



Development of Waste Treatment Facility, comprising Reception and Recycling Hall; Mechanical Biological Treatment (MBT) Facility; Advanced Conversion Technology (ACT) Facility; Power Generation and Export Facility; Education and Office Accommodation; Landscaping and, Access.

Sinfin Lane, Derby

Resource Recovery Solutions (Derbyshire) Ltd

Environmental Statement

Chapter 10:

Hydrology and Flood Risk

Prepared by:
Andrew Clay

Checked by:
Jonathan Standen

34 Lisbon Street
Leeds
LS1 4LX

Tel 0113 220 6190
Fax 0113 243 9161
Email rpsld@rpsgroup.com

Contents

10.	Hydrology	1
10.1	Introduction	1-10
10.2	Legislation and Planning Context	1-10
10.3	Assessment Methodology	5-10
10.4	Baseline Conditions	8-10
10.5	Incorporated Enhancement and Mitigation	12-10
10.6	Identification and Evaluation of Likely Significant Effects	15-10
10.7	Mitigation	17-10
10.8	Residual Impact	20-10
10.9	Conclusions	21-10
10.10	References	22-10

Tables, Figures and Appendices

Tables

Table 10.1	Significance Matrix
Table 10.2	Criteria for Determining the Importance or Sensitivity
Table 10.3	Criteria for Determining the Magnitude of the Effect
Table 10.4	Summary of Residual Impacts

Appendices

Appendix 10.1	Flood Risk Assessment
Appendix 10.2	Information from Envirocheck

10 Hydrology and Flood Risk

10.1 Introduction

10.1.1 This chapter of the ES assesses the likely significant effects of the Proposed Development in terms of Hydrology and Flood Risk, including surface water resources and quality, and incorporates a summary of the Flood Risk Assessment (FRA), as included in Appendix 10.1.

10.2.2 The chapter describes the legislation and planning context, assessment methodology; and the baseline conditions currently existing at the Assessment Site and surrounds. The enhancement measures that are to be incorporated are described, followed by an identification and evaluation of likely significant impacts. This is followed by a description of additional mitigation measures and an assessment of residual impacts after these have been employed. This chapter has been prepared by RPS Planning and Development Ltd.

10.2 Legislation and Planning Context

National Planning Policy

Planning Policy Statement 25 (PPS25) – December 2006

10.2.2 Planning Policy Statements set out the Government's national policies on different aspects of land use planning. The current national guidance on development and flood risk is outlined in PPS25 which became statutory from December 2006.

10.2.3 PPS25 aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is necessary in such areas, the policy aims to make it safe without increasing flood risk elsewhere, and where possible reducing overall flood risk. The risk of flooding to the development from all sources (such as surface water and infrastructural flooding) must be considered, together also with the adverse effect of development on flooding in other areas in the hydrological catchment.

10.2.4 A risk-based approach is adopted in PPS25 whereby the source-pathway-receptor model to developments in areas of flood risk is adhered to. The guidance advises that a FRA be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account and to inform the application of the sequential approach.

10.2.5 The PPS25 Sequential Test applies a risk-based approach, and aims to demonstrate that

there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate for the type of development or land use proposed. However, if after application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding, the PPS25 Exception Test can be applied. The Exception Test provides a method of managing flood risk while still allowing necessary development to occur. However, it should not be used to justify more vulnerable types of development in areas at flood risk.

- 10.2.6 The Environment Agency delimits land areas based on the risk of fluvial or tidal flooding with: Flood Zone 1 an area of low flood risk; Flood Zone 2 an area of medium flood risk; Flood Zone 3a an area of high flood risk; and Flood Zone 3b an area known as the Functional Floodplain. In areas at risk of fluvial or tidal flooding, preference should be given to locating new development in Flood Zone 1. If there are no reasonably available sites in Flood Zone 1, the flood vulnerability of a proposed development can be taken into account in locating it in Flood Zone 2 and then Flood Zone 3a. In assessing flood risk for each of the Flood Zones, PPS25 considers the flood risk vulnerability of different types of development and land-use. There are five vulnerability classifications defined: Essential Infrastructure; Highly Vulnerable; More Vulnerable; Less Vulnerable; and Water-Compatible Development.
- 10.2.7 The Proposed Development is to be used for waste treatment (except landfill and hazardous waste facilities), and classified in PPS25 as Less Vulnerable development. The advice given in PPS25 on flood risk vulnerability and flood zone compatibility indicates that Less Vulnerable development is appropriate in Flood Zone 1, Flood Zone 2 and Flood Zone 3a following the successful completion of the Sequential Test. The FRA has demonstrated that the site is located in Flood Zone 1, which is the lowest risk flood zone. The Sequential Test aims to steer new development away from higher flood risk areas to those areas of lower risk. Locating the proposed development in Flood Zone 1 is, therefore, an example of the successful application – and passing – of the PPS25 Sequential Test.
- 10.2.8 In summary, PPS25 advises of the requirement for an FRA for any of the following cases:
1. Any site located within the Environment Agency designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
 2. Non-residential development within Flood Zone 1 (low probability), where the site is in excess of 1ha, or has a development floor space in excess of 1000m²; and
 3. Residential development within Flood Zone 1 (low probability) where the site area is greater than 0.5ha or the development comprises more than 10 residential units.
- 10.2.9 The Proposed Development is a non-residential development within Flood Zone 1, with a site that is in excess of 1ha and having a development floor space that is in excess of 1000m².

Based on this, a FRA for the Proposed Development will be required.

Regional Planning Policy

East Midlands Regional Plan – March 2009

10.2.10 The East Midlands Regional Plan provides a broad development strategy up to 2026, and also represents the spatial element of the East Midlands Integrated Regional Strategy. The plan is divided into four sections. The policies in Section 3 (Topic Based Priorities) on Natural and Cultural Resources that are of relevance to Flood Risk and Hydrology are given below.

