Swadlincote Energy Recovery Facility

Cost Benefit Assessment

Appendix 1

Heat Opportunities Report

May 2025

Prepared By

aardvark
environment matters

Project Quality Control Sheet

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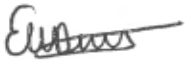
Signature			
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Company	Aardvark EM Ltd	Aardvark EM Ltd	Aardvark EM Ltd

Location: **Willshee's Depot 3, Keith Willshee Way, Swadlincote, DE11 9EN**

Grid Reference: SK268190

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1 Introduction

R&P Clean Power Ltd are applying for an environmental permit for a facility known as the Swadlincote Energy Recovery Facility (SERF) to be located at Keith, Willshee Way, in Swadlincote, South Derbyshire. The postcode for the site is DE11 9EN and the grid coordinates for the centre of the site are SK268190.

SERF includes an Energy Recovery Facility (ERF) designed to accept up to a maximum of 230,000 tonnes per annum of waste including Refuse Derived Fuel (RDF) and will generate approximately 20.5MW of electricity (gross), of which 18.5MW will be exported to the local electricity distribution network operated by National Grid Electricity Distribution (NGED).

Guidance from the Environment Agency indicates that the Best Available Technique (BAT) for energy efficiency for new energy from waste facilities with a throughput of non-hazardous waste in excess of 3 tonnes per hour is met, if a supply of heat is provided to a district heating network, or industrial/commercial use where technical and economic opportunities exist.

This report presents the results of a study to identify technically and economically viable heat loads with the context of the site.

