MWDA: Gillmoss Materials Recovery Facility

Flood Risk Assessment

10 December 2008

Produced for
Merseyside Waste Disposal Authority

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Document Control Sheet

Project Title	MWDA: Gillmoss Materials Recovery Facility
Report Title	Flood Risk Assessment
Revision	6
Status	Final
Control Date	10 December 2008

Record of Issue

Issue	Status	Author	Date	Check	Date	Authorised	Date
1	Draft	B Adeyemi-Doro	14/08/08	M Crowther	15/08/08	Z Hutchison	15/08/08
2	Draft Final	B Adeyemi-Doro	26/08/08	M Crowther	29/08/08	Z Hutchison	29/08/08
3	Draft Final	B Adeyemi-Doro	01/10/08	M Crowther	01/10/08	Z Hutchison	01/10/08
4	Final	B Adeyemi-Doro	23/10/08	M Crowther	24/10/08	Z Hutchison	24/10/08
5	Final	B Adeyemi-Doro	23/10/08	S. Duff	02/12/08	P Coughtrey	03/12/08
6	Final	B Adeyemi-Doro	23/10/08	S. Duff	10/12/08	P Coughtrey	10/12/08

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Abbreviations

AOD	Above Ordnance Datum
DTM	Digital Terrain Map
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
ha	Hectares
MRF	Materials Recovery Facility
MWDA	Merseyside Waste Disposal Authority
SPZ	Source Protection Zone
SUDS	Sustainable Urban Drainage System
TPA	Tonnes per annum
WTS	Waste Transfer Station

1 Introduction

1.1 Proposed Work Description

Merseyside Waste Disposal Authority (MWDA) proposes to develop a 100,000 tonnes per annum (tpa) Materials Recovery Facility (MRF) that incorporates a visitor centre and administration building within its design. The new MRF is proposed to be located on the same site as the existing Gillmoss Waste Transfer Station (WTS) owned by MWDA.

The MRF will process dry recyclable material that is collected from the kerbside. This will principally comprise of, paper, card, plastic bottles, steel and aluminium cans and glass bottles. The recyclable material will be brought to site in either conventional collection vehicles or in bulk haulage vehicles. All material will be handled within the MRF building and there will be no external storage of material. All doors to the facility will operate on a fast open and close operation to ensure that they are open for the shortest possible time.

The sorting system within the building will separate co-mingled dry recyclable materials into individual streams whilst also removing reject material that has been incorrectly placed into bins by householders. This reject material will be taken off site to a licensed disposal facility. Recyclable materials will be sorted using a variety of screens, magnets, electronic and manual separation systems before being bulked and loaded for transport to third party recycling processors.

The MRF is proposed to be situated southwest of the existing WTS.

1.2 Report Objectives

Mouchel has been commissioned by Merseyside Waste Disposal Authority to undertake a Flood Risk Assessment for the proposed development site. This is to support a planning application for the proposed MRF. This report outlines the findings of the assessment and highlights the issues to be considered with regard to flood risk.

2 Site Description

The proposed MRF site at Gillmoss is located approximately 7.5 km north east of Liverpool City centre and is part of the Gillmoss Industrial Estate, near Fazakerley, Merseyside. The Gillmoss site is approximately 9.2 ha, consisting mainly of grassland with areas of scrub, marshy grassland and extensive patches of invasive weeds. The proposed MRF development site will occupy approximately 1 ha of the Gillmoss site.

The approximate site grid reference is SJ 39758 96609, and can be accessed from the east via junction 5 of the M57, onto the A580 and through the industrial estate. From the north, the site can be accessed via the A506 and through the residential area of Fazakerley onto Stonebridge Lane. Figure 2.1 shows the proposed site and its surrounding area.