10.2.11 Policy 32: A Regional Approach to Water Resources and Water Quality. The policy advises that local authorities, developers, water companies, the Environment Agency and other relevant public bodies should work together to:

- Take water related issues into account at an early stage in the process of identifying land for development and in the phasing and implementation of development, e.g. by undertaking water-cycle studies;
- Ensure timely provision of appropriate additional infrastructure for water supply and wastewater treatment to cater for the levels of development provided for in this plan, whilst meeting surface and groundwater quality standards and avoiding adverse impacts on designated sites of nature conservation of international importance;
- Assess the scope for reducing leakage of public water supply from current levels;
- Promote improvements in water efficiency in new development and in regeneration to achieve a regional target of 25% (equivalent to an average saving of about 35 litres per person per day);
- Reduce unsustainable abstraction from watercourses and aquifers to sustainable levels;
- Protect and improve water quality and reduce the risk of pollution especially to vulnerable groundwater;
- Make provision for the development of new water resources where this represents the most sustainable solution to meeting identified water resource requirements, taking account of predictions of future climate change;
- Use sustainable drainage techniques wherever practicable to help mitigate diffuse pollution and support groundwater recharge. These will be required where development is upstream of a designated nature conservation site of international importance or to improve water quality, where the need is demonstrated through water cycle studies;
- Support water conservation measures such as winter storage reservoirs on agricultural land; and

- Ensure that sewage treatment capacity is sufficient to meet the needs of development and that, where necessary improvements are in place so that development does not compromise the quality of discharged effluent.

10.2.12 Policy 35: A Regional Approach to Managing Flood Risk. The policy advises that Local Development Frameworks and the strategies of relevant public bodies should take account of the potential impact of climate change on flooding and land drainage. In particular they should:

- Be informed by Strategic Flood Risk Assessments in order to evaluate actual flood risk. Priority areas for assessment include the built up areas of Derby, Nottingham and Newark;
- Include policies which prevent inappropriate development either in, or where there would be an adverse impact on, the coastal and fluvial floodplain areas;
- Deliver a programme of flood management schemes that also maximise biodiversity, provide townscape enhancement and other public benefits; and
- Require sustainable drainage in all new developments where practicable.

10.2.13 Development should not be permitted if, alone or in conjunction with other new development, it would:

- Be at unacceptable risk from flooding or create such an unacceptable risk elsewhere;
- Inhibit the capacity of the floodplain to store water;
- Impede the flow of floodwater in a way which would create an unacceptable risk elsewhere;
- Have a detrimental impact upon infiltration of rainfall to ground water storage;
- Otherwise unacceptably increase flood risk; and
- Interfere with coastal processes.

10.2.14 However, such development may be acceptable on the basis of conditions or agreements for adequate measures to mitigate the effects on the overall flooding regime, including provision for the maintenance and enhancement of biodiversity. Any such measures must accord with the flood management regime for that location.

Local Planning Policy

City of Derby Local Plan Review

10.2.15 The City of Derby Local Plan Review has been prepared within the broad context of the 2001 Derby and Derbyshire Joint Structure Plan and the 2002 Regional Planning Guidance for the

East Midlands to 2021. Both of these documents emphasise the principles of sustainable development. The policies that are of relevance to Flood Risk and Hydrology are given below.

10.2.16 Policy GD3: Flood Protection. Except where satisfactory measures are provided to off-set any potential adverse effects of development on the water environment and associated lands, planning permission will not be granted for development which:

- Lies within undefended areas at risk of flooding;
- Would create or exacerbate flooding elsewhere;
- Results in the loss of natural floodplain;
- Would impede access to a watercourse for maintenance or flood defence purposes;
- Does not provide for the adequate management of surface run-off using sustainable drainage principles, unless it can be demonstrated that their use is inappropriate.

10.2.17 Policy GD8: Infrastructure. New development will make provision for necessary and appropriate infrastructure directly related to the development proposed, including water, sewerage and surface water drainage. This will include both on-site requirements related to the proposed use and to off site requirements needed to avoid placing additional burdens on the existing community. Where appropriate, development contributions will be pooled to allow infrastructure to be funded in a fair and equitable way.

Discussion

10.2.18 A waste treatment facility (except landfill and hazardous waste facilities) is classified in PPS25 as Less Vulnerable development. Less Vulnerable development in Flood Zone 1 is considered appropriate. However, with the size and extent of the Proposed Development and the potential adverse effects on the surface water runoff regime, a FRA will be required to ensure appropriate mitigation is incorporated.

10.2.19 There is other relevant policy at a Regional level (East Midlands Regional Plan) and local level (City of Derby Local Plan Review), and to a certain extent at a County level (Derby County Council Plan). However, these policies tend to confirm the position with respect to Hydrology and Flood Risk that is already outlined at a National level (Planning Policy Statement 25).

10.3 Assessment Methodology

10.3.1 The water quality and resources assessment involved the following methodology:

- 1 Consultation with relevant statutory and non-statutory bodies;
- 2 Desk study and walkover of Assessment Site and surrounds to establish baseline conditions, including the determination of the sensitivity of these conditions;

- 3 Evaluation of the potential effects of the Proposed Development and the effect these could have on the baseline conditions;
- 4 Evaluation of the significance of these effects through consideration of the sensitivity of conditions, and determine the magnitude of the effects (adverse and beneficial);
- 5 Identification of possible measures to help avoid and mitigate any potential adverse effects resulting from the Proposed Development;
- 6 Identification of residual effects following the implementation of mitigation measures.

