 D3			1,1/2,1,2,3					
4.00-4.45 4.00-4.45	SPT N=8 D4			1,1/1,2,2,3					
5.00-5.45 5.00-5.45	SPT N=9 D5			3,3/2,2,2,3					
6.00	D6								
6.50-6.95 6.50-6.95	SPT N=17 D7			3,3/4,4,4,5					
7.50	D8								
8.00-8.45 8.00-8.45	SPT N=18 D9			4,3/4,4,5,5					
9.00	D10								
9.50-9.95 9.50-9.95	SPT N=9 D11			2,2/2,2,2,3					

Remarks
Groundwater was not encountered.
Falling head test performed at 5 m, 10 m, 15 m and 20 m.

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH6

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH6**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 1.50m	104.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	537100 E 240571 N	17/11/2016- 22/11/2016		2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50	D12								
11.00-11.45	SPT N=22			4,5/6,5,5,6					
11.00-11.45	D13								
12.00	D14								
12.50-12.95	SPT N=48			3,10/14,8,12,14					
12.50-12.95	D15								
13.50	D16								
14.00-14.45	U1			56 blows					
14.45-14.50	D17								
15.00	D18					(19.50)			
15.50-15.95	SPT N=50			4,6/14,10,16,10					
15.50-15.95	D19								
16.50	D20								
17.00-17.45	SPT N=36			5,6/6,7,12,11					
17.00-17.45	D21								
18.00	D22								
18.50-18.95	SPT N=38			5,5/5,8,10,15					
18.50-18.95	D23								
19.50	D24				84.00	20.00			

Remarks

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH6

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH7**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to m	83.00	Countryside Properties PLC	J16202
	Location 536905 E 240704 N	**Dates** 20/12/2016- 21/12/2016	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.70)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal, concrete and brick fragments, and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
0.50	B1				82.30	0.70			
1.00-1.45	CPT N=17			3,4/4,5,4,4			CHALK: recovered as structureless CHALK composed of offwhite, creamish white and brown with orange staining gravelly silt of communited chalk. Gravel is low to medium density, weak offwhite and creamish white chalk, subangular to subrounded		
1.00-1.45	B2					(1.05)			
1.75	D1				81.25	1.75			
2.00-2.45	U1			60 blows			CHALK: recovered as structureless CHALK composed of slightly silty, subangular to subrounded gravel and cobbles. Clasts are low density, very weak to weak, offwhite and creamish white with frequent orange staining, rare black specks and scattered flint gravel		
2.50	B3								
2.75	D2								
3.00-3.45	SPT N=30			6,7/8,7,7,8					
3.00-3.45	D3								
3.50	B4								
3.75	D4								
4.00-4.45	U2			70 blows					
4.50	B5								
4.75	D5								
5.00-5.45	SPT N=31			5,7/8,7,8,8					
5.00-5.45	D6								
5.75	D7								
6.00	B6								
6.50-6.95	U3			80 blows					
7.00	B7								
7.75	D8								
8.00-8.45	SPT N=36			6,8/9,8,9,10					
8.00-8.45	D9								
8.50	B8					(13.25)			
9.00	D10								
9.50-9.95	U4			80 blows 20/12/2016:					
				21/12/2016:					

Remarks
Groundwater was not encountered
Falling head tests conducted at 6.5 m, 10 m and 15 m

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH7

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH7**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to m	83.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	536905 E 240704 N	20/12/2016- 21/12/2016		2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50	B9								
11.00-11.45	SPT N=28			3,5/6,7,7,8					
11.00-11.50	D11								
12.00	D12								
12.50-12.95	U5			80 blows		(13.25)			
13.50	B10								
14.55-15.00	SPT N=35			5,7/8,7,8,12					
14.55-15.00	B11								
14.55-15.00	D13								
				21/12/2016:	68.00	15.00	Complete at 15.00m		

Remarks	**Scale (approx)**	**Logged By**
	1:50	LB
	Figure No.	
	J16202.BH7	

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH8**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 6.20m	91.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	536750 E 240643 N	19/12/2016- 20/12/2016		1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.50)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
					90.50	0.50	CHALK: recovered as structureless CHALK composed of slightly silty, subangular to subrounded gravel and cobbles. Clasts are low density, very weak to weak, offwhite and creamish white with frequent orange staining, rare black specks and scattered flint gravel and cobbles		
1.00-1.45	U1			50 blows					
1.50	B1								
1.75	D1								
2.00-2.45	SPT N=8			2,2/2,2,2,2					
2.00-2.45	D2								
2.75	D3								
3.00-3.45	U2			65 blows					
3.50	B2								
3.75	D4								
4.00-4.45	SPT N=31			2,4/6,9,8,8					
4.00-4.45	D5								
4.75	D6								
5.00-5.45	U3			65 blows					
5.50	B3								
6.00	D7								
6.50-6.95	SPT N=25			2,4/5,6,7,7					
6.50-6.95	D8								
7.50	B4								
8.00-8.45	U4			60 blows					
9.00	D9								
9.50-9.95	SPT N=30			6,5/6,7,7,10					
9.50-9.95	D10								

Remarks
Groundwater was not encountered
Falling head tests conducted at 5 m, 10 m, 15 m and 20 m

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH8

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH8**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 6.20m	91.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	536750 E 240643 N	19/12/2016- 20/12/2016		2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50	D11								
11.00-11.45	B5								
11.50-11.95	SPT N=35			7,9/10,9,8,8					
11.50-11.95	D12								
12.50	B6								
13.00-13.45	SPT N=34			7,7/8,8,9,9					
13.00-13.45	D13								
14.00	D14								
14.50-14.95	U5			80 blows					
15.00-15.50	B7			19/12/2016:		(19.50)			
				20/12/2016:					
16.00-16.45	SPT N=37			7,8/7,9,9,12					
16.00-16.50	D15								
16.50-17.00	B8								
16.75	D16								
17.25	D17								
17.50-17.95	SPT N=44			10,11/10,11,11,12					
17.50-17.95	D18								
18.00-18.50	B9								
18.75	D19								
19.00-19.45	SPT N=36			5,7/7,8,11,10					
19.00-19.45	D20								
19.25	D21								
19.50-20.00	B10								
20.00-20.45	D22			20/12/2016:	71.00	20.00			

Remarks	**Scale (approx)**	**Logged By**
	1:50	LB
	Figure No.	
	J16202.BH8	

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Borehole Number** **BH8**

Boring Method	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Cable Percussion	150mm cased to 6.20m	91.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	536750 E 240643 N	19/12/2016- 20/12/2016		3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00-20.45	SPT N=50			3,5/6,9,13,22					

Remarks

Scale (approx)	**Logged By**
1:50	LB

Figure No.
J16202.BH8

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP1**
Excavation Method JCB 3CX	**Dimensions** 2200 x 600 x 1000	**Ground Level (mOD)** 107.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 537155 E 240593 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				106.70	(0.30) 0.30	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
0.80	B			106.00	(0.70) 1.00	CHALK: Very weak, low-density, white with orange and brown staining , CHALK. Fractures medium spaced, infilled, becoming very closely spaced and clean with depth (Grade C5, becoming grade B5)		
						Complete at 1.00m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP1

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GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware,Herts
SG12 7QE

Site
Newmarket Road, Royston SG8 7NJ

Trial Pit Number
TP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
JCB 3CX	2200 x 600 x 900	110.00	Countryside Properties PLC	J16202
	Location 537052 E 240554 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
				109.70	0.30			
					(0.60)	CHALK: Very weak, low-density, white with orange and brown staining , CHALK. Fractures medium spaced, infilled, becoming very closely spaced and clean with depth (Grade C5, becoming grade B5)		
0.90	B			109.10	0.90			
						Complete at 0.90m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP2

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP3**
Excavation Method JCB 3CX	**Dimensions** 2600 x 600 x 1200	**Ground Level (mOD)** 73.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 536945 E 240772 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal, tile and brick fragments, and flint cobbles gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
				72.40	0.60			
					(0.60)	CHALK: Very weak, low-density, white with orange and brown staining , CHALK. Fractures medium spaced, infilled, becoming very closely spaced and clean with depth (Grade C5, becoming grade B5)		
1.00	B			71.80	1.20			
						Complete at 1.20m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

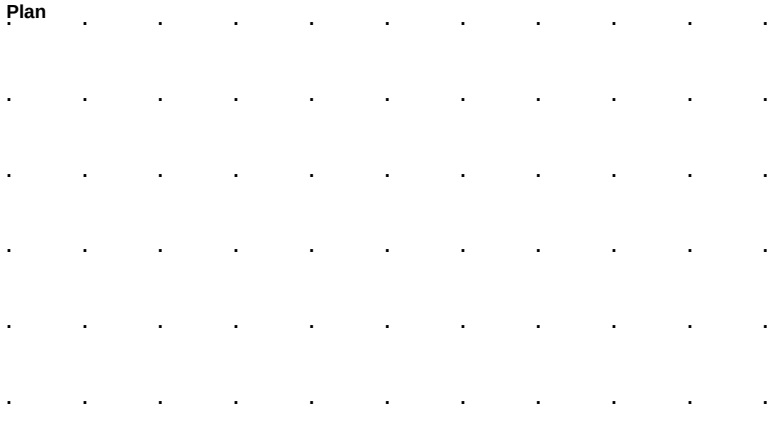
Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP3

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP4**
Excavation Method JCB 3CX	**Dimensions** 2400 x 800 x 950	**Ground Level (mOD)** 96.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 536738 E 240556 N	**Dates** 07/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				95.72	(0.28) 0.28	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
				95.05	(0.67) 0.95	CHALK: Very weak, low-density, white with orange and brown staining , CHALK. Fractures medium spaced, infilled, becoming very closely spaced and clean with depth (Grade C5, becoming grade B5)		
						Complete at 0.95m		

Plan



Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP4

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Trial Pit Number** **TP5**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
JCB 3CX	2.6 x 0.7 x 2.4	106.00	Countryside Properties PLC	J16202
	Location	**Dates**	**Engineer**	**Sheet**
	537148 E 240640 N	21/09/2016		1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.29)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
				105.71	0.29			
0.90 0.90 0.90	B B B				(2.11)	CHALK: Very weak, low density off-white / cream with frequent orange staining and rare black specks silty CHALK, with scattered flint gravel. Fractures are very closely spaced, infilled with light brown-communited chalk (Grade C5). The upper 200 mm has patches that are structureless (Grade Dc / Dm). At depth the fractures become open and clean, with patches of structureless chalk (Grade C5 to B4). From about 2.00 m the chalk fractures becoming prominent (Grade B3).		
				103.60	2.40	Complete at 2.40m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	**Logged By**	**Figure No.**
1:50	LB	J16202.TP5

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP6**
Excavation Method JCB 3CX	**Dimensions** 2.1 x 0.7 x 2.5	**Ground Level (mOD)** 84.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 536710 E 240702 N	**Dates** 21/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				83.70	(0.30) 0.30	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
1.20 1.20 1.20	B B B				(2.20)	CHALK: Very weak to moderately weak, low to medium density off-white / cream with frequent orange staining and rare black specks silty CHALK, with scattered flint gravel and cobbles. Fractures are very closely spaced, infilled with light brown-communited chalk (Grade C5). The upper 200 mm has patches that are structureless (Grade Dc / Dm). At depth the fractures become open and clean, with patches of structureless chalk (Grade C5 to B4). From about 2.00 m the chalk fractures become more prominent (Grade B3).		
				81.50	2.50	Complete at 2.50m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP6

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP7**
Excavation Method JCB 3CX	**Dimensions** 2.1 x 0.9 x 2.9	**Ground Level (mOD)** 87.00	**Client** Countryside Properties PLC	**Job Number** J16202
	Location 537029 E 240753 N	**Dates** 21/09/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments and flint cobbles, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
				86.60	0.40			
1.40 1.40 1.40	B B B				(2.50)	CHALK: Very weak, low density off-white / cream with frequent orange staining and rare black specks silty CHALK, with scattered flint gravel. Fractures are very closely spaced, infilled with light brown-communited chalk (Grade C5). The upper 200 mm has patches that are structureless (Grade Dc / Dm). At depth the fractures become open and clean, with patches of structureless chalk (Grade C5 to B4). From about 2.00 m the chalk fractures become more prominent (Grade B3).		
				84.10	2.90	Complete at 2.90m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP7

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Trial Pit Number** **TP8**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
JCB 3CX	2900 x 700 x 3000		Countryside Properties PLC	J16202
	Location	**Dates** 01/11/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25) 0.25	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
0.50	D				(0.35) 0.60	CHALK: structured, very weak to weak, low density, offwhite CHALK, with brown clay and communited chalk infill and orange staining (Grade C5)		
1.00	D				(1.00)	CHALK: structured, very weak, low density, white with black specks CHALK with open clean discontinuities, shell fragments and orange staining (Grade B5)		
1.50	B				1.60	CHALK: structured, very weak, low density white CHALK, with open clean discontinuities and orange staining (Grade B4, becoming B3 at 2.00 m)		
2.00	B				(1.40)			
2.50	B					Flint cobble band		
3.00	B				3.00	Complete at 3.00m		

Plan

Remarks

Groundwater was not encountered

Scale (approx)	**Logged By**	**Figure No.**
1:50	LB	J16202.TP8

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Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ	**Trial Pit Number** **TP9**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
JCB 3CX	3500 x 700 x 3300		Countryside Properties PLC	J16202
	Location	**Dates** 01/11/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.28)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
					0.28			
					(0.22)			
0.50	D				0.50	CHALK: structured, very weak, low density, offwhite CHALK, with structureless patches (Grade Dm), brown infill of clay and communited chalk and orange staining (Grade C5)		
1.00	D					CHALK: structured, very weak, low density, white CHALK, with open an dclean discontinuities and orange staining (Grade B4, becoming B2 at 1.80 m)		
1.50	D							
					(2.80)			
2.00	B					Black specks		
2.50	B					Band of large flint cobbles		
3.00	B					Band of large flint cobbles		
3.30	B				3.30			
						Complete at 3.30m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	**Logged By**	**Figure No.**
1:50	LB	J16202.TP9

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP10**
Excavation Method JCB 3CX	**Dimensions** 2900 x 700 x 3000	**Ground Level (mOD)**	**Client** Countryside Properties PLC	**Job Number** J16202
	Location	**Dates** 01/11/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.36)	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
					0.36			
0.50	D				(0.24)	CHALK: structureless CHALK, composed of an offwhite and brown matrix of clay and communited chalk and white silty chalk gravel (Grade Dm/Dc)		
					0.60			
1.00	D					CHALK: structured, very weak, low density, offwhite CHALK, with orange staining and scattered flint gravel and cobbled (Grade C5, becoming B3 at 1.20 m)		
1.50	D							
					(2.40)			
2.00	D							
2.50	D							
					3.00			
3.00	D					Complete at 3.00m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP10

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP11**
Excavation Method JCB 3CX	**Dimensions** 2500 x 700 x 2500	**Ground Level (mOD)**	**Client** Countryside Properties PLC	**Job Number** J16202
	Location	**Dates** 01/11/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
0.50	D				(0.20) 0.50	CHALK: structureless CHALK, composed of a brown matrix of clay and communited chalk and white chalk gravel (Grade Dm/Dc)		
1.00	D					CHALK: structured, very weak, low density, offwhite to white CHALK, with open, clean discontinuities and orange staining (Grade C5 to B3) Bands of flint gravel and cobbles at 0.80 m, 1.20 m and 2.50 m		
1.50	D				(2.00)			
2.00	D							
2.50	D				2.50	Complete at 2.50m		

Plan

Remarks

Groundwater was not encountered
Sides of trial pit remained stable during excavation

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP11

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GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware,Herts SG12 7QE	**Site** Newmarket Road, Royston SG8 7NJ		**Trial Pit Number** **TP12**
Excavation Method JCB 3CX	**Dimensions** 2200 x 700 x 2500	**Ground Level (mOD)**	**Client** Countryside Properties PLC	**Job Number** J16202
	Location	**Dates** 01/11/2016	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	MADE GROUND (light brownish grey sandy gravelly silt with rootlets, metal fragments, gravel of chalk and flint is fine-medium, angular-rounded, sand is very fine to fine)		
0.50	D				(0.20) 0.50	CHALK: structureless CHALK, composed of a brown matrix of clay and communited chalk and white chalk gravel (Grade Dm/Dc)		
1.00	D					CHALK: structured, very weak, low density, offwhite to white CHALK, with open, claen discontinuities and orange staining (Grade C5 to B3)		
1.50	D				(2.00)			
2.00	B							
2.50	B				2.50	Patches of structureless putty chalk		
						Complete at 2.50m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:50	LB	J16202.TP12

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Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Soakage Test Results

Site Newmarket Road, Royston SG8 7NJ

Client Countryside Properties PLC

Engineer

Job Number J16202

Sheet 1/3

Trial Pit No: 1 **Soakage Test No: 1**

Dimensions (m): 2.2 x 0.6 x 1.0

Time (mins)	Depth to water (m)
0	0.70
1	0.70
2	0.70
3	0.70
4	0.70
5	0.70
6	0.70
7	0.70
10	0.70
15	0.70
20	0.70
25	0.71
30	0.72
45	0.75
60	0.75
90	0.77
120	0.79
180	0.8

Trial Pit No: 2 **Soakage Test No: 1**

Dimensions (m): 2.2 x 0.6 x 0.9

Time (mins)	Depth to water (m)
0	0.75
0.5	0.75
1	0.75
2	0.75
3	0.75
4	0.76
5	0.76
6	0.76
7	0.77
10	0.78
15	0.79
20	0.81
25	0.82
30	0.82
60	0.92
90	DRY

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Widbury Barn
Widbury Hill
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Herts SG12 7QE

Soakage Test Results

Site Newmarket Road, Royston SG8 7NJ

Client Countryside Properties PLC

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Job Number J16202

Sheet 2/3

Trial Pit No: 3 **Soakage Test No: 1**

Dimensions (m): 2.6 x 0.6 x 1.2

Time (mins)	Depth to water (m)
0	0.89
0.5	0.89
1	0.90
2	0.90
3	0.90
4	0.90
5	0.91
6	0.92
7	0.92
10	0.93
15	0.95
25	1.01
30	1.01
45	1.06
60	1.08
90	1.11
120	1.17

Trial Pit No: 5 **Soakage Test No: 1**

Dimensions (m): 2.6 x 0.7 x 2.4

Time (mins)	Depth to water (m)
0	1.40
1	1.44
2	1.44
3	1.45
4	1.47
5	1.48
6	1.49
7	1.52
10	1.55
15	1.60
20	1.65
25	1.70
30	1.78
60	1.87
90	1.98
110	2.28
refill 110	1.66
111	1.67
112	1.69
113	1.70
114	1.72
115	1.76
150	1.99
226	2.4

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Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Soakage Test Results

Site Newmarket Road, Royston SG8 7NJ

Client Countryside Properties PLC

Engineer

Job Number J16202

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Trial Pit No: 6 **Soakage Test No: 1**

Dimensions (m): 2.1 x 0.7 x 2.5

Time (mins)	Depth to water (m)
0	1.17
1	1.20
2	1.21
3	1.26
4	1.27
5	1.28
6	1.29
7	1.31
10	1.35
15	1.40
25	1.44
30	1.50
60	1.63
90	1.71
120	1.84
180	1.90

Trial Pit No: 7 **Soakage Test No: 1**

Dimensions (m): 2.1 x 0.9 x 2.9

Time (mins)	Depth to water (m)
0	2.12
1	2.28
2	2.36
3	2.40
4	2.49
5	2.49
6	2.58
7	2.59
8	2.64
9	2.67
10	2.68
11	2.69
13	2.73
14	2.75
15	2.79
17	2.86
18	2.89
19	DRY

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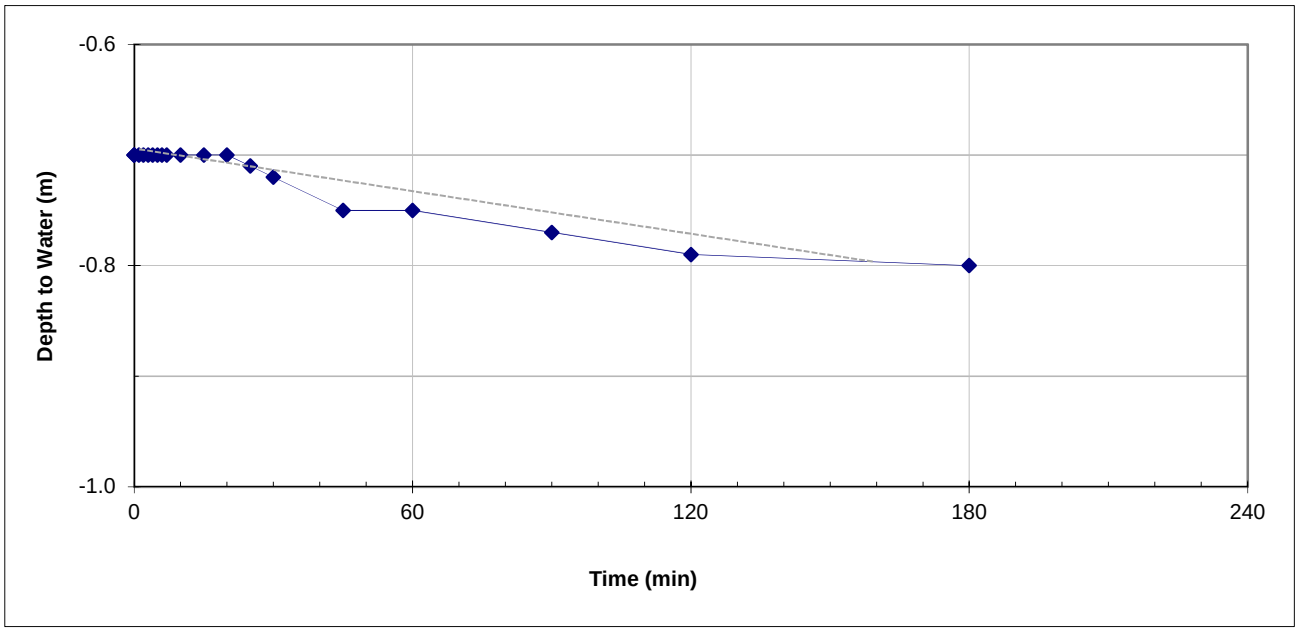
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Soakage Test Results

Site	Newmarket Road, Royston SG8 7NJ	**Job Number**	J16202
Client	Countryside Properties PLC	**Sheet**	1/3
Engineer			

Trial Pit No. TP1 Soakage Test No. 1

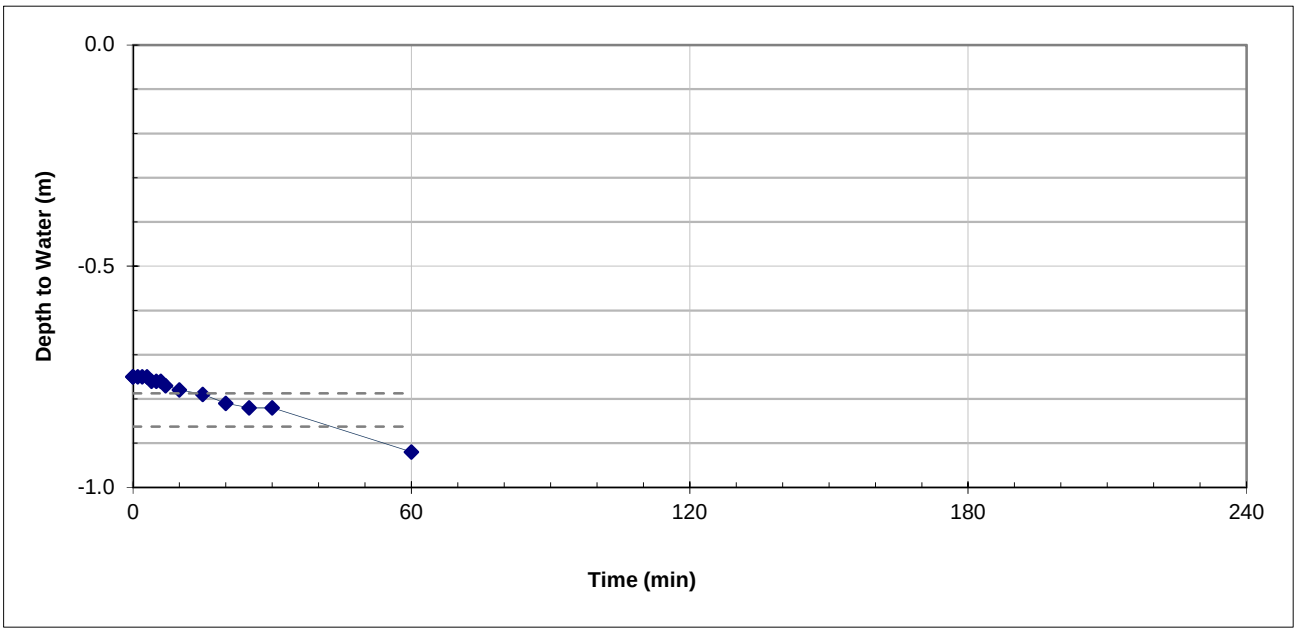
Pit Length (m) 2.2 Pit Width (m) 0.6 Pit Depth (m) 1



Design Soakage Rate 5.1E-06 m/s (based on linear portion of graph as shown)
0.44 m/day

Trial Pit No. TP2 Soakage Test No. 1

Pit Length (m) 2.2 Pit Width (m) 0.6 Pit Depth (m) 0.9



Design Soakage Rate 3.5E-05 m/s (based on BRE 365 method)
3.04 m/day

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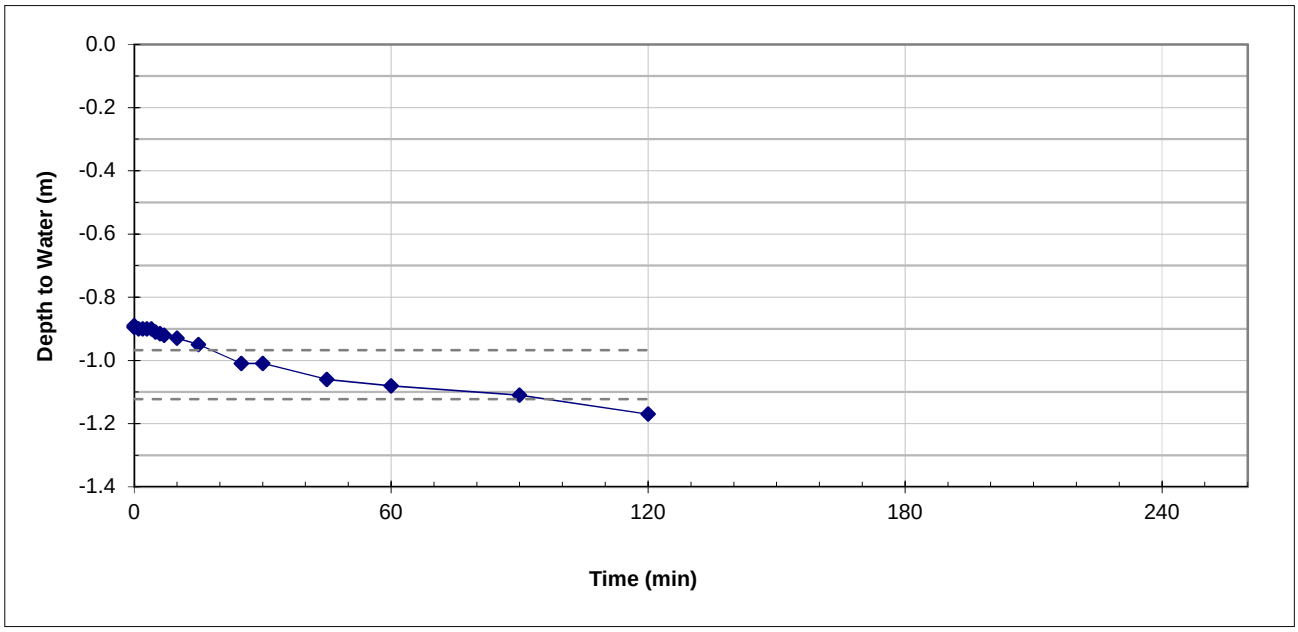
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Soakage Test Results

Site	Newmarket Road, Royston SG8 7NJ	**Job Number**	J16202
Client	Countryside Properties PLC	**Sheet**	2/3
Engineer			

Trial Pit No. TP3 Soakage Test No. 1

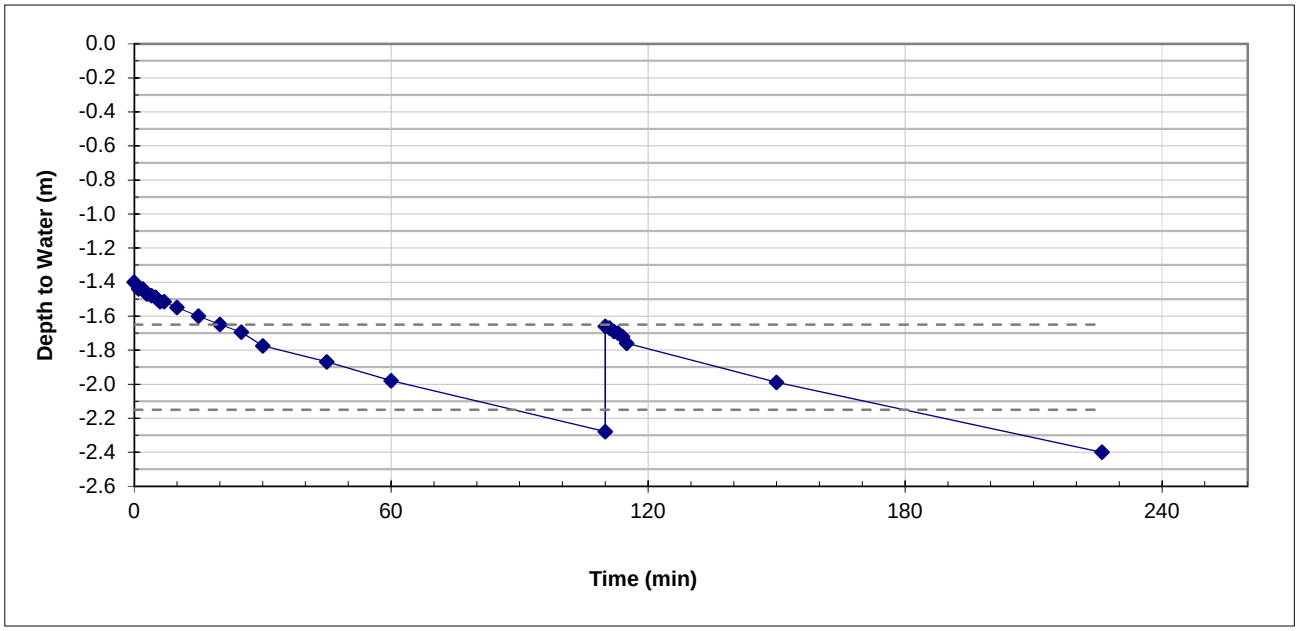
Pit Length (m) 2.6 Pit Width (m) 0.6 Pit Depth (m) 1.2



Design Soakage Rate 2.0E-05 m/s (based on BRE 365 method)
1.73 m/day

Trial Pit No. TP5 Soakage Test No. 1

Pit Length (m) 2.6 Pit Width (m) 0.7 Pit Depth (m) 2.4



Design Soakage Rate 4.4E-05 m/s (based on BRE 365 method)
3.82 m/day

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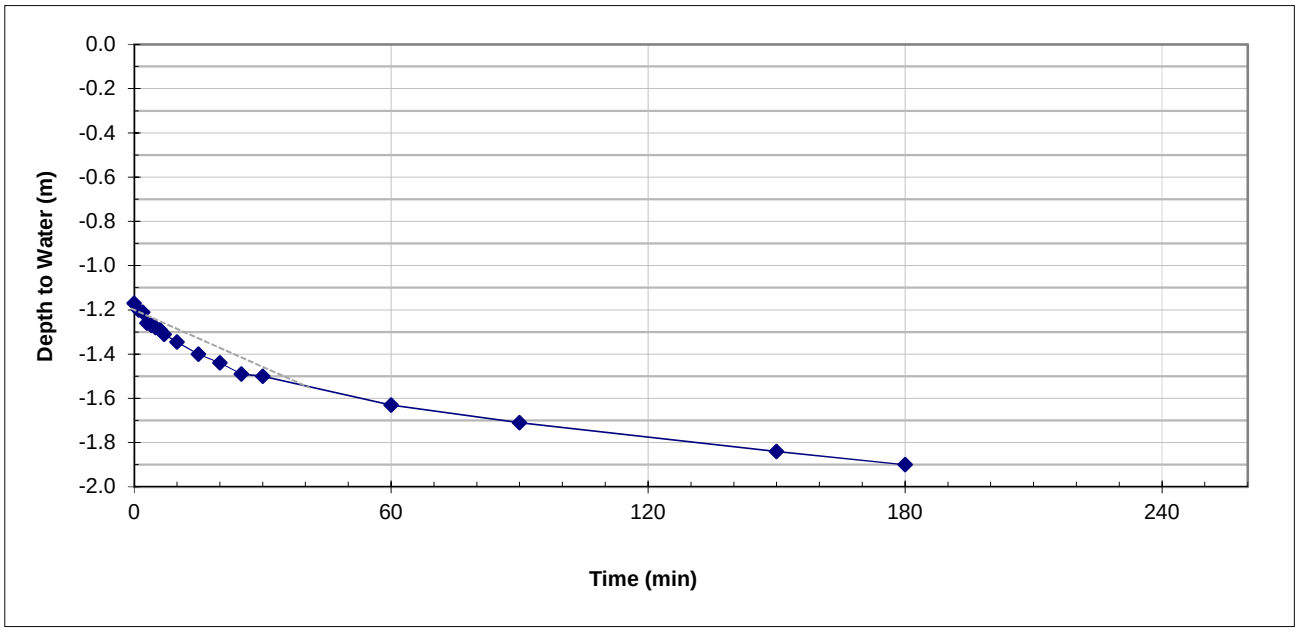
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Soakage Test Results

Site	Newmarket Road, Royston SG8 7NJ	**Job Number**	J16202
Client	Countryside Properties PLC	**Sheet**	3/3
Engineer			

Trial Pit No. TP6 Soakage Test No. 1

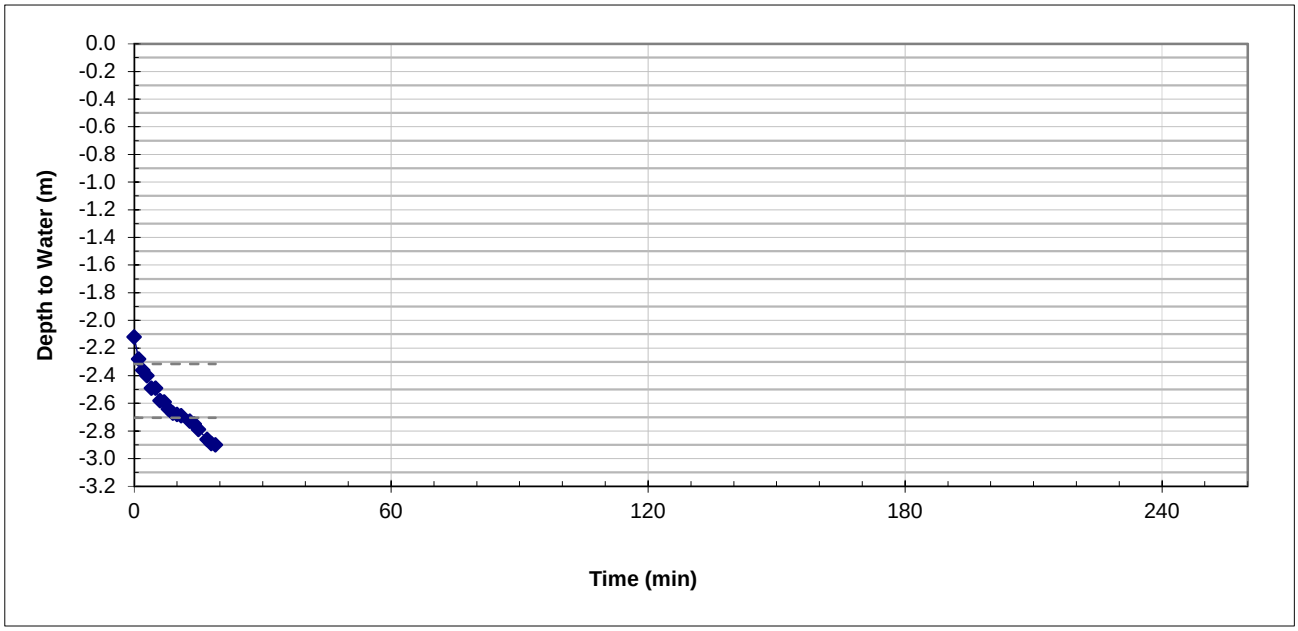
Pit Length (m) 2.1 Pit Width (m) 0.7 Pit Depth (m) 2.5



Design Soakage Rate 3.0E-05 m/s (based on linear portion of graph as shown)
2.57 m/day

Trial Pit No. TP7 Soakage Test No. 1

Pit Length (m) 2.1 Pit Width (m) 0.9 Pit Depth (m) 2.9



Design Soakage Rate 2.9E-04 m/s (based on BRE 365 method)
25.09 m/day

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

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Sheet 1/2

Date: 18 November 2016

Borehole No: 6 **Test No:** 1

Test Data

Before start of test:

Borehole depth (m): 5.00
Casing depth (m): 1.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
1	2.80	2.20
2	2.94	2.06
3	3.00	2.00
4	3.05	1.95
5	3.10	1.90
6	3.13	1.87
7	3.17	1.83
8	3.20	1.80
9	3.23	1.77
10	3.27	1.73
15	3.39	1.61
20	3.50	1.50
25	3.60	1.40

Soakage Calculation

Borehole Diameter (m)		0.1500
Borehole Area (m)		0.0177
Borehole Perimeter (m)		0.471
From Plot:	D1 (m)	2
	D2 (m)	1.4
	T1 (min)	3
	T2 (min)	25
Soakage Volume (m^3)		0.011
Soakage Area (m^2)		0.82
Time (min)		22

Soakage rate (m/sec)	9.81033E-06
Soakage rate (m/day)	0.847612819

Remarks:
Test carried out in cable percussion borehole
Borehole collapsed to 3.6 m after 25 minutes