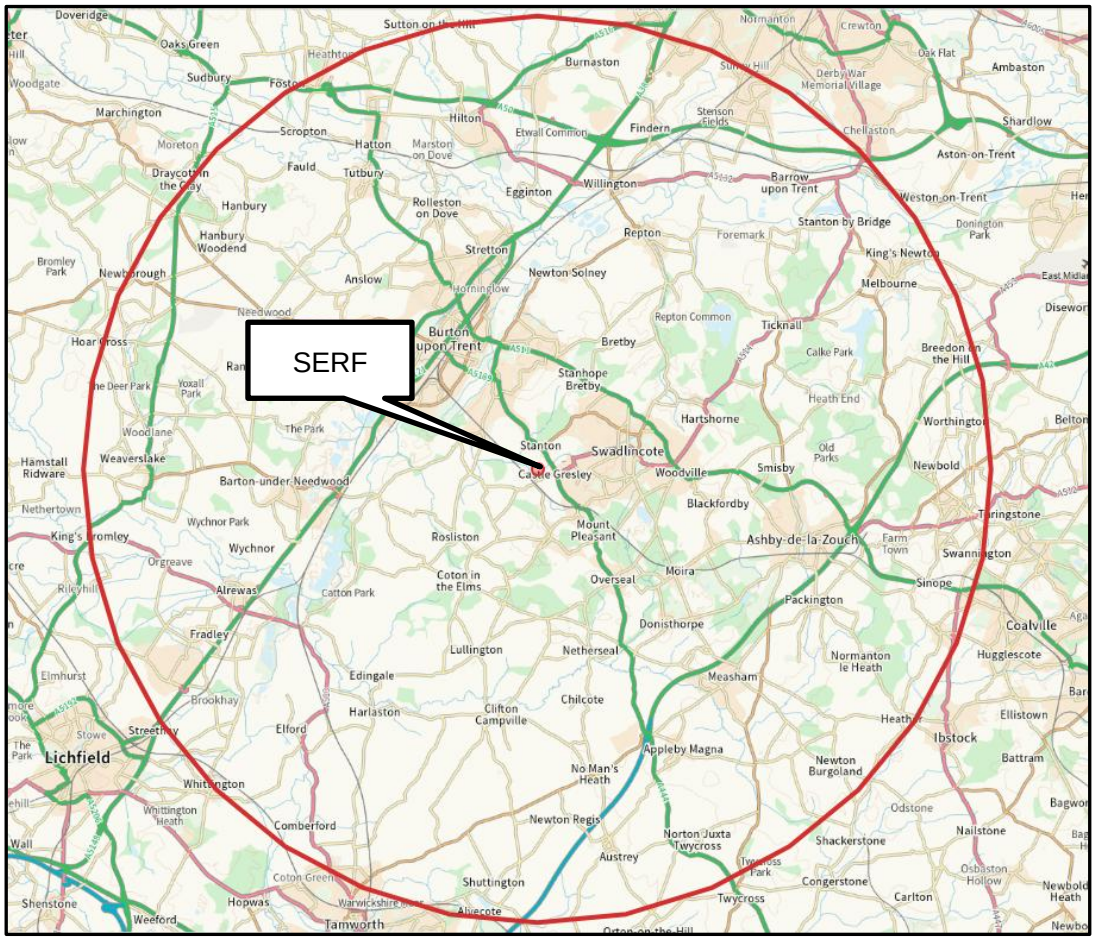

Figure 1 - Site Location

2 Heat Opportunity Selection Criteria

2.1 General

The proposed facility lies on the western border of Swadlincote and around 6km from the larger conurbation of Burton upon Trent to the north-west. The site is on an area of land formerly used for railway infrastructure and is bordered by industrial and commercial land uses. The site is bounded by the A444 to the east, an active railway located to the south-west and wastewater infrastructure to the north. Beyond these features, new residential and commercial areas are being developed, primarily to the east.

2.2 Distance

The distance to a heat load is a significant factor in determining both technical and commercial viability, with longer distances not only inevitably being more expensive to construct, but also increase the heat loss incurred within the transmission, reducing the overall energy efficiency of the proposal. CHP-Ready Guidance[1] indicates that the area of search for plants with less than 300MW should be 10km. However, the Energy Efficiency Directive requires that for new electricity generating installations a radius of 15km should be used. That is why this distance from the site is used for this assessment. The area within a 15km radius of the site is shown on Figure 1 and indicates that the main potential for appropriate heat demands is likely to be within the Burton and Swadlincote area.

2.3 National and local policy context

The potential for heat distribution from biomass, energy from waste facilities and combined heat and power in the area of Swadlincote and South Derbyshire has not been specifically assessed recently, although it is considered within local initiatives incorporated in the South Derbyshire District Council (SDDC) Climate and Environment Action Plan 2021-2030[2]. This plan identifies the importance of space heating for future carbon reductions and envisages circumstances where a district heating network may provide significant benefits.

This view is reinforced by the data collected by the CHP focus mapping undertaken by the Department of Energy and Climate Change (DECC), now incorporated into the Department for Energy Security and Net Zero (DESNZ), where only two significant heat demands were identified, with the remainder being lower density housing and commercial demands. Meeting such building space heat demands is therefore not generally suitable from a commercial perspective without external funding (as they require multiple connection points and do not represent year-round heat use). Such a conclusion is also in accordance with the results of the National Assessment undertaken by DECC in 2015[3], which indicates only limited technical and economically viable opportunity within the area of search (Figure 2) or the above mentioned CHP focus mapping by DESNZ (formerly DECC) (Figure 3).

[1] CHP Ready Guidance for Combustion and Energy from Waste Power Plants V1.0, Environment Agency, 2013

[2] South Derbyshire District Council Climate and Environment Action Plan 2021-2030, Ref STEMS-07-ST2-F1 July 2022

[3] National Comprehensive Assessment of the Potential for Combined Heat and Power and District Heating and Cooling in the UK; Ricado-AEA Ltd on Behalf of the Department of Energy and Climate Change, 2015