10.3.2 The assessment used the professional judgement of the assessor and was based on information available and attained at the time. The identification of significant effects adhered to the matrix in Table 10.1 (in providing a Major, Moderate or Minor classification), and uses the terms Beneficial (for an advantageous or positive effect to an environmental resource and receptor) or Adverse (for a detrimental or negative effect to an environmental resource or receptor). Where an effect was considered to be not significant or have no influence, irrespective of other effects, it was classified as Negligible.

Table 10.1: Significance Matrix

Sensitivity or Value of Receptor	Magnitude of Effect		
	High	Medium	Low
High (England/UK/International)	Major	Major/ Moderate	Moderate
Medium (County/Regional)	Major/ Moderate	Moderate	Moderate/ Minor
Low (Local/District)	Moderate	Moderate/ Minor	Minor

10.3.3 The level of significance after incorporation of mitigation measures is then considered, applying the same matrix as provided in Table 10.1. The assessment of significance, both before and after incorporation of mitigation, are therefore dependent upon the sensitivity or value of the feature or attribute (Table 10.2) and on the magnitude of the effect (Table 10.3).

10.3.4 The sensitivity or value (High, Medium or Low) of features and attributes has been described using the criteria and examples as outlined in Table 10.2.

Table 10.2: Criteria for Determining the Importance or Sensitivity

Importance	Criteria	Example of Attribute
High	Attribute with high quality and rarity, important at a regional or local scale, or a feature of medium quality and rarity, important at a regional or national scale	Major flood defence strategy providing flood defence to a small population Major river providing a potable water resource to a large population
Medium	Attribute with a medium quality and rarity, important at a regional or local scale, or a feature of low quality and rarity important at a regional or national scale	Natural river and floodplain providing a local flood storage volume Minor river providing a water resource to a small population or industry
Low	Attribute with low quality and rarity, important at a local scale	Heavily managed river and floodplain providing a local flood storage volume Minor river or drain of low quality

10.3.5 The magnitude (High, Medium or Low) of the predicted effect on features and attributes has been described using the criteria and examples as outlined in Table 10.3.

Table 10.3: Criteria for Determining the Magnitude of the Effect

Magnitude	Criteria	Examples
High	Results in loss of an attribute	A considerable effect on a water resource of high quality, such as the destruction of a designated or sensitive site (i.e. SSSI or salmonid fishery)
Medium	Results in an effect on the integrity of an attribute or loss of part of an attribute	A limited effect on a water resource of high quality (i.e. potable water), or a considerable effect on a resource of moderate quality (i.e. industrial uses)
Low	Results in a minor effect on the integrity of an attribute	A slight effect on a water resource of high quality (i.e. potable water); a limited effect on a water resource of moderate quality (i.e. agricultural abstraction); or a considerable impact on a water resource of low quality)
Negligible	Results in an impact on attribute but insufficient to effect the integrity	N/A

10.3.6 The duration of the effect has been indicated where known using the terminology Short, Medium and Long-term. Short-term effects would tend to relate to the demolition and construction phase of the Proposed Development, whereas Long-term effects would tend to relate to the operational phase. The terminology of Temporary and Permanent is used for describing the longevity of the effect, and whether the effect is Direct or Indirect has also been indicated where known.

10.3.7 Finally, the scale of the effect has been indicated and will either be at a Local level (e.g. on the Assessment Site or neighbouring sites); Borough level (e.g. Wokingham Borough); County level (e.g. Berkshire); Regional level (e.g. South-East); National (e.g. England) or International level.

10.4 Baseline Conditions

Catchment Hydrology

10.4.1 The River Derwent is the main watercourse in the surrounding area, with this situated approximately 4.5km to the north-east of the assessment site. The nearest watercourse to the assessment site is the Cuttle Brook, with this situated approximately 0.3km to the south-west of the site at its closest point and draining in a south-easterly direction to the Trent and Mersey Canal. Chapter 11 identifies the Barracks Brook from historical maps of the area, issuing 80m to the south-east of the assessment site and joining the Cuttle Brook – however, this watercourse is not identified on current maps or correspondence and is a culverted feature. There are no watercourses or permanent water features over the assessment site.

Land Use and Topography

10.4.2 The Assessment Site has an area of 3.4ha and is unused and undeveloped following the demolition of the tannery buildings that previously occupied it. The hardstanding and floor areas of the tannery remain in part and the site remains in a contaminated condition.

10.4.3 The south-east part of the Assessment Site lies at a lower level than the remainder and is bounded by mature poplar trees. This area currently comprises rough grass and shrub vegetation. The remainder of the Assessment Site is uneven and comprises rough grass, brambles and vegetation. There are no above ground structures from the former tannery operations visible.

10.4.4 The topographic survey for the Assessment Site is included in Appendix 10.1, with existing ground levels between 49.03m AOD at the south-eastern boundary and 53.87m AOD at the north-western boundary. Ground levels are typically around a level of 52.00m AOD towards the centre of the Assessment Site. The main gradient is therefore from the centre of the Assessment Site decreasing in a north, east and southwards direction, and increasing slightly in a westward direction.

Sources of Flood Risk

10.4.5 The information from the Environment Agency shows the Assessment Site to be within Flood Zone 1, and as such, the risk of tidal and fluvial flooding is considered to be of low probability. The FRA in Appendix 10.1 gives further information on the classification of flood risk.