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

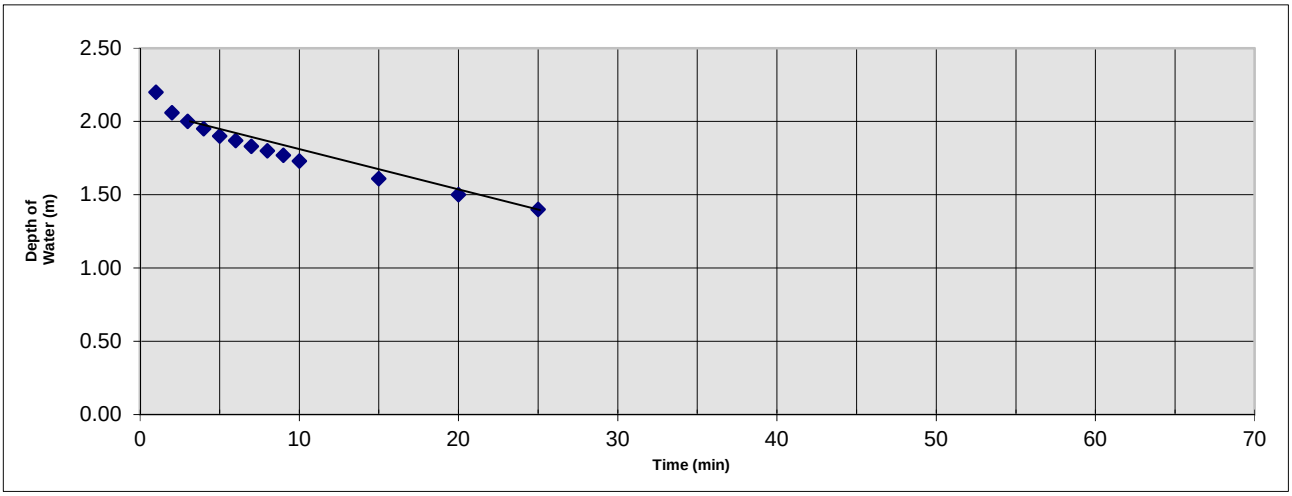
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Job Number J16202

Sheet 2/2

Soakage Graph

Test No: 1



Remarks:

Test carried out in Cable percussion borehole

Borehole collapsed to 3.6 m after 25 minutes

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Widbury Barn
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Job Number J16202

Sheet 1/2

Date: 22 November 2016

Borehole No: 6 **Test No:** 2

Test Data

Before start of test:

Borehole depth (m): 10.00
Casing depth (m): 1.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
1	5.95	4.05
2	6.31	3.69
3	6.63	3.37
4	6.92	3.08
5	7.18	2.82
6	7.40	2.60
7	7.60	2.40
8	7.78	2.22
9	7.94	2.06
10	8.09	1.91
15	8.68	1.32
20	8.90	1.10

Soakage Calculation

Borehole Diameter (m)		0.1500
Borehole Area (m)		0.0177
Borehole Perimeter (m)		0.471
From Plot:	D1 (m)	3.3
	D2 (m)	1.1
	T1 (min)	2.5
	T2 (min)	20
Soakage Volume (m^3)		0.039
Soakage Area (m^2)		1.05
Time (min)		18

Soakage rate (m/sec)	3.51157E-05
Soakage rate (m/day)	3.033998404

Remarks:
Test carried out in Cable percussion borehole
Borehole collapsed to 8.9 m after 20 minutes

Geotechnical & Environmental Associates
Widbury Barn
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

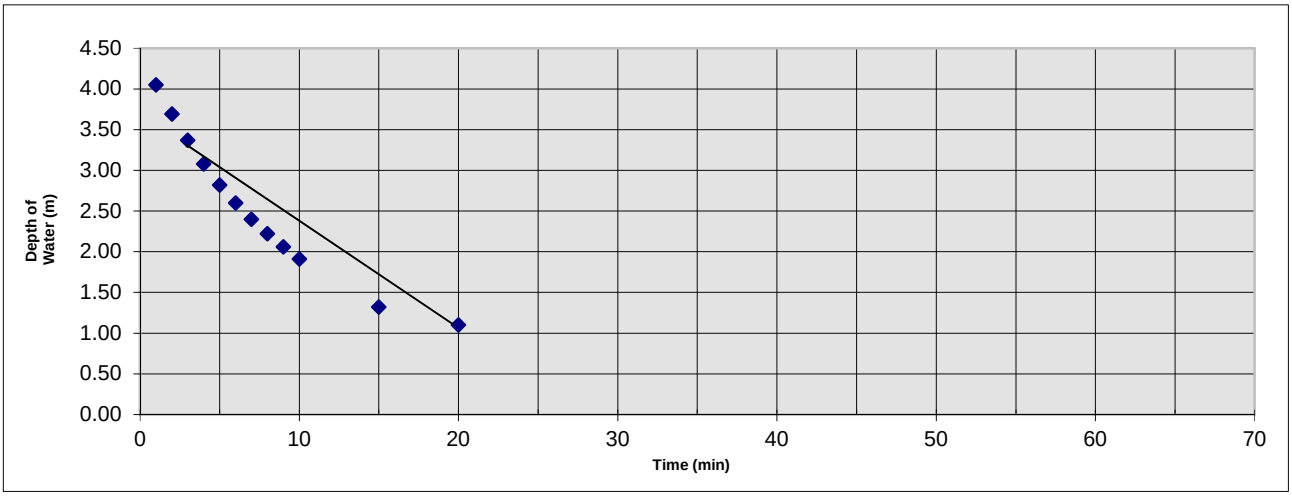
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Job Number J16202

Sheet 2/2

Soakage Graph

Test No: 2



Remarks:

Test carried out in Cable percussion borehole

Borehole collapsed to 8.9 m after 20 minutes

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Widbury Hill
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Job Number J16202

Sheet 1/2

Date: 22 November 2016

Borehole No: 6 **Test No:** 3

Test Data

Before start of test:

Borehole depth (m): 15.00
Casing depth (m): 1.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
1	8.70	6.30
2	9.54	5.46
3	9.96	5.04
4	10.20	4.80
5	10.38	4.62
6	10.52	4.48
7	10.65	4.35
8	10.74	4.26
9	10.80	4.20
10	10.84	4.16
15	11.00	4.00
20	11.17	3.83
25	11.32	3.68
30	11.43	3.57
35	11.55	3.45
40	11.61	3.39
45	11.66	3.34
50	11.69	3.31
55	11.72	3.28
60	11.74	3.26

Soakage Calculation

Borehole Diameter (m)		0.1500
Borehole Area (m)		0.0177
Borehole Perimeter (m)		0.471
From Plot:	D1 (m)	4.2
	D2 (m)	3.2
	T1 (min)	10
	T2 (min)	60
Soakage Volume (m^3)		0.018
Soakage Area (m^2)		1.76
Time (min)		50

Soakage rate (m/sec)	3.34448E-06
Soakage rate (m/day)	0.288963211

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

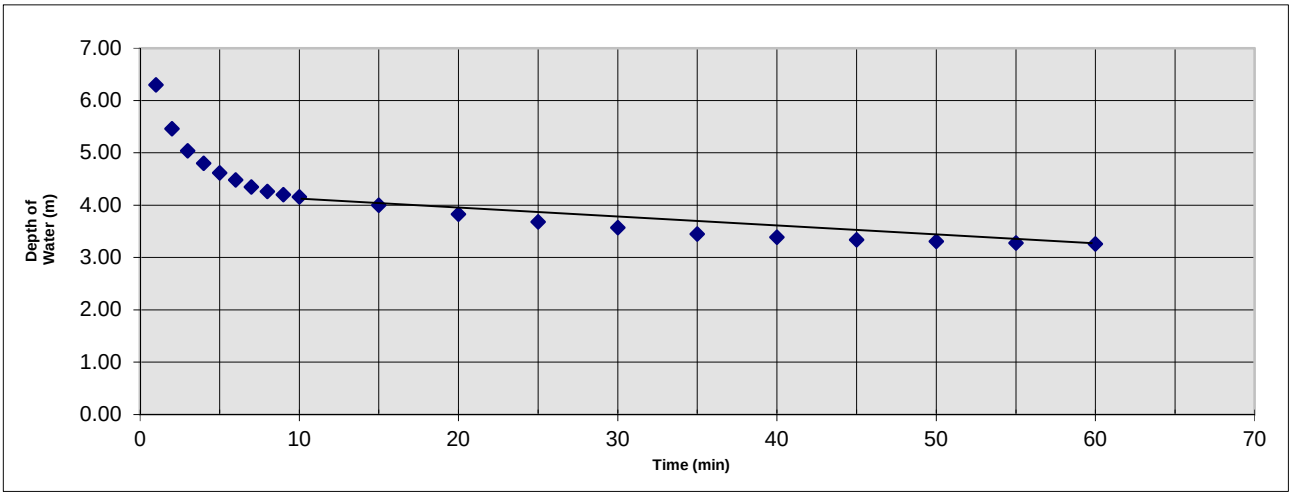
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Job Number J16202

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Soakage Graph

Test No: 3



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Sheet 1/2

Date: 22 November 2016

Borehole No: 6 **Test No:** 4

Test Data

Before start of test:

Borehole depth (m): 20.00
Casing depth (m): 1.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
1	19.65	0.35
2	19.95	0.05
3	20.00	0.00

Soakage Calculation

Borehole Diameter (m)	0.1500	
Borehole Area (m)	0.0177	
Borehole Perimeter (m)	0.471	
From Plot:	D1 (m)	0.35
	D2 (m)	0
	T1 (min)	1
	T2 (min)	3
Soakage Volume (m^3)	0.006	
Soakage Area (m^2)	0.10	
Time (min)	2	

Soakage rate (m/sec)	5.14706E-04
Soakage rate (m/day)	44.47058824

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

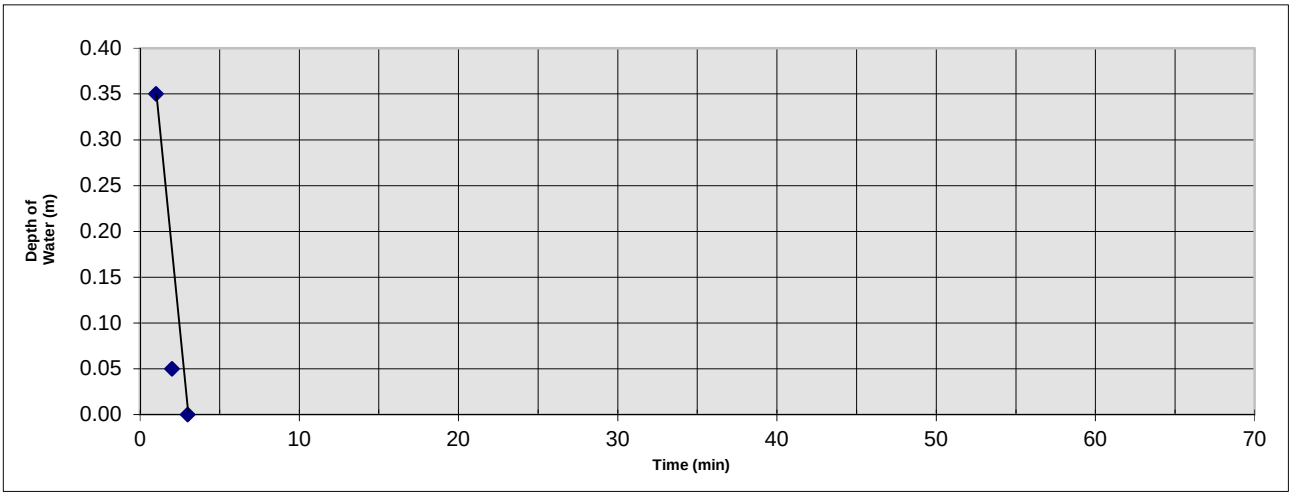
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Soakage Graph

Test No: 4



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Job Number J16202

Sheet 1/2

Date: 19 December 2016

Borehole No: 8 **Test No:** 1

Test Data

Before start of test:

Borehole depth (m): 5.50
Casing depth (m): 3.20
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
1	0.86	4.64
2	1.07	4.43
3	1.19	4.31
4	1.32	4.18
5	1.40	4.10
10	2.52	2.98
15	3.10	2.40
20	3.50	2.00
30	4.70	0.80
45	4.90	0.60

Soakage Calculation

Borehole Diameter (m)		0.1500
Borehole Area (m)		0.0177
Borehole Perimeter (m)		0.471
From Plot:	D1 (m)	4.5
	D2 (m)	0.8
	T1 (min)	2
	T2 (min)	30
Soakage Volume (m^3)		0.065
Soakage Area (m^2)		1.27
Time (min)		28

Soakage rate (m/sec)	3.07309E-05
Soakage rate (m/day)	2.655149502

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

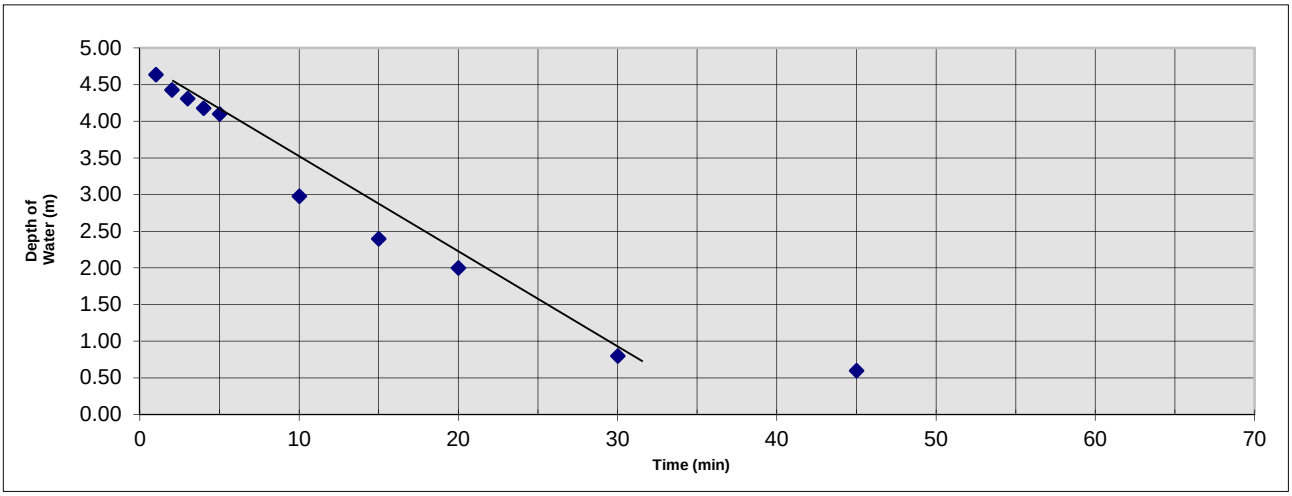
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Soakage Graph

Test No: 1



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Widbury Barn
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

Engineer

Job Number J16202

Sheet 1/2

Date: 20 December 2016

Borehole No: 7 **Test No:** 1

Test Data

Before start of test:

Borehole depth (m): 6.50
Casing depth (m): 5.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	0.00	6.50
1	0.40	6.10
2	0.80	5.70
3	1.20	5.30
4	1.55	4.95
5	1.95	4.55
10	2.95	3.55
15	3.75	2.75
20	4.25	2.25
30	4.60	1.90
45	5.50	1.00

Soakage Calculation

Borehole Diameter (m)	0.1500	
Borehole Area (m)	0.0177	
Borehole Perimeter (m)	0.471	
From Plot:	D1 (m)	6.2
	D2 (m)	2
	T1 (min)	0
	T2 (min)	35
Soakage Volume (m^3)	0.074	
Soakage Area (m^2)	1.95	
Time (min)	35	

Soakage rate (m/sec)	1.81269E-05
Soakage rate (m/day)	1.566163142

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

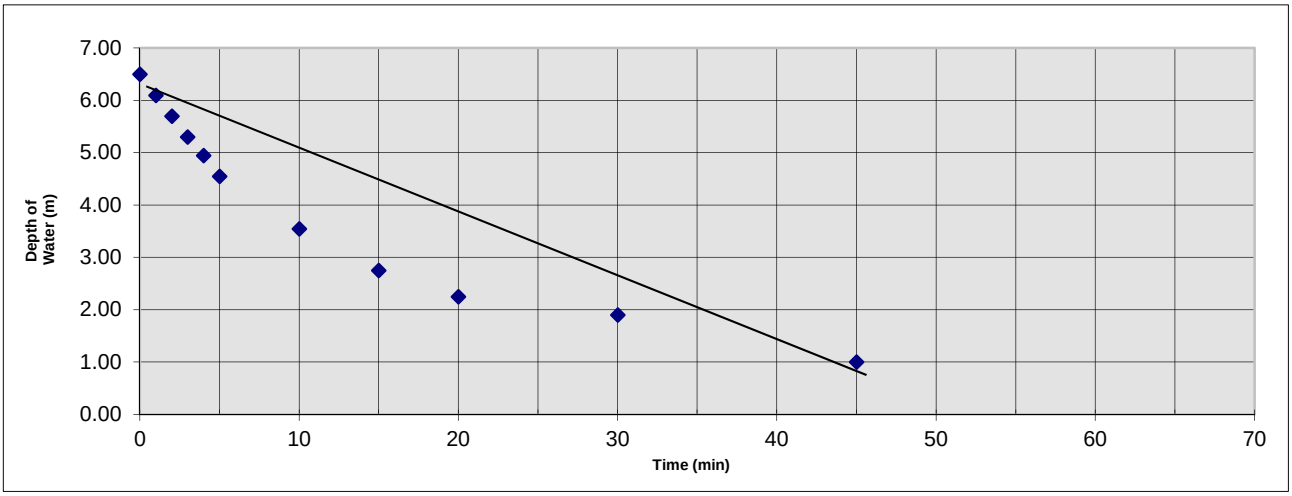
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Soakage Graph

Test No: 1



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Widbury Barn
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Sheet 1/2

Date: 20 November 2016

Borehole No: 7 **Test No:** 2

Test Data

Before start of test:

Borehole depth (m): 10.00
Casing depth (m): 5.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	6.10	3.90
1	7.20	2.80
2	8.00	2.00
3	8.50	1.50
4	8.80	1.20
5	9.00	1.00
10	9.50	0.50
15	Sludge	

Soakage Calculation

Borehole Diameter (m)	0.1500
Borehole Area (m)	0.0177
Borehole Perimeter (m)	0.471

From Plot:		
	D1 (m)	3.5
	D2 (m)	1.3
	T1 (min)	0
	T2 (min)	5

Soakage Volume (m^3)	0.039
Soakage Area (m^2)	1.15
Time (min)	5

Soakage rate (m/sec)	1.12821E-04
Soakage rate (m/day)	9.747692308

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

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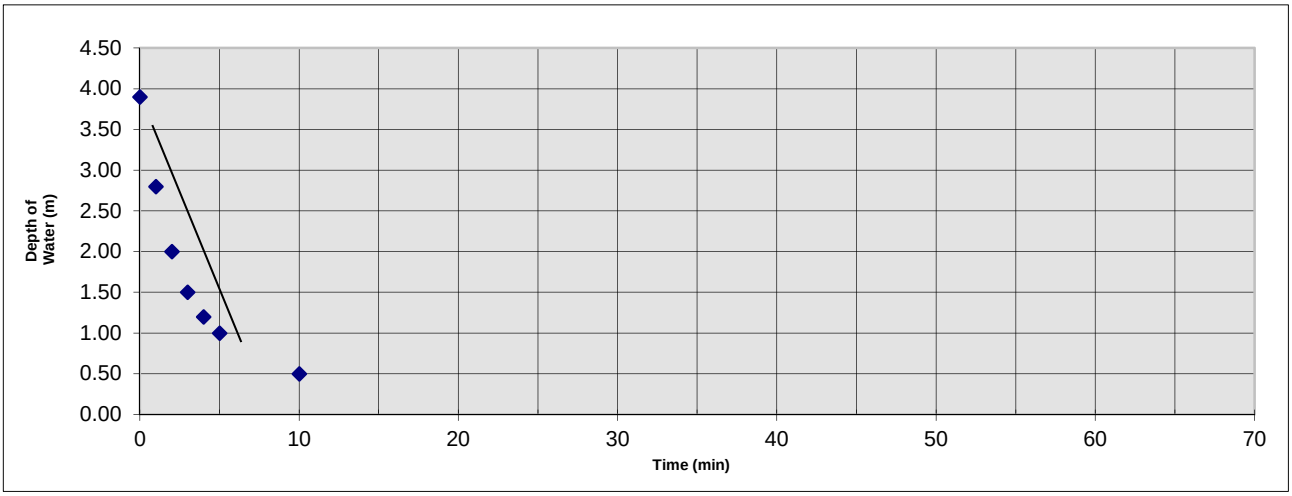
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Soakage Graph

Test No: 2



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

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Date: 21 November 2016

Borehole No: 7 **Test No:** 3

Test Data

Before start of test:

Borehole depth (m): 15.00
Casing depth (m): 5.00
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	10.50	4.50
1	11.50	3.50
2	12.00	3.00
3	12.50	2.50
4	12.90	2.10
5	13.30	1.70
10	13.90	1.10
15	14.10	0.90
30	14.40	0.60
45	14.50	0.50
60	14.70	0.30

Soakage Calculation

Borehole Diameter (m)	0.1500	
Borehole Area (m)	0.0177	
Borehole Perimeter (m)	0.471	
From Plot:	D1 (m)	3.6
	D2 (m)	0.8
	T1 (min)	0
	T2 (min)	15
Soakage Volume (m^3)	0.049	
Soakage Area (m^2)	1.05	
Time (min)	15	

Soakage rate (m/sec)	5.21415E-05
Soakage rate (m/day)	4.505027933

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

Geotechnical & Environmental Associates
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

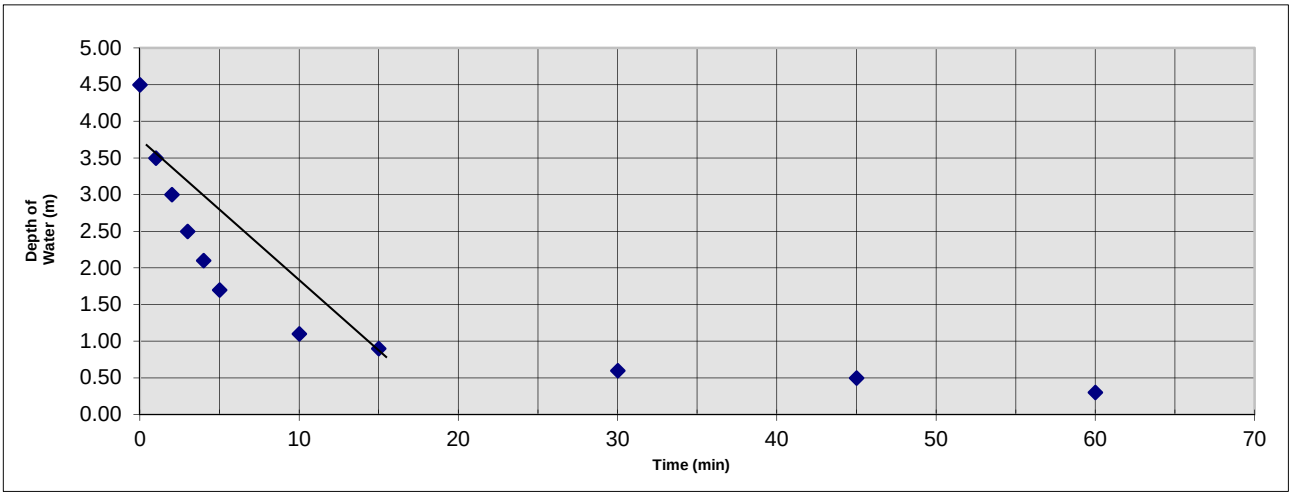
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Soakage Graph

Test No: 3



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

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Job Number J16202

Sheet 1/2

Date: 19 December 2016

Borehole No: 8 **Test No:** 2

Test Data

Before start of test:

Borehole depth (m): 10.00
Casing depth (m): 6.20
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	1.90	8.10
1	2.90	7.10
2	3.15	6.85
3	3.35	6.65
4	3.60	6.40
5	3.80	6.20
10	4.90	5.10
15	5.90	4.10
20	6.85	3.15
30	8.80	1.20
45	9.55	0.45

Soakage Calculation

Borehole Diameter (m)	0.1500	
Borehole Area (m)	0.0177	
Borehole Perimeter (m)	0.471	
From Plot:	D1 (m)	7
	D2 (m)	1
	T1 (min)	1
	T2 (min)	30
Soakage Volume (m^3)	0.106	
Soakage Area (m^2)	1.90	
Time (min)	29	

Soakage rate (m/sec)	3.20273E-05
Soakage rate (m/day)	2.767161311

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Widbury Hill
Ware
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

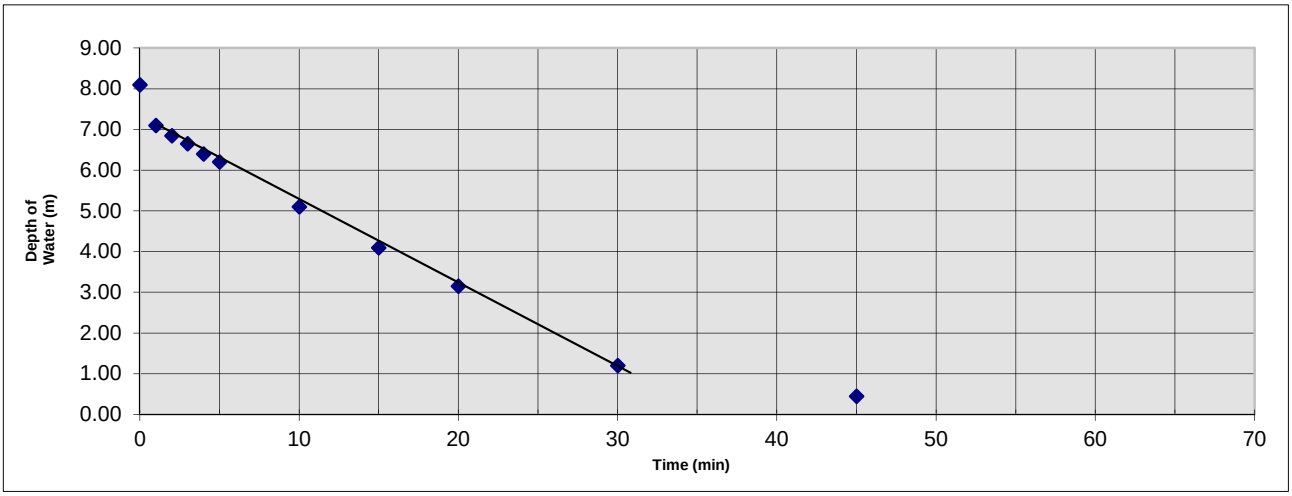
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Job Number J16202

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Soakage Graph

Test No: 2



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

Engineer

Job Number J16202

Sheet 1/2

Date: 19 December 2016

Borehole No: 8 **Test No:** 3

Test Data

Before start of test:

Borehole depth (m): 15.00
Casing depth (m): 6.20
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	5.00	10.00
2	5.50	9.50
4	6.00	9.00
6	6.40	8.60
8	6.80	8.20
10	7.20	7.80
15	8.20	6.80
20	9.20	5.80
30	10.90	4.10
45	13.10	1.90

Soakage Calculation

Borehole Diameter (m)	0.1500	
Borehole Area (m)	0.0177	
Borehole Perimeter (m)	0.471	
From Plot:	D1 (m)	10
	D2 (m)	1.9
	T1 (min)	1
	T2 (min)	10
Soakage Volume (m^3)	0.143	
Soakage Area (m^2)	2.82	
Time (min)	9	

Soakage rate (m/sec)	9.39457E-05
Soakage rate (m/day)	8.11691023

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

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Borehole Soakage Test

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Client Countryside Properties

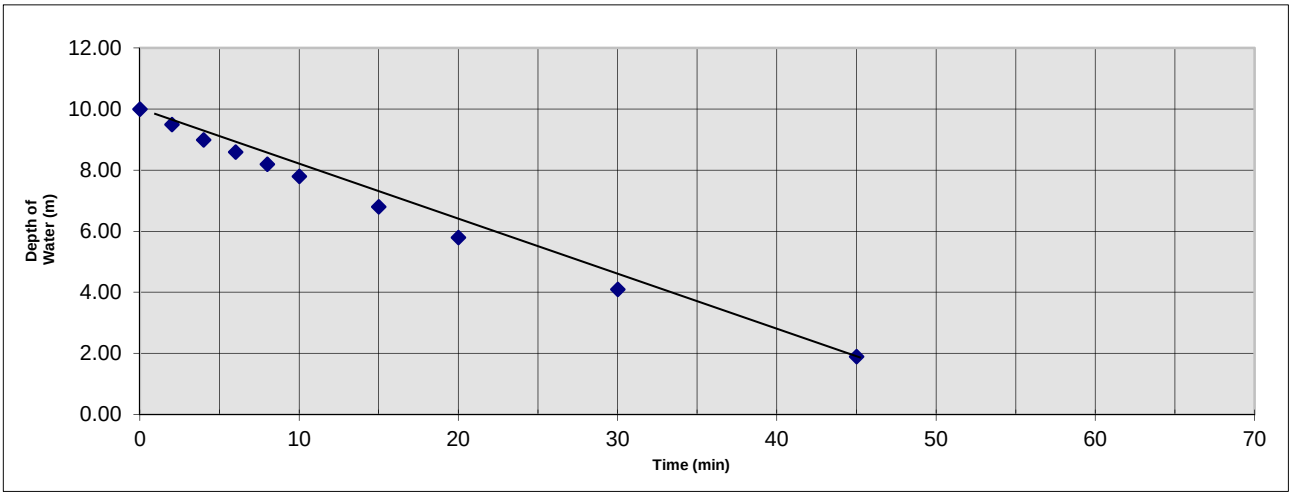
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Soakage Graph

Test No: 3



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

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Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

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Date: 20 December 2016

Borehole No: 8 **Test No:** 4

Test Data

Before start of test:

Borehole depth (m): 20.00
Casing depth (m): 6.20
Water level (m): DRY

Time (mins)	Depth to Water (m)	Depth of Water (m)
0	13.50	6.50
1	13.50	6.50
2	14.00	6.00
3	14.50	5.50
4	15.00	5.00
5	15.50	4.50
10	17.00	3.00
15	18.00	2.00
20	18.50	1.50
30	18.90	1.10
45	19.50	0.50

Soakage Calculation

Borehole Diameter (m)	0.1500
Borehole Area (m)	0.0177
Borehole Perimeter (m)	0.471

From Plot:		
	D1 (m)	6.5
	D2 (m)	1.5
	T1 (min)	0
	T2 (min)	20

Soakage Volume (m^3)	0.088
Soakage Area (m^2)	1.90
Time (min)	20

Soakage rate (m/sec)	3.86997E-05
Soakage rate (m/day)	3.343653251

Remarks:
Test carried out in Cable percussion borehole
Sides of borehole remained stable during test

Geotechnical & Environmental Associates
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Borehole Soakage Test

Site Newmarket Road, Royston, Herts, SG8 7NJ

Client Countryside Properties

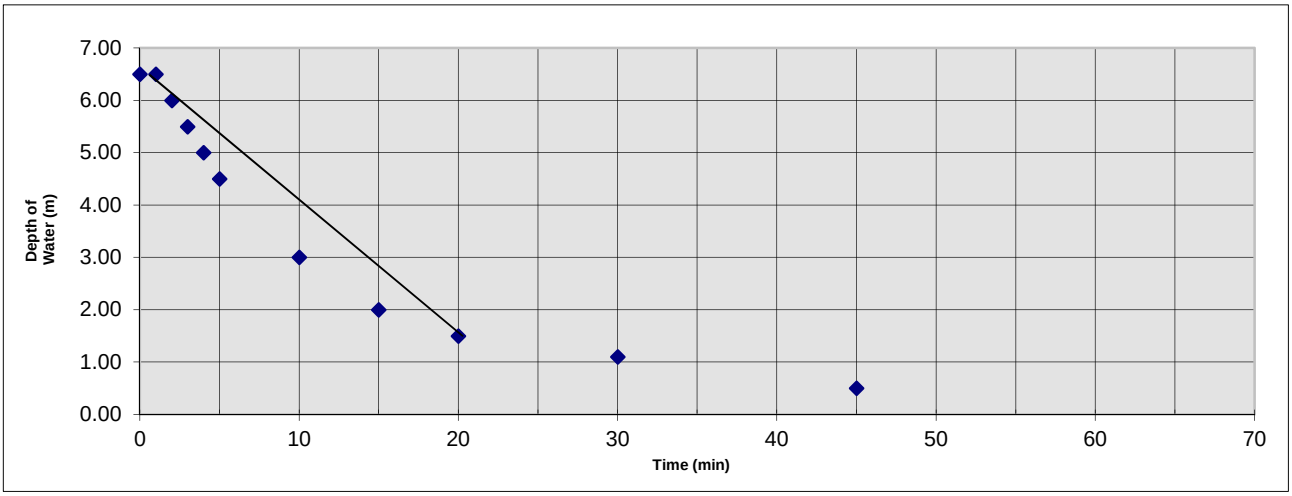
Engineer

Job Number J16202

Sheet 2/2

Soakage Graph

Test No: 4



Remarks:

Test carried out in Cable percussion borehole

Sides of borehole remained stable during test

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
21558	Royston	Samples received	08/09/2016
		Schedule received	20/10/2016
Project No.	Client	Project started	20/10/2016
J16202	GEA	Testing Started	25/10/2016

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
BH3	-	4.00	-	D	Off white putty CHALK with fmc intact chalk fragments	27	27	2.00	1.57	No
BH4	-	3.00	-	D	Off white putty CHALK with fm intact chalk fragments	35	32	1.83	1.38	No
TP1	-	0.80	-	D	Fmc intact CHALK fragments	35	32	1.82	1.39	Yes
TP2	-	0.90	-	D	Fmc intact CHALK fragments	32	30	1.88	1.44	Yes
TP3	-	1.00	-	D	Fmc intact CHALK fragments	29	24	1.88	1.52	Yes

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

Checked and Approved

Initials **J.P**

Date: **26/10/2016**

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
21882	Royston	Samples received	03/11/2016
		Schedule received	02/11/2016
Project No.	Client	Project started	03/11/2016
J16202	GEA	Testing Started	03/11/2016

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
TP8	-	0.50	-	D	Off white fmc CHALK fragments	28	27	1.95	1.54	NO
TP8	-	1.00	-	D	Off white fmc CHALK fragments	32	30	1.90	1.46	NO
TP8	-	1.50	-	B	Off white fmc CHALK fragments	34	34	1.88	1.41	YES
TP8	-	2.00	-	B	Off white fmc CHALK fragments	33	32	1.89	1.44	YES
TP8	-	3.00	-	B	Off white fmc CHALK fragments	33	32	1.89	1.43	YES
TP9	-	0.50	-	D	Off white fmc CHALK fragments	28	26	1.94	1.54	NO
TP9	-	1.00	-	D	Off white fmc CHALK fragments	31	31	1.91	1.46	NO
TP9	-	1.50	-	D	Off white fmc CHALK fragments	31	31	1.91	1.46	NO
TP9	-	2.00	-	B	Off white fmc CHALK fragments	30	29	1.94	1.50	YES
TP9	-	3.00	-	B	Off white fmc CHALK fragments	30	30	1.94	1.50	YES
TP11	-	0.50	-	D	Off white fmc CHALK fragments	32	29	1.86	1.44	NO
TP11	-	1.00	-	D	Off white fmc CHALK fragments	30	29	1.92	1.49	NO

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Initials **J.P**

Date: **04/11/2016**

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
21882	Royston	Samples received	03/11/2016
		Schedule received	02/11/2016
Project No.	Client	Project started	03/11/2016
J16202	GEA	Testing Started	03/11/2016

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
TP11	-	1.50	-	D	Off white fmc CHALK fragments	28	27	1.95	1.53	NO
TP11	-	2.00	-	D	Off white fmc CHALK fragments	31	30	1.91	1.47	NO
TP11	-	2.50	-	D	Off white fmc CHALK fragments	30	29	1.92	1.49	NO
TP12	-	0.50	-	D	Off white fmc CHALK fragments	32	30	1.88	1.45	NO
TP12	-	1.00	-	D	Off white fmc CHALK fragments	33	31	1.86	1.43	NO
TP12	-	1.50	-	D	Off white fmc CHALK fragments	35	30	1.82	1.39	YES
TP12	-	2.00	-	B	Off white fmc CHALK fragments	31	30	1.91	1.47	NO
TP12	-	2.50	-	B	Off white fmc CHALK fragments	32	31	1.89	1.44	NO

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Checked and Approved

Initials **J.P**

Date: **04/11/2016**

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
22049	Royston	Samples received	06/12/2016
		Schedule received	06/12/2016
Project No.	Client	Project started	06/12/2016
J16202	GEA	Testing Started	07/12/2016

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
BH6	-	6.00	-	D	Off white putty CHALK with fmc intact chalk fragments	33	31	1.87	1.42	No
BH6	-	9.00	-	D	Off white putty CHALK with fmc intact chalk fragments	33	30	1.86	1.43	No
BH6	-	12.00	-	D	Off white putty CHALK with fmc intact chalk fragments	30	27	1.91	1.50	No
BH6	-	16.65	-	D	Off white putty CHALK with fmc intact chalk fragments	30	28	1.91	1.49	No
BH6	-	19.50	-	D	Off white and occasional brownish grey putty CHALK with fmc intact chalk fragments	30	28	1.91	1.50	No

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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Email: James@k4soils.com

Checked and Approved

Initials **J.P**

Date: **08/12/2016**

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
22171	Royston	Samples received	03/01/2017
		Schedule received	09/01/2017
Project No.	Client	Project started	10/01/2017
J16202	GEA	Testing Started	10/01/2017

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
BH7	-	1.00	-	B	Off white fm intact CHALK fragments in a brown and off white chalky clayey matrix	27	27	1.97	1.55	No
BH7	-	2.00	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	28	26	1.96	1.55	No
BH7	-	4.00	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	29	29	1.96	1.52	No
BH7	-	6.50	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	28	28	1.96	1.53	No
BH7	-	7.75	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	33	31	1.88	1.44	No
BH7	-	9.50	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	30	31	1.95	1.48	No
BH7	-	12.50	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	33	32	1.90	1.44	No
BH8	-	1.00	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	32	30	1.87	1.44	No
BH8	-	2.00	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	35	34	1.86	1.39	No
BH8	-	3.50	-	B	Off white FMC intact CHALK fragments in a putty chalk matrix	35	35	1.87	1.39	No
BH8	-	5.00	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	31	31	1.93	1.47	No
BH8	-	6.00	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	32	32	1.92	1.45	No

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
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Checked and Approved

Initials **J.P**

Date: **11/01/2017**

Saturation Moisture Content - Summary of Results
Tested in accordance with BS1377 : Part 2 : 1990, clause 3.3 unless annotated otherwise.