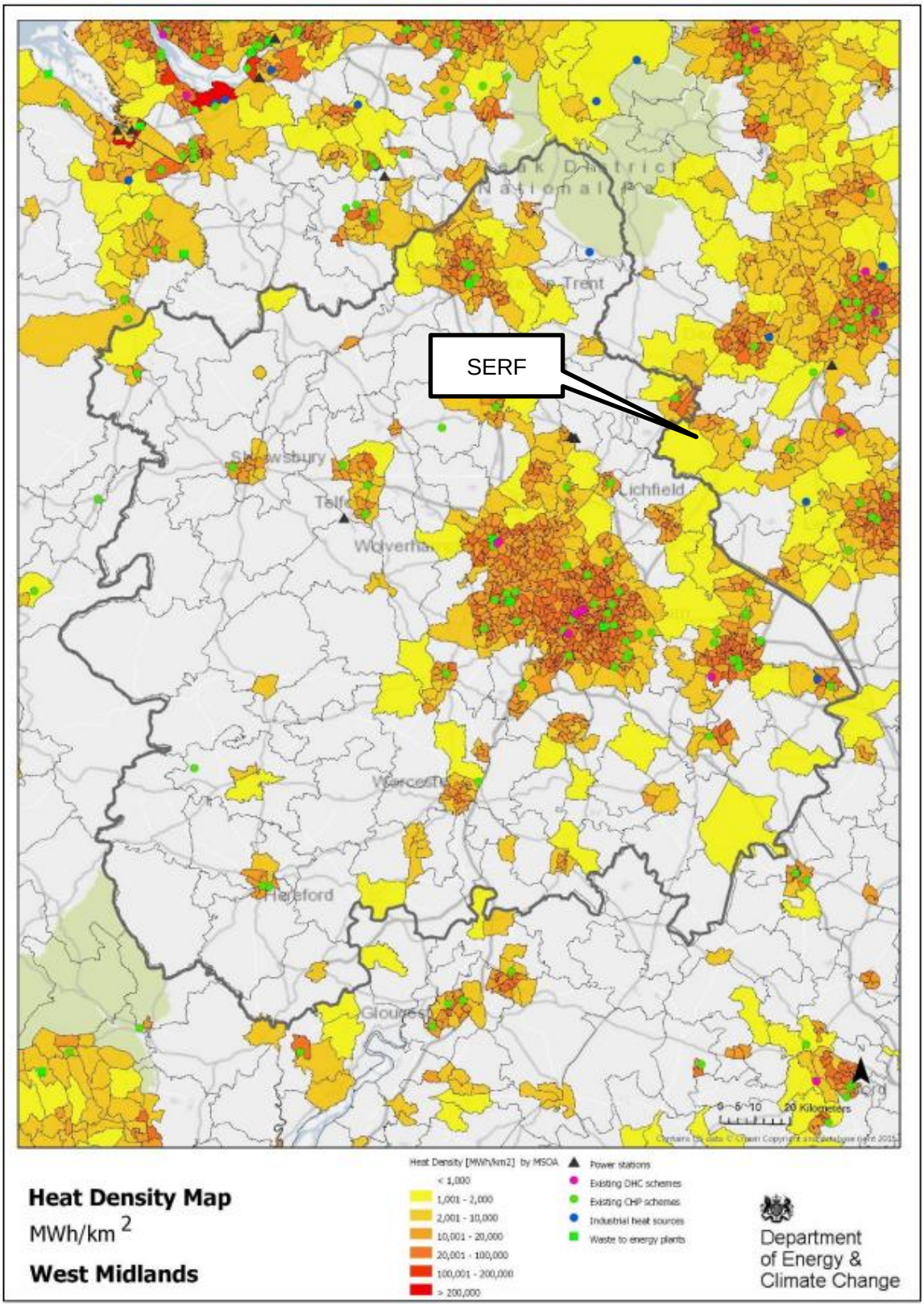

Figure 2 - Heat density map for West Midlands of England

Source: *National Comprehensive Assessment of the Potential for Combined Heat and Power and District Heating and Cooling in the UK; Ricado-AEA Ltd on Behalf of the Department of Energy and Climate Change, 2015*