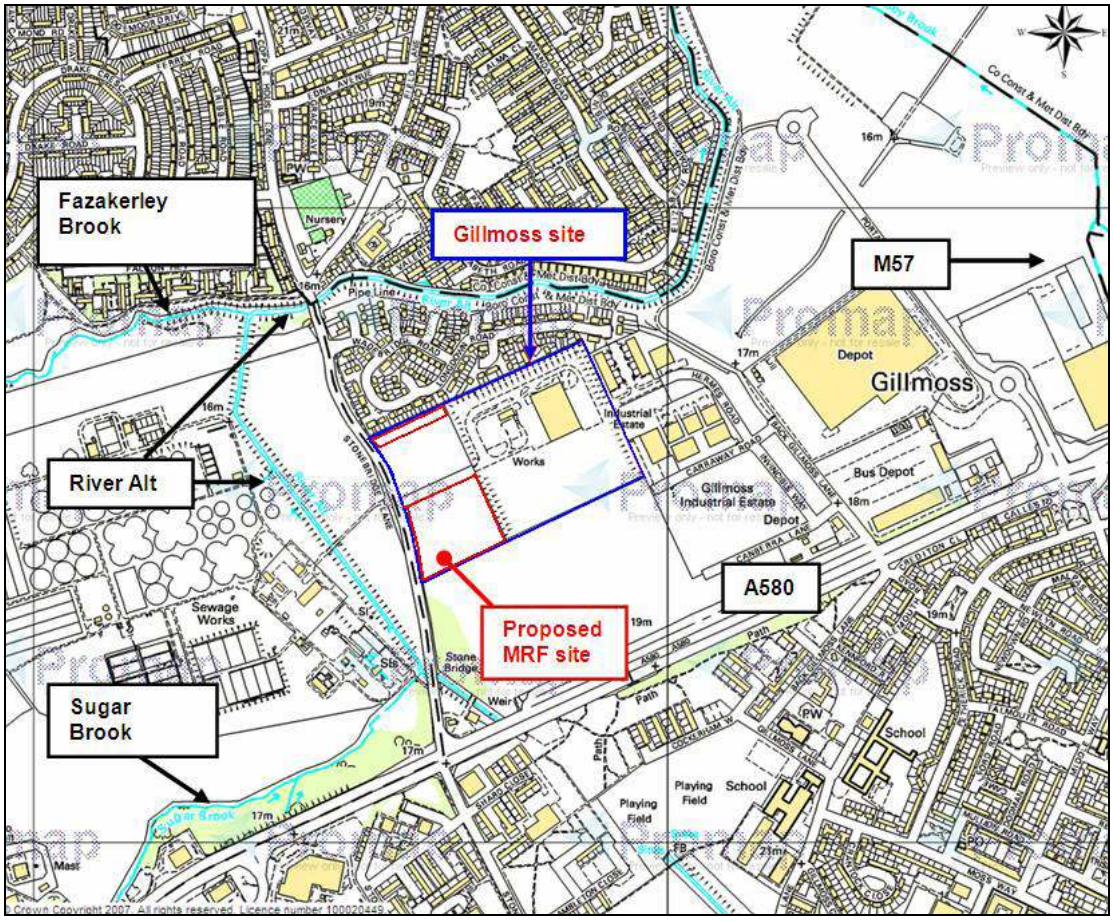

Figure 2.1 – Proposed Site and its Vicinity

Situated within the Gillmoss site is an existing WTS which occupies approximately 1.9 ha of the total site and consists of a large warehouse, a small office block, vehicular access and parking (see Figure 2.2). The WTS has a 500,000 tpa licensed capacity to manage municipal solid and trade waste. Currently, approximately 270,000 tonnes or 54% of the current licensed capacity is processed per annum.

Figure 2.2 - Aerial View of Site (Source: www.multimap.co.uk)

The residential properties south of Longdown Road form the northern boundary of the site and a 25 m wide woodland buffer strip separates these properties from the existing WTS. To the immediate north of Longdown Road is the district border with Knowsley Borough Council. A vacant brownfield site, also designated for industrial use and included in the development plans for Stonebridge Business Park is situated south of the site whilst an effluent treatment works operated by United Utilities is situated to the west of the site. Gillmoss Industrial Estate lies to the east of the site and extends as far as the District boundary.

The River Alt runs to the north and west of the proposed site, and there are five brooks (all tributaries of the River Alt) within 1 km of the site (see Figure 2.1).

3 Assessment

3.1 Desktop Information Search

3.1.1 Flooding History

The proposed site falls within the 248 km^2 Alt catchment. The majority of surface water runoff within the catchment is pumped into the Irish Sea from Altmouth Pumping Station. Since the pumping station's installation in 1971, only four localised flood incidents have been reported (see Table 3.1).