Job No.	Project Name	Programme	
22171	Royston	Samples received	03/01/2017
		Schedule received	09/01/2017
Project No.	Client	Project started	10/01/2017
J16202	GEA	Testing Started	10/01/2017

Hole No.	Sample				Description	SMC	NMC	Bulk Density	Dry Density	Remarks - Sample size complies with BS1377:1990: Part 2 (Yes/No)
	Ref	Top	Base	Type		%	%	Mg/m3	Mg/m3	
BH8	-	8.00	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	31	31	1.92	1.47	No
BH8	-	10.50	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	24	24	2.02	1.64	No
BH8	-	12.50	-	B	Off white FMC intact CHALK fragments in a putty chalk matrix	30	30	1.93	1.48	No
BH8	-	14.50	-	U	Off white FMC intact CHALK fragments in a putty chalk matrix	29	28	1.95	1.52	No
BH8	-	16.75	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	26	27	2.00	1.58	No
BH8	-	18.00	-	B	Off white FMC intact CHALK fragments in a putty chalk matrix	32	31	1.91	1.45	No
BH8	-	20.00	-	D	Off white FMC intact CHALK fragments in a putty chalk matrix	29	26	1.92	1.52	No

Test Report by K4 SOILS LABORATORY
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Checked and Approved

Initials **J.P**

Date: **11/01/2017**

CHALK CRUSHING VALUE - Summary of Results
Tests performed in accordance with BS 1377 : Part 4 : 1990, clause 8

Job No.	Project Name	Programme	
21558	Royston	Samples received	08/09/2016
		Schedule received	08/09/2016
Project No.	Client	Project started	09/09/2016
J16202	GEA	Testing Started	04/10/2016

Hole No.	Sample				Soil Description	Material >10mm	Specimen Moisture Content	Saturated Moisture Content	Chalk Crushing Value	Remarks
	Ref	Depth Top m	Depth Base m	Type		%	%	%	CCV	
TP5	-	0.90	-	B	FMC intact CHALK fragments	94	31.0	32.0	3.4	
TP6	-	1.20	-	B	FMC intact CHALK fragments	95	27.0	27.0	3.5	
TP7	-	1.40	-	B	FMC intact CHALK fragments	96	28.0	31.0	3.2	

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
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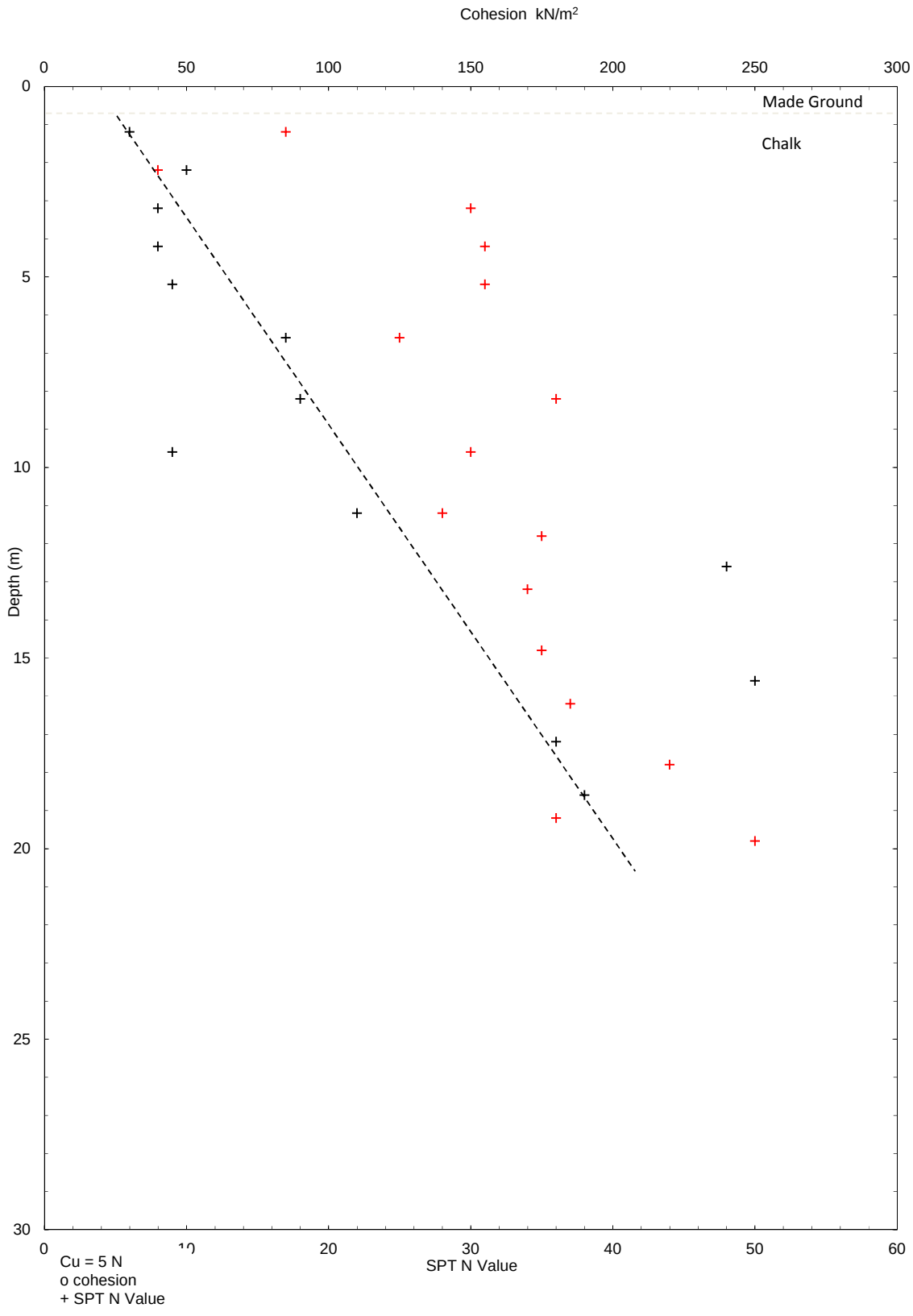
Checked and Approved

Initials K.P

Date 06/10/2016

GEA Geotechnical & Environmental Associates	Widbury Barn Widbury Hill Ware Herts SG12 7QE	**SPT & Cohesion / Depth Graph**

Site	Newmarket Road, Royston, Herts, SG8 7NJ	**Job Number** J16202
Client	Countryside Properties PLC	**Sheet** 1 / 1
Engineer		



Analytical Report Number: 16-27324

Project / Site name: Newmarket Road, Royston, SG8 7NJ
Your Order No: J16202

Lab Sample Number				626989	626990	626991	626992	626993
Sample Reference				BH1	BH2	BH3	BH4	BH5
Sample Number				D	D	D	D	D
Depth (m)				0.30	0.30	0.30	0.40	0.20
Date Sampled				07/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	14	13	13	11	14
Total mass of sample received	kg	0.001	NONE	1.2	1.1	1.1	1.2	1.1
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.3	8.1	8.5	8.5	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	960	1000	1200	940	1000
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0097	0.013	0.0061	0.0060	0.0079
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	7.4	8.7	12	5.4	7.8
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.1	2.4	2.5	1.8	2.4
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 16-27324

Project / Site name: Newmarket Road, Royston, SG8 7NJ
Your Order No: J16202

Lab Sample Number				626989	626990	626991	626992	626993
Sample Reference				BH1	BH2	BH3	BH4	BH5
Sample Number				D	D	D	D	D
Depth (m)				0.30	0.30	0.30	0.40	0.20
Date Sampled				07/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	2.0	3.1	4.2	1.6	4.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.5	0.5	0.5	0.7
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	10	10	7.4	5.0	7.4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	16	17	13	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	44	31	30	26	29
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3	< 0.3	0.6	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.2	7.9	6.5	5.7	7.8
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.6	< 1.0	2.1
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	31	35	29	27	36
Petroleum Hydrocarbons								
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	ISO 17025	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	ISO 17025	< 1.0	5.1	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	ISO 17025	5.4	10	8.6	< 1.0	3.6

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Analytical Report Number : 16-27324

Project / Site name: Newmarket Road, Royston, SG8 7NJ

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
626989	BH1	D	0.30	Brown loam and sand with gravel.
626990	BH2	D	0.30	Brown loam and sand with gravel and chalk.
626991	BH3	D	0.30	Brown loam and sand with gravel and vegetation.
626992	BH4	D	0.40	Brown loam and sand with gravel.
626993	BH5	D	0.20	Brown loam and sand with gravel and chalk.

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Analytical Report Number : 16-27324

Project / Site name: Newmarket Road, Royston, SG8 7NJ

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	NONE
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

GEA Geotechnical & Environmental Associates

Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	32 Green Street & 17 Dunraven Street, London W1K 7FL	**Job Number** J16044
Client	Green Street Developments	**Sheet** 1 / 2
Engineer	Constructure	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 2.5

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	37	C4SL
Cadmium	26	C4SL
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	21	C4SL
Copper	2,330	LQM/CIEH
Lead	200	C4SL
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	97	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.34	C4SL
Toluene	320	SGV
Ethyl Benzene	180	SGV
Xylene	120	SGV
Aliphatic C5-C6	55	LQM/CIEH
Aliphatic C6-C8	160	LQM/CIEH
Aliphatic C8-C10	46	LQM/CIEH
Aliphatic C10-C12	230	LQM/CIEH
Aliphatic C12-C16	1700	LQM/CIEH
Aliphatic C16-C35	64,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	65	LQM/CIEH
Aromatic C10-C12	160	LQM/CIEH
Aromatic C12-C16	310	LQM/CIEH
Aromatic C16-C21	480	LQM/CIEH
Aromatic C21-C35	1100	LQM/CIEH
PRO (C_5 –C_{10})	646	Calc
DRO (C_{12} –C_{28})	66,490	Calc
Lube Oil (C_{28} –C_{44})	65,100	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	290	SGV
PAH		
Naphthalene	5.30	C4SL exp & LQM/CIEH
Acenaphthylene	400	LQM/CIEH
Acenaphthene	480	LQM/CIEH
Fluorene	380	LQM/CIEH
Phenanthrene	200	LQM/CIEH
Anthracene	4,900	LQM/CIEH
Fluoranthene	460	LQM/CIEH
Pyrene	1,000	LQM/CIEH
Benzo(a) Anthracene	6.7	C4SL exp & LQM/CIEH
Chrysene	11	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	9.5	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	14.1	C4SL exp & LQM/CIEH
Benzo(a) pyrene	4.40	C4SL
Indeno(1 2 3 cd) Pyrene	5.6	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	1.27	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	69	C4SL exp & LQM/CIEH
Screening value for PAH	**62.9**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	27.2	LQM/CIEH
tetrachloroethane (PCA)	1.25	LQM/CIEH
tetrachloroethene (PCE)	2.32	LQM/CIEH
trichloroethene (TCE)	0.308	LQM/CIEH
1,2-dichloroethane (DCA)	0.008	LQM/CIEH
vinyl chloride (Chloroethene)	0.000184	LQM/CIEH
tetrachloromethane (Carbon tetra	0.039	LQM/CIEH
trichloromethane (Chloroform)	1.99	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these valuesindicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health croiteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

GEA Geotechnical & Environmental Associates

Widbury Barn
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Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	32 Green Street & 17 Dunraven Street, London W1K 7FL	**Job Number** J16044
Client	Green Street Developments	**Sheet** 2 / 2
Engineer	Constructure	

Proposed End Use **Residential with plant uptake**

The key generic assumptions for this end use are as follows;

- ❑ that groundwater will not be a critical risk receptor;
- ❑ that the critical receptor for human health will be a young female aged 0 to 6 years old;
- ❑ that the exposure duration will be six years;
- ❑ that the building type equates to a terraced house.
- ❑ that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of home grown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- ❑ additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- ❑ site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- ❑ soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
95900613_1_1

Customer Reference:
J16202

National Grid Reference:
536910, 240650

Slice:
A

Site Area (Ha):
14.65

Search Buffer (m):
1000

Site Details:

2 Burloes Cottages
Newmarket Road
ROYSTON
Hertfordshire
SG8 7NJ

Client Details:

Mr S Branch
GEA Ltd
Widbury Barn
Widbury Hill
Ware
Herts
SG12 7QE

Contents

Report Section	Page Number
Summary	-
Agency & Hydrological	1
Waste	9
Hazardous Substances	-
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Industrial Land Use	13
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Data Suppliers	25
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Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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Report Version v50.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1	Yes		Yes	n/a
Contaminated Land Register Entries and Notices					
Discharge Consents					
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 1				1
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 1		Yes		
Pollution Incidents to Controlled Waters					
Prosecutions Relating to Authorised Processes	pg 1				1
Registered Radioactive Substances					
River Quality					
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions	pg 1		1		4 (*19)
Water Industry Act Referrals					
Groundwater Vulnerability	pg 7	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 7	Yes	n/a	n/a	n/a
Superficial Aquifer Designations	pg 7	Yes	n/a	n/a	n/a
Source Protection Zones	pg 7	1	1		3
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
Detailed River Network Lines					n/a
Detailed River Network Offline Drainage	pg 8		Yes		n/a

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites					
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Landfill Coverage	pg 9	2	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 9				1
Potentially Infilled Land (Water)	pg 9				1
Registered Landfill Sites					
Registered Waste Transfer Sites					
Registered Waste Treatment or Disposal Sites					
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Geological					
BGS 1:625,000 Solid Geology	pg 10	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 10	Yes	Yes	Yes	Yes
BGS Recorded Mineral Sites	pg 11				1
BGS Urban Soil Chemistry					
BGS Urban Soil Chemistry Averages					
Brine Compensation Area			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities	pg 11				2
Natural Cavities					
Non Coal Mining Areas of Great Britain	pg 11	Yes		n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 11	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards				n/a	n/a
Potential for Ground Dissolution Stability Hazards	pg 11	Yes	Yes	n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 11	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 12	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 12	Yes	Yes	n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
Industrial Land Use					
Contemporary Trade Directory Entries	pg 13		2		24
Fuel Station Entries	pg 15				1
Points of Interest - Commercial Services	pg 15				2
Points of Interest - Education and Health					
Points of Interest - Manufacturing and Production	pg 15				7
Points of Interest - Public Infrastructure	pg 16				9
Points of Interest - Recreational and Environmental	pg 16		2	2	4
Gas Pipelines	pg 17				1
Underground Electrical Cables					

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland					
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves					
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones	pg 18	2			
Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A10NE (E)	0	2	536913 240649
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A6NE (S)	422	2	536913 240000
1	**Local Authority Pollution Prevention and Controls** Name: H Precious & Son Location: Melbourn Road, ROYSTON, Hertfordshire, . Authority: North Hertfordshire District Council, Environmental Health Department Permit Reference: Not Given Dated: 19th March 1999 Process Type: Local Authority Air Pollution Control Description: PG1/14 Petrol filling station **Status: Authorised** Positional Accuracy: Manually positioned to the road within the address or location	A13NE (NW)	879	3	535969 241309
	Nearest Surface Water Feature	A15SW (NE)	186	-	537181 241015
2	**Prosecutions Relating to Authorised Processes** Location: Garden Walk, Royston, Hertfordshire, SG8 7HP Prosecution Text: EA Data 02/11/1998, Supplying a radioactive source on hire to a person not registered to hold one; not having a person competent to ensure compliance with registration conditions; and failing to keep adequate records Prosecution Act: RSA93 s32(1b) Hearing Date: 6th October 1998 Verdict: Guilty Fine: 15000 Costs: 1305 Positional Accuracy: Manually positioned to the road within the address or location	A14SW (NW)	577	4	536391 241298
3	**Water Abstractions** Operator: Sir G Newman Licence Number: 6/33/30/*G/0093 Permit Version: 100 Location: Well E Of Royston Authority: Environment Agency, Anglian Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: C Chalk 3; Status: Perpetuity Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st December 1970 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A11SE (E)	141	4	537300 240500
4	**Water Abstractions** Operator: Stanley Hoy & Sons Licence Number: 6/33/30/*G/0078 Permit Version: 100 Location: Well At Hyde Fam Ne Of Royston Authority: Environment Agency, Anglian Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: C Chalk 3; Status: Perpetuity Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st June 1966 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A15SE (NE)	605	4	537600 241200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Rayner Brothers, Licence Number: 6/33/30/*g/107 Permit Version: Not Supplied Location: Well At Mile End Farm, ROYSTON Authority: Environment Agency, Anglian Region Abstraction: Domestic & Agriculture Abstraction Type: Not Supplied Source: Well And Borehole Daily Rate (m3): 1 Yearly Rate (m3): 2050 Details: C Chalk 3; Status: Revoked Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(SW)	1872	4	536000 238700
	Water Abstractions Operator: J. Dodkin Limited, Licence Number: 6/33/30/*g/050 Permit Version: Not Supplied Location: Well At Muncey's Farm, MELBOURN Authority: Environment Agency, Anglian Region Abstraction: Domestic & Agriculture Abstraction Type: Not Supplied Source: Well And Borehole Daily Rate (m3): 1 Yearly Rate (m3): 4550 Details: C Chalk 3; Status: Revoked Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	(NE)	1987	4	538200 242500
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (H1) - Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater Map Sheet: Sheet 32 North Essex Scale: 1:100,000	A10NE (E)	0	4	536913 240649
	Groundwater Vulnerability Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise Map Sheet: Sheet 32 North Essex Scale: 1:100,000	A10NE (NW)	0	4	536810 240771
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Principal Aquifer	A10NE (E)	0	2	536913 240649
	Superficial Aquifer Designations Aquifer Designation: Secondary Aquifer - Undifferentiated	A10NE (NW)	0	2	536881 240685
6	**Source Protection Zones** Name: Various Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone III (Total Catchment): The total area needed to support the discharge from the protected groundwater source.	A10NE (E)	0	4	536913 240649
7	**Source Protection Zones** Name: Various Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone II (Outer Protection Zone): Either 25% of the source area or a 400 day travel time whichever is greater.	A11SW (E)	64	4	537241 240557
8	**Source Protection Zones** Name: Eagle Tavern Source: Environment Agency, Head Office Reference: An080 Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A7NE (SE)	568	4	537309 240015

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
9	**Source Protection Zones** Name: Various Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A5NE (SW)	715	4	536034 240258
10	**Source Protection Zones** Name: Eagle Tavern Source: Environment Agency, Head Office Reference: An080 Type: Groundwater Source	A7SE (SE)	895	4	537400 239700
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
	Detailed River Network Lines None				
11	**Detailed River Network Offline Drainage** River Type: Tertiary River Hydrographic Area: D005	A15SW (NE)	186	4	537182 241014
12	**Detailed River Network Offline Drainage** River Type: Tertiary River Hydrographic Area: D005	A15SW (NE)	227	4	537194 241055

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: Hertfordshire County Council - Has supplied landfill data		0	5	536913 240649
	Local Authority Landfill Coverage Name: North Hertfordshire District Council - Has supplied landfill data		0	3	536913 240649
	Local Authority Landfill Coverage Name: South Cambridgeshire District Council - Has supplied landfill data		251	6	537228 241064
	Local Authority Landfill Coverage Name: Cambridgeshire County Council - Has not been able to supply Landfill data		251	7	537228 241064
13	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A9SE (W)	583	10	536150 240382
14	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1899	A9SW (W)	874	10	535831 240593

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: White Chalk Subgroup	A10NE (E)	0	2	536913 240649
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 20 - 40 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: <15 mg/kg	A10NE (E)	0	2	536913 240649
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 40 - 60 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A10NE (NW)	0	2	536881 240685
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 40 - 60 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A10NW (W)	203	2	536482 240706
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 40 - 60 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A7NW (S)	277	2	537071 240243
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 30 - 45 mg/kg	A6SW (SW)	719	2	536504 239741
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: <15 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 30 - 45 mg/kg	A16NW (NE)	981	2	537708 241618

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
15	**BGS Recorded Mineral Sites** Site Name: Stile Plantation Chalk Pit Location: , Royston, Hertfordshire Source: British Geological Survey, National Geoscience Information Service Reference: 165882 Type: Opencast **Status: Ceased** Operator: Not Supplied Operator Location: Not Supplied Periodic Type: Cretaceous Geology: New Pit Chalk Formation Commodity: Chalk Positional Accuracy: Located by supplier to within 10m	A9SE (W)	632	2	536101 240378
	BGS Measured Urban Soil Chemistry No data available				
	BGS Urban Soil Chemistry Averages No data available				
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Man-Made Mining Cavities Easting: 536200 Northing: 240300 Distance: 547 Quadrant Reference: A9 Quadrant Reference: SE Bearing Ref: SW Cavity Type: Historical Lime Kiln-Potential Chalk Mining Commodity: Chalk Solid Geology Detail: Middle Chalk Formation Superficial Geology Detail: No Details	A9SE (SW)	547	8	536200 240300
	Man-Made Mining Cavities Easting: 536000 Northing: 239800 Distance: 961 Quadrant Reference: A5 Quadrant Reference: SE Bearing Ref: SW Cavity Type: Chalkwell/Denehole Commodity: Chalk Solid Geology Detail: Middle Chalk Formation Superficial Geology Detail: Glacial Till	A5SE (SW)	961	8	536000 239800
	Non Coal Mining Areas of Great Britain Risk: Rare Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Ground Dissolution Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (NW)	0	2	536881 240685
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Ground Dissolution Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NW (W)	203	2	536482 240706
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A10NE (N)	0	2	536875 240774
	Potential for Landslide Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (NW)	0	2	536881 240685
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (N)	1	2	536897 240818
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NW (W)	203	2	536482 240706
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (NW)	0	2	536881 240685
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NW (W)	203	2	536482 240706
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NE (NW)	0	2	536881 240685
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A10NW (W)	203	2	536482 240706
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A10NE (E)	0	2	536913 240649

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
16	**Contemporary Trade Directory Entries** Name: Email Mum Location: 20, Ascot Road, Royston, Hertfordshire, SG8 9JD Classification: Cleaning Services - Domestic **Status: Active** Positional Accuracy: Automatically positioned to the address	A10SW (W)	206	-	536502 240613
17	**Contemporary Trade Directory Entries** Name: P S B Carpet Care Location: 9, Newman Avenue, Royston, SG8 7LE Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A14SE (NW)	209	-	536661 241010
18	**Contemporary Trade Directory Entries** Name: Ironing Angel Location: Parklands, Royston, Hertfordshire, SG8 9HJ Classification: Ironing & Home Laundry Services **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A9SE (W)	513	-	536201 240539
19	**Contemporary Trade Directory Entries** Name: Mark Weatherhead Location: Garden Walk, Royston, Hertfordshire, SG8 7HT Classification: Agricultural Vehicles **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (NW)	562	-	536215 241107
19	**Contemporary Trade Directory Entries** Name: Mark Weatherhead Ltd Location: Garden Walk, Royston, Hertfordshire, SG8 7HT Classification: Agricultural Machinery - Sales & Service **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SE (NW)	562	-	536215 241107
20	**Contemporary Trade Directory Entries** Name: Metrology Sales & Services Location: 45, Garden Walk, Royston, Hertfordshire, SG8 7HT Classification: Testing, Inspection & Calibration Equipment Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (NW)	635	-	536146 241136
21	**Contemporary Trade Directory Entries** Name: Harry Collins Location: Barkway Rd, Royston, Hertfordshire, SG8 9NB Classification: Radio Communication Equipment **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A7SW (S)	637	-	536940 239820
22	**Contemporary Trade Directory Entries** Name: Aladdin Cleaning Services Location: 24, Grange Bottom, Royston, Hertfordshire, SG8 9UQ Classification: Carpet, Curtain & Upholstery Cleaners **Status: Active** Positional Accuracy: Automatically positioned to the address	A5NE (SW)	643	-	536127 240205
23	**Contemporary Trade Directory Entries** Name: Cleaning Assurance Ltd Location: 34, Priory Close, Royston, SG8 7DU Classification: Commercial Cleaning Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A9SE (W)	687	-	536043 240403
24	**Contemporary Trade Directory Entries** Name: P & G Logistics Location: 32, Kingston Vale, Royston, Hertfordshire, SG8 9UG Classification: Road Haulage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A5NE (SW)	695	-	536153 240040
25	**Contemporary Trade Directory Entries** Name: Proctor Engineering Location: Meridian Works,Barkway Rd, Royston, Hertfordshire, SG8 9NB Classification: Commercial Vehicle Servicing, Repairs, Parts & Accessories **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A7SW (S)	776	-	537133 239738
25	**Contemporary Trade Directory Entries** Name: The Royston M O T Centre Location: Wickstead Park, Barkway Road, Royston, Hertfordshire, SG8 9NB Classification: Mot Testing Centres **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A7SW (S)	818	-	537162 239703

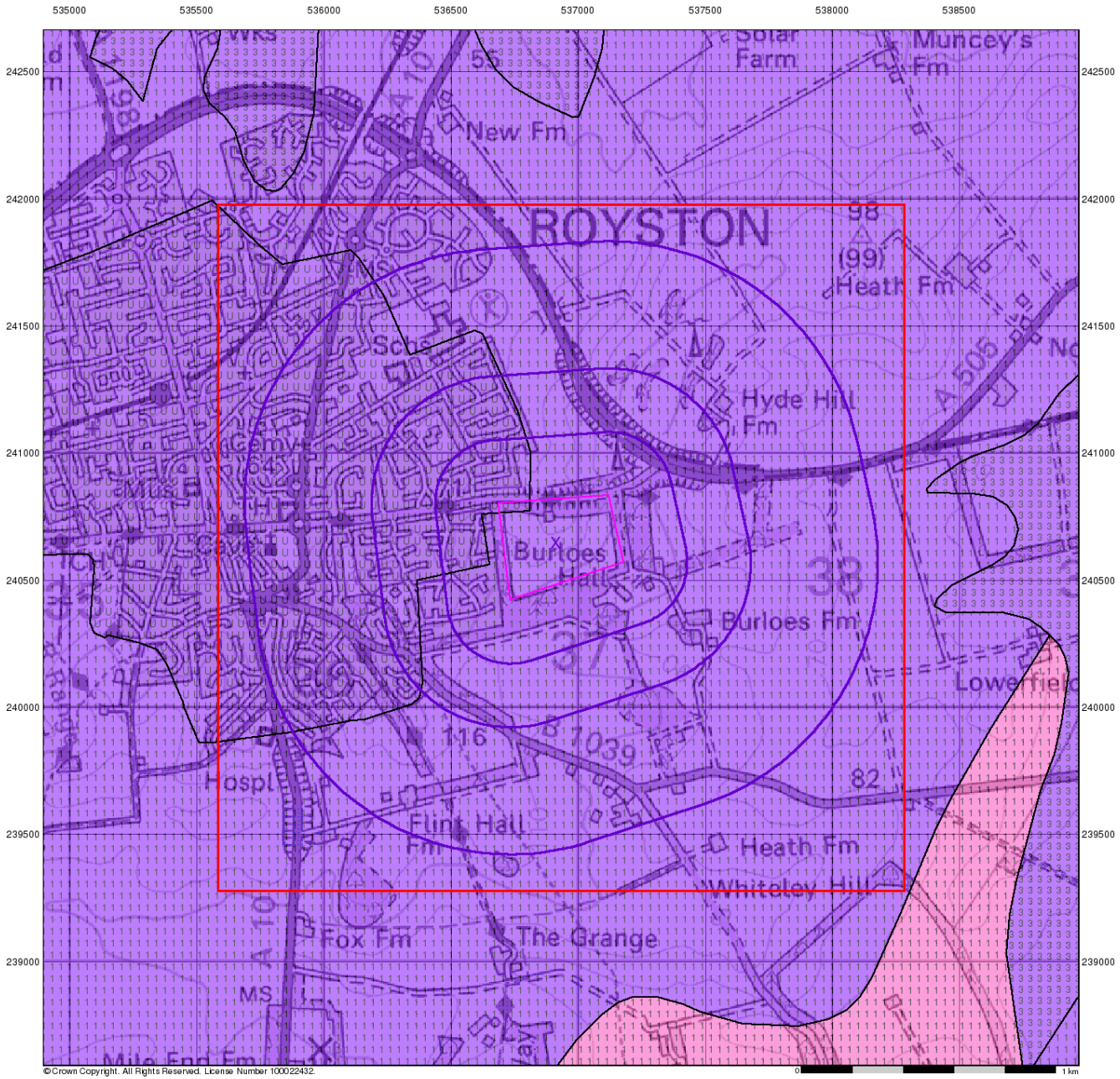
Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
40	**Points of Interest - Manufacturing and Production** Name: Works Location: SG8 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A13SW (W)	996	9	535738 241105
41	**Points of Interest - Public Infrastructure** Name: Cemetery Location: SG8 Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A13SE (NW)	807	9	536023 241261
41	**Points of Interest - Public Infrastructure** Name: Cemetery Location: SG8 Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A13SE (NW)	830	9	535995 241261
41	**Points of Interest - Public Infrastructure** Name: Cemetery Location: Not Supplied Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A13SE (NW)	836	9	535984 241256
42	**Points of Interest - Public Infrastructure** Name: Hertfordshire Constabulary Location: Melbourn Street, Royston, SG8 7BZ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A9NW (W)	868	9	535821 240741
42	**Points of Interest - Public Infrastructure** Name: Royston Police Station Location: Melbourn Street, Royston, SG8 7BZ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A9NW (W)	868	9	535821 240741
42	**Points of Interest - Public Infrastructure** Name: Royston Police Station Location: Melbourn Street, Royston, SG8 7BZ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A9NW (W)	868	9	535821 240741
43	**Points of Interest - Public Infrastructure** Name: Cemetery Location: Not Supplied Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A13SW (NW)	911	9	535844 241147
43	**Points of Interest - Public Infrastructure** Name: Cemetery Location: SG8 Category: Infrastructure and Facilities Class Code: Cemeteries and Crematoria Positional Accuracy: Positioned to an adjacent address or location	A13SW (NW)	911	9	535844 241147
44	**Points of Interest - Public Infrastructure** Name: Bus Station Location: SG8 Category: Public Transport, Stations and Infrastructure Class Code: Bus and Coach Stations, Depots and Companies Positional Accuracy: Positioned to address or location	A9SW (W)	974	9	535753 240404
45	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A14SE (NW)	235	9	536726 241040
45	**Points of Interest - Recreational and Environmental** Name: Playground Location: Newman Avenue, SG8 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A14SE (NW)	235	9	536726 241040

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
46	**Points of Interest - Recreational and Environmental** Name: Play Area Location: Furze Grove, SG8 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A10SW (SW)	453	9	536281 240383
46	**Points of Interest - Recreational and Environmental** Name: Play Area Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A10SW (W)	455	9	536278 240392
47	**Points of Interest - Recreational and Environmental** Name: Playground Location: Priory Lane, SG8 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A9SW (W)	864	9	535848 240540
47	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A9SW (W)	865	9	535846 240542
47	**Points of Interest - Recreational and Environmental** Name: Playground Location: Fish Hill, SG8 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A9SW (W)	901	9	535809 240555
47	**Points of Interest - Recreational and Environmental** Name: Playground Location: SG8 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A9SW (W)	906	9	535802 240566
48	**Gas Pipelines** Name: FM03 - Gt Wilbraham to Whitwell Nat Grid: Owned By National Grid Diameter (mm): 900 Building Proximity Distance (m): 78 Status: Active Pipe Length (m): 54620.4 Pipe Number: Feeder 3	A8SW (SE)	841	10	537759 239952

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
49	**Nitrate Vulnerable Zones** Name: Not Supplied Description: Surface Water Source: Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	A10NE (E)	0	12	536913 240649
50	**Nitrate Vulnerable Zones** Name: Not Supplied Description: Groundwater Source: Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	A10NE (E)	0	12	536913 240649

Contact	Name and Address	Contact Details
2	**British Geological Survey - Enquiry Service** British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
3	**North Hertfordshire District Council - Environmental Health Department** Council Offices, Gernon Road, Letchworth, Hertfordshire, SG6 3JF	Telephone: 01462 474000 Fax: 01462 474559 Website: www.north-herts.gov.uk
4	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
5	**Hertfordshire County Council - Spatial Planning and Economy Unit** County Hall, Hertford, Hertfordshire, SG13 8DN	Telephone: 01992 556266 Fax: 01992 556015 Email: spatialplanning@hertfordshire.gov.uk Website: www.hertsdirect.org
6	**South Cambridgeshire District Council** South Cambridgeshire Hall, Cambourne Business Park, Cambourne, Cambridgeshire, CB23 6EA	Telephone: 08450 450 500 Website: www.scambs.gov.uk
7	**Cambridgeshire County Council** Shire Hall, Castle Hill, Cambridge, Cambridgeshire, CB3 OAP	Telephone: 01223 717111 Fax: 01223 717201 Website: www.camcnty.gov.uk
8	**Peter Brett Associates** Caversham Bridge House, Waterman Place, Reading, Berkshire, RG1 8DN	Telephone: 0118 950 0761 Fax: 0118 959 7498 Email: reading@pba.co.uk Website: www.pba.co.uk
9	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
10	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmark.co.uk Website: www.landmark.co.uk
11	**Natural England** County Hall, Spetchley Road, Worcester, WR5 2NP	Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk Website: www.naturalengland.org.uk
12	**Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)** Government Buildings, Otley Road, Lawnswood, Leeds, West Yorkshire, LS16 5QT	Telephone: 0113 2613333 Fax: 0113 230 0879
13	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



GEA Geotechnical & Environmental Associates

Groundwater Vulnerability

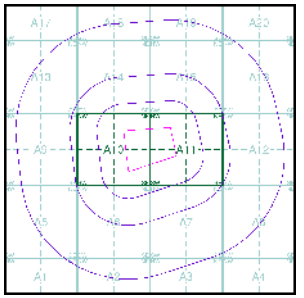
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes	Soil Classes
Major Aquifer (Highly Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Minor Aquifer (Variably Permeable)	High (H) 1, 2, 3, U
	Intermediate (I) 1, 2
	Low
Non Aquifer (Negligibly Permeable)	
Water or Sea	
Drift Deposit	

Site Sensitivity Context Map - Slice A



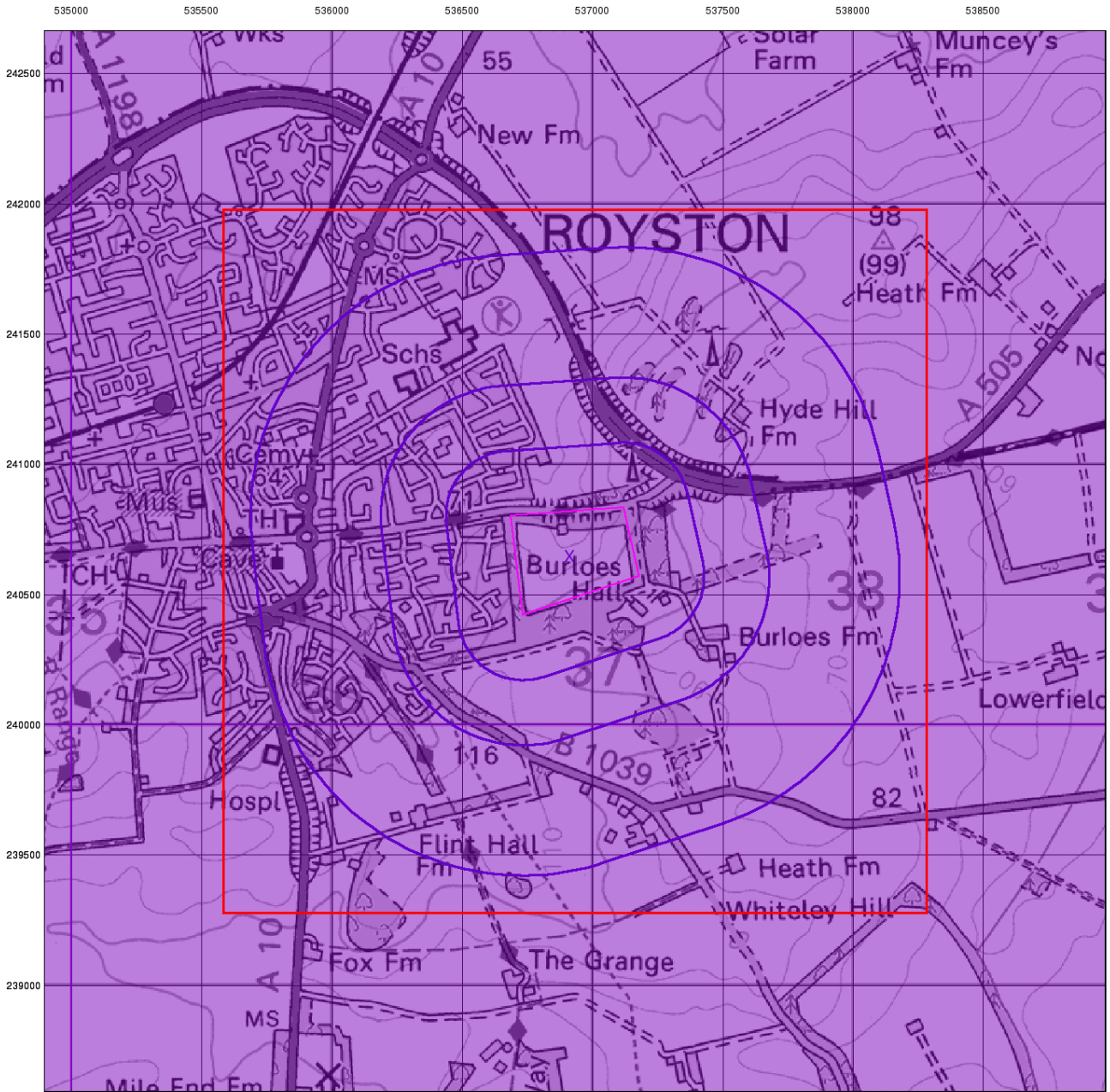
Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

Bedrock Aquifer Designation

General

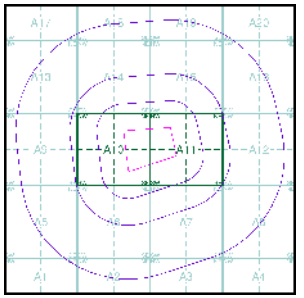
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