- 10.4.6 There are no non-main rivers over the Assessment Site. The Cuttle Brook is the nearest non-main river, with this situated approximately 0.4km to the south-west and draining south-eastwards. The Cuttle Brook has a small catchment area (approximately 3.2km²), a considerable amount of which is urbanised and likely therefore to be drained by surface water infrastructure. Based on the distance from the Assessment Site and the information from the Environment Agency, the Cuttle Brook is not anticipated to present a significant fluvial risk.
- 10.4.7 Pluvial flooding is a result of overland flow that can follow a rainfall event, before the runoff enters a watercourse or sewer. This form of flooding is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall under certain conditions. The flood risk relates to both the conveyance of waters to the Assessment Site by overland flow from areas outside the site and also the conveyance of water to lower lying areas within the Assessment Site itself, and the ponding of these waters in depressions in the topography.
- 10.4.8 Ground levels in the surrounding area tend to be higher than the Assessment Site in the urbanised areas to the north-west and north and in the parkland and urbanised area to the north-east. However, there is a railway line running along the northern boundary of the site which resides in a depression, any pluvial run-off entering this will preferentially flow along the railway bypassing the site. Ground levels in the surrounding area tend to be lower than the Assessment Site in the urbanised areas to the south and to the south-east. Ground levels to the south-west tend to be similar. Urbanised areas are all served by an existing drainage infrastructure, and based on this, overland flows and flooding from off-site areas is not anticipated to be an issue.
- 10.4.9 Ground levels over the Assessment Site are lowest in the south-east part of the Assessment Site, with ground levels grading from the centre of the Assessment Site to the north, east and south. These lower lying areas are likely to be more at risk from overland flows and flooding that might result from the development of the higher parts of the Assessment Site.
- 10.4.10 Infrastructural flooding is where sewerage systems are completely overwhelmed to cause flooding, and may occur alone or be combined with other flood sources. It is most common in urban environments and often a result of inadequate or poorly designed surface water drainage systems. There is sewerage infrastructure to the east and west of the Assessment Site. However, there has been no evidence of infrastructural flooding following our correspondence with the Environment Agency and Severn Trent Water and the ground levels and potential flows paths (see 10.4.8) indicate that the site is not at risk.
- 10.4.11 The assessment site is located on a keuper marl of the Triassic epoch, with this a red-brown

marl and siltstone and having an aquifer with limited potential. From our data search and consultation with the Environment Agency, no history of groundwater flooding was reported.

Surface Water Drainage

- 10.4.12 Aside from the buildings described earlier, the Assessment Site is undeveloped ground and as such, soil character is important to ground conditions and to surface water drainage. Details on soil types and character were taken from the 1:250,000 scale Soil Map of England and Wales produced by the Soil Survey of England and Wales (1983). Unfortunately, due to the urbanised nature of the assessment site and surrounds, it was not possible for the soil survey to provide a classification of soil association. Intrusive investigation would be required to assess soil conditions; however, the previous use of the site as a landfill may mean that the investigation would not return viable results relating to the drainage capability of the region.
- 10.4.13 Based on the topographic survey, the main gradient for the drainage of surface waters over the site is from the centre of the Assessment Site to the north, east and south.
- 10.4.14 The changed land use with the proposed development of the assessment site will alter the areas response to rain events, with altered surface water runoff rates and conveyance routes. The effect on surface water drainage, and the potential impact to local and catchment-wide flooding, will therefore need to be considered.

Water Resources

- 10.4.15 The spatial mapping and nodal information in the Severn Trent Water asset plans show that there is local water supply and surface and foul water infrastructure in the surrounding area.
- 10.4.16 There are two distribution water supply mains to the west of the Assessment Site, beneath Sinfin Lane – the first a 4” diameter pipe and the second a 9” diameter pipe.
- 10.4.17 There is a public surface water gravity sewer beneath Sinfin Lane to the west of the Assessment Site with the first node in the sewer adjacent the western boundary, with the sewer draining southward. There is another surface water gravity sewer adjacent the road to the east of the Assessment Site with the first node in the sewer adjacent the eastern boundary, with the sewer draining southward. There is a private surface water sewer from areas further to the east that connects to the eastern public surface water gravity sewer.
- 10.4.18 There is a public foul gravity sewer beneath Sinfin Lane to the west of the Assessment Site, with the first node in the sewer adjacent the western boundary of the site, with a connection from the former tannery building. The sewer drains southward from the first node in the sewer, before joining another sewer and draining eastward.

Discharge Consents

10.4.19 Registered details on discharge consents are available from the data search completed for the Assessment Site and surrounding area on 13th November 2008. Appendix 10.2 shows the locations and provides a brief summary of these discharges. The statuses of the listed discharge consents are classified as either being pre- or post-National Rivers Authority Legislation (31/08/89), modified (Water Resources Act) or revoked. Aside from one discharge to the River Derwent, discharges tend to be to the Cuttle Brook or to a tributary of the Cuttle Brook, with waters then draining towards the River Trent. Discharge consents tend to be associated with trade (cooling water, effluent) or sewage (storm overflow, surface water).

Water Abstractions

10.4.20 Registered details on water abstractions are available from the data search completed for the Assessment Site and surrounding area on 13th November 2008. Appendix 10.2 shows the locations and provides a brief summary of these abstractions. There are three water abstractions from a groundwater source and one water abstraction from a surface water source. Water abstractions are for process waters in the industrial/commercial/public services or general farming and domestic purposes, with the surface water abstraction for impounding.

Pollution Incidents to Controlled Waters

10.4.21 Registered details on recent pollution incidents to controlled waters are available from the data search completed for the Assessment Site and surrounding area on 13th November 2008. Appendix 10.2 shows the locations and provides a brief summary of these incidents. Pollution incidents occur either within the Trent catchment (confluence with Derwent, Lower Derwent, confluence with Lean) or Derwent (confluence with Wye). Pollution incidents are most frequent in the Trent confluence with the Derwent. Pollution incidents to controlled waters are from chemicals (detergent/surfactant, pesticide, acid, paints/dyes, other organic/inorganic), oils (unknown, diesel, gas oil), sewage (crude, storm, debris/litter) and miscellaneous (inert suspended solids, foam). Pollution from inert suspended solids occur the most frequently. All of the pollution incidents in the surrounds are classified as a Category 3 – Minor Incident.