Table 3.1 - Alt Catchment History (Source: Alt Alt-Crossens Catchment Flood Management Plan – Scoping Report Jan 2007)

Date	Event
1200's	Monks are thought to have started reclaiming lowland areas of the catchment from the effects of the sea by constructing drainage ditches and embankments.
1600's	Dutch engineers were thought to have been employed to improve drainage in the lower catchment. During this time an Act was passed allowing drainage improvements to 2,000 ha of the Lower Alt catchment.
1779	River Alt Drainage Act was passed for 'Draining, Improving and Preserving, the Low Lands, in the Parishes of Altcar, Sefton, Halsall, and Walton-upon-the-Hill, in the County Palatine of Lancaster'. River Alt Commissioners are recorded as having constructed new tide gates downstream of existing gates. During these works, evidence of even earlier gates was found.
1800's	The Secretary to the River Alt Commissioners wrote about the common continual inundation of areas of the Lower Alt during winter seasons, and that 'at many of the houses there were boats, in which, during the continuance of the floods, the inhabitants were accustomed to go aboard and visit each other'. During this period the Lower Alt area was recorded as being used for hay crops, which were used to supply Liverpool.
1830	The tide gates constructed in 1779 failed and a new structure built downstream. This consisted of two openings 12ft wide by 10ft high to the springing of the arches, with each arch rising another 3ft. It is worth noting that the sill level for all the above works were located as low as possible (at approx 2.7ft (0.8m) AOD).
1842	As far as is known, the first wind driven pumping station was installed at Altcar by the Earl of Sefton. This was upgraded to a stream driven pump in 1842.
End 1800's	The form of the larger embankments in the Lower Alt catchment appears to have been set by this stage.
1920's	The tidal channel downstream of Hightown meandered southwards, resulting in considerable damage at Blundellsands.
1933	The gates built in 1830 were extended with three small gates. Siltation problems with the earlier gates meant that the new gates sill level was set higher at 4.7ft (1.4m) AOD.
1934	Crosby Groyne was constructed in order to prevent any further damage to the shoreline to the south .This also had the effect of halving the length of the outfall channel, thus reducing low water levels at the tidal flaps by 1.5m.
1900's	Construction/upgrading of smaller pumping stations around the Lower Alt catchment, discharging into the main (embanked) carriers.
1950's	Urban development in the upper parts of the catchment resulted in increased run-off and increased water levels during high rainfall events. During times of high tide and rainfall this resulted in higher water levels throughout the Lower Alt embankment network and increased risk of overtopping and breaching. The tidal local on the Lower Alt was seen as the main constraint to be overcome as ground conditions and the fill material did not allow embankments to be raised further.

Date	Event
1972	After consideration of alternative options to improve drainage at the tidal limit of the Alt (additional diversion channels and new tide gates were considered) a large pumping station was found to be the best option and Altmouth Pumping Station was commissioned on 21st July 1972. The station was designed with a peak discharge capacity of 84m^3/s.
1970's	Channel improvement works were completed between Altmouth Pumping Station and (now) Formby By-Pass. It is assumed that these works were completed in order to improve conveyance to the station.
1980's	Limited embankment berm re-sectioning and crest improvements were undertaken on the Alt upstream of Formby By-Pass. This was completed as heavy maintenance rather than capital spend.
1987/88	An automatic weed screen cleaner was installed at Altmouth Pumping Station in order to reduce manpower requirements during flood events.
1990's	Continued high operation and maintenance expenditure throughout the Lower Alt catchment but no substantial capital works. Gradual decline in the mechanical and electrical plant at Altmouth Pumping Station.

The Alt catchment is made up of two main areas, namely the Upper and Lower Alt. The proposed site is situated within the Upper Alt which is characterised by low risk of flooding due to higher ground elevations and good planning. Most of the Lower Alt is low lying areas and at higher risk of flooding. The Altmouth Pumping Station acts as a barrier to prevent tidal flooding of the Lower Alt area.

3.1.2 Indicative Flood Maps

The Environment Agency Indicative Flood Maps provide an indication of the sensitivity of the site to the incidence of flooding (see Figure 3.1). The proposed site falls outside the 1:1000 fluvial flood plain of the River Alt and thus has an associated flood risk of less than 0.1% (land assessed as having less than a 1 in 1000 annual probability of flooding from the river).