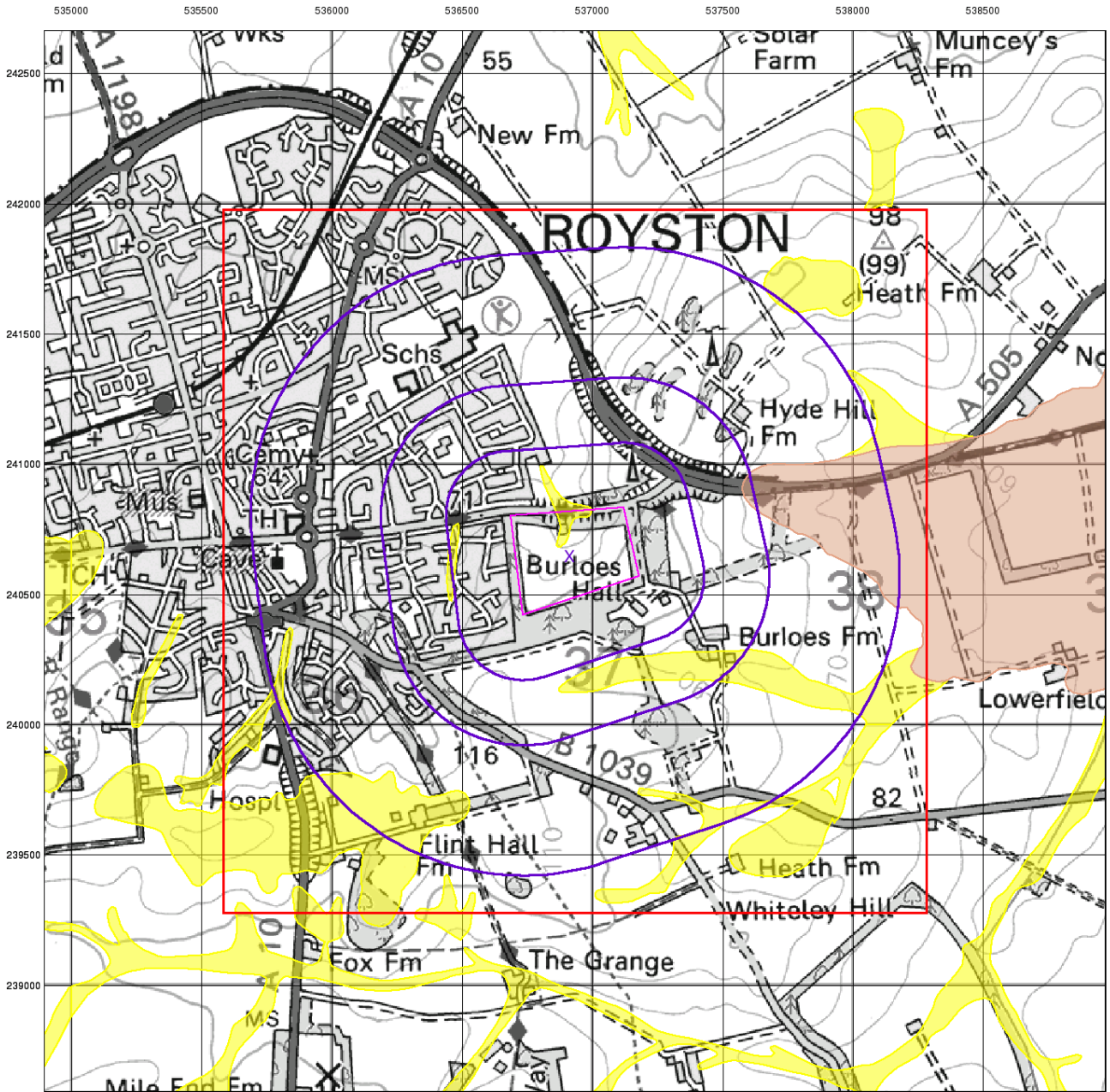


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Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ



GEA Geotechnical & Environmental Associates

Superficial Aquifer Designation

General

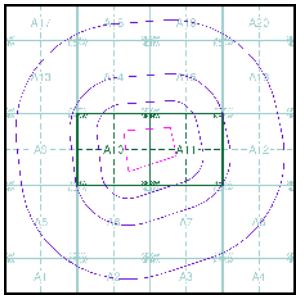
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

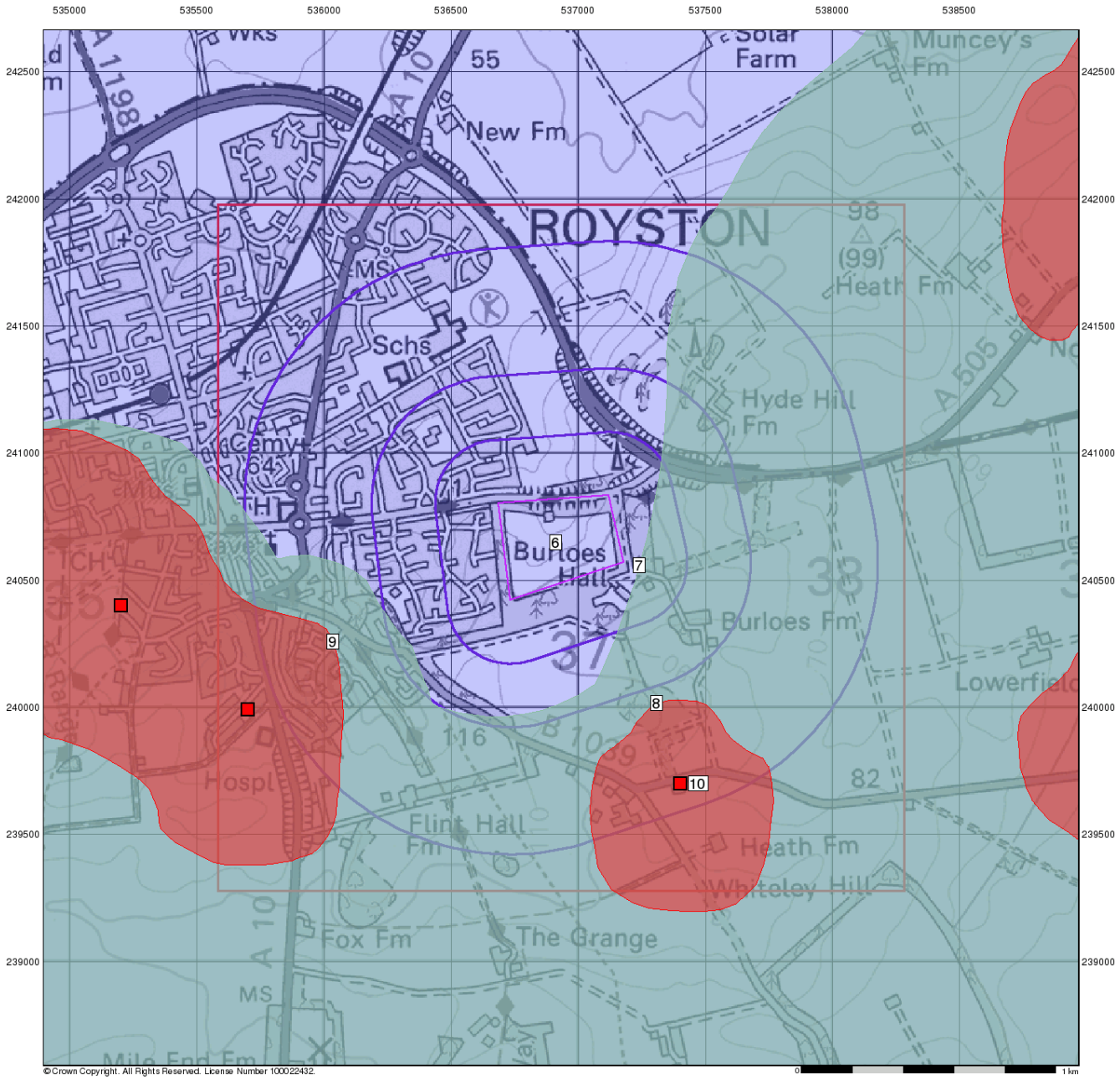


Order Details

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National Grid Reference:	536910, 240650
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Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ



GEA Geotechnical & Environmental Associates

Source Protection Zones

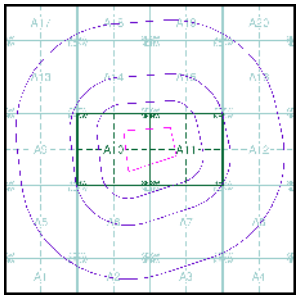
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A

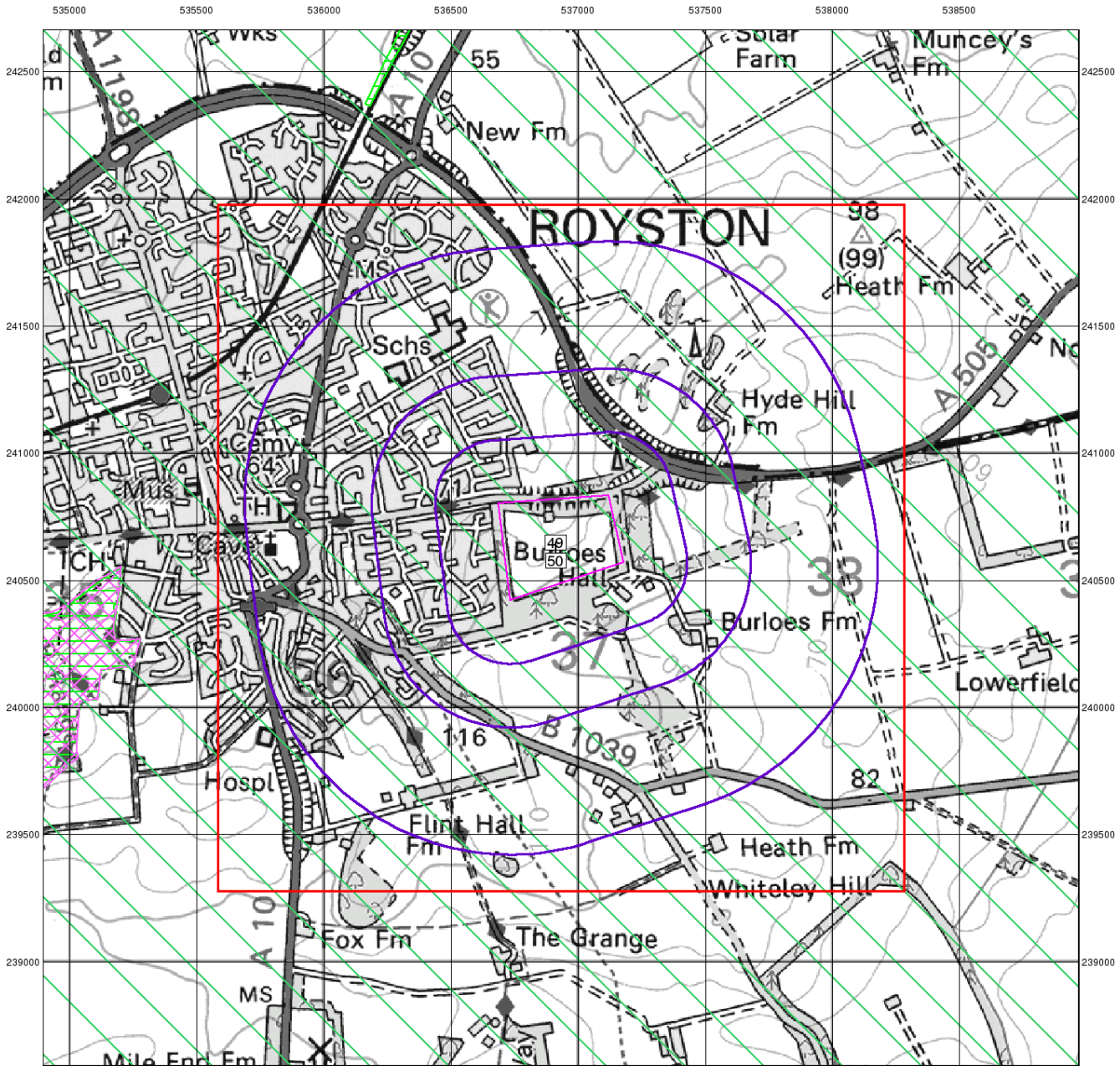


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Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ



GEA Geotechnical & Environmental Associates

Sensitive Land Uses

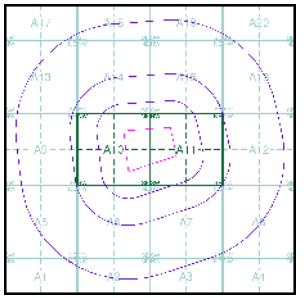
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A



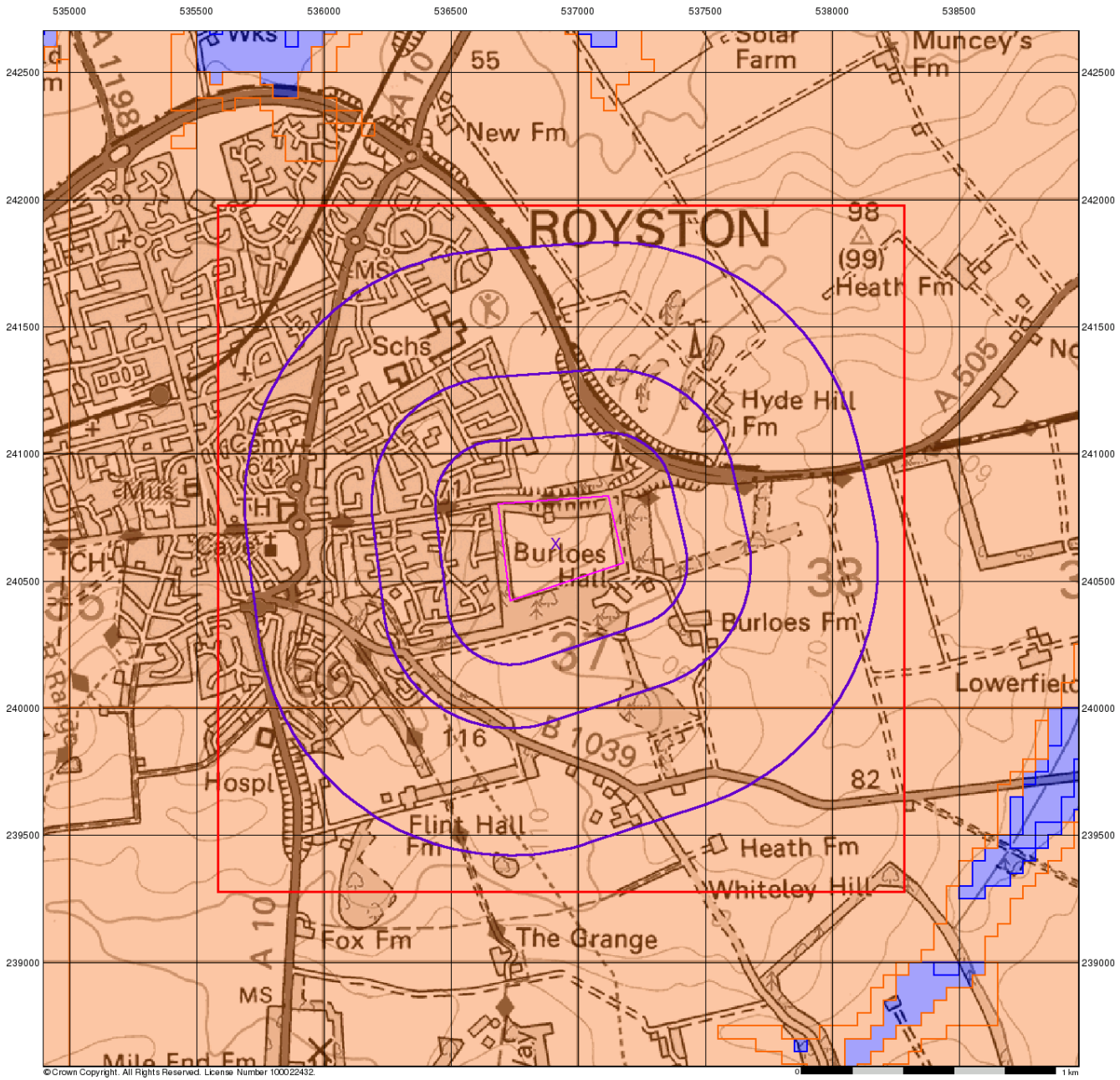
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Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



GEA Geotechnical & Environmental Associates

BGS Flood GFS Data

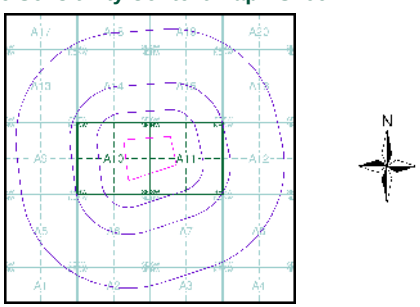
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A

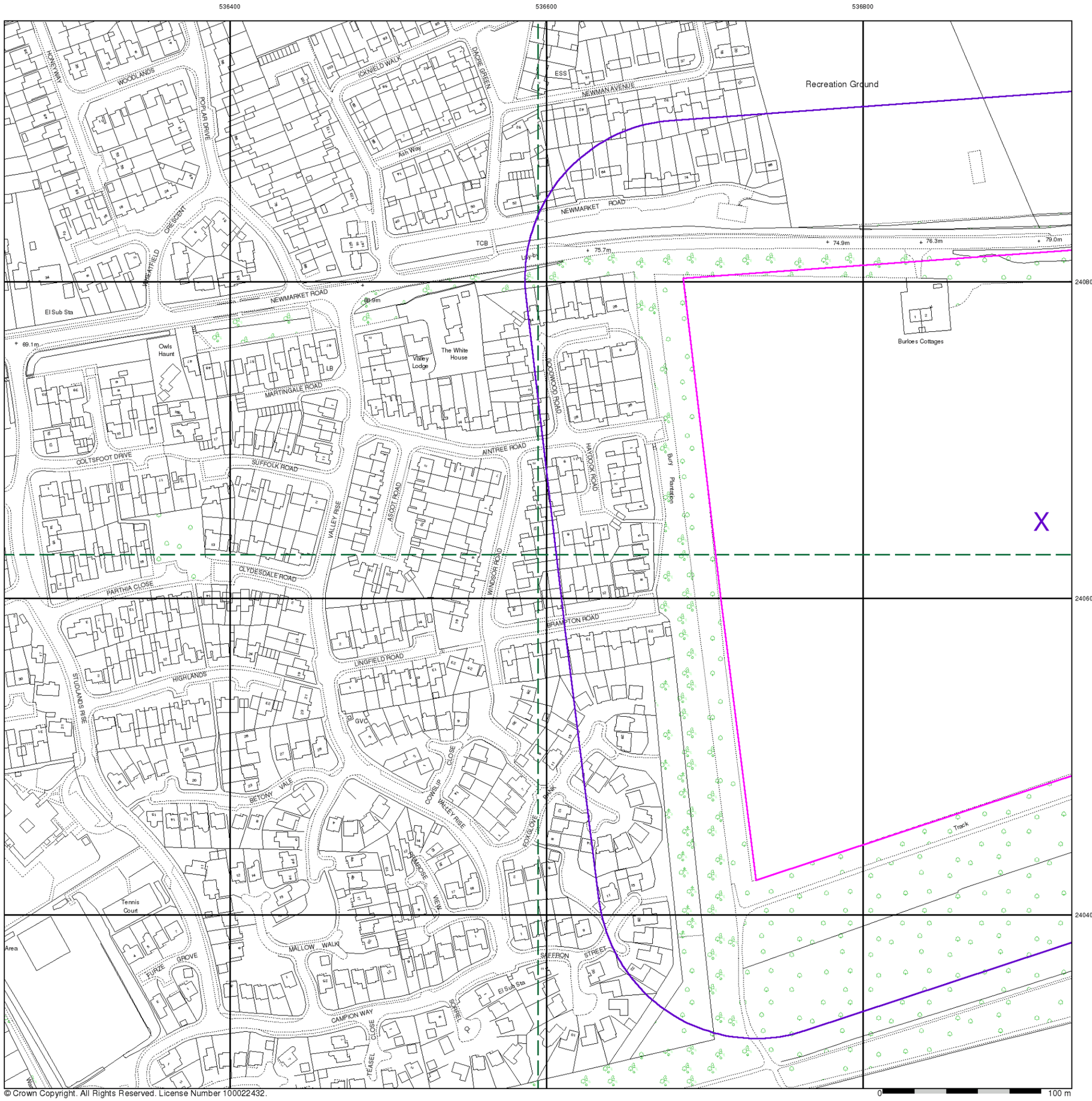


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Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ



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GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

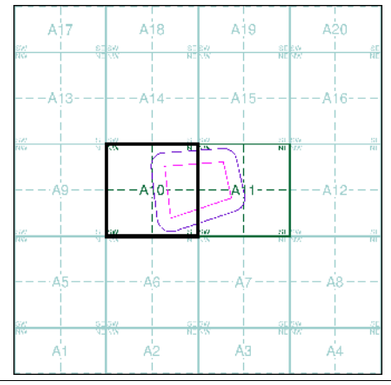
Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Geological

- BGS Recorded Mineral Site

Site Sensitivity Map - Segment A10



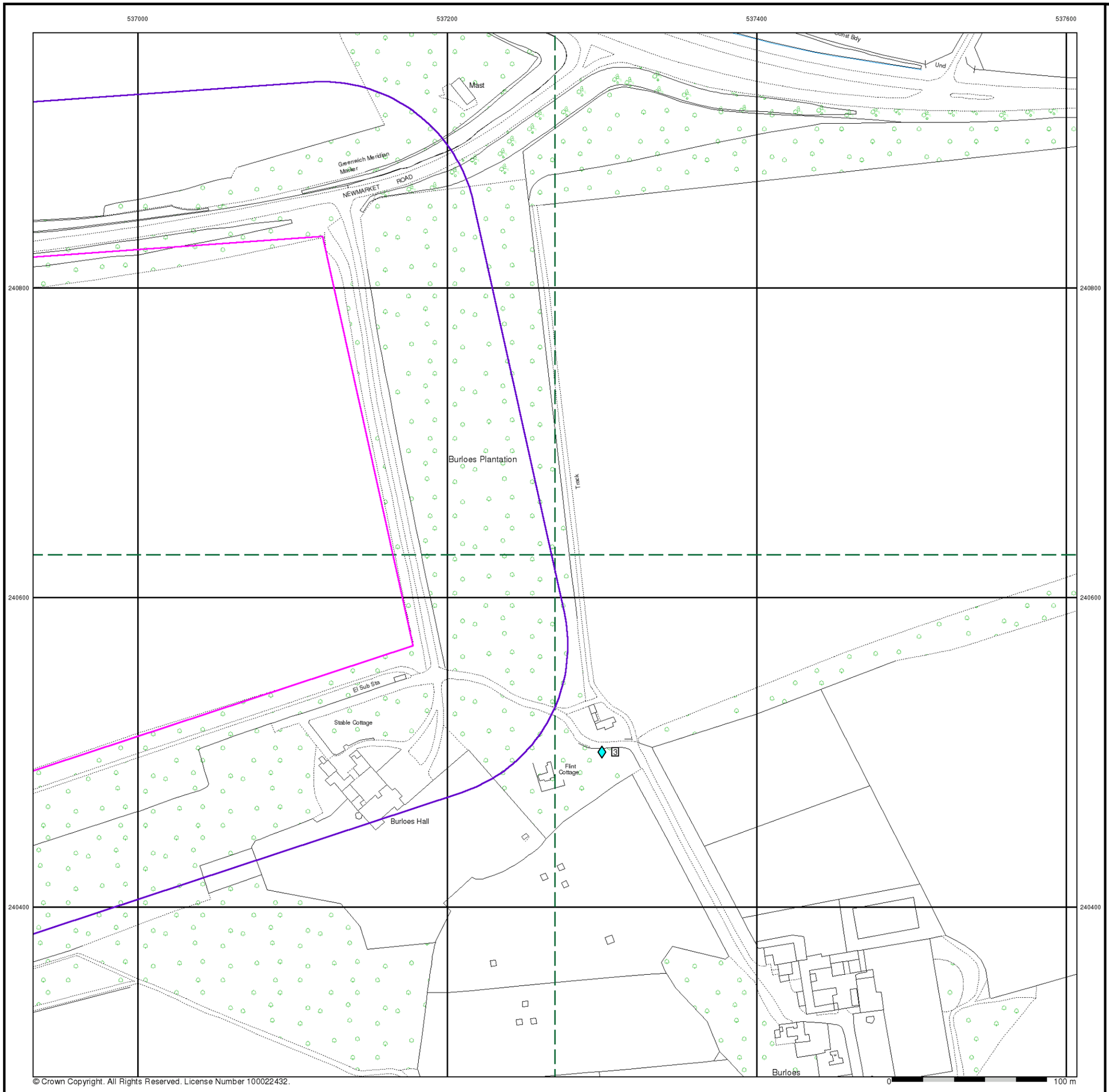
Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Plot Buffer (m):	100

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Geotechnical & Environmental Associates

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID
Several of Type at Location | Pylon | Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

COMAH Site | Explosive Site
NIHHS Site
Planning Hazardous Substance Consent
Planning Hazardous Substance Enforcement

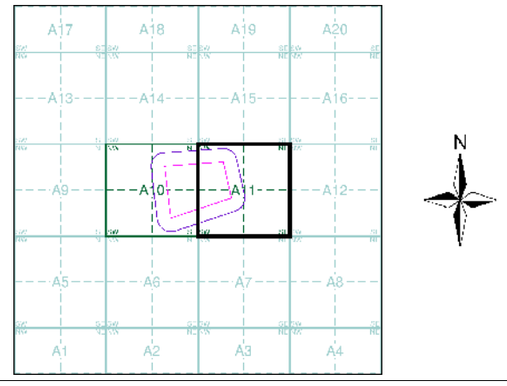
Geological

- BGS Recorded Mineral Site

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Segment A11



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Plot Buffer (m):	100

Site Details

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GEA Geotechnical & Environmental Associates

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point | 8 Map ID

Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
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- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Waste

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- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
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- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

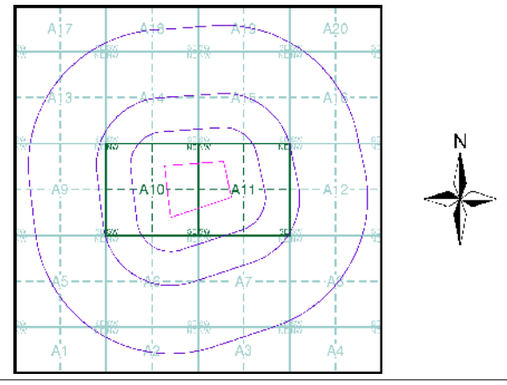
COMAH Site | Explosive Site

- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Geological

- BGS Recorded Mineral Site

Site Sensitivity Map - Slice A



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

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Industrial Land Use Map

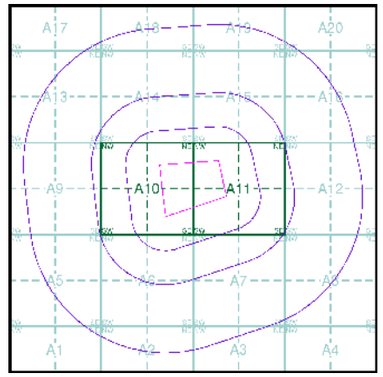
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Gas Pipeline
- Points of Interest - Commercial Services
- Points of Interest - Education and Health
- Points of Interest - Manufacturing and Production
- Points of Interest - Public Infrastructure
- Points of Interest - Recreational and Environmental
- Underground Electrical Cables

Industrial Land Use Map - Slice A



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

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Geotechnical & Environmental Associates

General

Specified Site

Specified Buffer(s)

X Bearing Reference Point

Agency and Hydrological (Flood)

Extreme Flooding from Rivers or Sea without Defences (Zone 2)

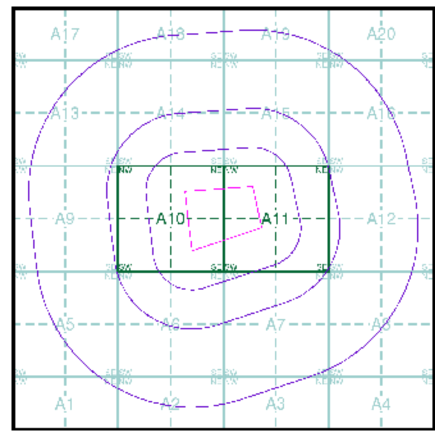
Flooding from Rivers or Sea without Defences (Zone 3)

Area Benefiting from Flood Defence

Flood Water Storage Areas

Flood Defence

Flood Map - Slice A



N

Order Details

Order Number: 95900613_1_1
Customer Ref: J16202
National Grid Reference: 536910, 240650
Slice: A
Site Area (Ha): 14.65
Search Buffer (m): 1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- Map ID
- Several of Type at Location

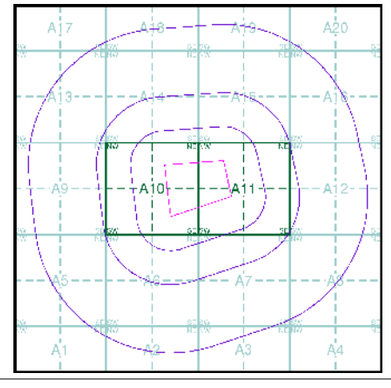
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point
- 8 Map ID

Detailed River Network Data

- Primary River
- Secondary River
- Tertiary River
- Canal
- Canal Tunnel
- Undefined River
- Lake/Reservoir
- Offline Drainage Feature
- Extended Culvert (greater than 50m)
- Underground River (inferred)
- Underground River (local knowledge)
- Downstream of High Water Mark
- Downstream of Seaward Extension
- Not assigned River feature

Contours (height in metres)

Standard Contour — 105 — 100 — 95

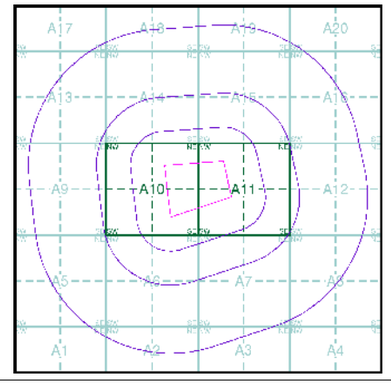
Master Contour

Spot Height *167.3

MLW Mean Low Water

MHW Mean High Water

EA/NRW Detailed River Network Map - Slice A



Order Details

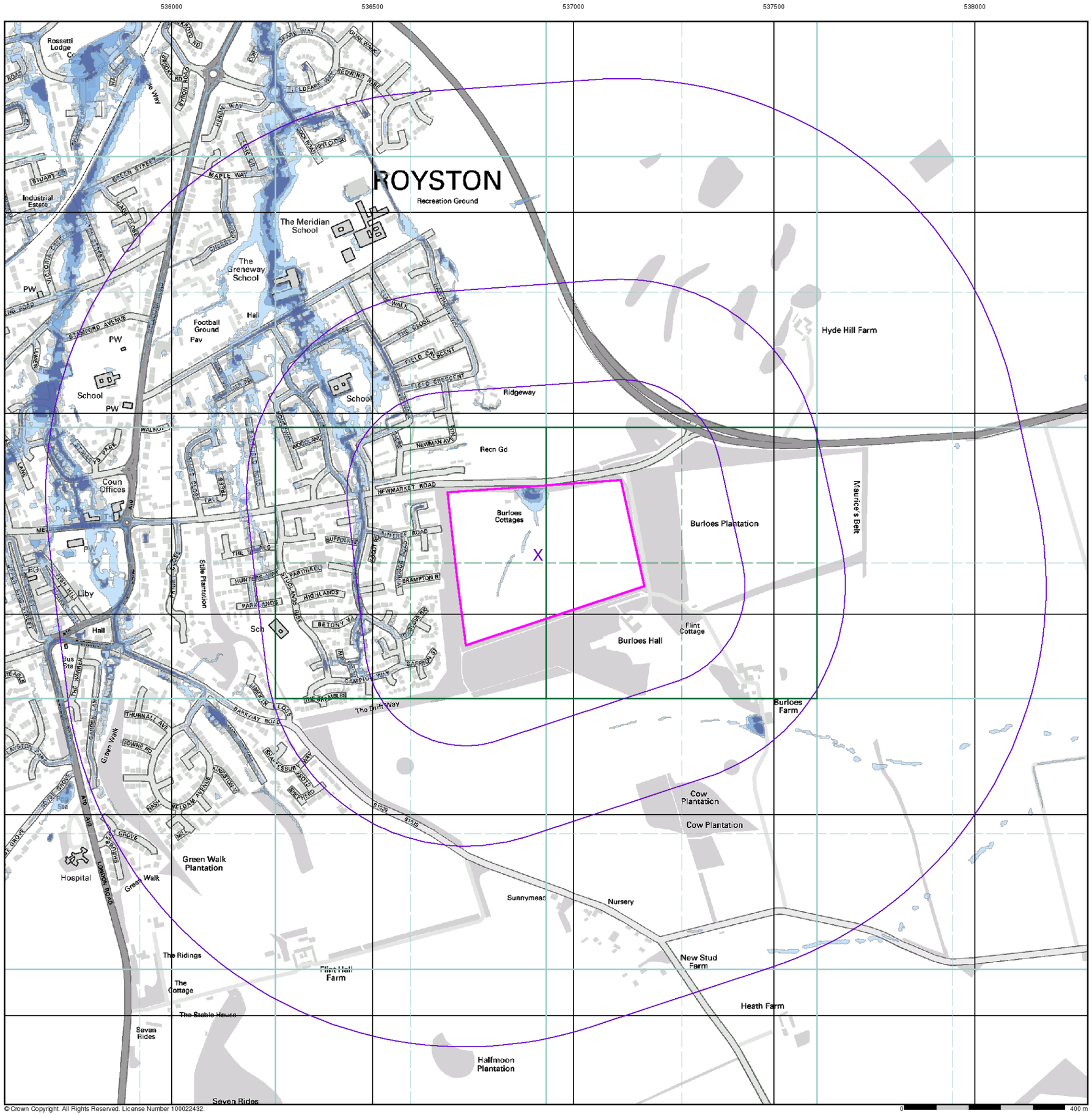
Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
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GEA Geotechnical & Environmental Associates

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Risk of Flooding from Surface Water

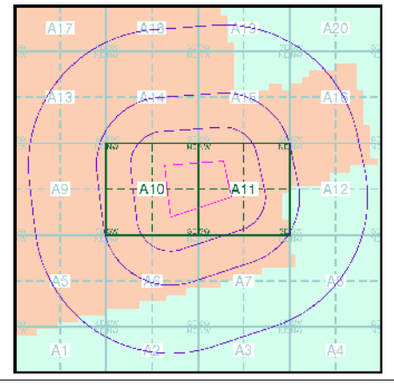
- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

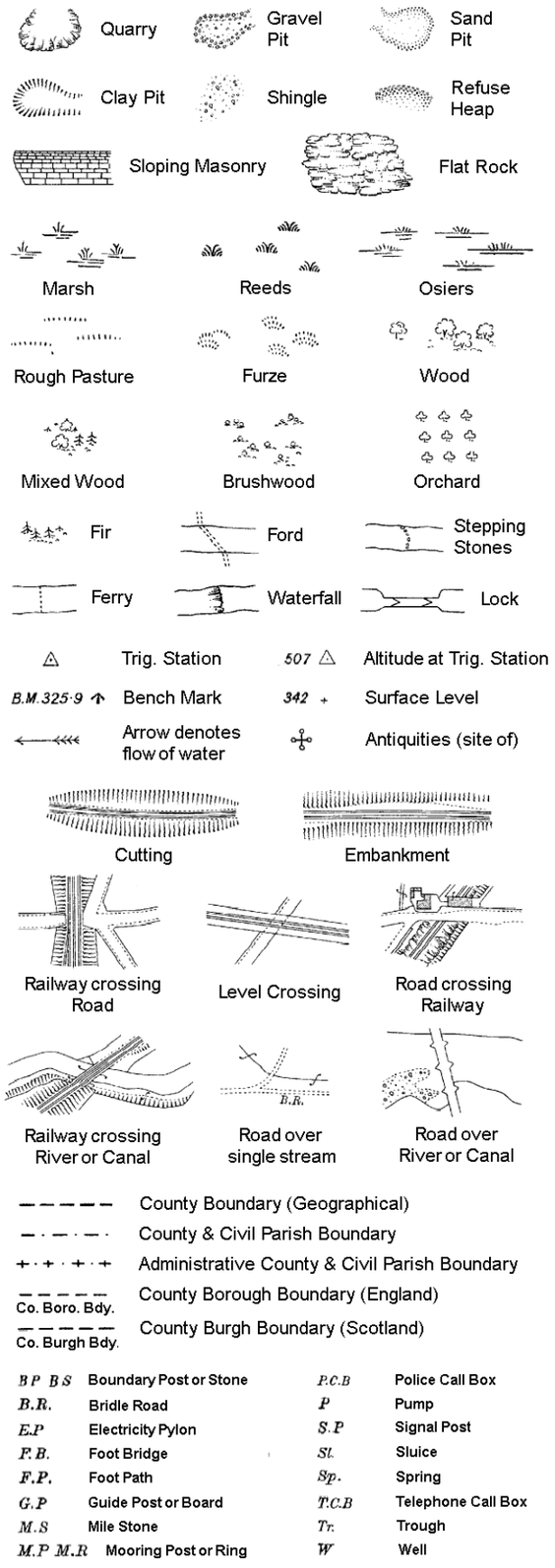
2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group

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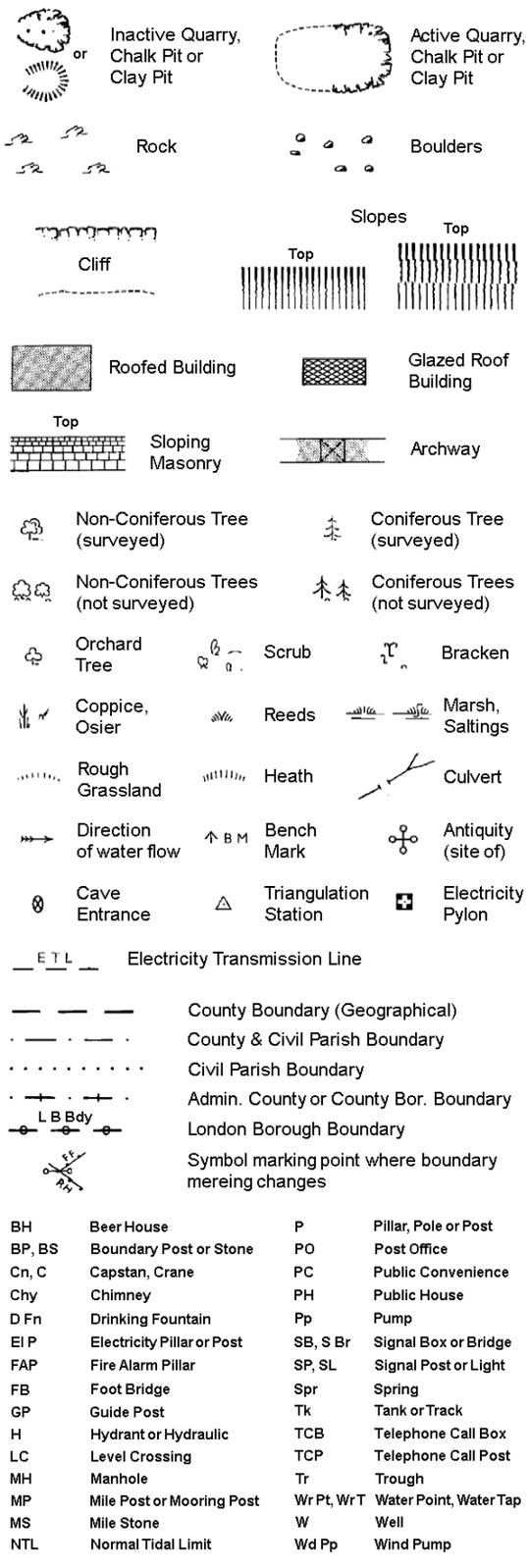
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