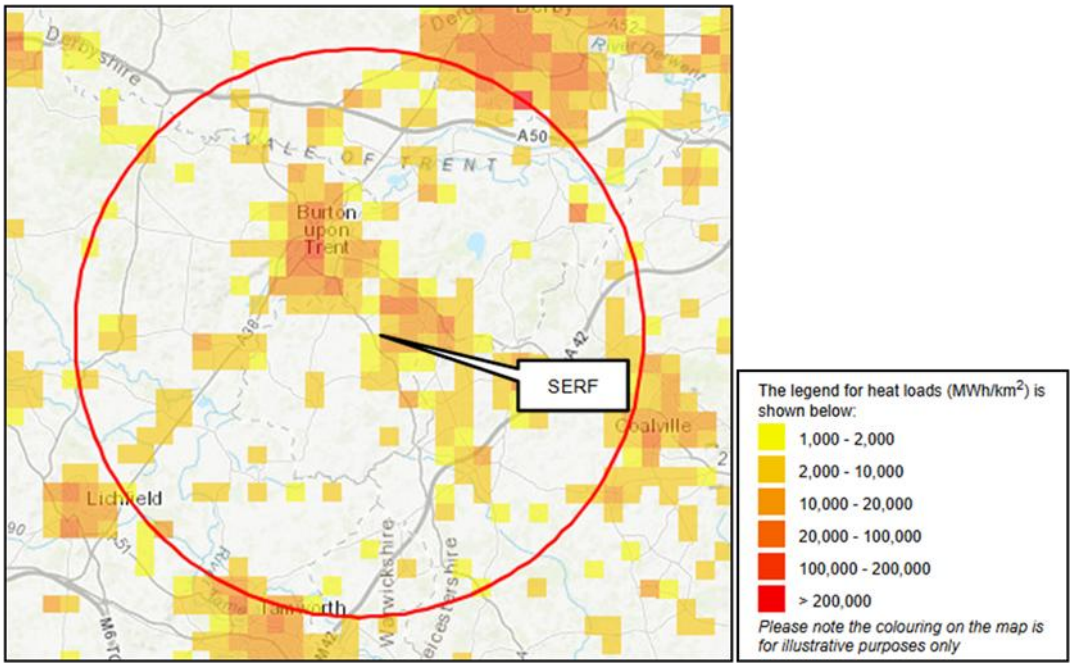

Figure 3 - Extract from the DESNEZ/DECC Heat Map[4] - 15km search radius

2.4 Methodology for assessing potential heat loads

Within the immediate vicinity of SERF there are no current process heat loads (that could be served by the provision of steam). The majority of potential heat demand is assumed to be from space heating or hot water requirements of buildings. Data on floor areas has been obtained for different building use types (hospitals, residential healthcare, hotels, leisure and manufacturing) and an assessment made of the expected average heat demand. This has been limited to potential annual heat demands that are in excess of 10MWh per annum to enable screening of those that are the most economically viable. This equates to an average heat demand of 1.1kW. However, the seasonal impacts of heat requirements would indicate that this demand may vary between 4-6kW in winter and zero in summer.

Once the most significant heat loads had been identified, the geographic and topographic constraints have been considered. Significant considerations include:

- Grouping of heat loads - this can significantly reduce the cost per connection.
- Impact of existing infrastructure – crossing of physical features such as rivers, main roads and railways can have a significant impact on the viability of connections due to the physical challenges of constructing and maintaining crossings and the potential additional capital and operational costs. These can be categorised into ‘hard’ and ‘soft’ constraints, with hard constraints proving prohibitively expensive and technically challenging to cross when considering the scale of the development.

[4] This map shows potential heat demands to promote the development of CHP projects see UK CHP Development Map - Department for Business, Energy and Industrial Strategy (decc.gov.uk) (now incorporated into the Department for Energy Security and Net Zero (DESNEZ)

- Development status of pipeline route – land that has been developed can be problematic due to the requirement to gain consent from landowners to cross and the added expenses of crossing developed areas as opposed to soft surfaces such as agricultural land or roadside verges.
- Review of any existing or planned district heat networks detailed in the Heat Networks Planning Database[5] and the BEIS 2021 NCA Report on opportunities for district heating networks in the UK.[6]

2.5 Constraints Mapping

Figures 4 and 5 below provide constraints mapping for a 15km area around the facility and highlights the priority potential heat loads that have been taken forward in this assessment. Due to the geographical location of the SERF in relation to nearby infrastructure and geographical features, the constraint mapping assessment predominantly focuses the heat opportunities assessment on the potential for sharing heat loads to the east of the site.

Notably the Leicester to Burton-on-Trent Rail Line (also known as the Ivanhoe Line) represents a potential barrier to the extension of a heat pipeline to supply premises to the west of the site. Laying a buried heat pipework beneath the railway is likely to require an agreement with Network Rail under their asset protection framework.