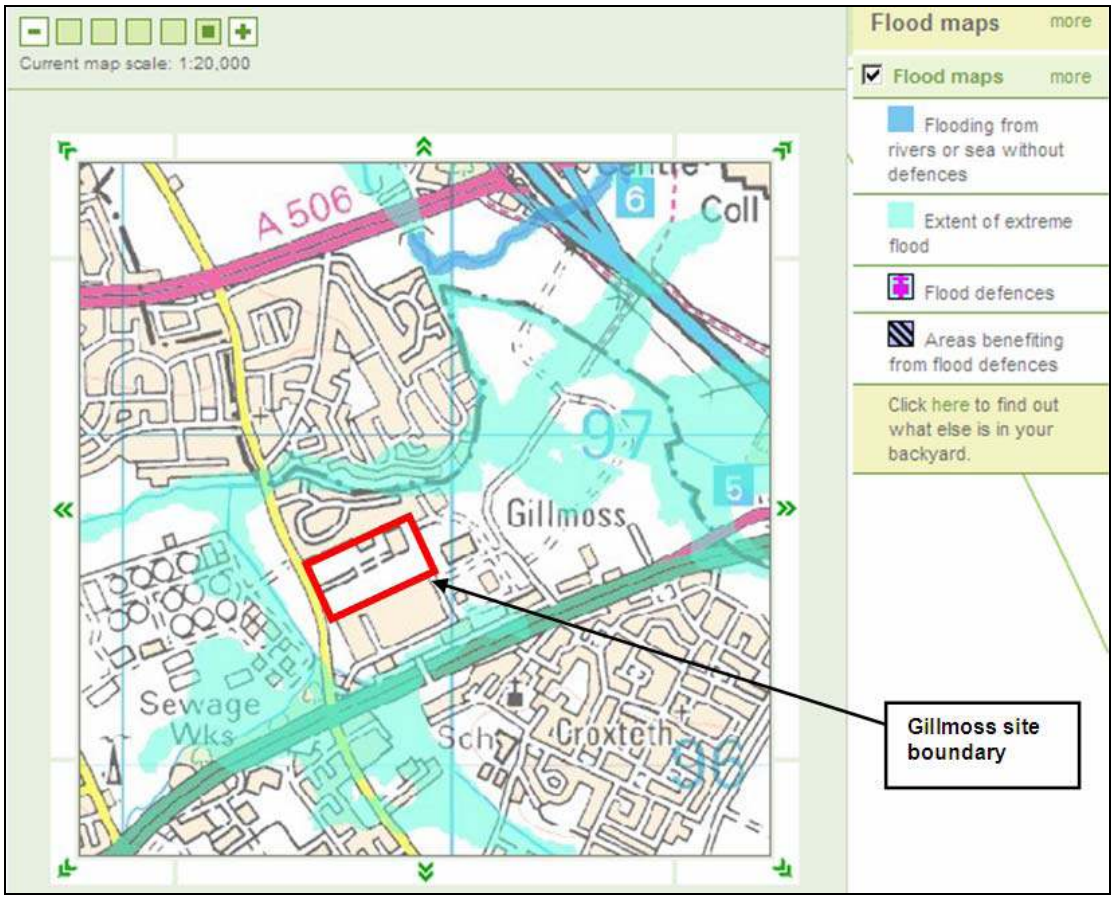

Figure 3.1 - Aerial Indicative 1:1000 Year Return Period Flood Plain Map (Source: Environment Agency website)

Figure 3.2 shows the 1 in 100 year flood levels at and near the site. The point nearest to the site (AL60521) has a 1 in 100 flood level of 14.79 m AOD.

The lowest point of the access road within the Gillmoss site is at a level of 17.40 m AOD and therefore will be elevated above the 1:100 flood level and remain dry in all but the most extreme events.

Produced by Ian Caunce,
Flood Risk Mapping & Data Management,
April 2008.

Environment Agency

Modelled Flood Levels at Return Period (mAOD):				
Q75	Q50	Q25	Q10	Q5
16.08	16.05	15.96	15.85	15.77
14.93	14.86	14.76	14.63	14.54
14.72	14.65	14.53	14.39	14.30
14.42	14.34	14.21	14.05	13.95
14.37	14.29	14.16	13.99	13.89
13.55	13.49	13.37	13.22	13.14
13.19	13.11	12.97	12.78	12.68
13.07	12.97	12.81	12.58	12.46

Key

Main River

Flood Zone 3

Flood Zone 2

Flood Zone 3

Shows the area that could be affected by flooding from rivers or the sea, if there were no defences.

This area could be flooded:
- from the sea by a flood that has a 0.5% (1 in 200) chance or greater of happening each year.