River Quality

10.4.22 The Environment Agency provide a classification of river quality, based on a General Quality Assessment (GQA) approach and also based on the quality of certain river reaches from biological or chemical water sampling. River reaches are graded based on the GQA and/or water sampling, and assigned a grade between A and F. River quality is classified as either A (very good), B (good), C (fairly good), D (fair) or E (poor) or F (bad).

10.4.23 Registered details on river quality are available from the data search completed for the

Assessment Site and surrounding area on 13th November 2008. Appendix 10.2 shows the location of rivers in the vicinity of the Assessment Site. Data were provided for one reach of the Cuttle Brook, from upstream of Reckitts to the confluence of the Main Drain. The GQA classification for this 3.8km long river reach in 2000 was D (fair), with a river flow of less than 0.31 cumecs.

10.4.24 Biological sampling on the Cuttle Brook from upstream of Reckitts to the confluence of the Main Drain (NGR 434700 332800) has enabled a classification of water quality. Appendix 10.2 shows the location of rivers in the vicinity of the Assessment Site. The river quality from biological sampling was classified as D (fair) in 1990 to 2003 improving to C (fairly good) in 2004 to 2006.

10.4.25 Chemical sampling on the Cuttle Brook from upstream of Reckitts to Moor Lane Bridge (NGR 435000 332500) has enabled a classification of water quality. Appendix 10.2 shows the location of rivers in the vicinity of the Assessment Site. The river quality from chemical sampling was classified as E (poor) in 1990, C (fairly good) in 1993 to 1994, D (fair) in 1995 to 2001, C (fairly good) in 2002 to 2005 and B (good) in 2006.

10.5 Incorporated Enhancement and Mitigation

Surface Water Quality

10.5.1 There are a number of materials and wastes or by-products which could arise during the demolition and construction works and with the operation of the facility, and which may give rise to an impact on surface water quality. A large part of the site is to be covered with buildings and hardstanding where there is the potential for an accident or spillage event and also the build-up of polluting materials, such as with certain liquids and silts. The first flush of these materials from hardstanding areas is likely to have the most significant effect on surface water quality. This first flush is likely to be more prolific after a prolonged dry period and with a low intensity rainfall event, as this offers little opportunity for the dilution of pollutants.

10.5.2 Although there are no main rivers over the Assessment Site or within the immediate surrounds, there are non-main rivers in the surrounding area, as well as main rivers in the downstream catchment that are of a high quality. Although direct contamination of watercourses is unlikely, there is the potential direct contamination of surface water runoff with the use and storage of machinery, equipment and materials. There is also the potential indirect contamination of watercourses from an accident or spillage event.

10.5.3 Water quality interceptors and/or sumps would be included as an incorporated enhancement

and mitigation measure for the drainage of surface waters from hardstanding areas prior to their release from the Assessment Site. These measures would be designed for the volumes and rates of surface water runoff at design return period events. The measures would have an appropriate design and classification for the potential polluting nature of materials. Although hazardous wastes are not being handled, there is the possibility for petrochemical spillages from vehicles and the build-up of silts with the use of the facility. The surface water drainage network should also be fitted with a means of isolation at appropriate locations in the drainage network, notably at release points for surface waters from the Assessment Site.

- 10.5.4 Reference should be made to the relevant Pollution Prevention Guidelines (PPG) – notably to PPG1 (General Guide to the Prevention of Pollution), PPG3 (Use and Design of Oil Separators in Surface Water Drainage Systems), PPG6 (Working at Construction and Demolition Sites) and PPG18 (Managing Fire Water and Major Spillages).

Surface Water and Flood Risk

- 10.5.5 The Proposed Development is in Flood Zone 1, with this an area where the risk of flooding from tidal or fluvial sources is considered to be low. The classification and assessment of flood risk is further defined in the FRA (Appendix 10.1). The Proposed Development is a waste treatment facility (except landfill and hazardous waste) and classified in PPS25 as Less Vulnerable development. The advice on flood risk vulnerability and compatibility indicates that Less Vulnerable development is appropriate in Flood Zone 1. The risk posed to the Proposed Development from fluvial or tidal sources is therefore considered to be insignificant, and as such, no incorporated enhancement and mitigation measures are required.
- 10.5.6 The changed land use with the Proposed Development will have the potential to increase surface water runoff rates and volumes and alter drainage patterns, thereby affecting local and catchment-wide flooding. The introduction of permanent and temporary structures and hardstanding areas to the Assessment Site, together with the laying of infrastructure can all have an effect.
- 10.5.7 The responsible management of surface waters can often be achieved through the adoption of SUDS, and covers a range of measures which aim to manage the discharge of surface water draining from a site in a more sustainable way. SUDS are used to control the rate and route of surface water runoff as close to its point of origin as possible using solutions that seek to mimic the natural drainage regime and offer many benefits, including a reduction of flood risk, improvements to water quality, the recharge of groundwater and the provision of amenity and wildlife benefits. Because of the nature of the Proposed Development and the proposed use of the land area, the range of SUDS measures suitable for the site is limited.