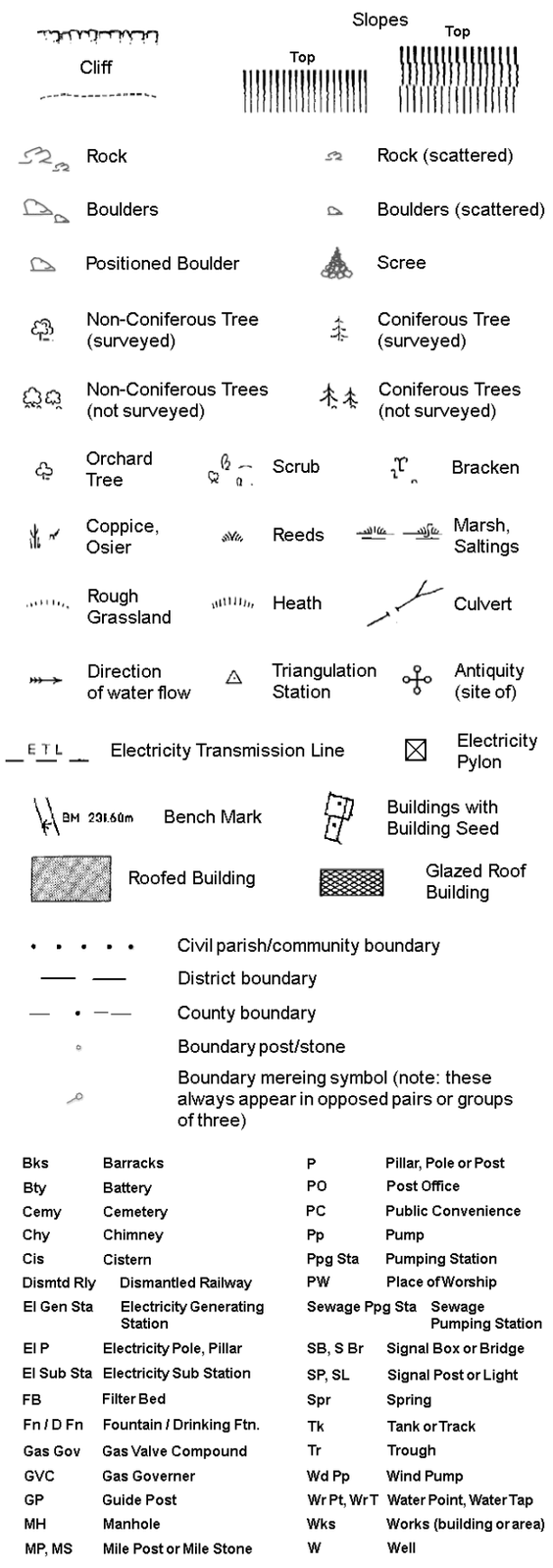
B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



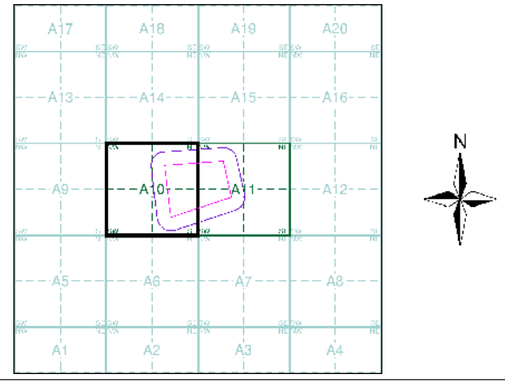
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place ofWorship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

GEA Geotechnical & Environmental Associates

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Hertfordshire	1:2,500	1878	2
Cambridgeshire & Isle Of Ely	1:2,500	1887	3
Hertfordshire	1:2,500	1898	4
Cambridgeshire & Isle Of Ely	1:2,500	1903	5
Hertfordshire	1:2,500	1921	6
Hertfordshire	1:2,500	1938	7
Ordnance Survey Plan	1:2,500	1971	8
Supply of Unpublished Survey Information	1:2,500	1973	9
Ordnance Survey Plan	1:2,500	1977	10
Additional SIMs	1:2,500	1979	11
Ordnance Survey Plan	1:2,500	1984	12
Additional SIMs	1:2,500	1987	13
Additional SIMs	1:2,500	1988	14
Additional SIMs	1:2,500	1989	15
Large-Scale National Grid Data	1:2,500	1993	16
Historical Aerial Photography	1:2,500	2000	17

Historical Map - Segment A10



Order Details

Order Number: 95900613_1_1
Customer Ref: J16202
National Grid Reference: 536910, 240650
Slice: A
Site Area (Ha): 14.65
Search Buffer (m): 100

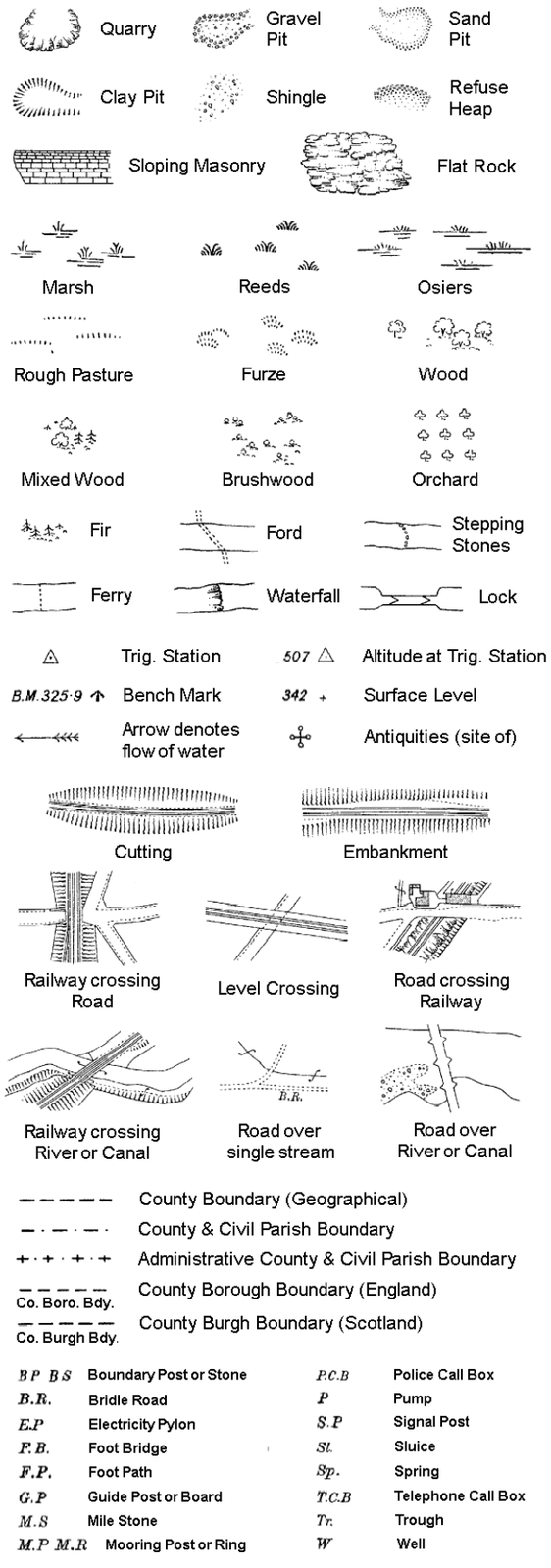
Site Details

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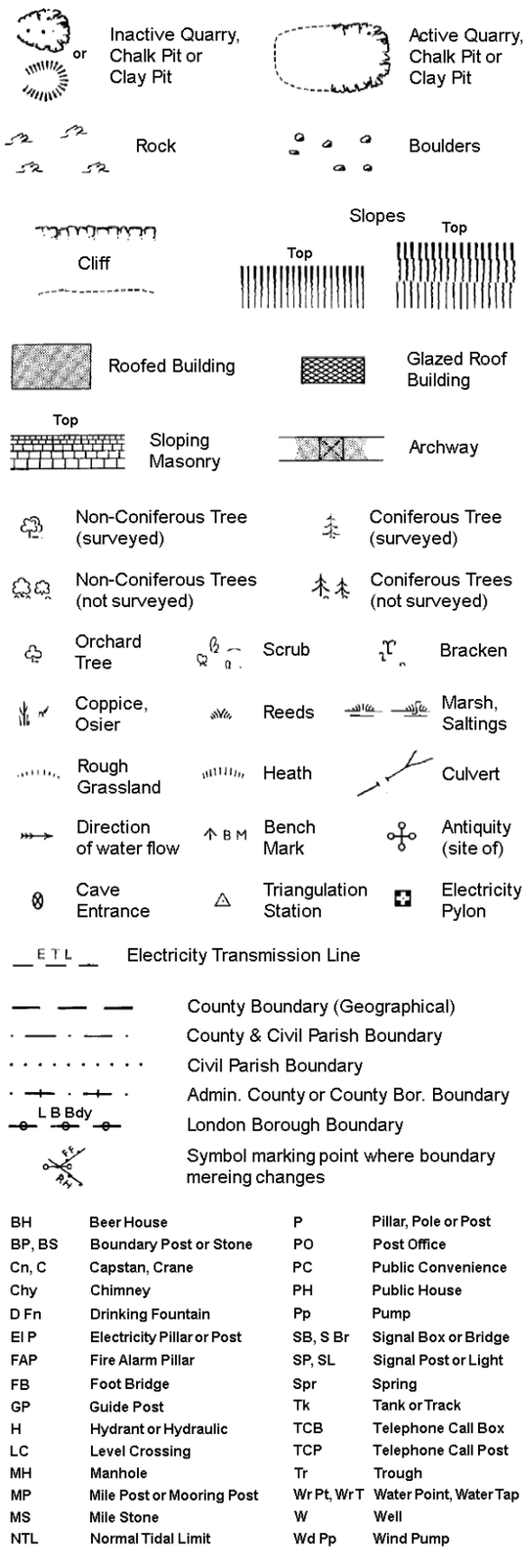
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



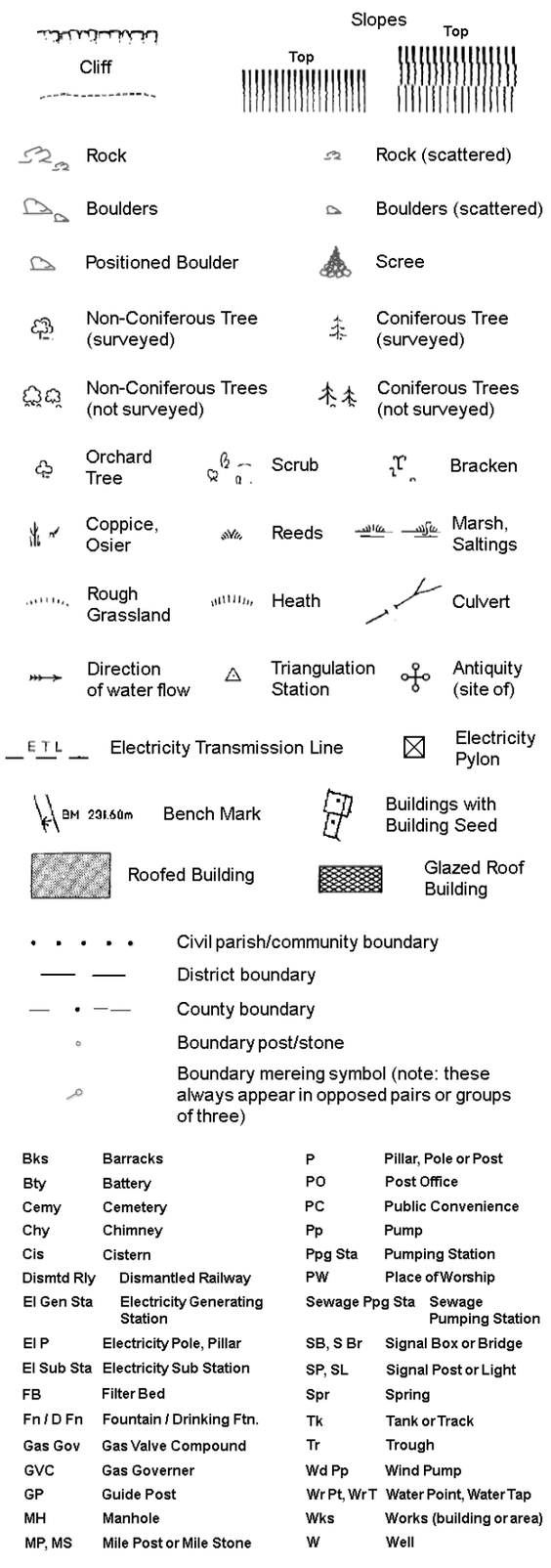
B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH	Beer House	P	Pillar, Pole or Post
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Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
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MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



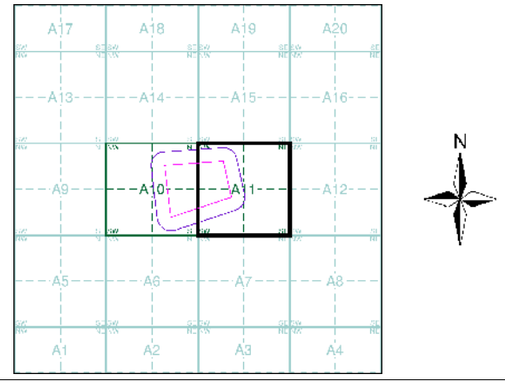
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place ofWorship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

GEA Geotechnical & Environmental Associates

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
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Hertfordshire	1:2,500	1898	4
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Supply of Unpublished Survey Information	1:2,500	1973	9
Ordnance Survey Plan	1:2,500	1977 - 1984	10
Additional SIMs	1:2,500	1979 - 1983	11
Ordnance Survey Plan	1:2,500	1984	12
Additional SIMs	1:2,500	1987	13
Additional SIMs	1:2,500	1988	14
Additional SIMs	1:2,500	1989	15
Large-Scale National Grid Data	1:2,500	1993	16
Historical Aerial Photography	1:2,500	2000	17

Historical Map - Segment A11



Order Details

Order Number: 95900613_1_1
Customer Ref: J16202
National Grid Reference: 536910, 240650
Slice: A
Site Area (Ha): 14.65
Search Buffer (m): 100

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Electricity Transmission Line
Sloping Masonry
Pole
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

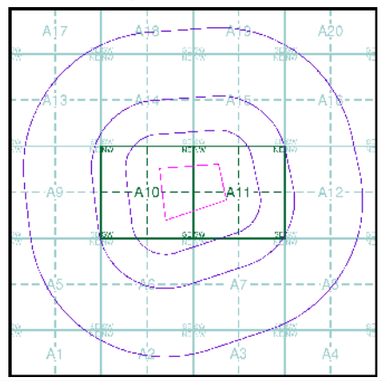
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Essex	1:10,560	1880	2
Hertfordshire	1:10,560	1882 - 1883	3
Cambridgeshire & Isle Of Ely	1:10,560	1886	4
Hertfordshire	1:10,560	1899	5
Cambridgeshire & Isle Of Ely	1:10,560	1903 - 1904	6
Essex	1:10,560	1924	7
Hertfordshire	1:10,560	1925	8
Hertfordshire	1:10,560	1925	9
Hertfordshire	1:10,560	1938 - 1947	10
Essex	1:10,560	1938	11
Cambridgeshire & Isle Of Ely	1:10,560	1950	12
Hertfordshire	1:10,560	1950	13
Essex	1:10,560	1951	14
Ordnance Survey Plan	1:10,000	1960	15
Ordnance Survey Plan	1:10,000	1966	16
Ordnance Survey Plan	1:10,000	1973	17
Ordnance Survey Plan	1:10,000	1980 - 1984	18
Ordnance Survey Plan	1:10,000	1987	19
Ordnance Survey Plan	1:10,000	1990	20
10K Raster Mapping	1:10,000	1999	21
10K Raster Mapping	1:10,000	2006	22
VectorMap Local	1:10,000	2016	23

Historical Map - Slice A



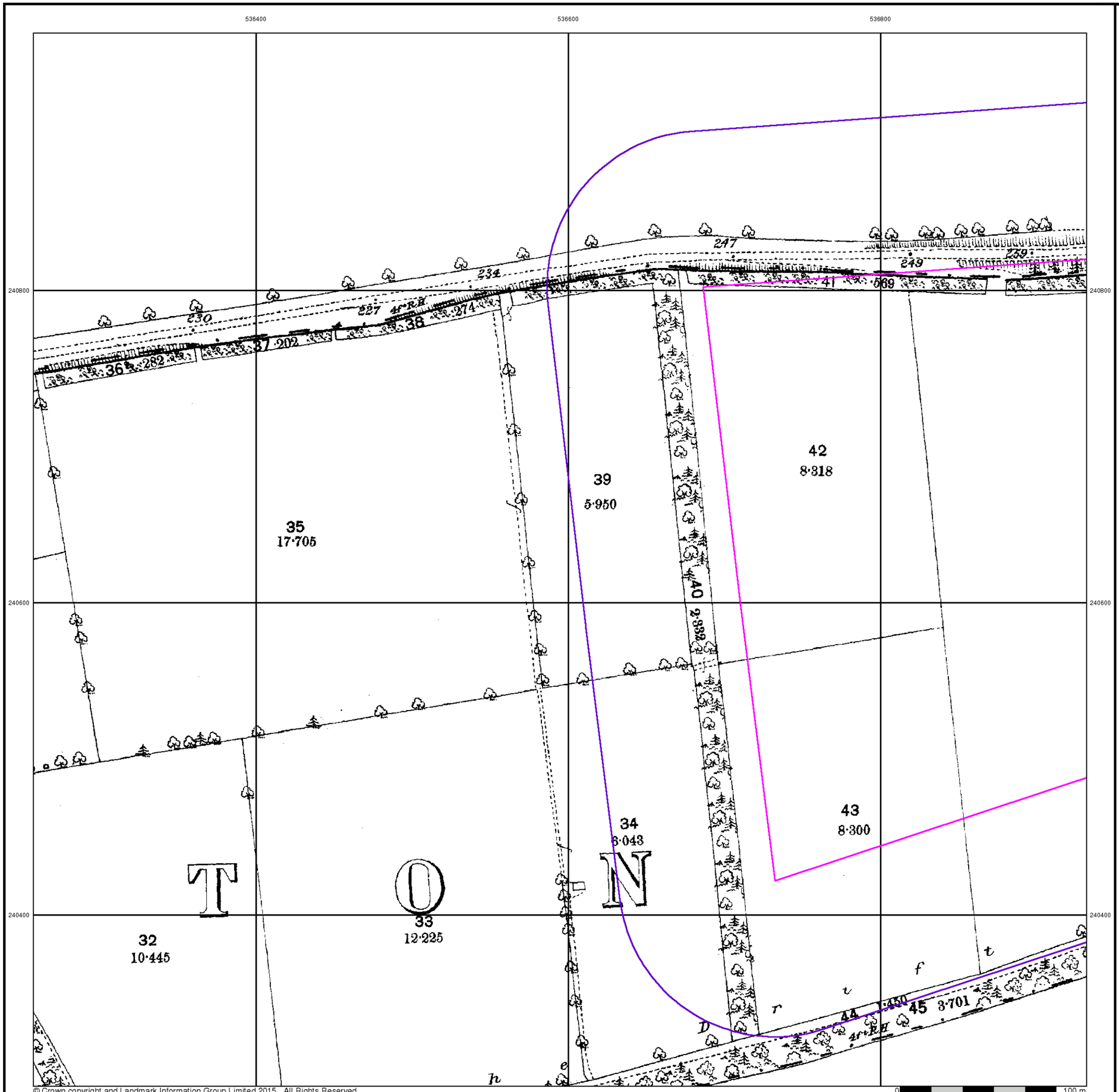
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Order Number: 95900613_1_1
Customer Ref: J16202
National Grid Reference: 536910, 240650
Slice: A
Site Area (Ha): 14.65
Search Buffer (m): 1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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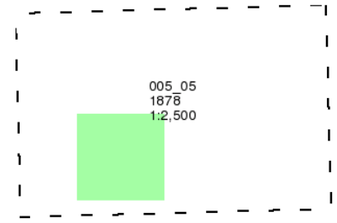
Hertfordshire

Published 1878

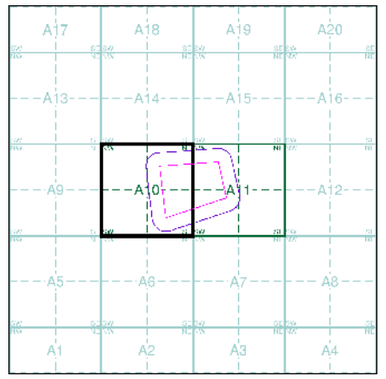
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

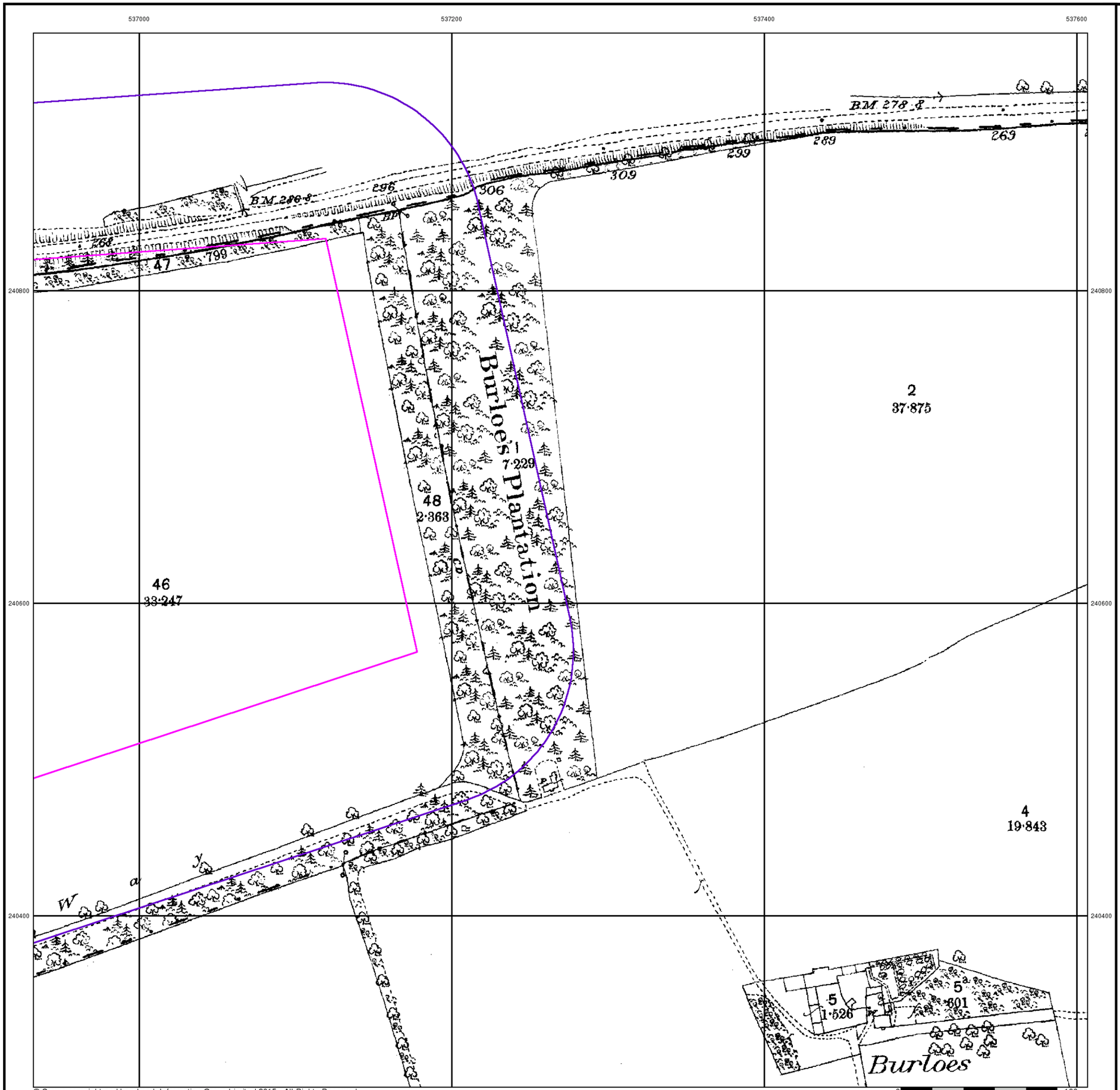
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Slice:	A
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Search Buffer (m):	100

Site Details

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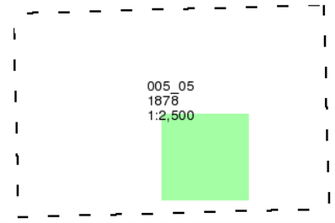
Hertfordshire

Published 1878

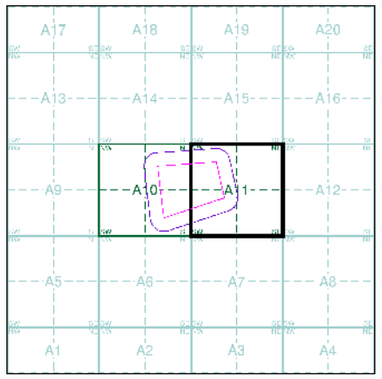
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

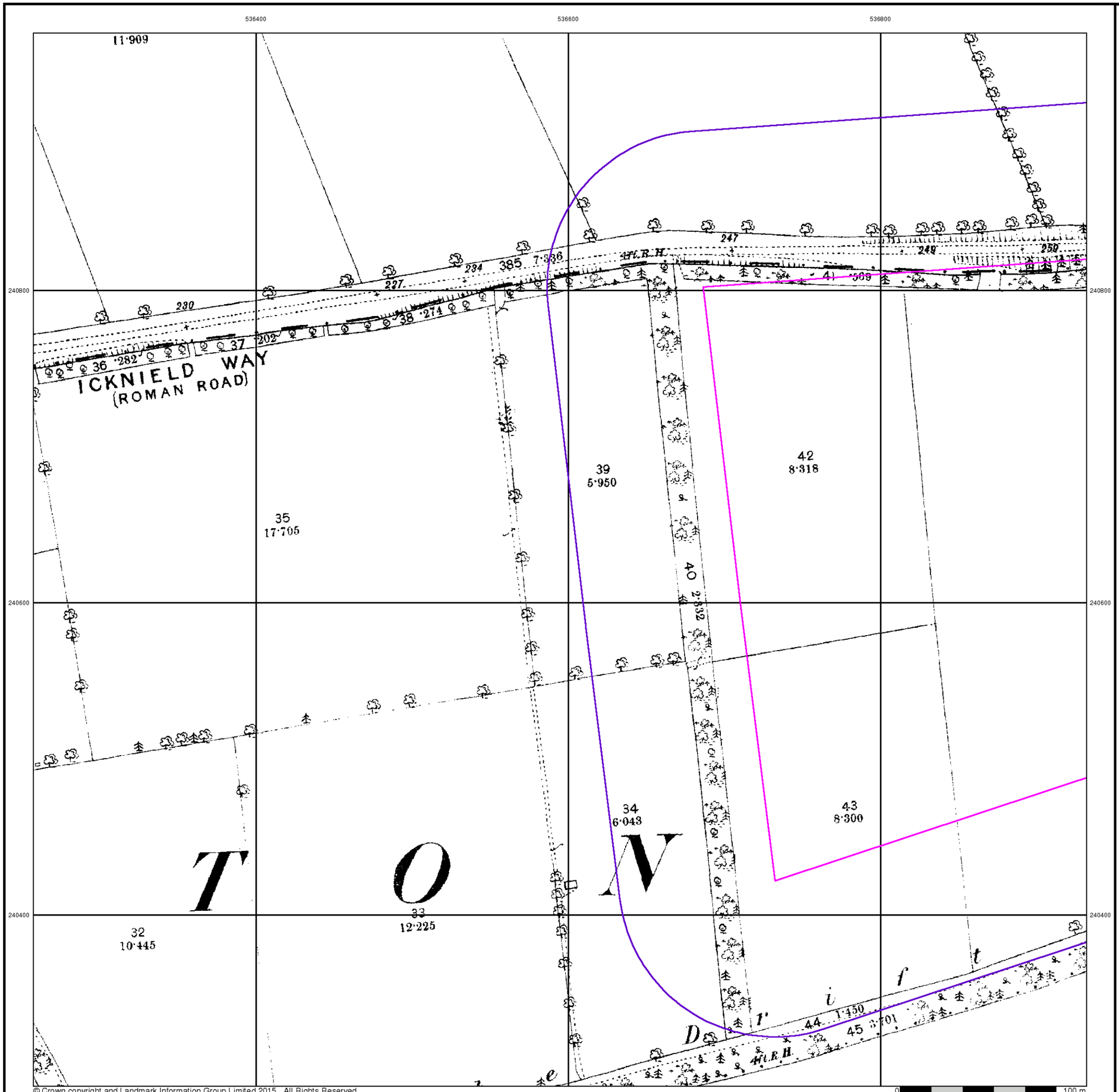
Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

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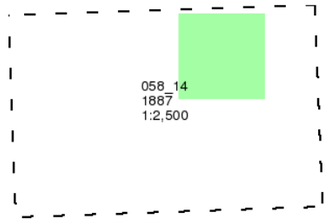
Cambridgeshire & Isle Of Ely

Published 1887

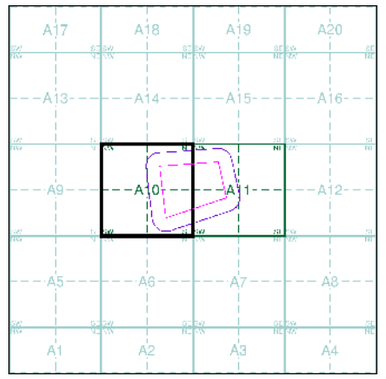
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



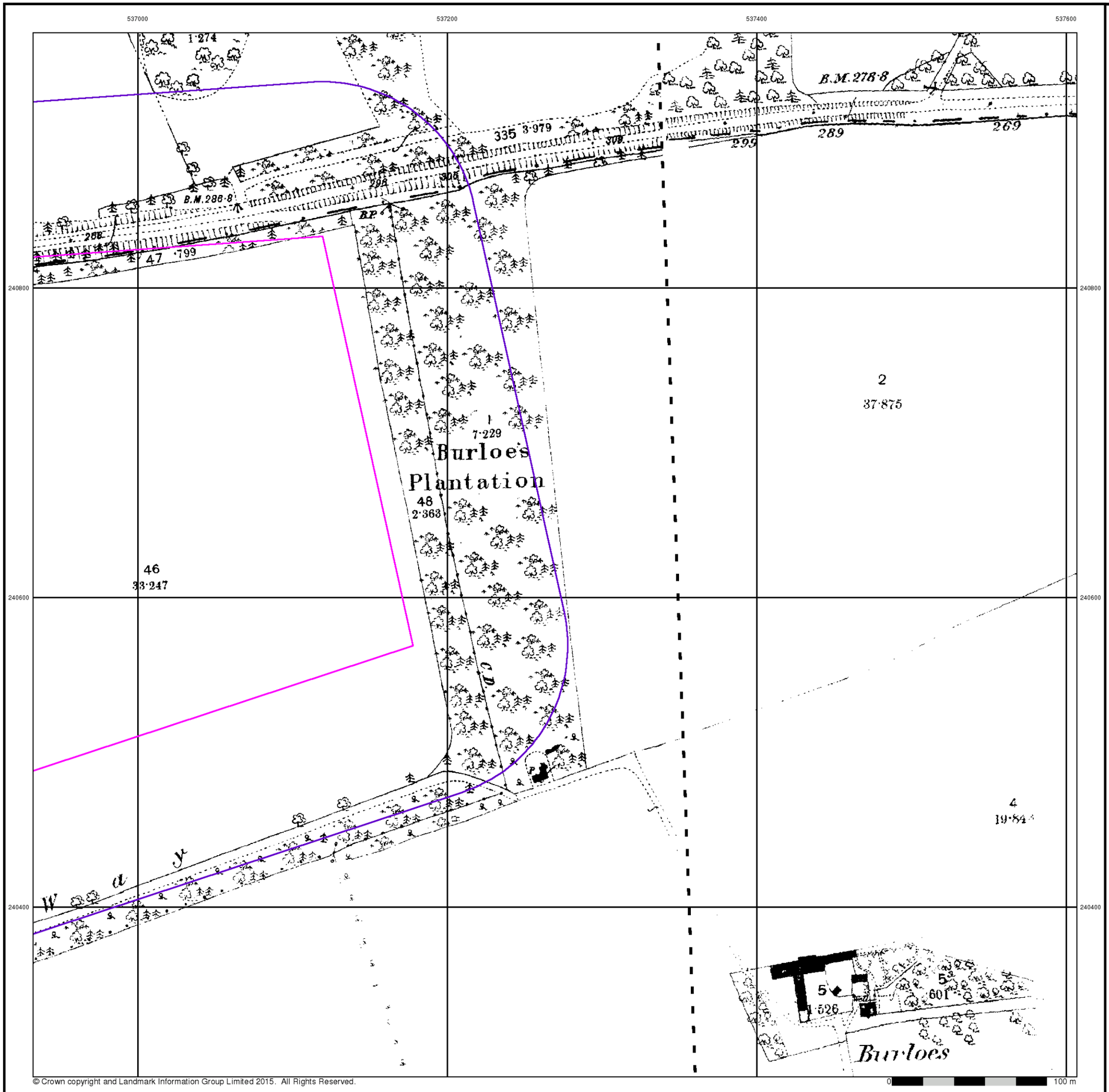
Order Details

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Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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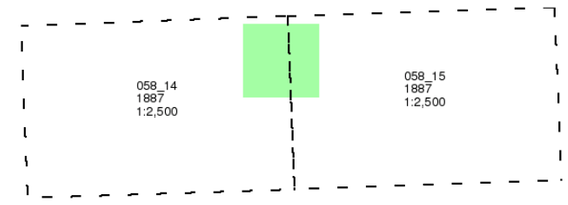
Cambridgeshire & Isle Of Ely

Published 1887

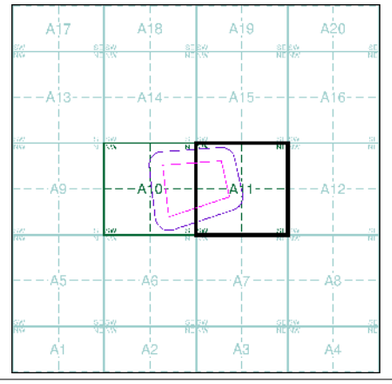
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

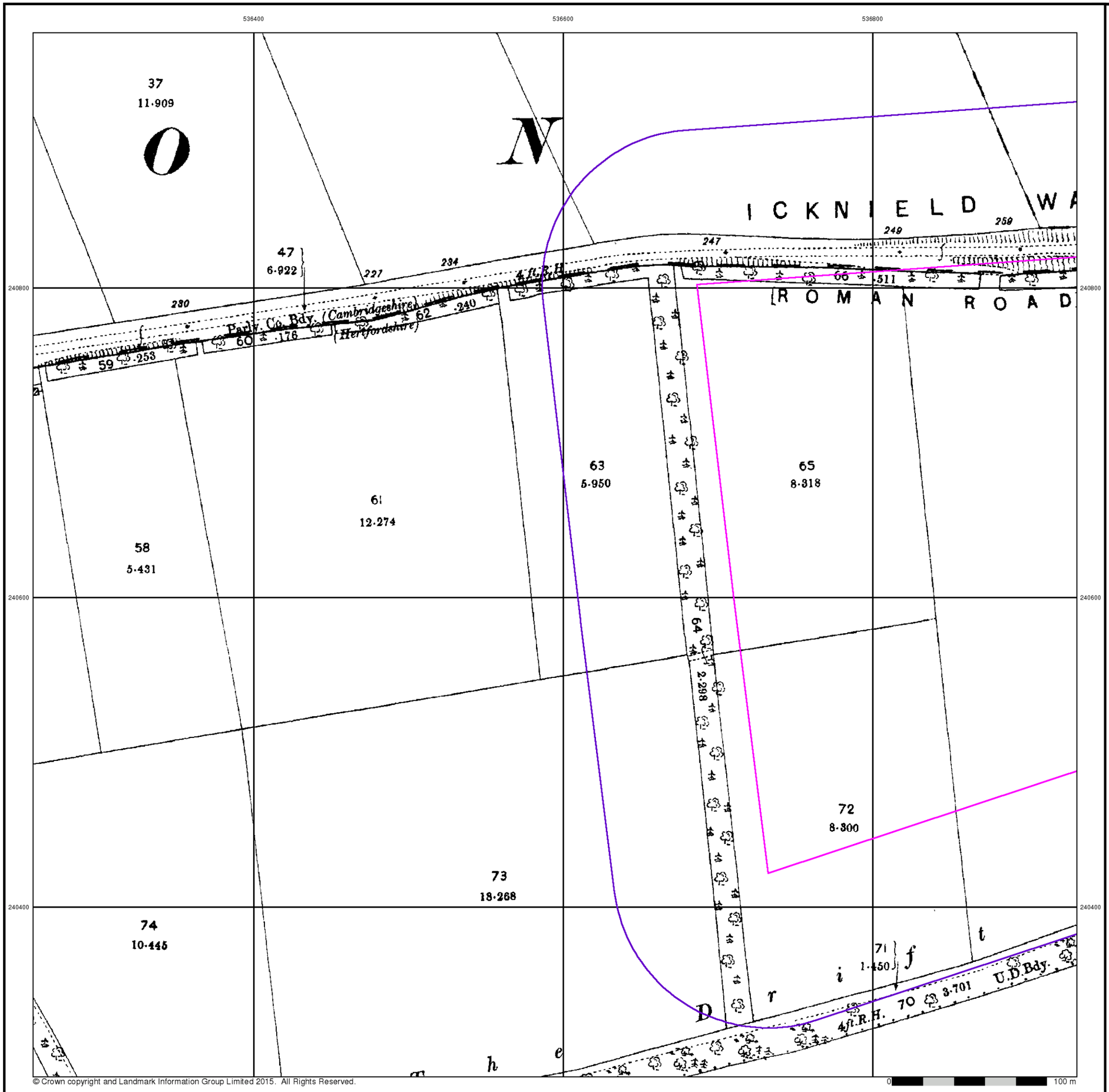
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Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