- or from a river by a flood that has a 1% (1 in 100) chance or greater of happening each year.

Flood Zone 2

Shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, that has up to a 0.1% (1 in 1000) chance of occurring each year.

The datasets used in this plan may not have been audited. The Agency cannot ensure that the data in its possession will always be accurate, up to date or valid but the Agency will use reasonable care to ensure an accurate copy of the data. The accompanying disclaimer should be used in conjunction with this plan.

0 100 200 Meters

3.1.3 Topography Survey and Services Information

The topographical survey (Appendix A) shows ground levels within the boundary of the entire Gillmoss site to vary between 12.99 and 18.00 m AOD as follows:

- Approximately 97% or 8.9 ha of the site is above the 1:100 year flood level; and
- Approximately 3% or 0.3 ha of the site falls below the 1:100 flood level, but as described below (section 3.2), it is well protected from overland flood flow by earth bunds.

The site topographical survey (Appendix A) shows the lowest point at the proposed MRF site (see Figure 3.3) to be at a level of approximately 16.99 m AOD. The proposed MRF site is located in an area that is slightly elevated in relation to its surroundings and is ALL located above the 1:100 year flood level.

The site is served by a combined, as well as a separate foul and surface water network, maintained by United Utilities (see Appendix B).

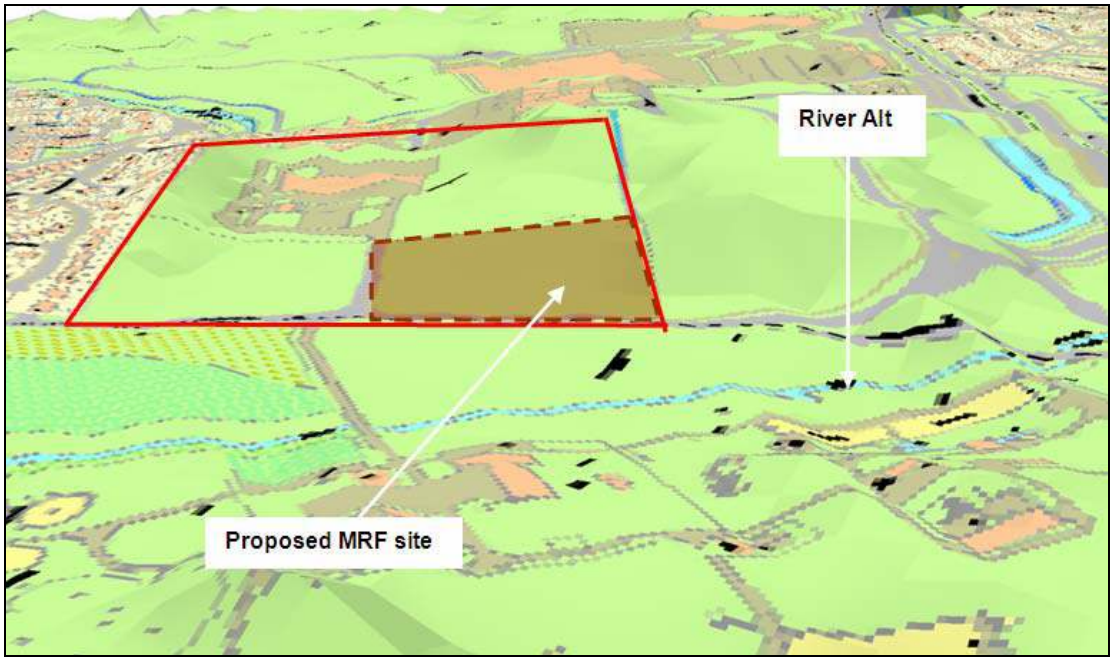

Figure 3.3 - OS Mastermap of Gillmoss Site Overlain onto a 5m Grid Digital Terrain Model (DTM)

3.2 Site Visit

A site visit was conducted on the 4th of July 2008. A walkover of the Gillmoss site, revealed it to be relatively flat, except for a sunken basin at the north-eastern corner of the site, where trucks deliver municipal waste to the existing WTS. This low lying area is at a level of 12.99 m AOD, which is below the 1:100 flood levels (14.79 m AOD), but is well protected by bunds to the north, east and south.

The Gillmoss site surface consists of approximately 1.9 ha or 22% of impermeable cover (paved and roof area), whereas the remaining 88% of the site can be treated as Greenfield (with respect to surface water runoff).