- 10.5.8 The soil contamination of the site is described in Chapter 11. This indicates that despite the nature and distribution of potentially contaminating activities historically undertaken at the Assessment Site, there is no evidence of widespread or gross contamination. Where contamination has been identified, it is generally localised in nature and is usually associated with the former settlement lagoons, ponds and tannery.
- 10.5.9 Surface water attenuation will be provided beneath parts of the hardstanding surface using subsurface storage cells. With the localised nature of soil contamination, subsurface storage cells may need to be surrounded by an impermeable membrane. This requirement would be determined as a part of a more intrusive investigation. Surface waters will reach the storage cells via gulleys or permeable paving on suitable areas of the Assessment Site. Surface water will be conveyed from attenuation areas via pipes, and released to the existing public surface water gravity sewers to the west of the Assessment Site at an agreed rate.
- 10.5.10 The FRA in Appendix 10.1 and the Report on Drainage Philosophy that is included within the assessment provides further detail on the surface water drainage strategy for the site and the discharge of surface water runoff. Peak surface water discharge rates from site will not increase as a result of the proposed development up to a 1 in 100-year storm including an allowance for climate change. Based on the guidance in PPS25, an allowance is to be included for climate change for a short development lifespan. This allowance is an increase in rainfall intensity (and consequently an increase in rainfall volume) from an exceptional storm event with the projected impacts of climate change over the development design life. The guidance from the Environment Agency also requires at least a 20% reduction in discharge rate compared to the existing situation. The drainage philosophy indicates that surface water discharge rates from the site are to be agreed with Severn Trent Water, however, a 20% reduction in discharge rates will be aspired to over existing brownfield rates.

Water Resources

- 10.5.11 There is existing water and surface and foul water infrastructure in the vicinity of the Assessment Site, with this to be used with the Proposed Development. It may be necessary for Severn Trent Water to undertake a Network Impact Assessment to ensure that there is adequate capacity in this infrastructure. However, given that the Proposed Development is likely to place a low demand on the infrastructure compared with other types of development (e.g. residential), it is anticipated that this existing infrastructure will be adequate. Based on this summation, no incorporated enhancement and mitigation measures are required.

10.6 Identification and Evaluation of Likely Significant Effects

Surface Water Quality

- 10.6.1 After inclusion of incorporated enhancement and mitigation measures, there remain possible significant effects to surface water quality during the construction and operation phases.
- 10.6.2 Chapter 11 indicates that where contamination of soils has been identified, that this is generally localised in nature and usually associated with the former settlement lagoons, ponds and tannery. The disturbance of these contaminated areas, or the discovery of other contaminated areas, during the construction phase could impact upon surface water quality.
- 10.6.3 Groundwater contamination is commented on in Chapter 11, with low concentrations of inorganic contaminants observed, together with slightly elevated concentrations of arsenic and significantly elevated concentrations of chromium on parts of the Assessment Site. The assessment of controlled waters in Chapter 11 identifies contaminations of concern in local leachate/perched waters, and also present in groundwater samples taken down-gradient of the Assessment Site. This presents a possible impact to surface water quality through the interaction of runoff with contaminated groundwater, notably through infiltration to ground.
- 10.6.4 Despite the inclusion of water quality interceptors and/or sumps within the surface water drainage network, there remains the possibility of an impact to surface water quality – notably during the construction phase, and especially prior to the completion of these measures. Key pollution sources to surface waters from demolition and construction activities include:
- Mobilisation and deposition of fine materials (e.g. silts and clays) from the use of machinery and vehicles (e.g. access routes, construction compounds);
 - Pollution risk in relation to the use of certain materials (e.g. cement, lubricants);
 - Accidental leaks or spills during transportation, storage and maintenance;
 - Creation of new access tracks and temporary increases in vehicle volumes – both around the Assessment Site and with journeys to and from the area;
 - Soil erosion and increased sediment loading from localised changes to catchment hydrology (e.g. compaction of soil and the excavation of material);
 - Concentrated flows of water and the potential for erosion of soils and mobilisation of materials, such as along temporary drains; and / or
 - Provision of temporary on-site sanitary facilities for construction site staff.
- 10.6.5 The upkeep and long-term maintenance of the surface water drainage strategy through an appropriate management plan, including the surface water quality interceptors and/or sumps and the means of isolation fitted within the infrastructure, is essential if an impact on surface water quality is to be avoided.

10.6.6 The incorporated enhancement and mitigation measures greatly reduce the effects on surface water quality. However, there remains the possibility of an impact – notably during the construction phase, and also with the failure to maintain the surface water drainage strategy. Furthermore, the potentially contaminated nature of soils and groundwater, albeit at a local level within the Assessment Site, could cause an effect on surface water quality. Surface waters in the local area are of a low sensitivity; however, waters in the surrounding catchment are of a medium sensitivity. The magnitude of the effect would be negligible to low under normal circumstances. The significance would therefore be minor in the local area, although moderate to minor in the surrounding catchment. The duration of effects under normal circumstances are not likely to be more than short to medium-term and of a temporary nature.

Surface Water and Flood Risk

10.6.7 After inclusion of incorporated enhancement measures, there remain possible significant effects to surface water and flood risk during the construction and operation phases.

10.6.8 Despite the inclusion of a surface water drainage strategy, there remains the possibility of an impact to surface water and flood risk – notably during the construction phase, and especially prior to the completion of these measures. This mainly relates to unattenuated runoff from new areas of hardstanding or altered drainage patterns, such as through compressed soils.

10.6.9 The upkeep and long-term maintenance of the surface water drainage strategy through an appropriate management plan is essential if an impact on surface water and flood risk is to be avoided. This mainly relates to the subsurface storage cells that are used in the operation phase for attenuating the rate and volume of surface water runoff; the permeable paving or gulleys that allow waters to drain into these; and the release points from the Assessment Site.

10.6.10 The incorporated enhancement measures greatly reduce the effects on surface water and flood risk. However, there remains the possibility of an impact – notably during the construction phase, and also with the failure to maintain the surface water drainage strategy. The vulnerability of the proposed development to flooding is considered to be low, and therefore the sensitivity is low. The magnitude of the effect would be negligible to low under normal circumstances. The adverse significance would therefore be minor in the local area and in the surrounding catchment. The duration of effects under normal circumstances are not likely to be more than short-term and of a temporary nature.