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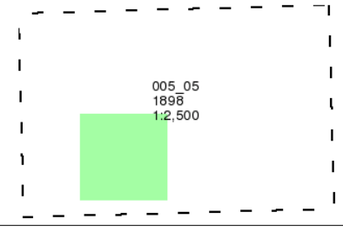
Hertfordshire

Published 1898

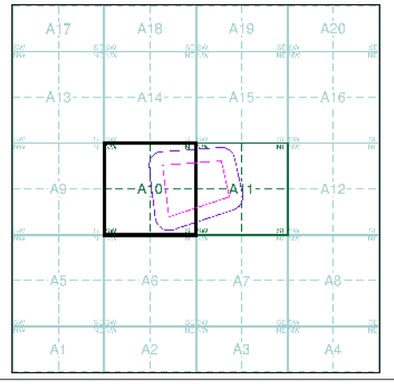
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



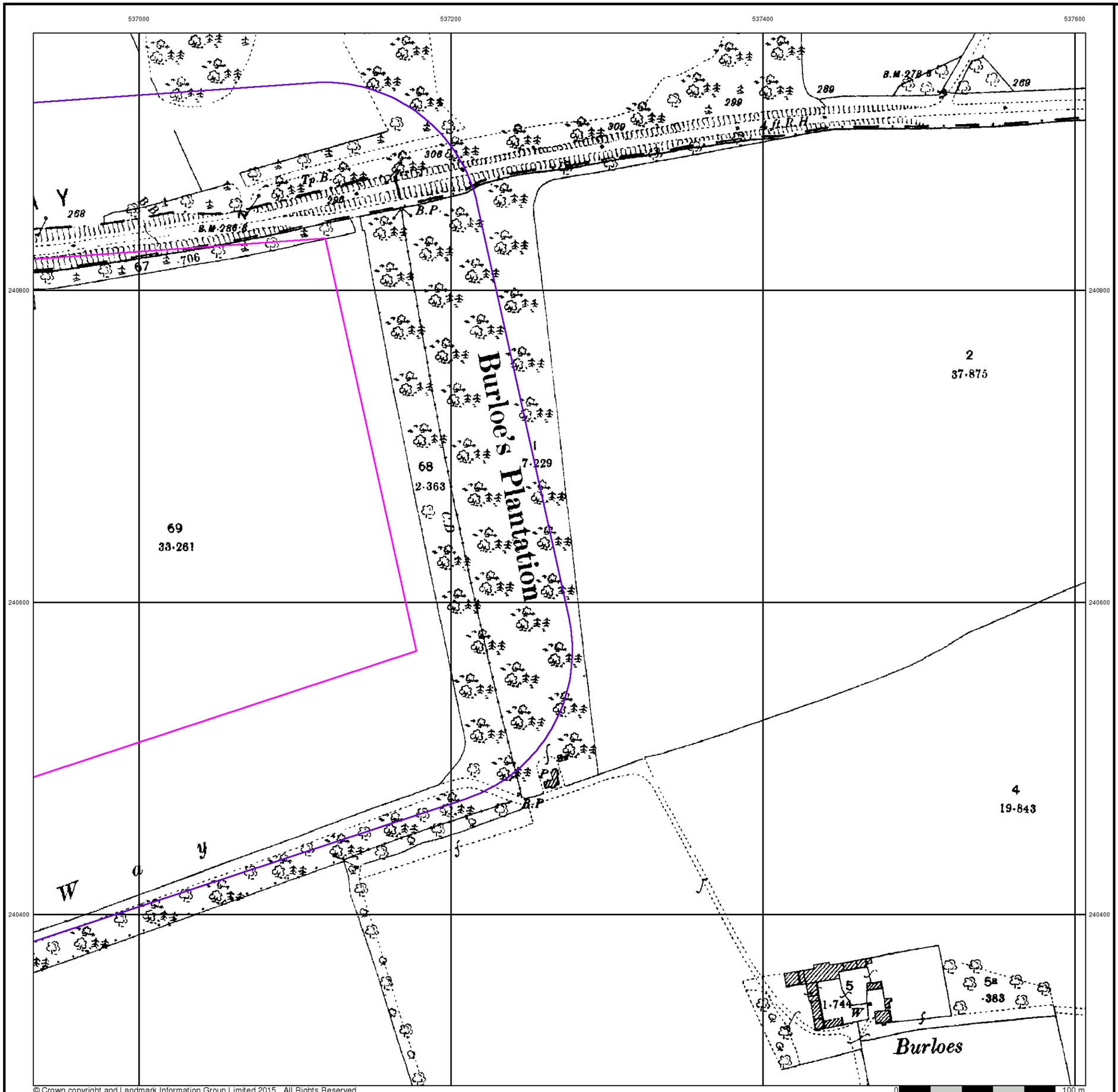
Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

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0 100 m

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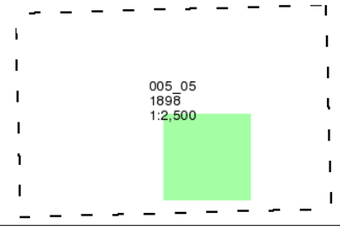
Hertfordshire

Published 1898

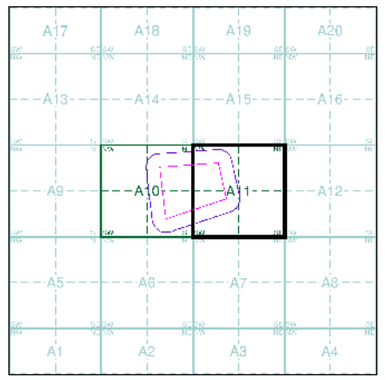
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

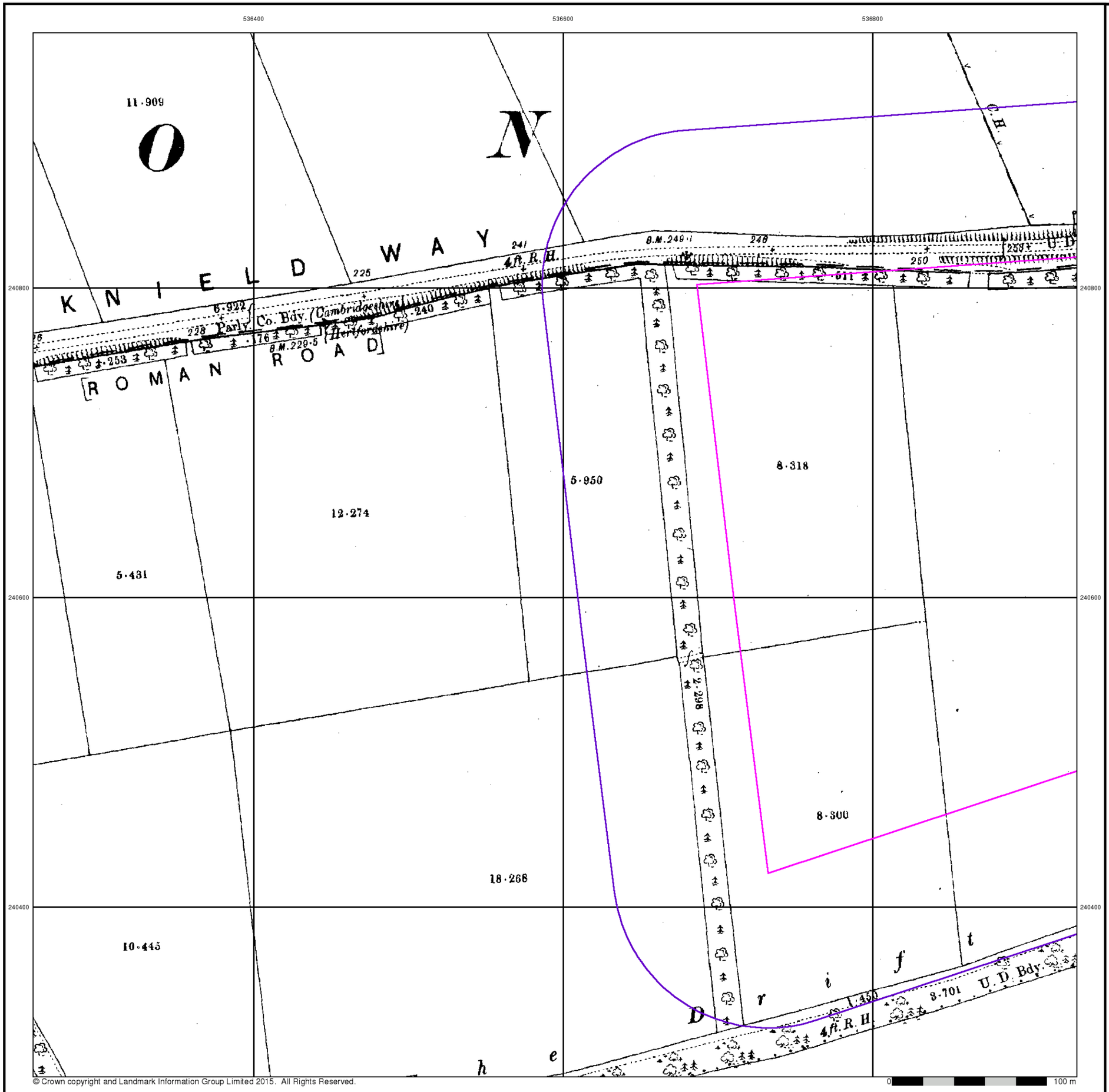
Order Number:	95900613_1_1
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Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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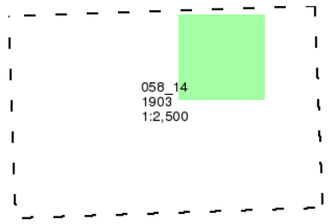
Cambridgeshire & Isle Of Ely

Published 1903

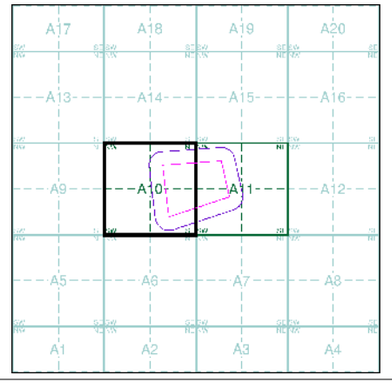
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Map Name(s) and Date(s)



Historical Map - Segment A10



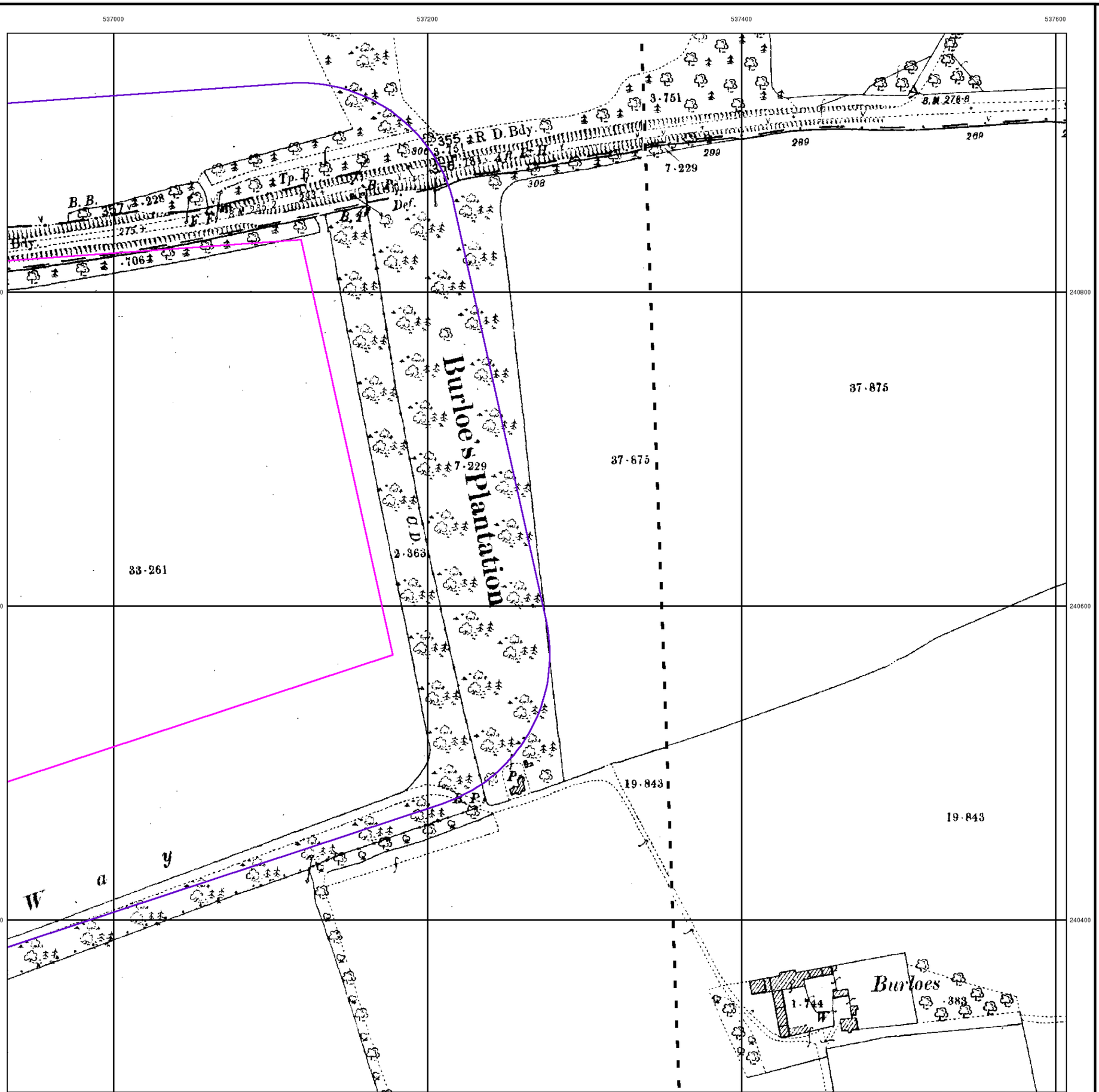
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Search Buffer (m):	100

Site Details

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0 100 m

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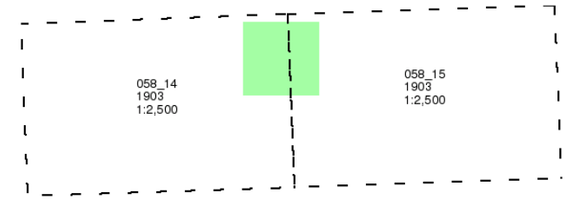
Cambridgeshire & Isle Of Ely

Published 1903

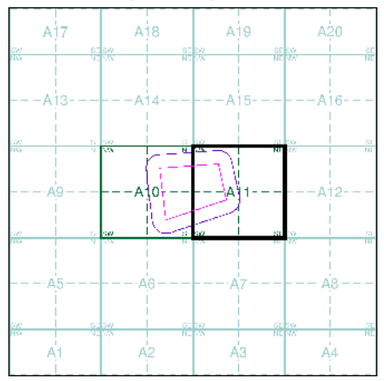
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Map Name(s) and Date(s)



Historical Map - Segment A11



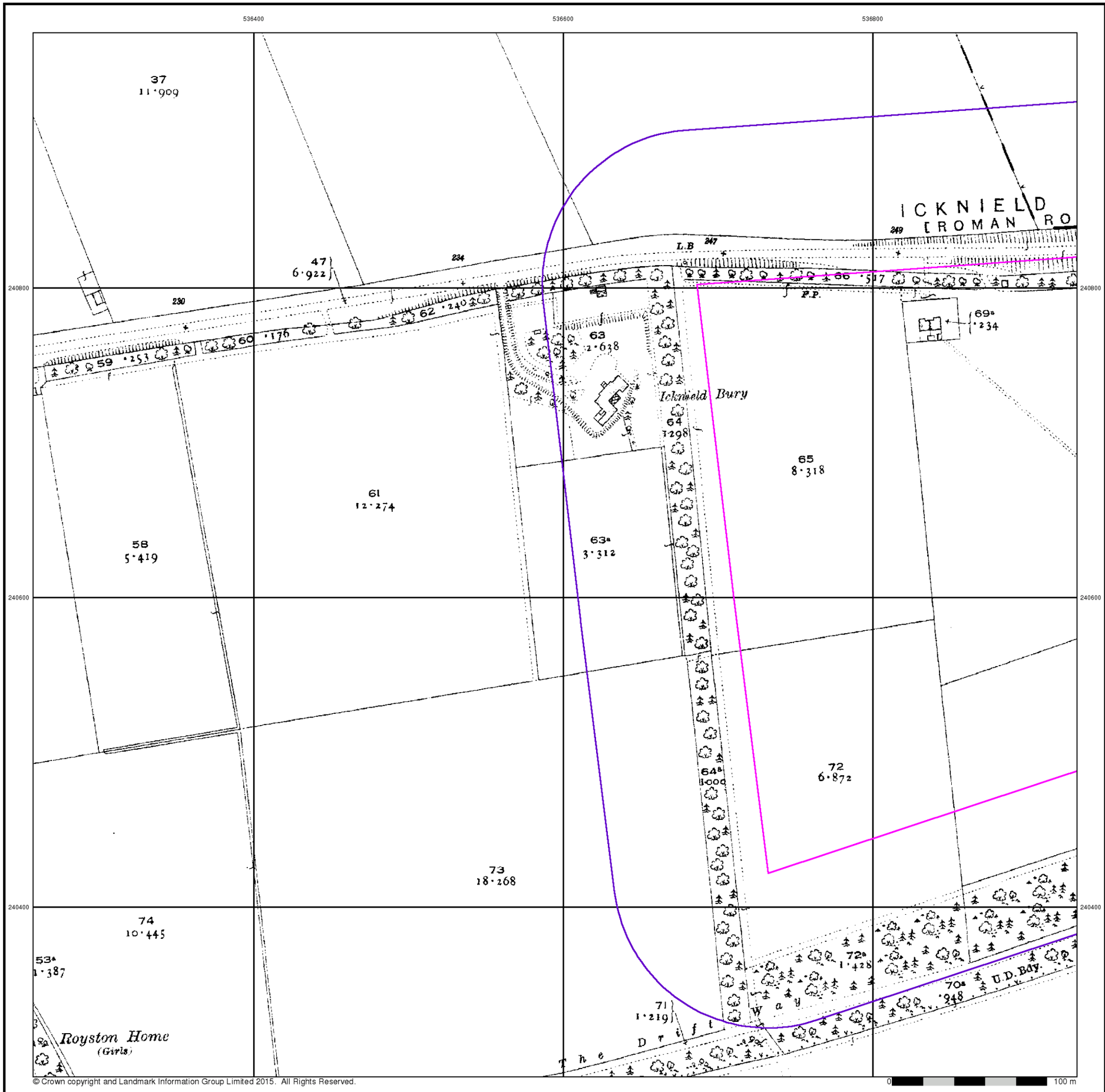
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Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

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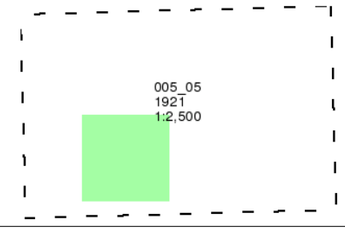
Hertfordshire

Published 1921

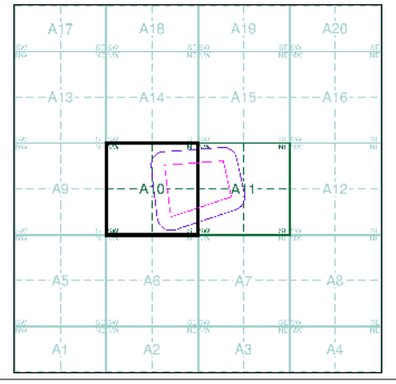
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



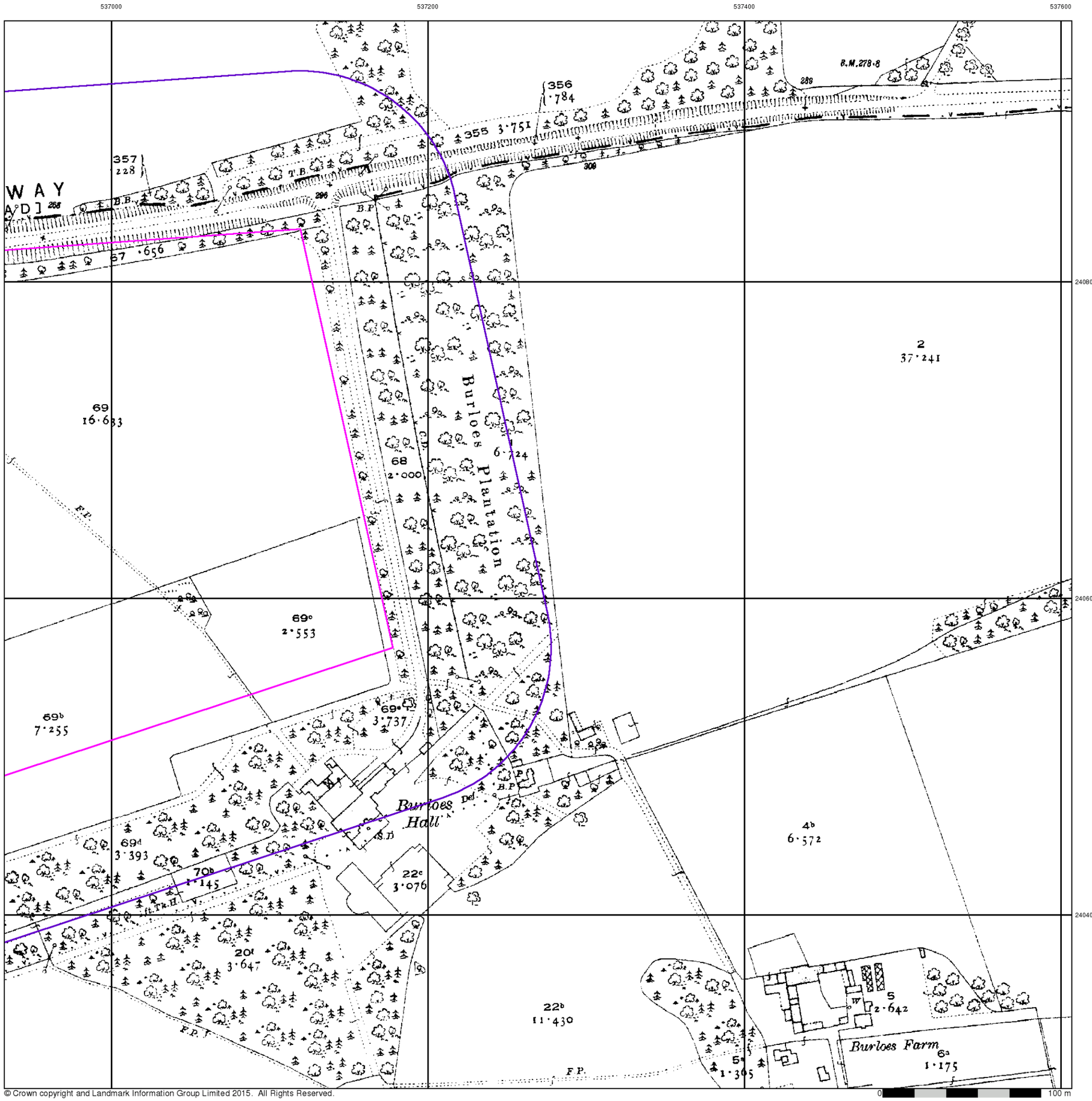
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Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

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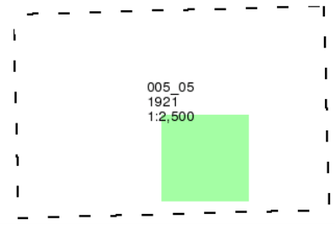
Hertfordshire

Published 1921

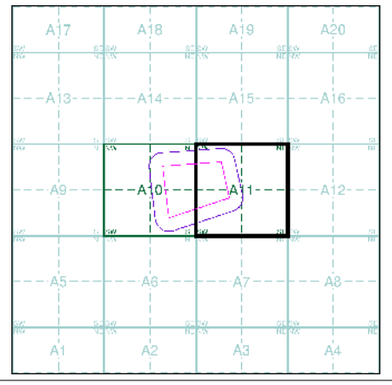
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11

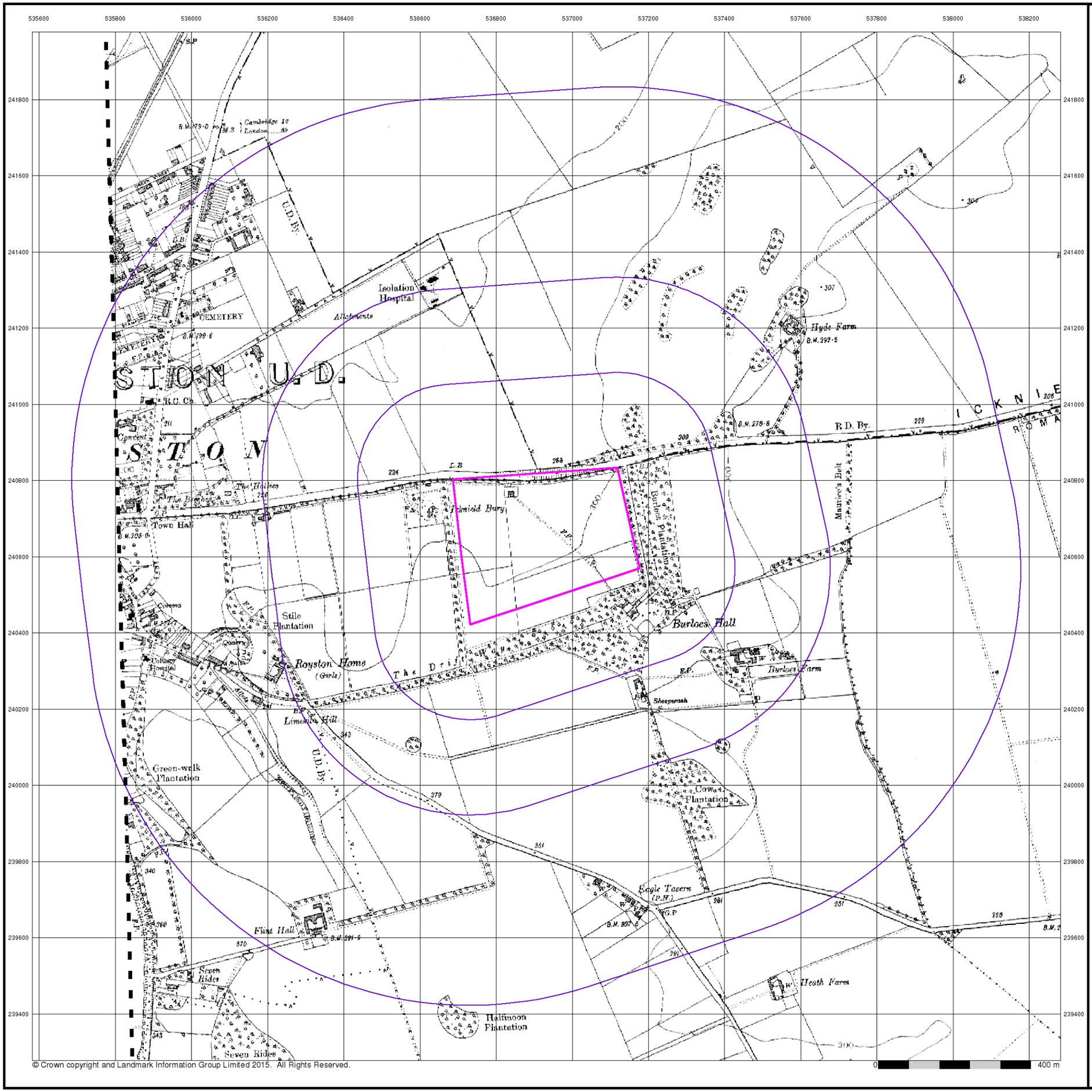


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Site Details

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Essex

Published 1924

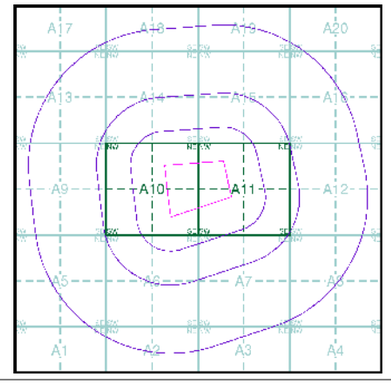
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

00600
1924
1:10,560

Historical Map - Slice A



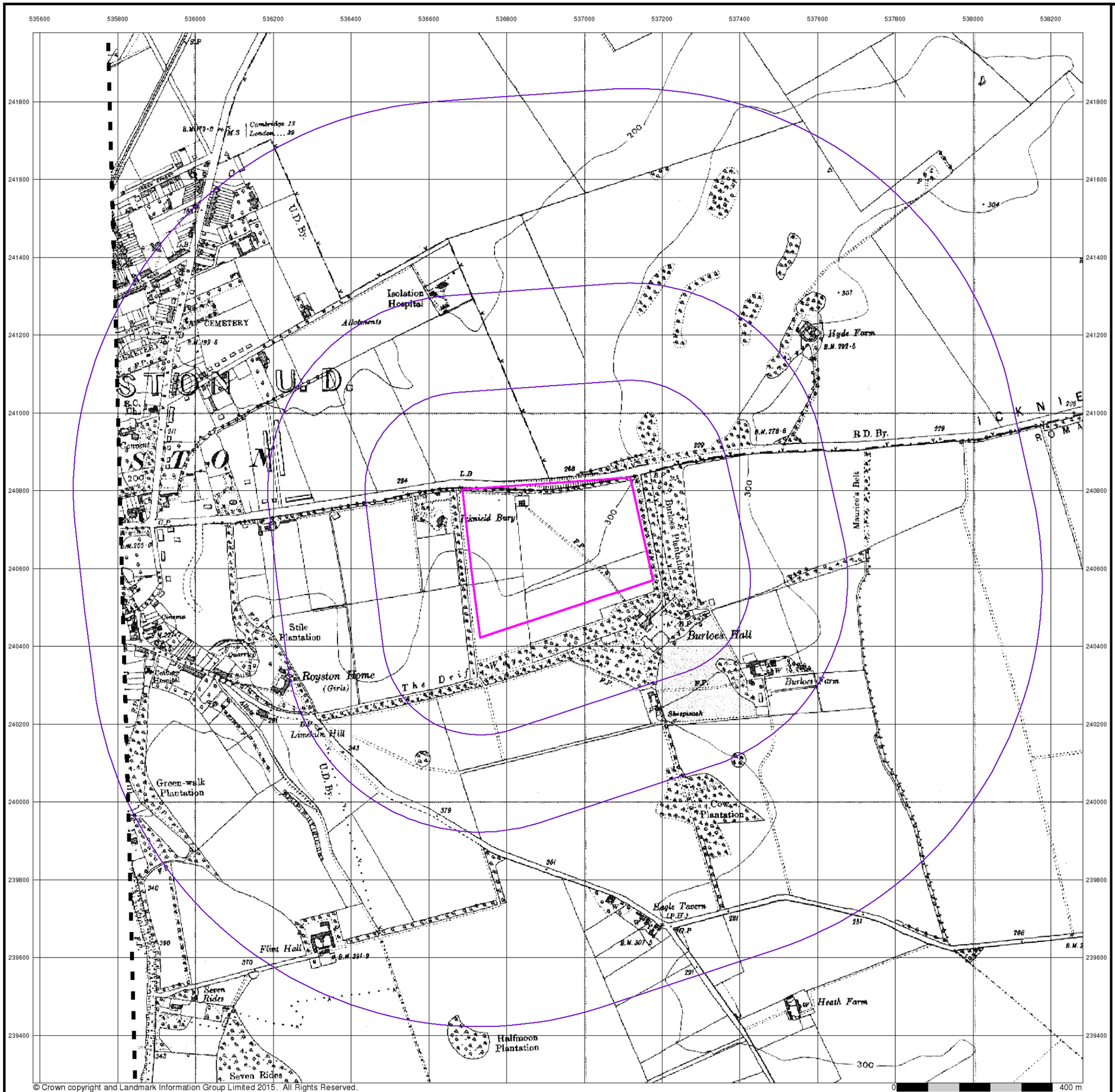
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Search Buffer (m):	1000

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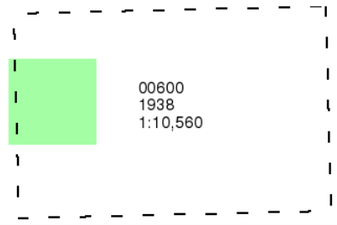
Essex

Published 1938

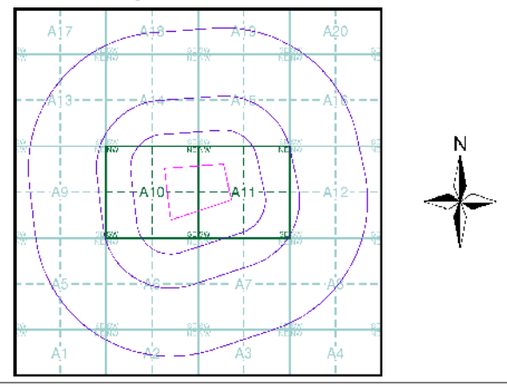
Source map scale - 1:10,560

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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

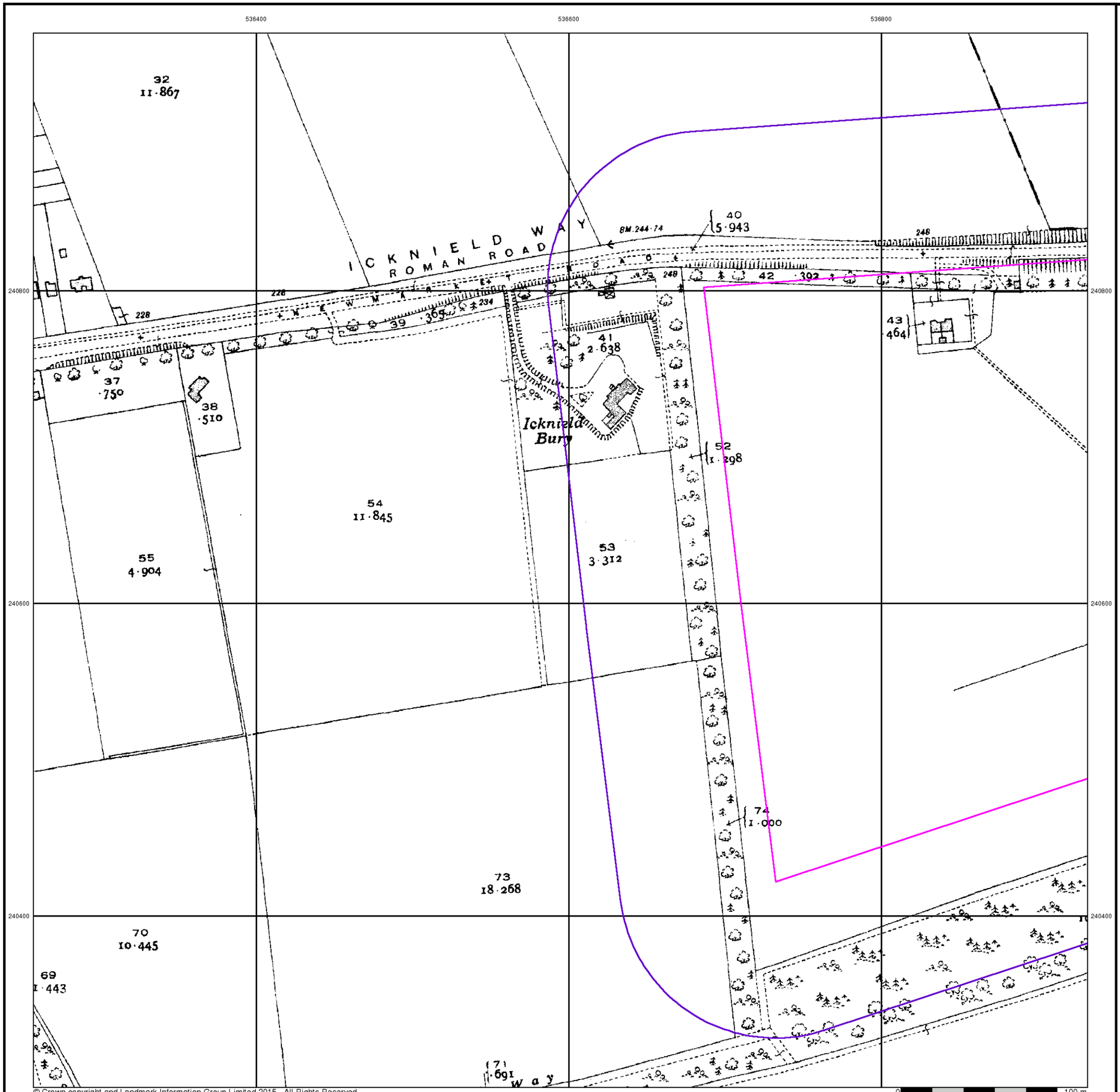
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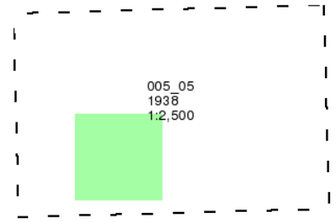
Hertfordshire

Published 1938

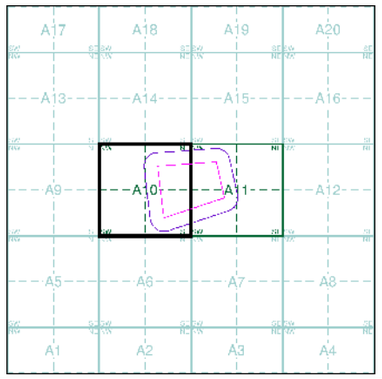
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