Opportunities to cross the railway line may be possible via existing underpasses close to the site. The Coton Bridge underpass at Cadley Lane, and south of Beach Farm are the most likely candidates. Additional railway crossing points at Stanton House to the north and Mount Road to the south are the next closest opportunities but are located further from the site and would require pipework to pass over the railway via the public highway network.

Accordingly, the proximity of the site to the railway line limits the potential crossing points, such that any heat supply opportunities to premises located west of the site would be dependent on agreement for the conveyance of the necessary pipework with a limited number of landowners.

Notwithstanding this point, the land use to the west of the site is predominantly rural/agricultural with very few industrial opportunities to provide the sharing of heat loads.

Further to the west and north of the site, other potential constraints include the River Trent and the Cross Country Mainline between Birmingham and Derby.

The Severn Trent Water Treatment Works at Stanton are located less than <100m from the site. The Water Treatment Works could be a potential offtaker for the heat, which is generated by the Facility, but any hot water pipework would need to traverse multiple sewer mains pipelines from Swadlincote.

As such the assessment focuses on facilities to the east of the site where there is an increased likelihood of achieving connectivity to the site, and greater demand identified.

[5] Heat networks Planning Database, Department for Energy Security & Net Zero

[6] Opportunity areas for district heating networks in the UK National Comprehensive Assessment of the potential for efficient heating and cooling, BEIS, September 2021