Water Resources

10.6.11 It is anticipated that the existing water, surface and foul water infrastructure will be adequate for the construction and operation of the Proposed Development.

10.6.12 However, measures to promote sustainability within the Proposed Development should be considered wherever possible. The importance of a sustainable approach and measures within new development are outlined in the National and Regional planning policy. Measures to help reduce the consumption of water and reduce the release of surface and foul water could therefore be included to improve the sustainability of the Proposed Development. For example, this includes the rainwater harvesting from roof areas that is to be provided, with this water re-used as boiler water in the facility and for toilet flushing. It has been estimated that the operation of the facility will require 24,000 litres of water a day – with the tanks when full from harvested rainwater providing 12.5 days of free water. Further details of this are given in the Report on Drainage Philosophy, as included in the FRA in Appendix 10.1.

10.6.13 There are two distribution water supply mains to the west of the Assessment Site, beneath Sinfin Lane – the first a 4” diameter pipe and the second a 9” diameter pipe. On occasions where rainwater harvesting is not able to provide the required water for the operation of the facility, then the existing water supply is to be used for the Proposed Development during the construction and operation phase. The existing surface and foul water infrastructure is to be used for the Proposed Development during the construction and operation phase. Based on this, there are no incorporated enhancement measures required. However, the inclusion of rainwater harvesting will be beneficial and of a minor significance in the local area, and due to the reliance on rainfall, of a short-term although permanent nature.

10.7 Mitigation

Surface Water Quality

Construction Phase

10.7.1 A Construction Environmental Management Plan (CEMP) would be prepared before commencement of works to ensure that best practice is employed. The CEMP would include method statements for the Proposed Development, details of materials to be taken from and to the Assessment Site, and a pollution control and contingency plan. The CEMP is therefore of relevance to the removal of material with the excavation and construction of the subsurface storage cells. Although the CEMP would help protect surface water quality, it would also benefit other water resource aspects together also with associated areas of the environment.

10.7.2 The potential effects identified in relation to surface water quality are applicable to most construction sites. The CEMP will be applied during construction of the Proposed Development to mitigate potential adverse effects on surface water quality. It is common practice for a local planning authority to impose planning conditions requiring a detailed CEMP to be submitted for approval prior to any development occurring on a site.

10.7.3 The CEMP will draw on the CIRIA document “Control of Water Pollution from Construction Sites” and the Environment Agency guidance on Sustainable Drainage Systems (SUDS), together with the appropriate PPG documents. The following specific measures for the protection of surface water quality during the demolition and construction activities will be included within the CEMP prepared for the Assessment Site:

- Management of demolition and construction works so as to comply with the necessary surface water quality standards and consent conditions;
- Surface water run-off from the Assessment Site will be managed through a temporary and / or permanent drainage infrastructure, including measures for removing suspended solids and potential contaminants;
- Plant machinery and vehicles will be maintained in a good condition, with washing and dust suppression measures to prevent the migration of pollutants (particularly in relation to works using concrete and with areas where dust and mud can build up);
- Areas at risk of spillage will be carefully sited and protected (e.g. bunds) so as to minimise the risk of hazardous substances impacting upon surface water quality – this may include vehicle maintenance and storage areas for hazardous materials;
- The movement of plant machinery and vehicles and the storage of materials during the demolition and construction works will be limited near to surface water features;
- Excavation activities will be carefully monitored and co-ordinated with forecasted dry periods, where possible, with excavation works covered during periods of heavy rain to minimise the entry and collection of rainwater and the transport of pollutants; and
- The movement of plant and machinery over bare soil areas will be limited so as to avoid soil compaction and smearing, with suitable preparatory works included where this can not be avoided so as to minimise effects on the surface water runoff regime.

10.7.4 The early phasing of the permanent surface water drainage strategy in the operation phase would help reduce potential impacts on surface water quality during the construction phase.

Operation Phase

10.7.5 A management plan will be adhered to for the upkeep and long-term maintenance of the surface water drainage strategy. This would provide specific measures for the upkeep and maintenance of surface water quality interceptors and/or sumps, and for the means of isolation fitted within the infrastructure. The management plan would outline an emergency procedure to be followed in the event of a spillage or event that could impact on surface water quality. The management plan would also outline responsibilities for the operation of the surface water drainage strategy, including the required training programme for staff members.

Surface Water and Flood Risk

Construction Phase

- 10.7.6 Temporary drainage facilities will be provided during the demolition and construction phase to ensure the controlled discharge of surface water run-off from the Assessment Site, until such a time as the permanent surface water drainage strategy is implemented. Early phasing of a part or the whole of the permanent surface water drainage strategy could also be facilitated.
- 10.7.7 These surface water drainage facilities will limit ponding of water within the construction site and help minimise the risk of any localised flooding. Further detail on the incorporation and design of the surface water drainage strategy is included in the FRA in Appendix 10.1.

Operation Phase

- 10.7.8 A management plan will be adhered to for the upkeep and long-term maintenance of the surface water drainage strategy. This would include the maintenance of any permeable paving, such as regular water blasting. The management plan would outline an emergency procedure to be followed in the event of a failure of the drainage strategy or with an extreme rain event. The management plan would also outline responsibilities for the operation of the surface water drainage strategy, including the required training programme for staff members.
- 10.7.9 In addition to those outline in the Construction Phase, reference should be made to the relevant Pollution Prevention Guidelines (PPG) – notably to PPG8 (Safe Storage and Disposal of Used Oils), PPG20 (Dewatering of Underground Ducts and Chambers), PPG21 (Pollution Incident Response Planning)

Water Resources

Construction Phase

- 10.7.10 The existing water supply and the existing surface and foul water infrastructure are considered to be adequate for the construction of the Proposed Development, hence no impacts are anticipated and no mitigation is required.