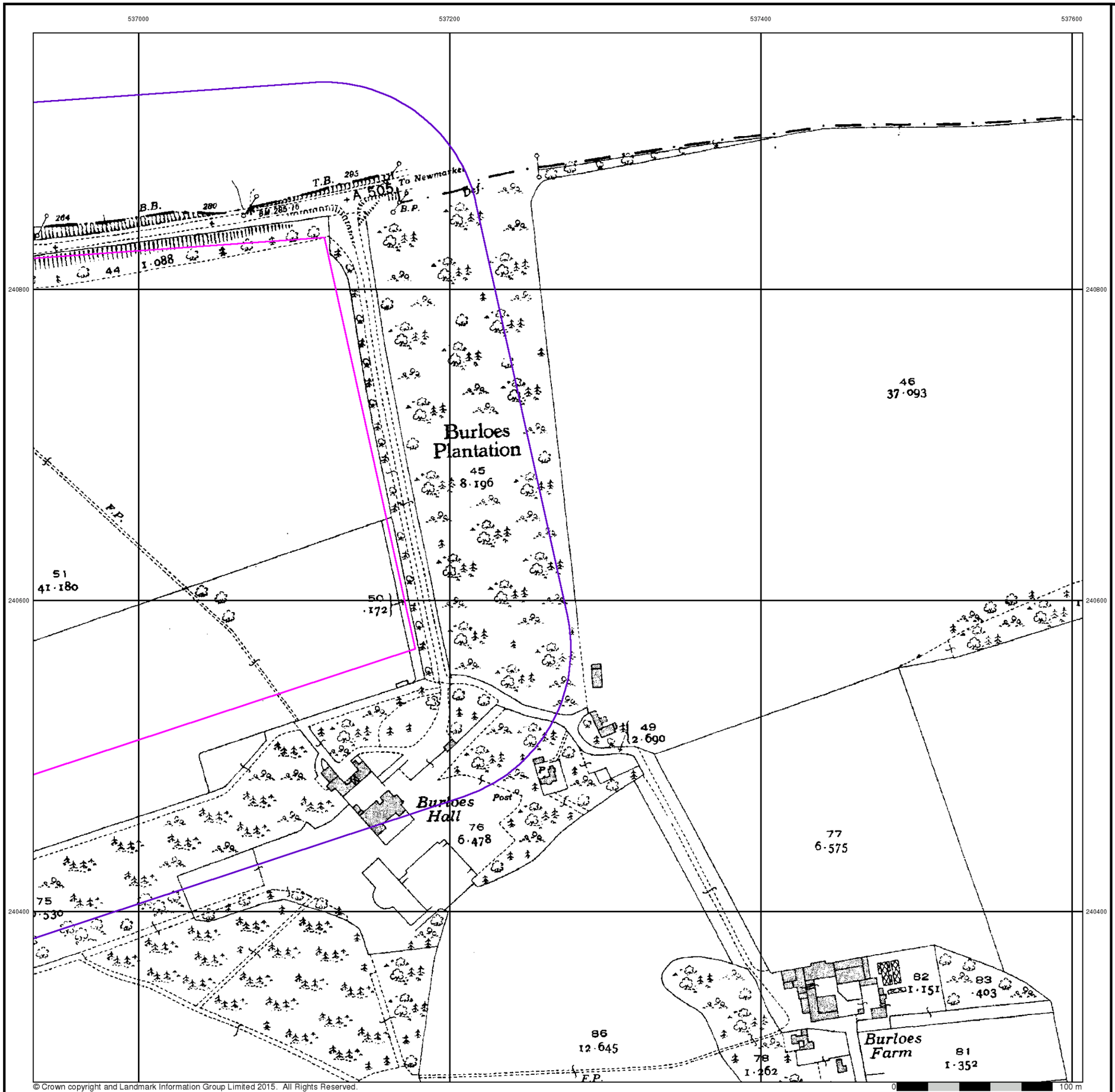
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Slice:	A
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Search Buffer (m):	100

Site Details

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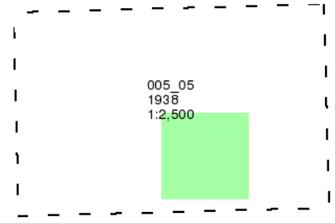
Hertfordshire

Published 1938

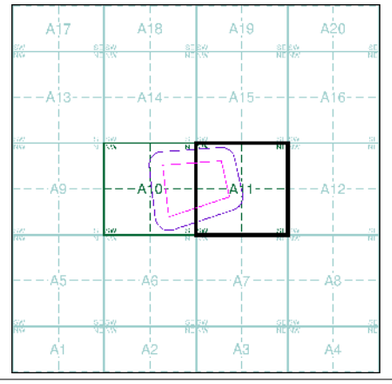
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



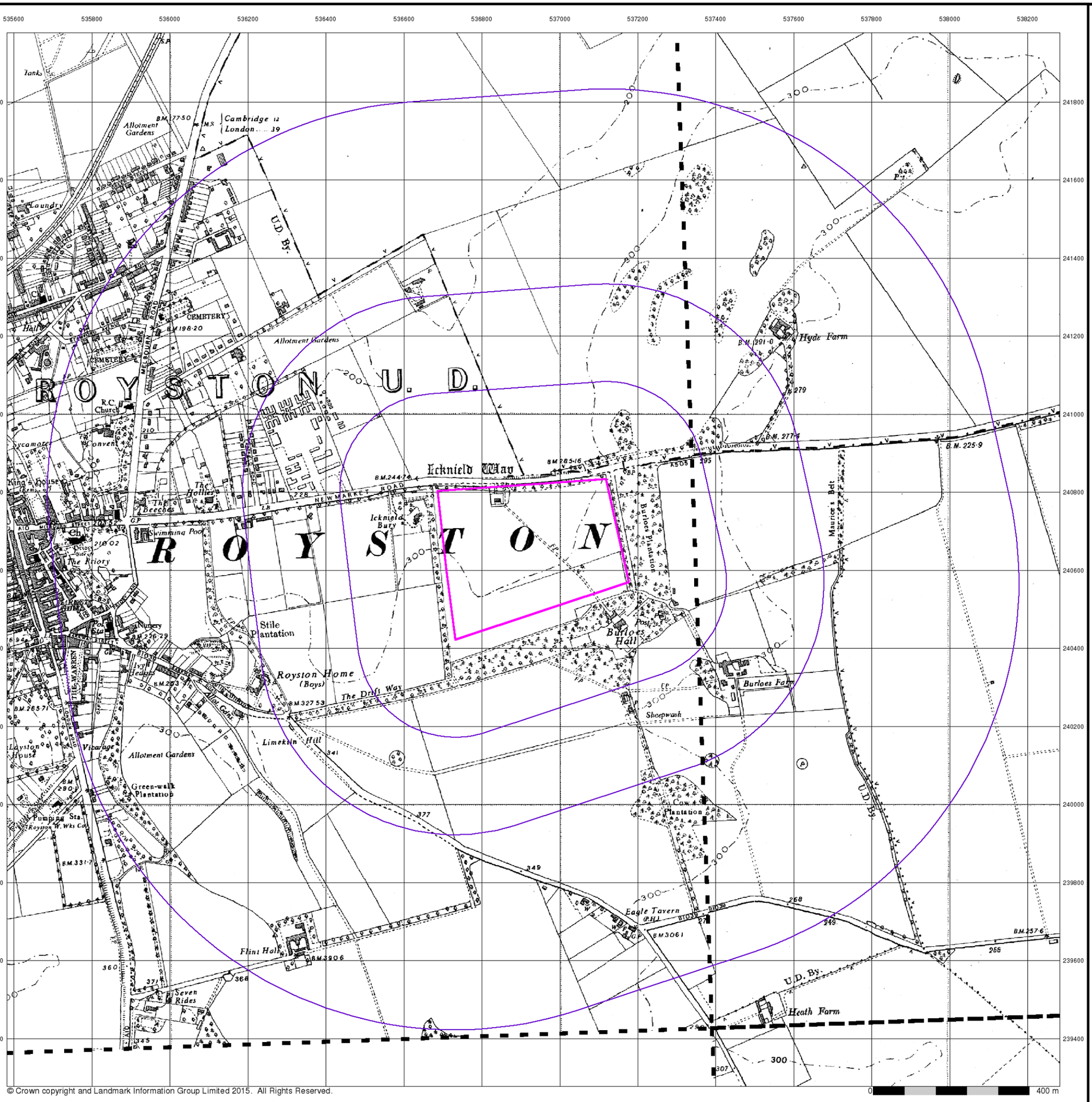
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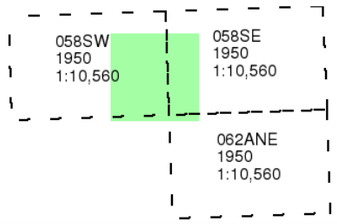
Cambridgeshire & Isle Of Ely

Published 1950

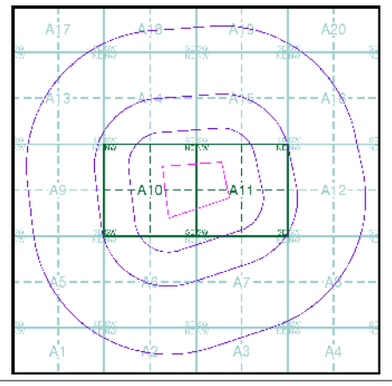
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



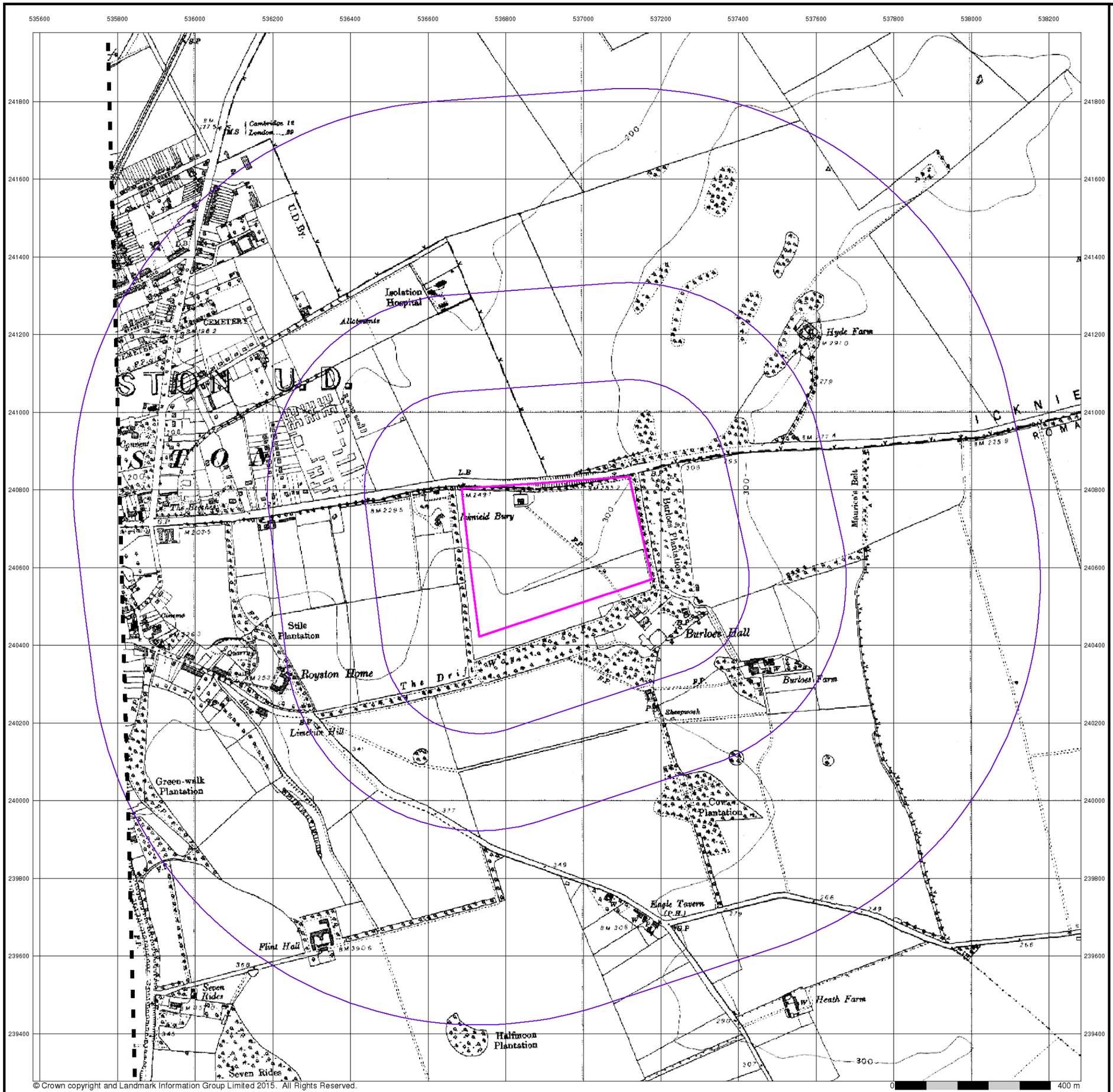
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Search Buffer (m):	1000

Site Details

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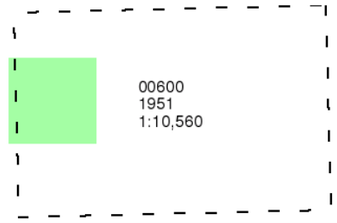
Essex

Published 1951

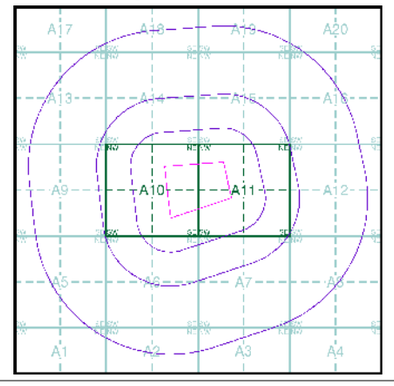
Source map scale - 1:10,560

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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

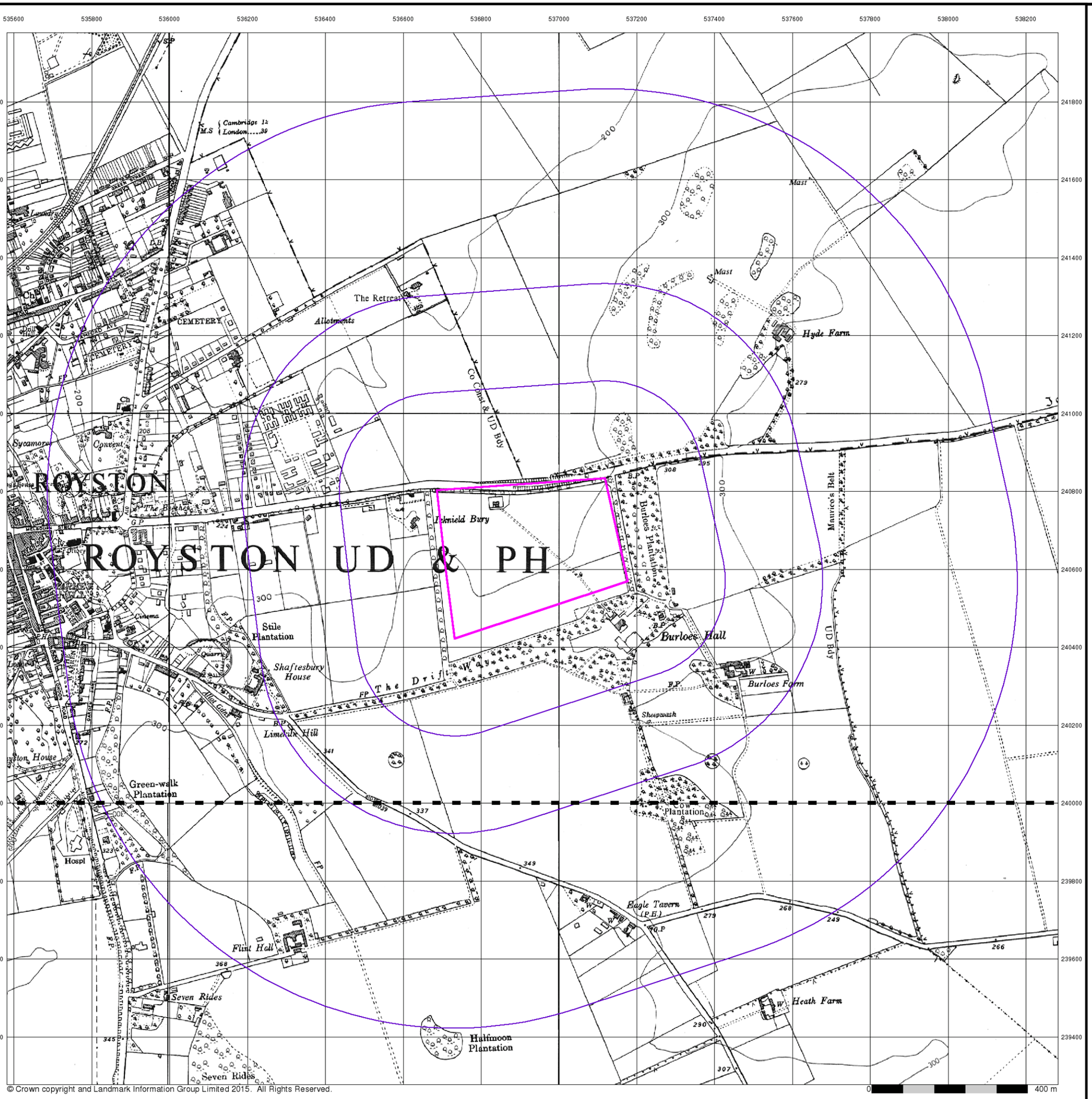
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Ordnance Survey Plan

Published 1960

Source map scale - 1:10,000

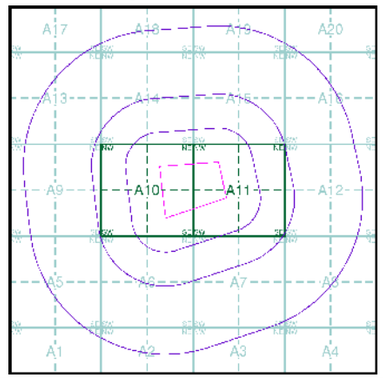
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

TL34SE
1960
1:10,560

TL33NE
1960
1:10,560

Historical Map - Slice A



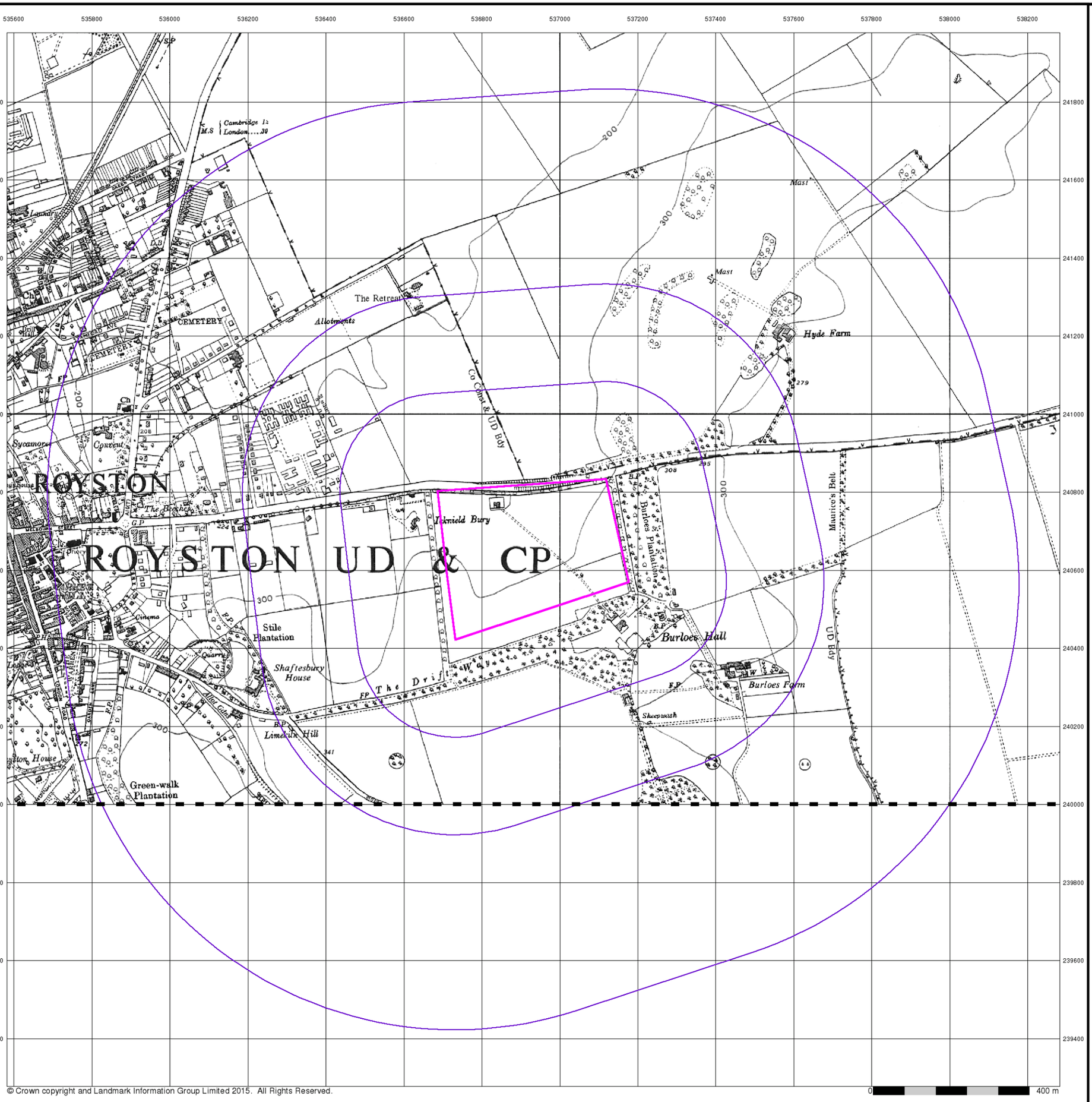
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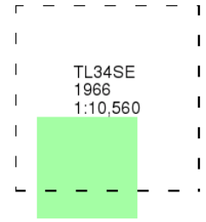
Ordnance Survey Plan

Published 1966

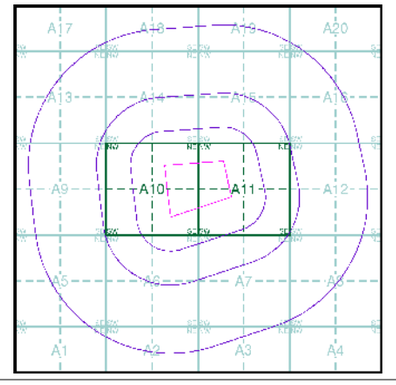
Source map scale - 1:10,000

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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

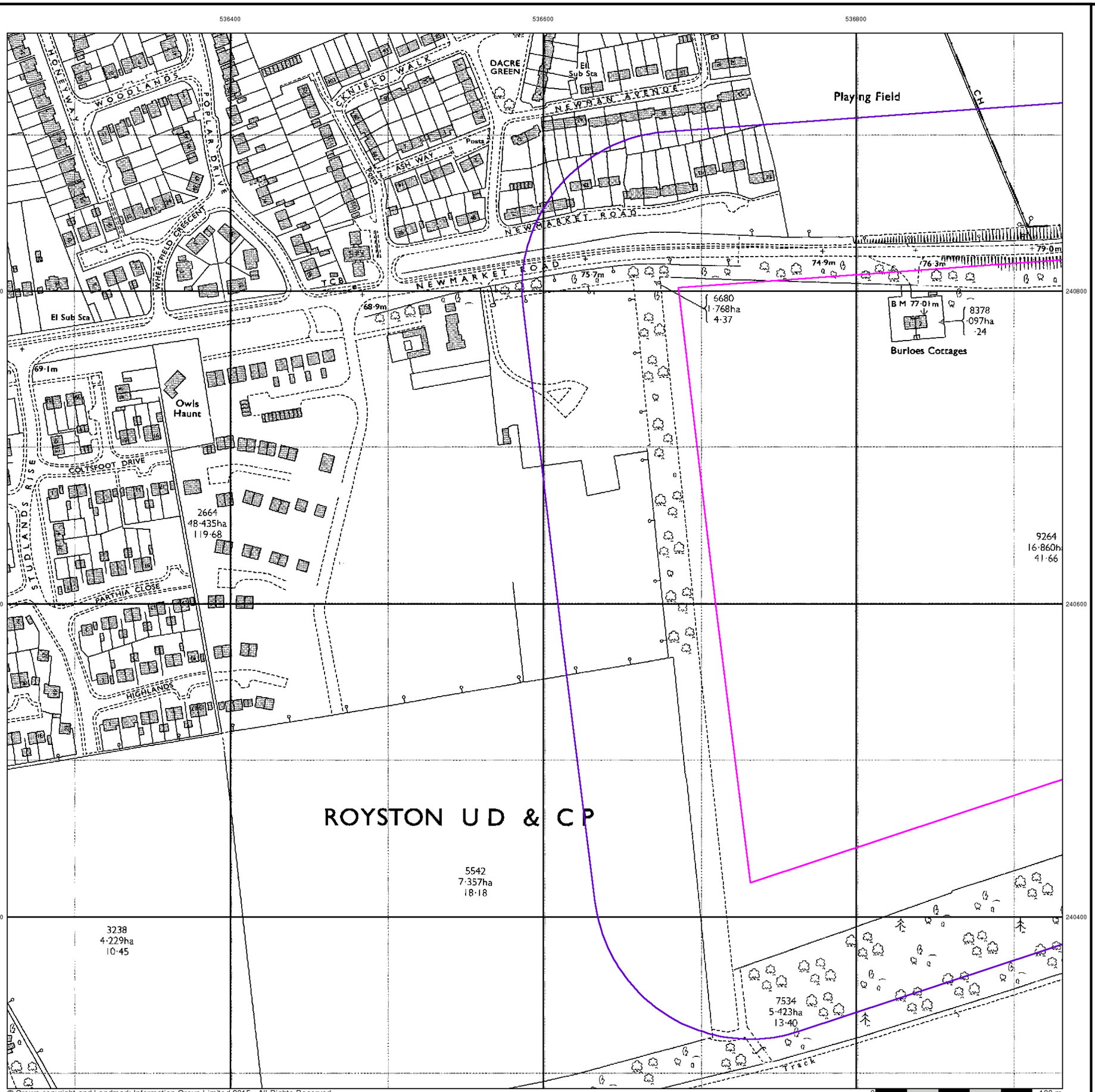
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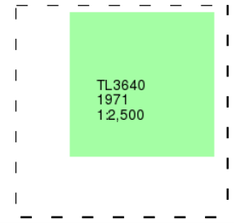
Ordnance Survey Plan

Published 1971

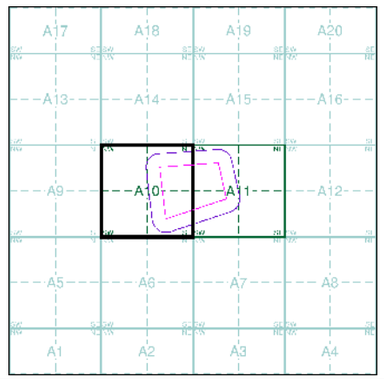
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



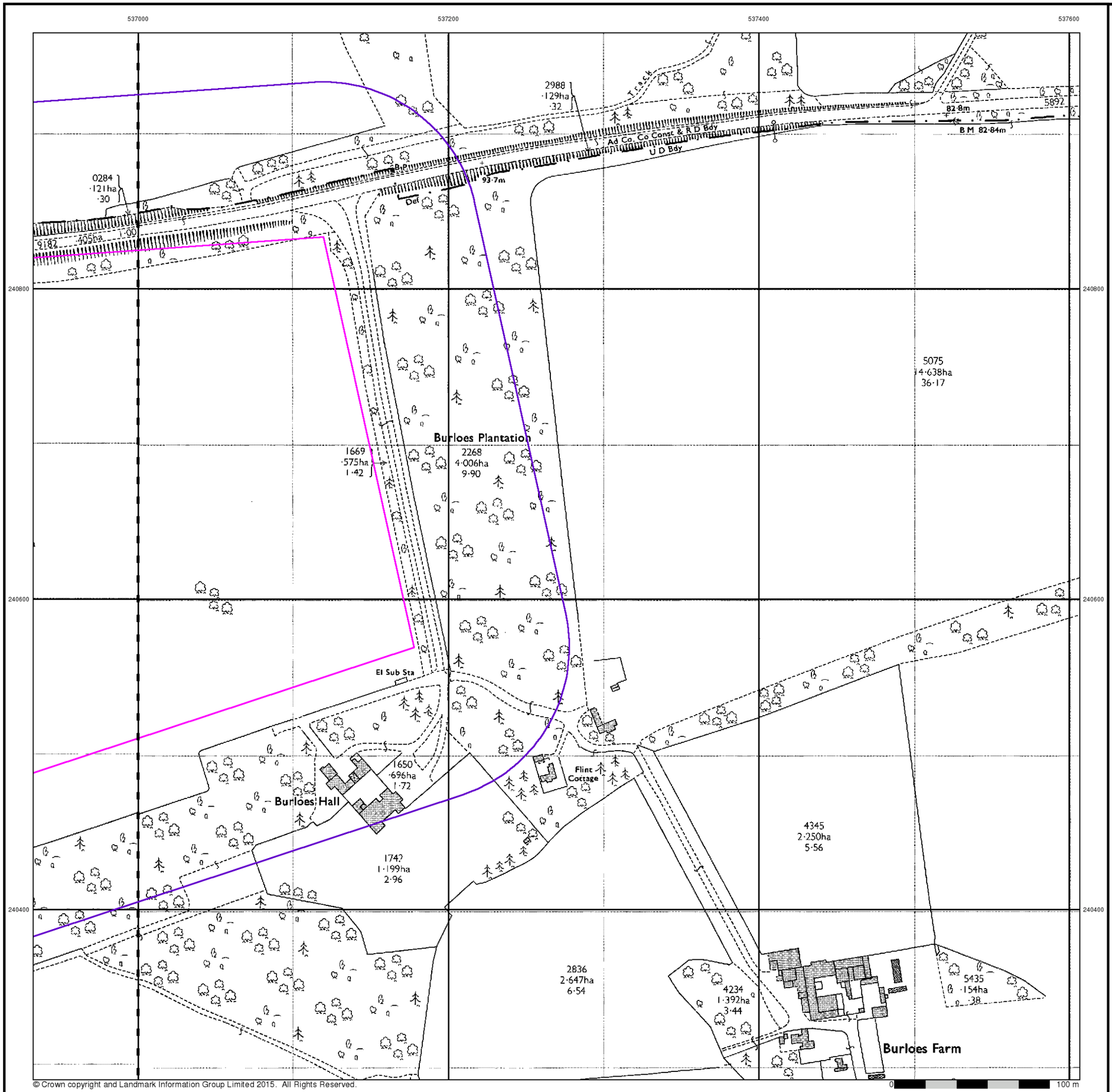
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Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

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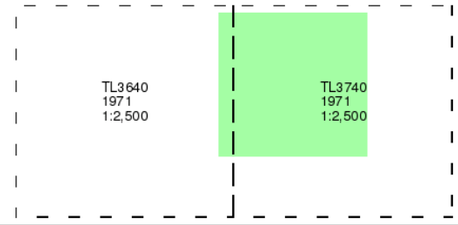
Ordnance Survey Plan

Published 1971

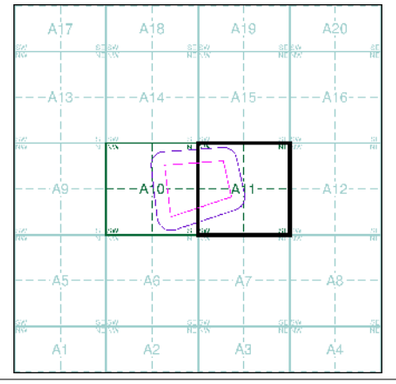
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



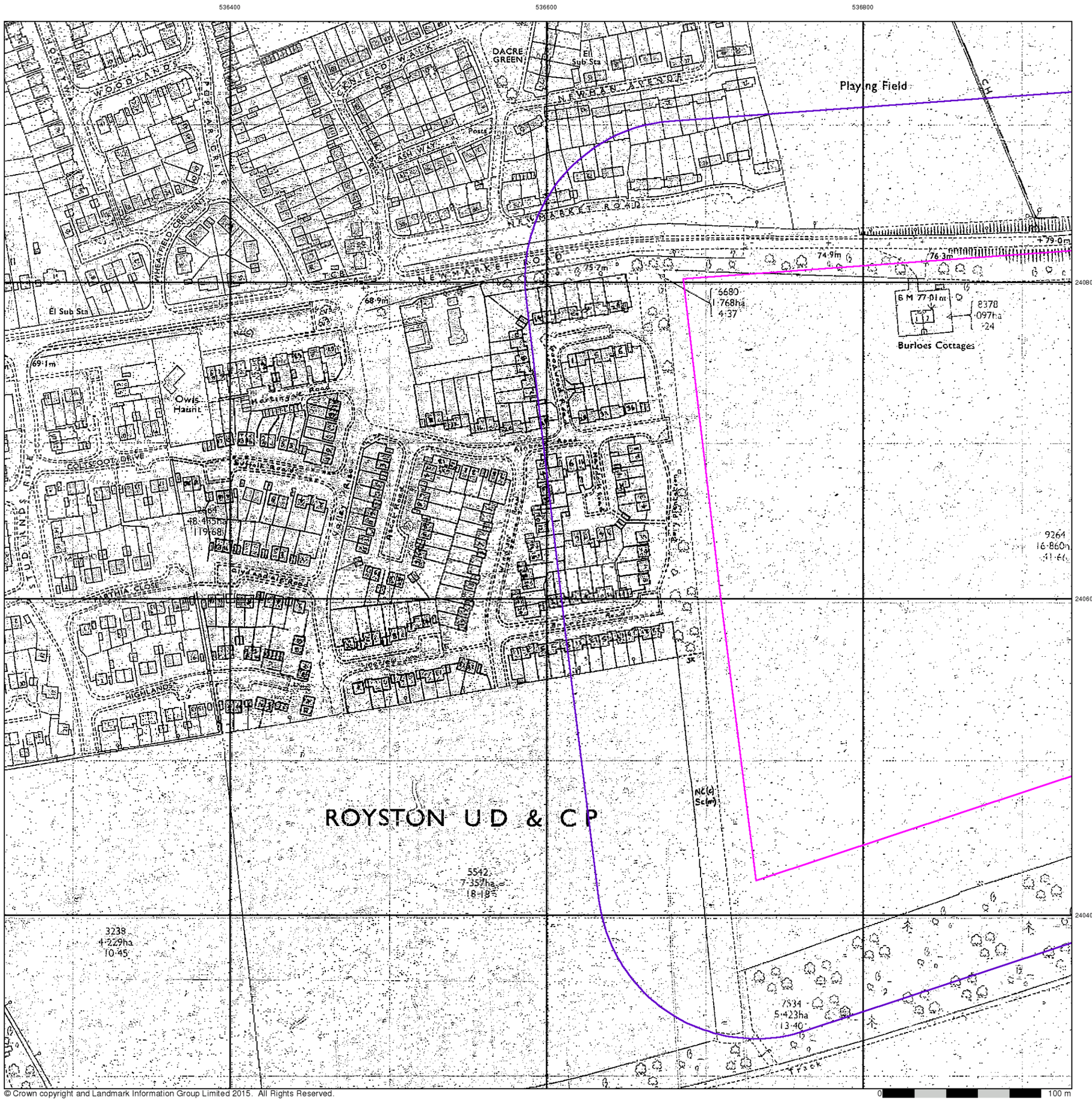
Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	100

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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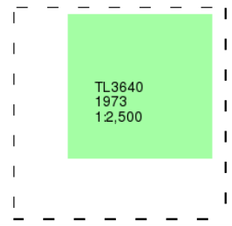
Supply of Unpublished Survey Information

Published 1973

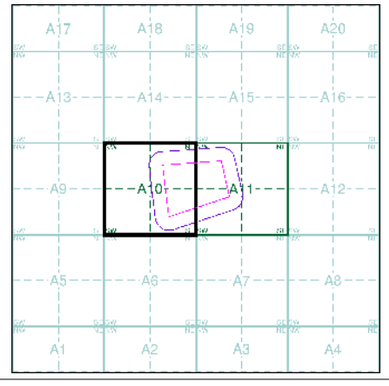
Source map scale - 1:2,500

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A10



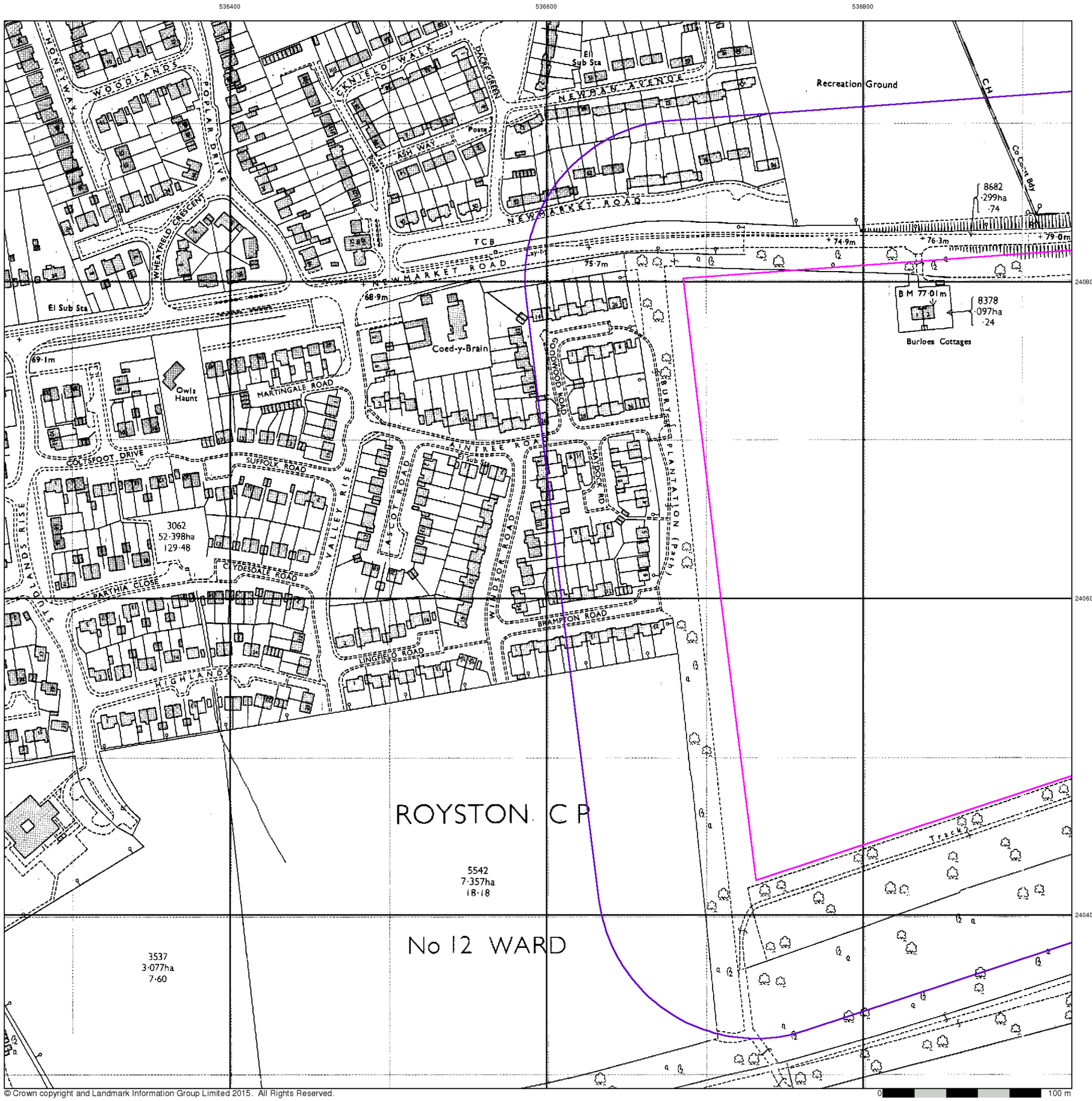
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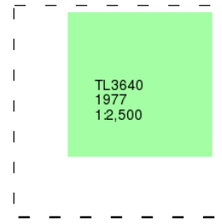
Ordnance Survey Plan