Figure 3.4 shows the proposed location of the proposed MRF and Figure 3.5 shows an aerial view of the entire site.

Figure 3.4 - View of the Location of the Proposed MRF

The low lying area at the north-eastern corner of the site is drained by a network of gullies leading to a 300 mm carrier pipe into a pump chamber and delivered via rising main to the foul water network. This arrangement will remain unaltered and is outside the scope of the proposed site considered within this FRA.

The hardcover surfaces of the site (paving, roof area) are drained by strategically placed gullies and delivered by pipe carriers and connectors to two surface water sewers running parallel through the centre (900 mm) and to the east (39” to 42”) of the site (see Appendix B).

Earth bunds surround the Gillmoss WTS site enabling containment and infiltration of surface water on the site.


Low lying area on site protected by bunds
Earth bunds with tree cover
d MRF site
visitor centre and
tion building)

3.3 Consultation

Consultation with the Environment Agency commenced on 2nd April 2008 and after evaluation, the Environment Agency confirmed the location of the site to fall outside the 1:1000 fluvial flood plain. Modelling data obtained from the Environment Agency (see Figure 4) shows the 1:100 flood level nearest the site to be 13.72 m AOD.

3.4 Flooding Assessment

3.4.1 Fluvial

The Upper Alt section of the Alt catchment in which the site is situated is predominantly urban, low lying and of a permeable nature, except for the southernmost areas with an impermeable layer (clay or loamy clay) at shallow depth. The catchment contains one principal natural watercourse, The River Alt.

The River Alt flows north and west of the proposed site. There are five brooks (all tributaries of the River Alt) within 1 km of the site, and their approximate distances to the site are as follows:

- Fazakerley Brook, 250 m north-west of site;
- Knowsley Brook, 650 m west of site;
- Sugar Brook, 150 m south of site;
- Kirby Brook, 700 m north; and
- Croxteth Brook, 800 m west.

It is considered that the risk associated with fluvial flooding is low due to:

- the site falling outside the 1:1000 year return period event fluvial flood plain of the River Alt;
- the elevation of the site grounds in relation to the surrounding area; and
- previous planning and investment in the flood defence infrastructure in this locality.

3.4.2 Tidal

The greatest flood risk within the Alt catchment is from tidal flooding. The Altmouth pumping station, serving the Alt catchment, is pumped to sea in conjunction with the sea defences on the coastline and currently provides a 1 in 100 year standard of protection from tidal flooding events.

However the risk associated with tidal flooding at the proposed site is considered to be insignificant, due to the elevation of the site (Environment Agency flood zone 1).

3.4.3 Site Runoff

An additional 1.3 ha of impermeable surface area will be established as a result of the construction of the new MRF. This will result in additional runoff into the surface water sewer. In Table 2 below, the additional runoff was calculated using the 60 minute rainfall data for a 1:100 year event as calculated by the Flood Estimation

Handbook (FEH). In addition a second calculation was included to accommodate the impact of climate change. This allows for a 20% increase in peak rainfall intensity.

Table 3.2 - Surface Water Runoff Calculations

Rainfall (mm/h)		Surface area (m^2)	Runoff Volume (m^3)	Runoff (ℓ/s)
M100–D60	40.47	13041	527.77	146.60
M100–D60 +20%	48.56	13041	633.32	175.92

Based on Table 3.2 and allowing for the impact of climate change:

- The total increase in impervious area is approximately 1.3 ha and will result in an additional surface water runoff of approximately 176 l/s for a 1 in 100 year (M100-D60 + 20%) design storm;
- Sustainable Urban Drainage Systems (SUDS) best practice should be employed to:
  - limit the discharge to the surface water sewer to the current discharge rate;
  - maintain the existing Greenfield runoff rate for this area (8.6 ℓ/s/ha – IH 124 Report for a 100 year return period), in compliance with the Design Manual for Roads and Bridges. Attenuation ponds, silt traps, petrol interceptors and trapped gullies could be provided to control flows and to prevent risk of pollution to the river;
- SUDS measures such as attenuation ponds should be designed for a 1 in 100 year flood event flow retention with due consideration to climate change effects (see Table 3.2);
- Surface water runoff from approximately 3537 m² of paved area to the east of the new MFR would be treated as “trade effluent” and will have to be returned to the combined or foul sewer at a controlled rate;
- There may be a nominal flow from washdown of the recyclable material sorting areas within the MRF building which may be classified as contaminated surface water and therefore need to be discharged via the on-site foul sewers to the receiving utility company foul sewer. A Trade Effluent License would be required for this flow;
- The EA defines ‘trade effluent’ as any liquid waste that is discharged from premises being used for a business, trade or industry. The only liquid wastes which are not classed as trade effluent are:
  1. domestic sewage;
  2. clean, uncontaminated surface water, i.e. clean rainwater which has not been contaminated when running over a site;
- Trade effluent within this development refers to surface water runoff from paved areas of the MRF site (which are affected by contamination from