Operation Phase

- 10.7.11 The existing water supply and the existing surface and foul water infrastructure are considered to be adequate for the operation of the Proposed Development, hence no impacts are anticipated and no mitigation is required.
- 10.7.12 However, measures to improve the sustainability of the scheme could be incorporated, with efforts to reduce the consumption of water and reduce the release of surface and foul water.

For example, this includes the rainwater harvesting from roof areas that is to be provided, with this water re-used as boiler water in the facility and for toilet flushing. It has been estimated that the operation of the facility will require 24,000 litres of water a day – with the tanks when full from harvested rainwater providing 12.5 days of free water. Further details of this are given in the Report on Drainage Philosophy, as included in the FRA in Appendix 10.1. In addition to this, measures to reduce the consumption and discharge of water from the Proposed Development should also be encouraged, such as low water consumption fixtures (e.g. toilets, taps) fitted with water efficiency and cut-off features.

10.8 Residual Impact

Surface Water Quality

- 10.8.1 It is important that the mitigation measures for protecting surface water quality are properly managed and maintained, particularly in relation to the surface water drainage strategy. Assuming these are correctly managed and maintained, there are no residual effects anticipated. The exception to this relates to a major accidental spillage, with this having the potential to effect surface water quality. Although the probability of occurrence is considered to be minimal, this could have a significant effect. The surface water quality measures in place would offer some protection from such an event, although not necessarily complete protection. Additional mitigation measures for reducing the effects from a major accidental spillage would include an emergency action plan (included within the Management Plan) for enabling a timely and efficient clean-up operation, including the use of shut-off valves.
- 10.8.2 A summary of the residual impacts of the Proposed Development on surface water quality is given in Table 10.4.

Surface Water and Flood Risk

- 10.8.3 The surface water drainage strategy for the Proposed Development would need to be properly managed and maintained, with a plan established for co-ordinating these activities. This plan would make a commitment to the maintenance of the surface water drainage strategy.
- 10.8.4 More extreme rainfall than the design event (intensity and/or duration) may cause some localised flooding over the site and surrounds. The outlined mitigation measures would provide protection up to the design event, and some protection for events exceeding this.
- 10.8.5 A summary of the residual impacts of the Proposed Development on surface water and flood risk is given in Table 10.4.

Water Resources

10.8.6 There are no residual effects anticipated from the potable or the foul water scheme.

10.8.7 A summary of the residual impacts of the Proposed Development on water resources is given in Table 10.4.

Table 10.4: Summary of Residual Impacts

Impact	Impact Type	Magnitude	Significance	Geographical Level of Importance *				
				I	N	R	D	L
Construction Phase								
Surface Water Quality	Adverse	Low to Medium	Negligible – Minor				X	X
Surface Water and Flood Risk	Adverse	Low	Negligible					X
Water Resources	Adverse	Low	Negligible					X
Operation Phase								
Surface Water Quality	Adverse	Low	Negligible					X
Surface Water and Flood Risk	Adverse	Low	Negligible					X
Water Resources	Beneficial	Low	Negligible – Minor					X

* I denotes International, N denotes National, R denotes Regional, D denotes District and L denotes Local scale impact

10.9 Conclusions

10.9.1 An assessment of the baseline conditions on Hydrology and Flood Risk as been undertaken for the Proposed Development of the Assessment Site. This assessment has been based on a review of available and collated information, and consultation with regulatory authorities. This includes a review of the Flood Risk Assessment completed for the Assessment Site.

10.9.2 Three main effects are considered in the assessment – that on surface water quality, on surface water and flood risk and on water resources. Committed enhancement measures are outlined to reduce the impact from these effects. This includes reference to a conceptual surface water drainage strategy for the attenuation of runoff rates from the site, also including measures to prevent an adverse impact on surface water quality. Reducing the significance of these effects would require further liaison with the Environment Agency and Severn Trent

Water, notably with the detailed design of the conceptual surface water drainage strategy.

10.9.3 The identification and evaluation of likely significant effects after incorporation of enhancement measures were then outlined. The significance of the effect on surface water quality was found to be minor in the local area, although moderate to minor in the surrounding catchment. The duration of effects under normal circumstances are not likely to be more than short to medium-term and of a temporary nature. The significance of the effect on surface water and flood risk was found to be minor in the local area and in the surrounding catchment. The duration of effects under normal circumstances are not likely to be more than short-term and of a temporary nature. The existing water supply and surface and foul water infrastructure can be used, and on the basis it is adequate for the Proposed Development, no incorporated enhancement water resources measures are required to reduce the significance.

10.9.4 Additional mitigation measures are provided for surface water quality and surface water and flood risk, notably during the construction phase through the introduction of a Construction Environmental Management Plan and during the operation phase with a Management Plan for the surface water drainage strategy. The residual impact after inclusion of these mitigation measures was then assessed, with all effects reduced to negligible – except the possibility of a minor significance effect on surface water quality in the rare event of a major accidental spillage.

10.10 References

- Soil Survey of England and Wales (1983) – Soil Map of England and Wales (1:250,000)
- Communities and Local Government (2006) - Planning Policy Statement 25: Development and Flood Risk
- East Midlands Regional Plan (2009) –
- City of Derby Local Plan Review (2006) –
- Environment Agency Pollution Prevention Guidelines (PPG): PPG1 (General Guide to the Prevention of Pollution), PPG3 (Use and Design of Oil Separators in Surface Water Drainage Systems), PPG6 (Working at Construction and Demolition Sites) and PPG18 (Managing Fire Water and Major Spillages), PPG8 (Safe Storage and Disposal of Used Oils), PPG20 (Dewatering of Underground Ducts and Chambers), PPG21 (Pollution Incident Response Planning)