Published 1977

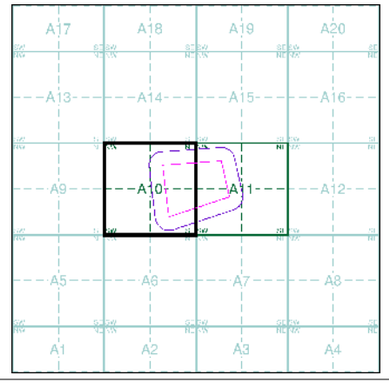
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



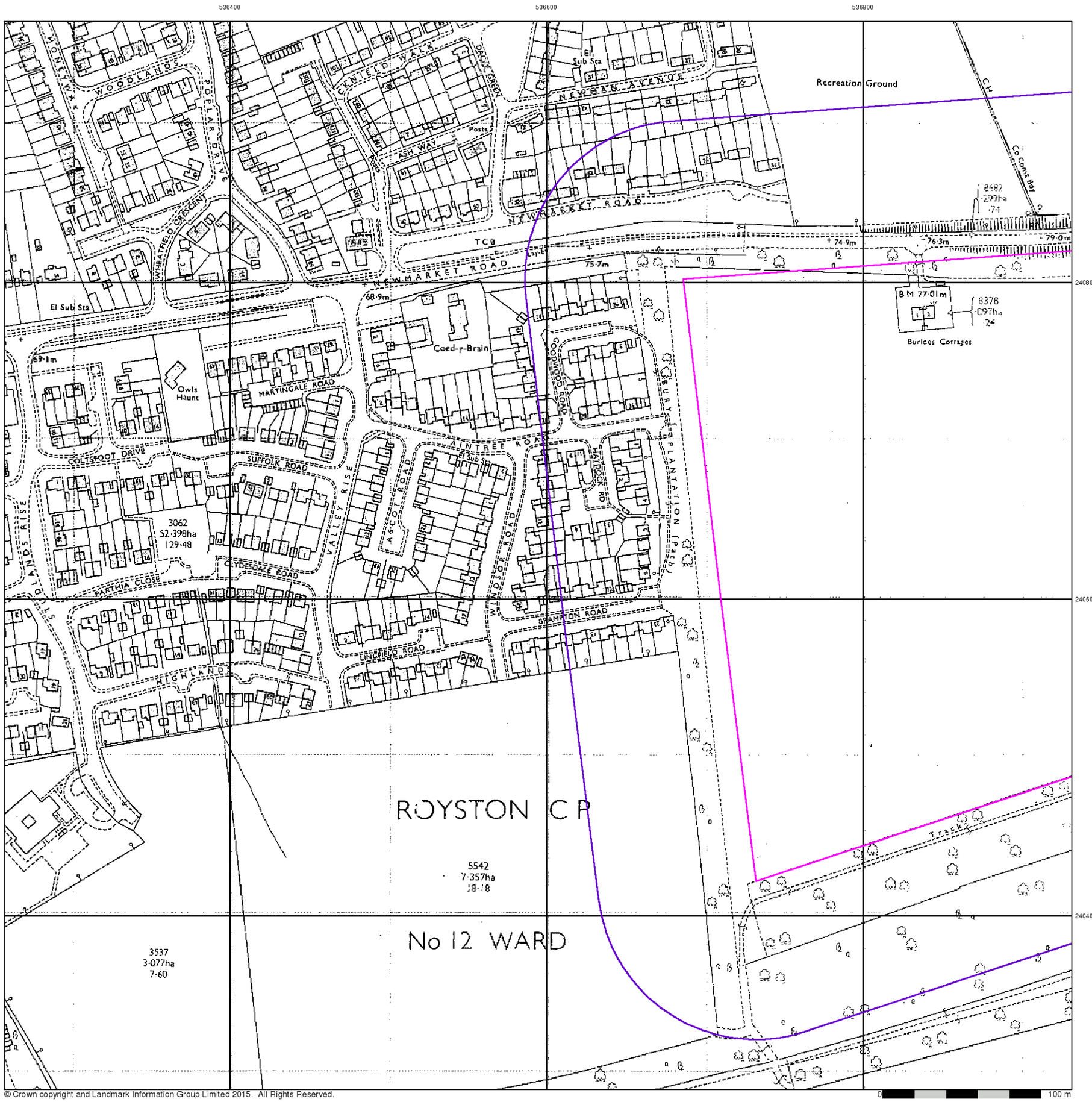
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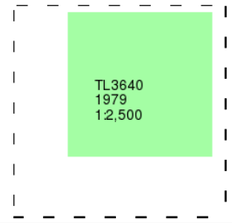
Additional SIMs

Published 1979

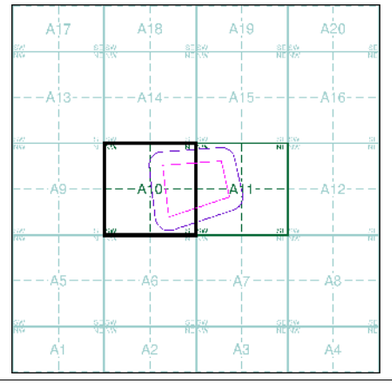
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



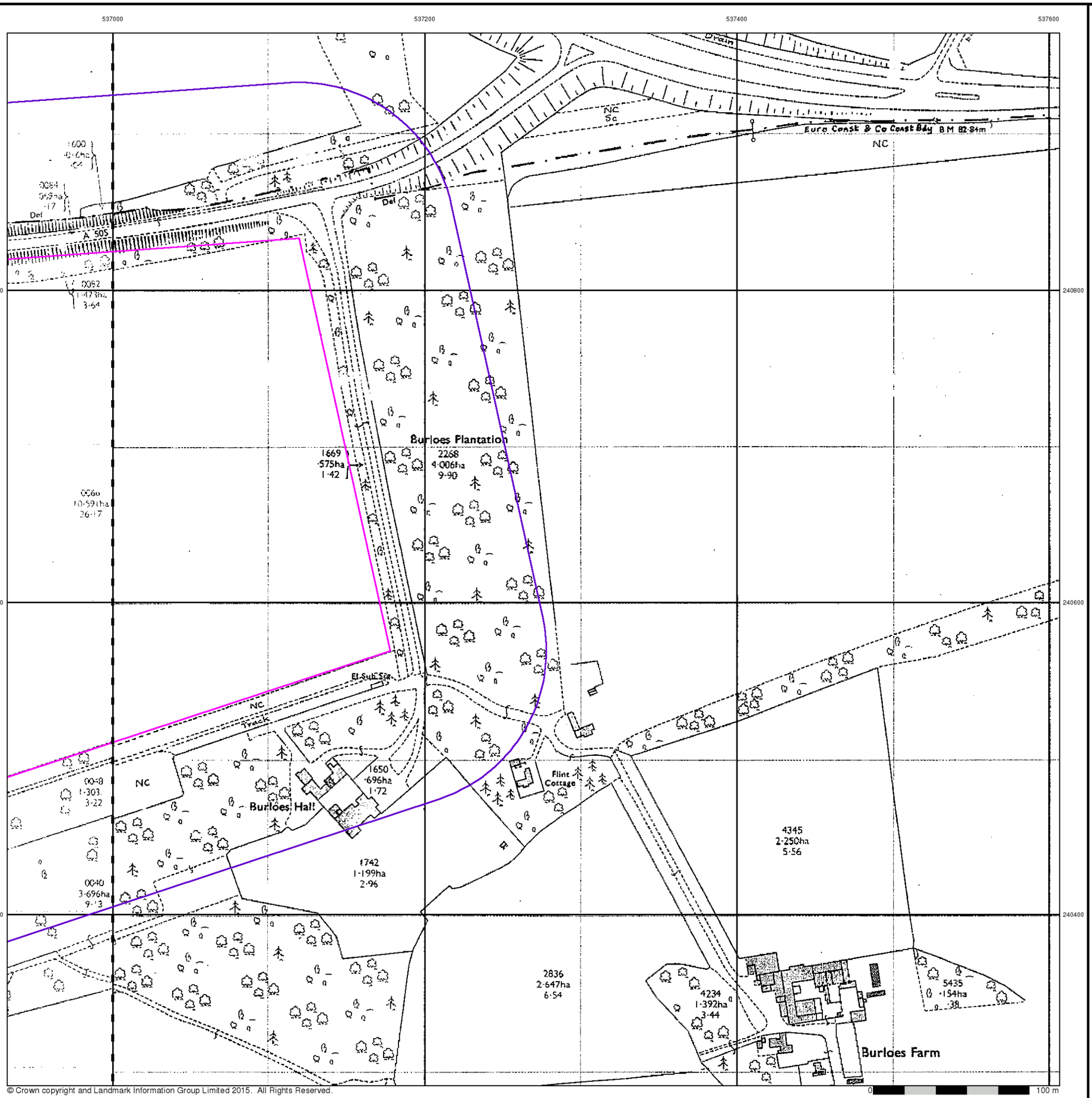
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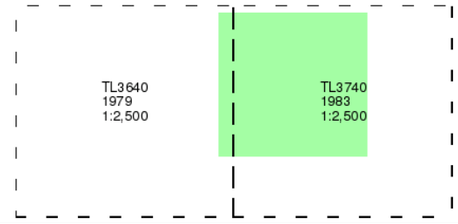
Additional SIMs

Published 1979 - 1983

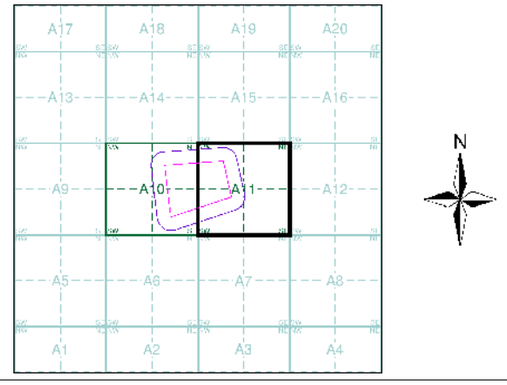
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



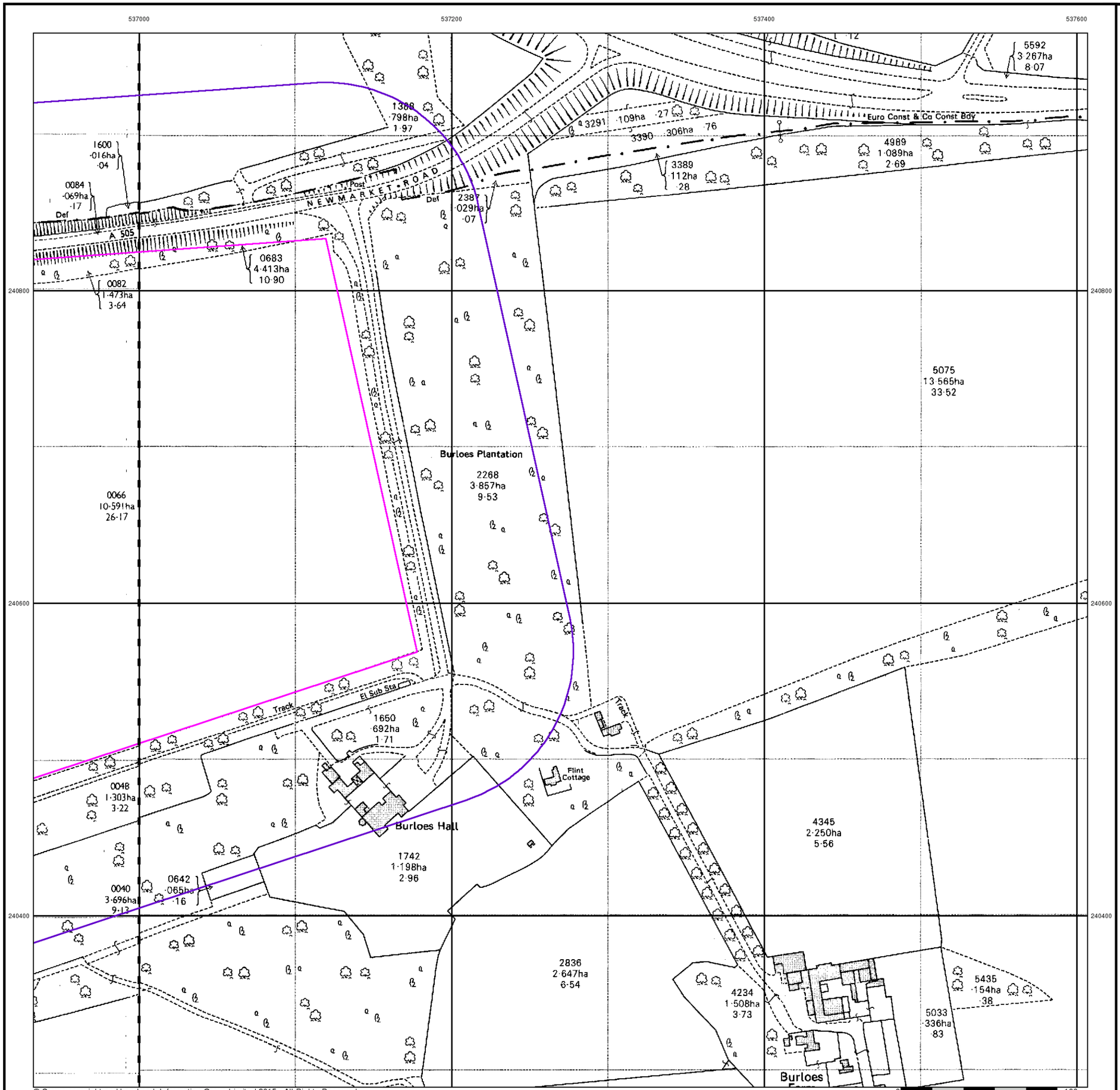
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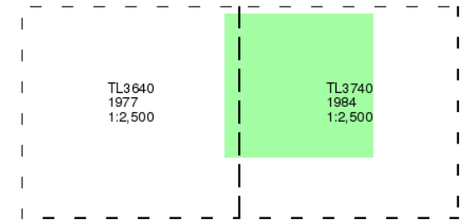
Ordnance Survey Plan

Published 1977 - 1984

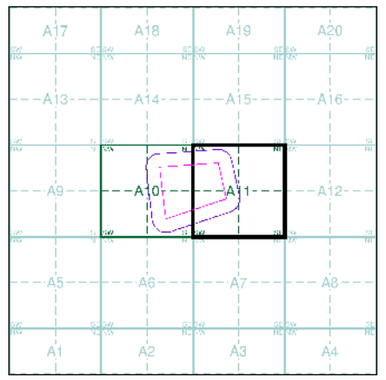
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



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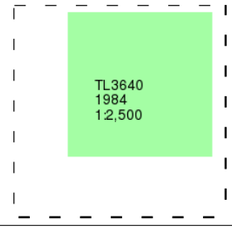
Ordnance Survey Plan

Published 1984

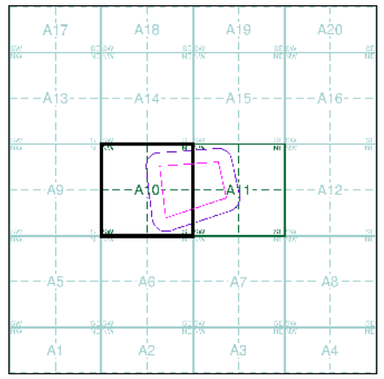
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

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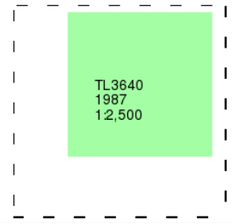
Additional SIMs

Published 1987

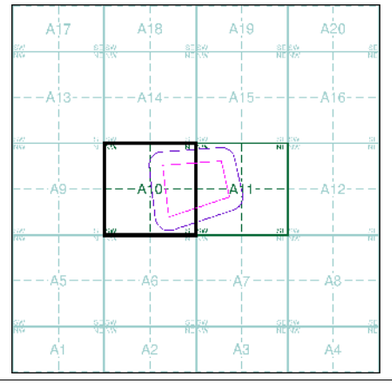
Source map scale - 1:2,500

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Historical Map - Segment A10



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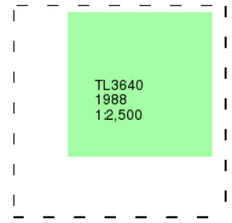
Additional SIMs

Published 1988

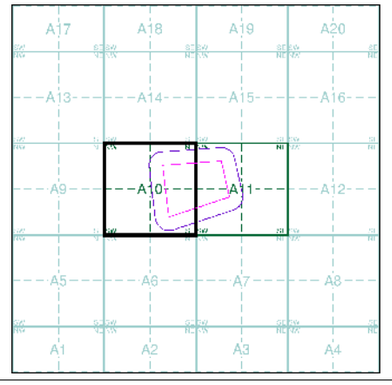
Source map scale - 1:2,500

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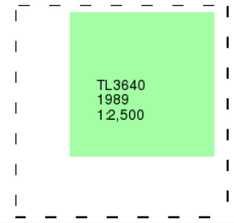
Additional SIMs

Published 1989

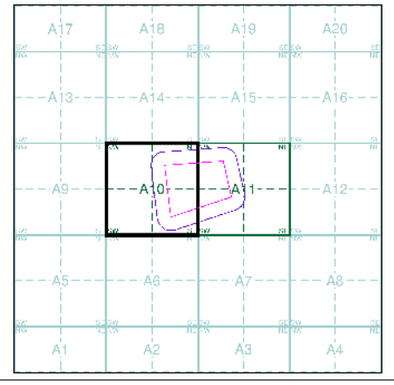
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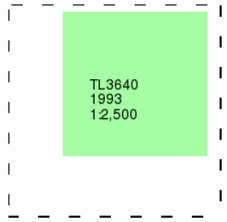
Large-Scale National Grid Data

Published 1993

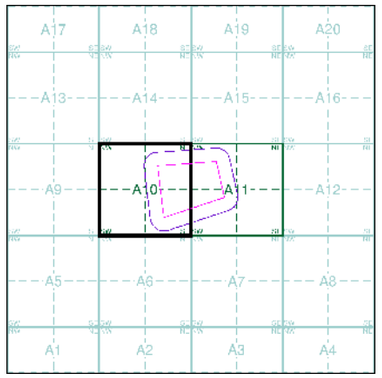
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

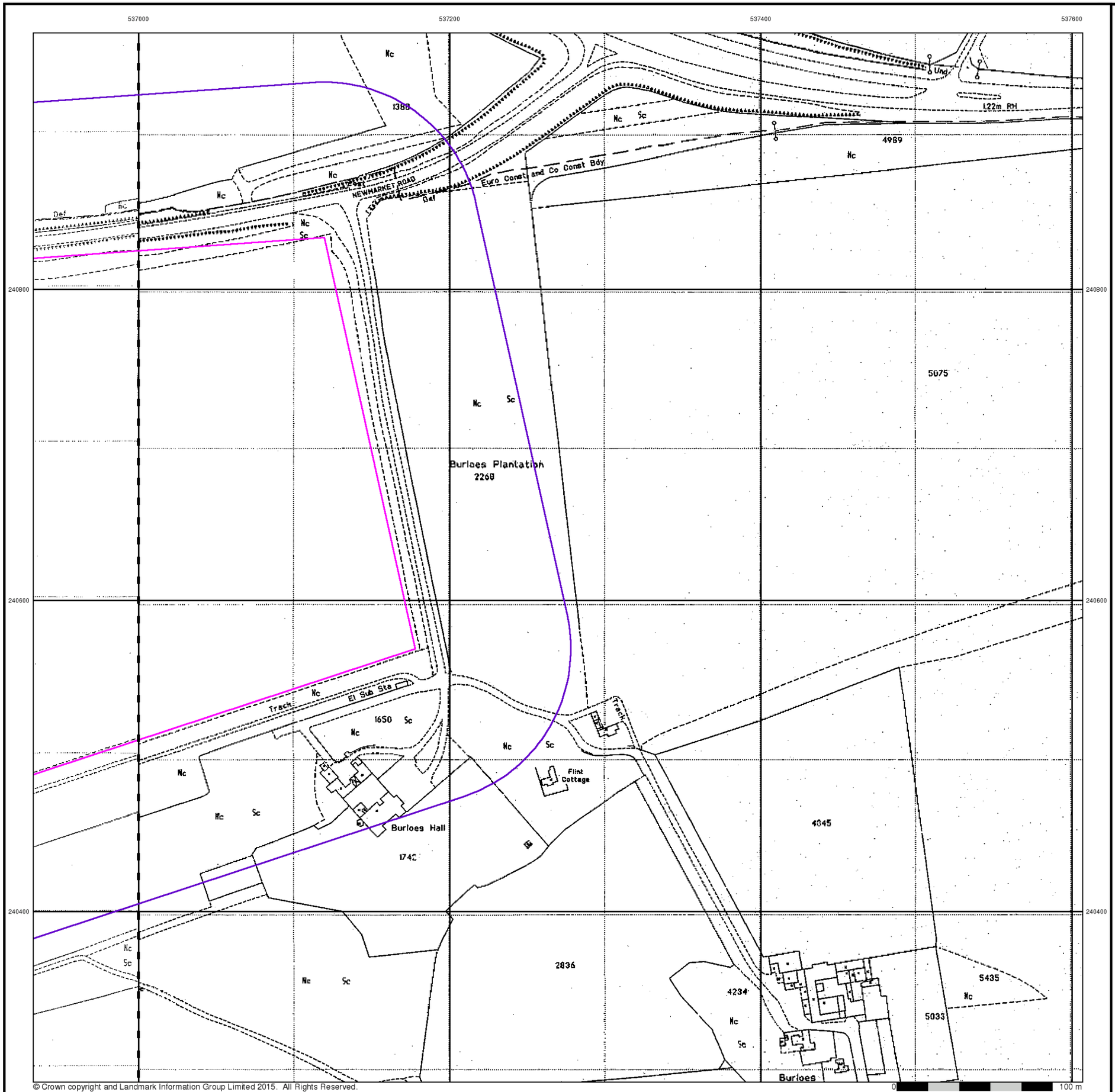
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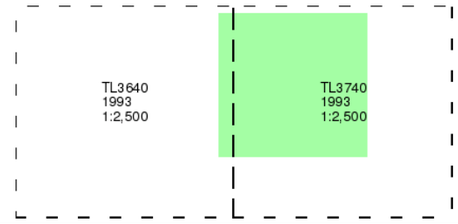
Large-Scale National Grid Data

Published 1993

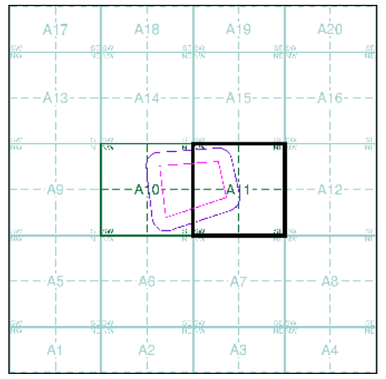
Source map scale - 1:2,500

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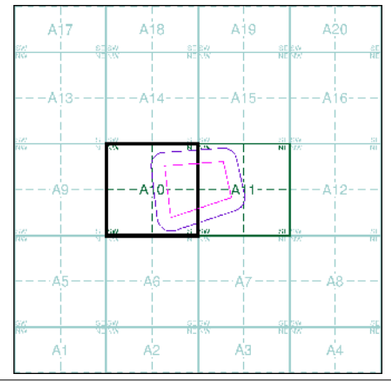


Historical Aerial Photography

Published 2000

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A10



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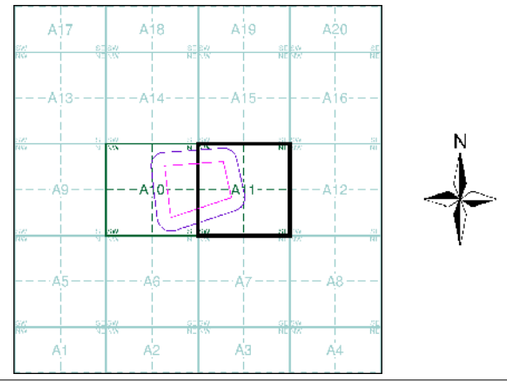
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Geotechnical & Environmental Associates

10k Raster Mapping

Published 1999

Source map scale - 1:10,000

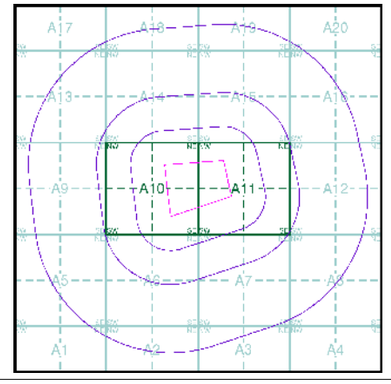
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TL34SE
1999
1:10,000

TL33NE
1999
1:10,000

Historical Map - Slice A



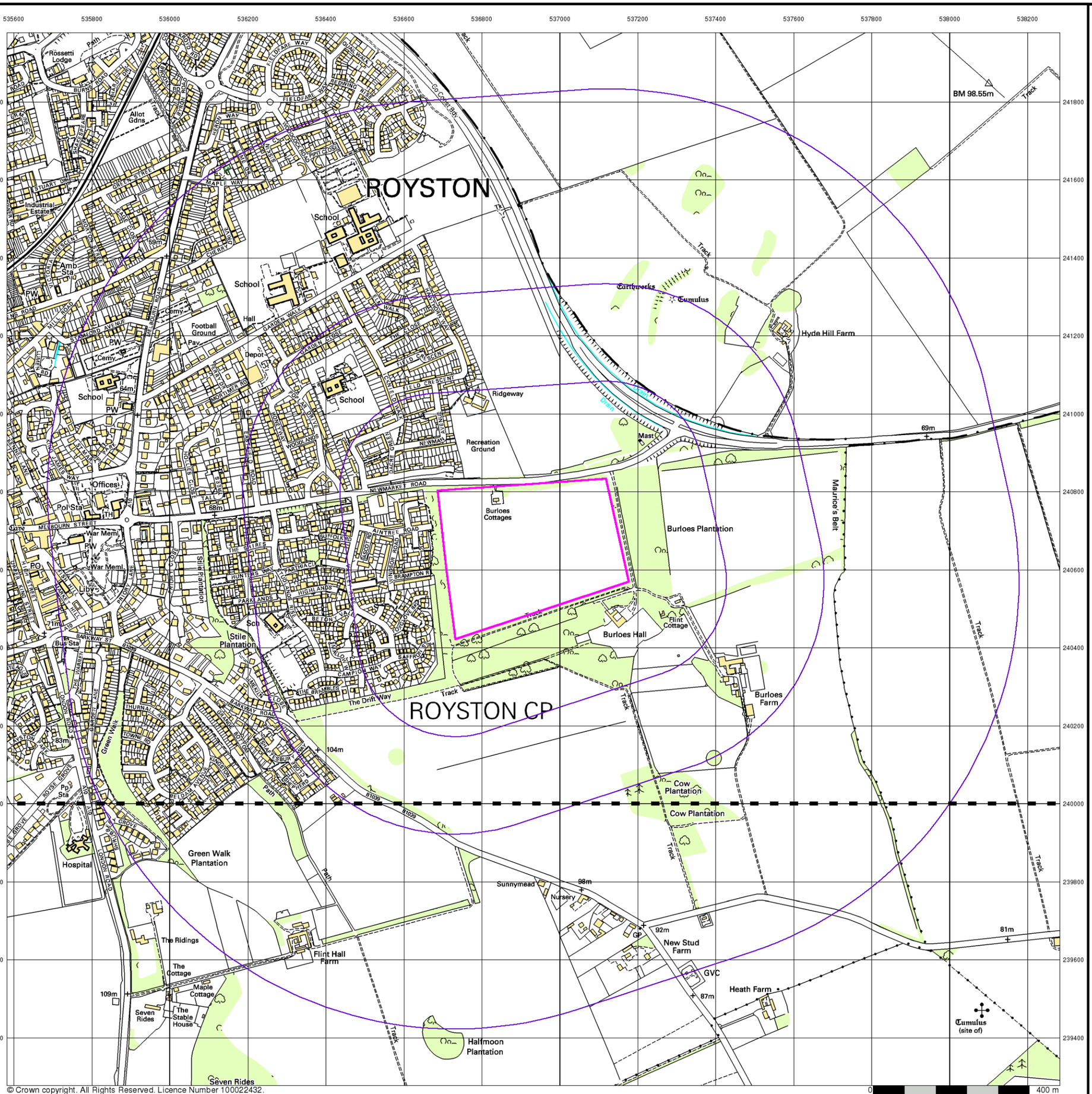
Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

Landmark Information Group
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GEA Geotechnical & Environmental Associates

10k Raster Mapping

Published 2006

Source map scale - 1:10,000

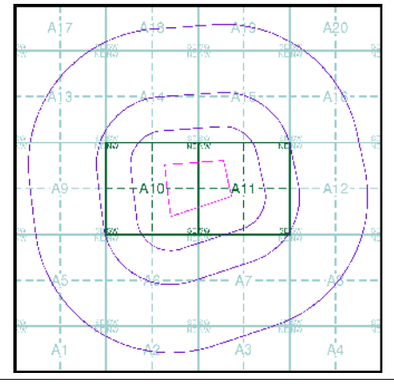
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TL34SE
2006
1:10,000

TL33NE
2006
1:10,000

Historical Map - Slice A



Order Details

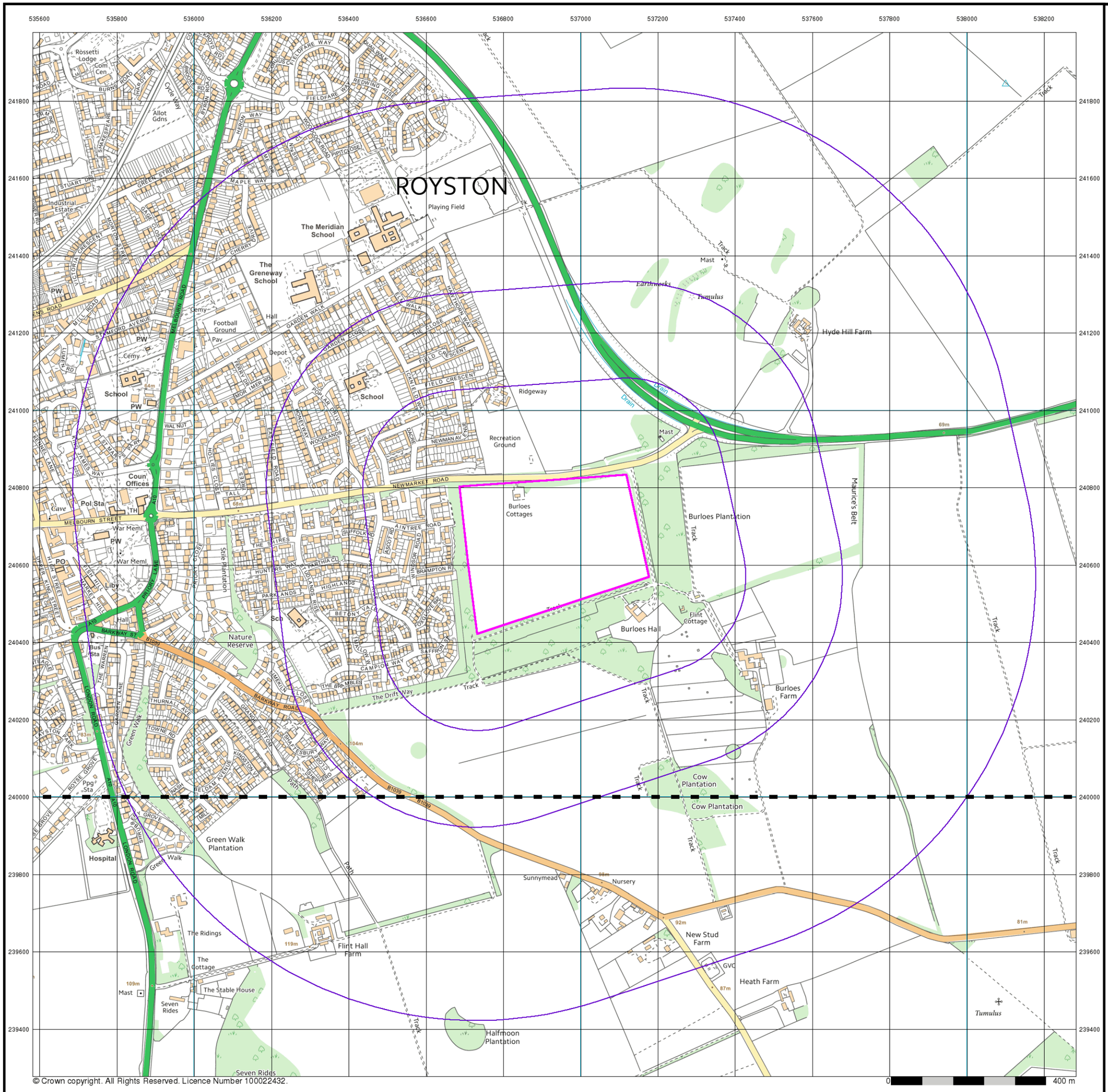
Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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VectorMap Local

Published 2016

Source map scale - 1:10,000

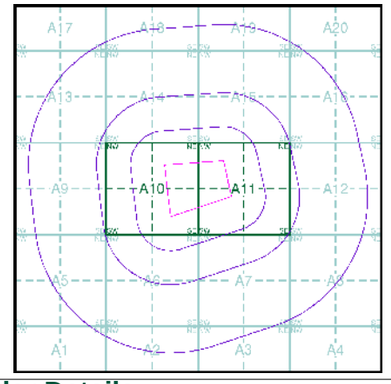
VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

TL34SE
2016
Variable

TL33NE
2016
Variable

Historical Map - Slice A



Order Details

Order Number:	95900613_1_1
Customer Ref:	J16202
National Grid Reference:	536910, 240650
Slice:	A
Site Area (Ha):	14.65
Search Buffer (m):	1000

Site Details

2 Burloes Cottages, Newmarket Road, ROYSTON, Hertfordshire, SG8 7NJ

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Widbury Barn
Widbury HilL
Ware
Herts SG12 7QE

Site Plan

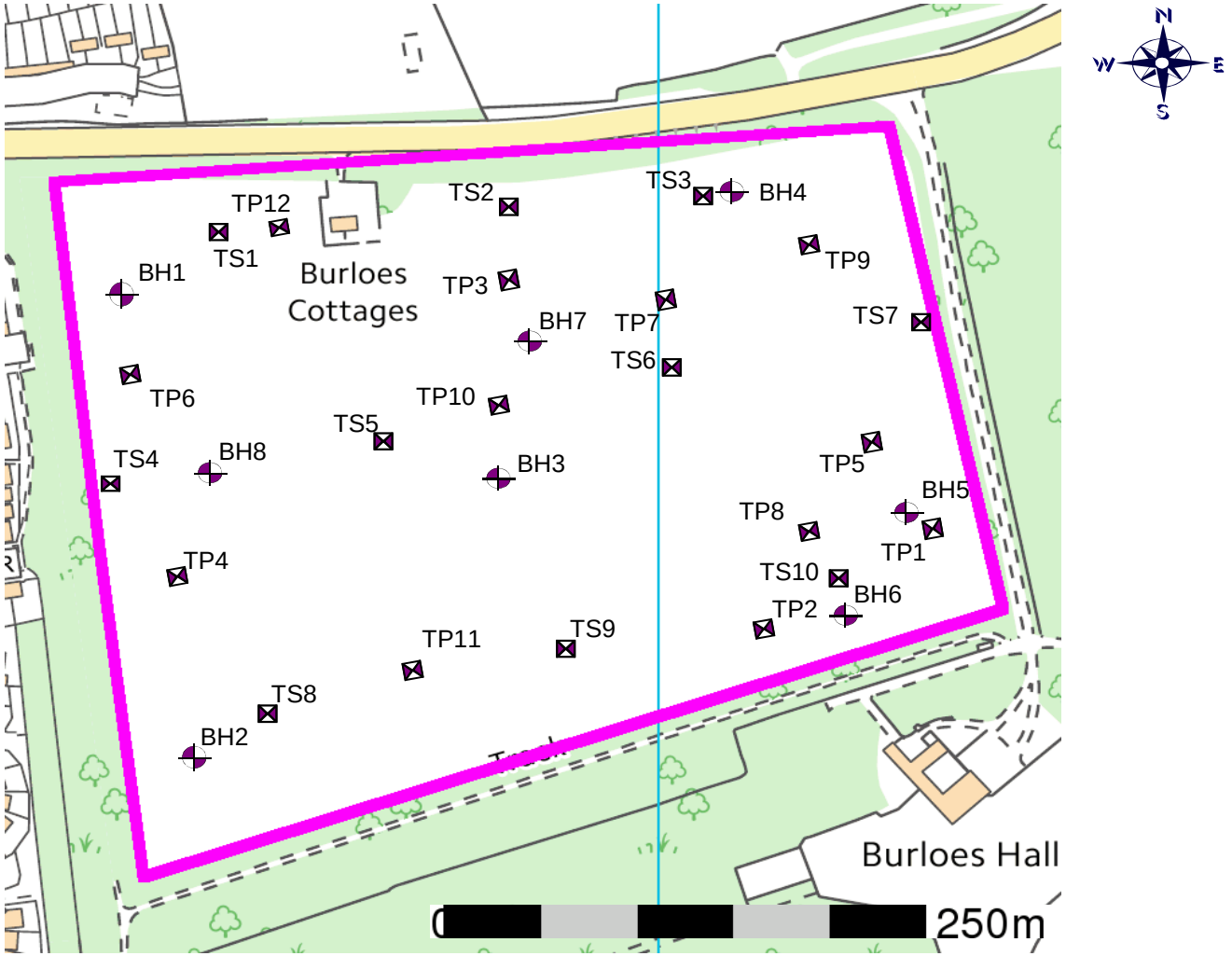
Site Newmarket Road, Royston SG8 7NJ

Client Countryside Properties PLC

Engineer

Job Number J16202

Sheet 1 / 1



Geotechnical & Environmental Associates (GEA)
is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

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where information can be found on all of the services that we offer.

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