refuse collection vehicles etc). This runoff will require a trade effluent consent from United Utilities in order to discharge to the foul sewer at a controlled rate;

- Attenuation of this trade effluent will be required to accommodate approximately 48 l/s runoff during a M100-D60 + 20% design storm;
  - attenuation for surface water = 462 m^3 (corresponding to 1 hour of attenuation of the uncontaminated runoff of 128.21 l/s), which will be returned to the surface water sewer;
  - attenuation for trade effluent = 172 m^3 (corresponding to 1 hour of attenuation of the contaminated runoff of 47.71 l/s), which will be returned to the foul sewer at controlled rate;
- The selection of embankment height and invert levels of the attenuation ponds should take into consideration the 1 in 100 year flood levels as well as the groundwater levels. Refer to Section 3.5.4 for assessment of flood risk from groundwater.

Provided these actions are taken and best practice is employed, the flood risk associated with the surface drainage system will not be increased by the proposed development.

3.4.4 Groundwater

From the limited information available on groundwater flooding within the lower Alt catchment, the rise of groundwater levels does occur. The risk of localised flooding increases during wet periods due to the likelihood that the groundwater table is close to the surface in the winter.

The groundwater vulnerability map (see Figure 3.6) indicates that the proposed site and surrounding land sit directly above a major aquifer and a soil class of high vulnerability. There are no Source Protection Zones (SPZs) on the site.

From the assessment carried out, the geological classification indicates that this major aquifer mainly contains highly permeable formations usually with a known or probable presence of significant fracturing. The proposed development will increase the runoff coefficient; discharge consents will therefore be necessary for the implementation of the scheme and will need to be agreed with the Environment Agency.

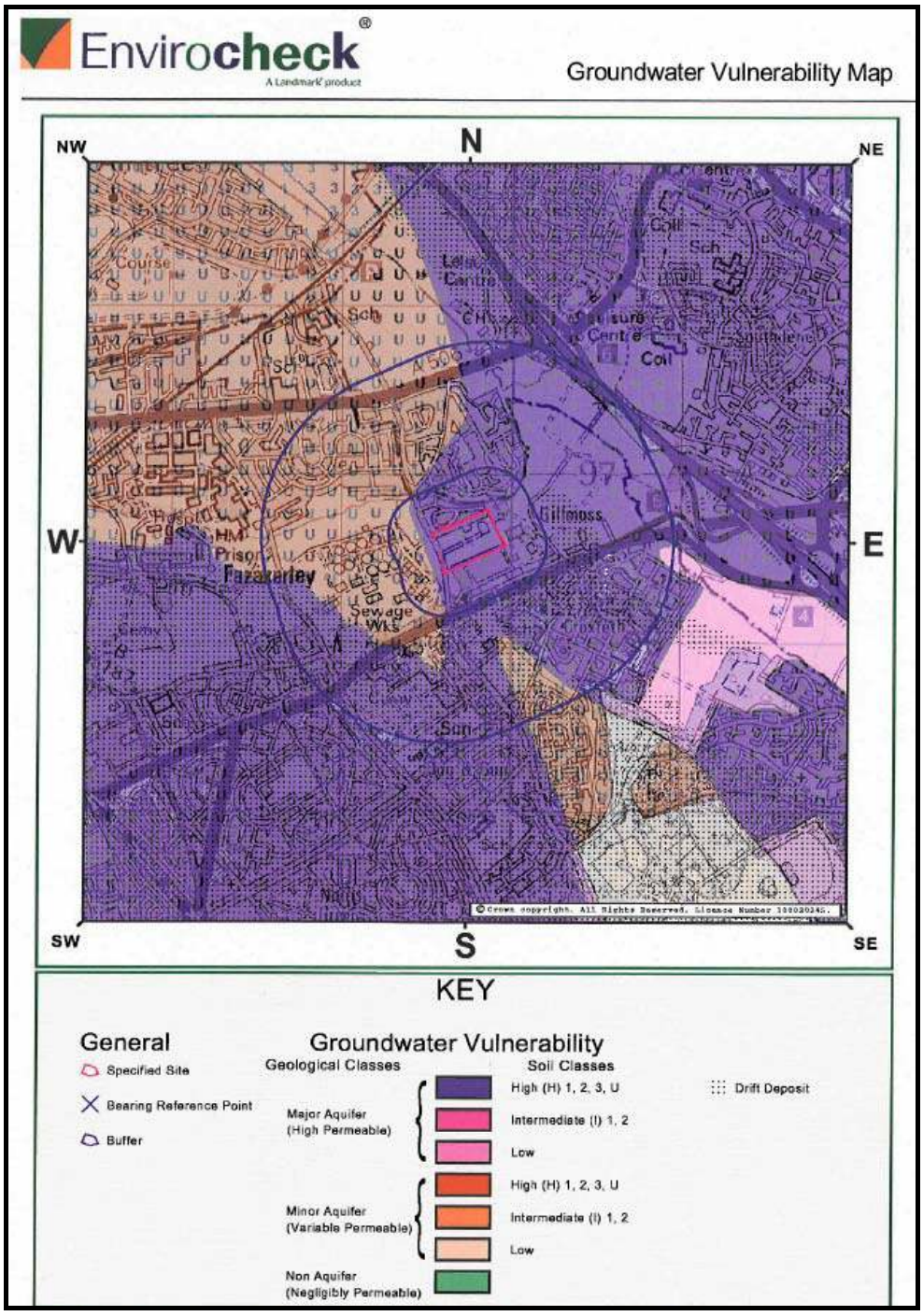

Figure 3.6 - Groundwater Vulnerability Map (Source: Envirocheck)

3.5 Existing Flood Defence Structures

The following is known of existing defences in the area:

- Raised flood defences: There are only two acknowledged flood defence assets under the Environment Agency's definition in the locality of the site. These are along the River Alt (raised defence from natural bank to man-made level) and Netherley Brook.

- Greenspaces: These provide a flood defence function, acting as a storage basin and allowing the water to infiltrate into the ground.

The Upper Alt catchment where the proposed site is situated is extensively urbanised, and a large section of the river channel has been culverted (see Figure 3.7).

Much of the Lower Alt catchment is at high risk of flooding, and a number of flood defences have been built over the years to help protect the area. They are as follows:

- A 20 mile network of embankments protecting farmland.
- A network of drainage ditches in the areas behind the embankments, much of the water from these ditches gets pumped into the River Alt and Downholland Brook.
- Altmouth Pumping Station which acts as a barrier to prevent tidal flooding of the Lower Alt area.

3.6 Proposed Layout

An outline of the existing layout and proposed MRF development is shown in Figure 3.8 and Appendix C.

Figure 3.7 - Flood Defences (Source: Alt Alt-Crossens Catchment Flood Management Plan – Scoping Report Jan 2007)


WEIGHBRIDGE
AMENITY / OFFICE BLOCK
FUEL TANK
WASTE TRANSFER BUILDING
TANK

3.7 Conclusion and Recommendations

Based on the assessed information, the proposed development site falls within the Environment Agency Flood Zone 1 which has a low annual probability of flooding (< 0.1% annual probability of fluvial or tidal flooding). Data obtained from the site topographical survey revealed the lowest point at proposed new MRF location (see Figure 3.3) to be at a level of around 16.99 m AOD.

SUDS best practices are recommended to be employed at the site to control surface water runoff by:

- limiting the additional discharge to the surface water sewer to the current discharge rate; and
- maintaining the existing Greenfield runoff rate for the area.

It is considered that surface water runoff from the paved area of the proposed MRF will be treated as trade effluent and returned to the combined or foul sewer. SUDS measures such as attenuation ponds will be considered to be used to attenuate for uncontaminated surface runoff.

The proposed development will increase the runoff volume; discharge consents will therefore be necessary for the implementation of the scheme and will need to be agreed with the Environment Agency.

It is believed that the proposed development will not create additional flood risk and will be exposed to an acceptable level of flood risk.

4 Appendix A – Topography Survey

5 Appendix B – Services

6 Appendix C – Proposed Site Layout