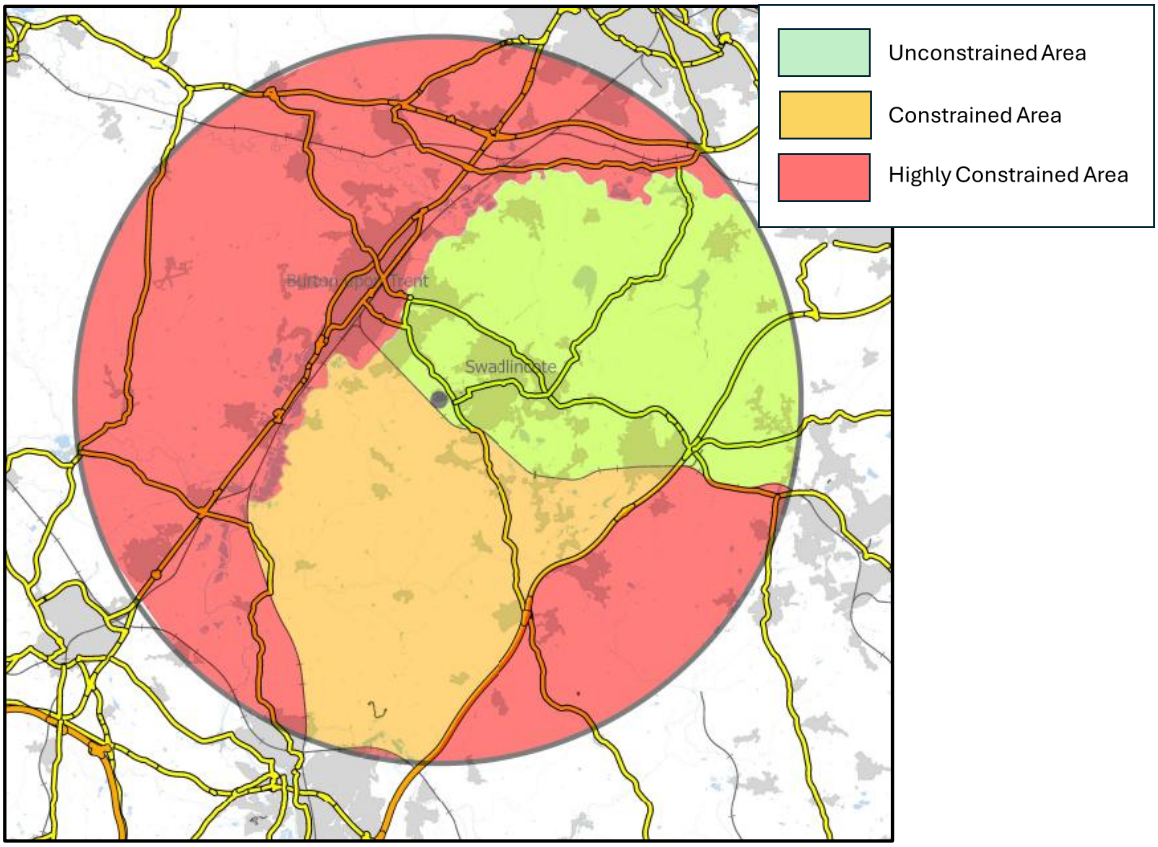

Figure 4 - Constraint mapping for potential heat loads within 15km radius

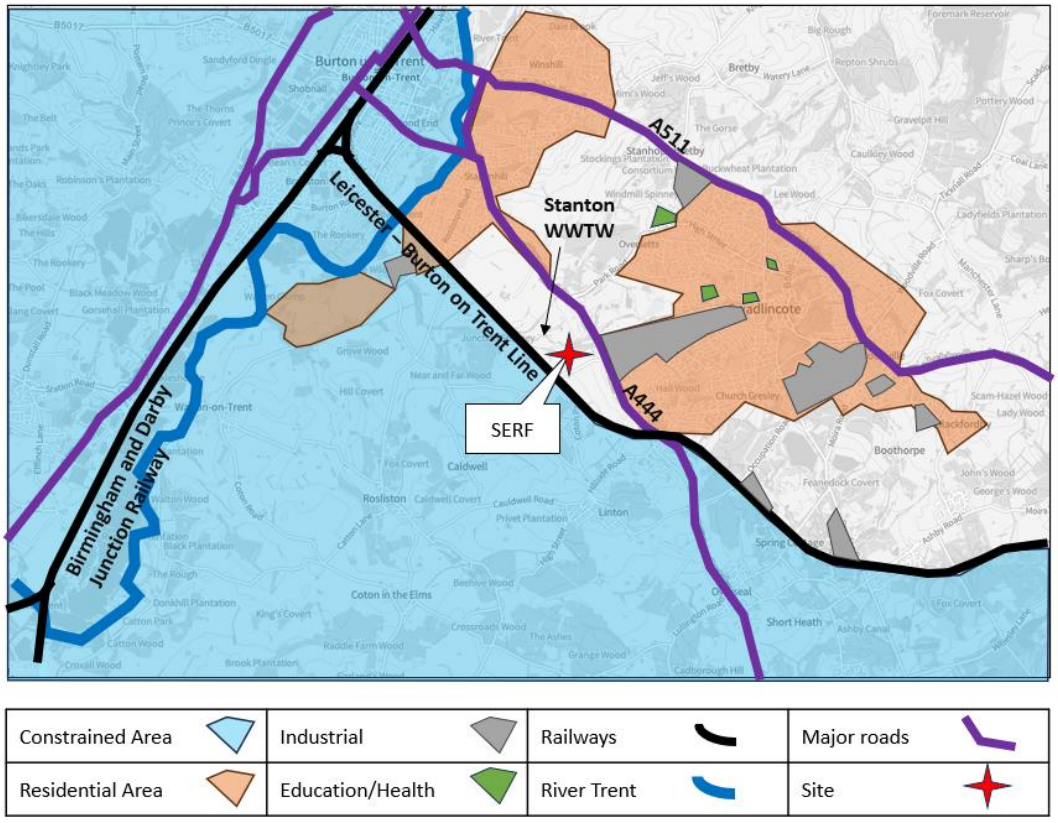

Figure 5 **- Constraint mapping for potential local heat loads**

3 Heat Opportunity Assessment

3.1 Assessment results

Figure 6 and Table 1 on the following pages detail the results of the heat load assessment. The assessment has identified a number of potential heat loads outside of the constrained area that are significant, and merit further consideration. These are addressed in the sections that follow (3.1.2 to 3.1.8). These potential heat users have been selected for further discussion based on their potential heat load, proximity to site, and possible feasibility to group end heat users with a potential single agreement framework. Where premises are likely to include several independent occupiers or tenants with the opportunity to connect to each without an existing district heat network, this would require multiple agreement and connecting infrastructure which is likely to be challenging to execute.

3.1.1 Existing and planned district heat networks

There are currently no heat networks within 15km of the Site. The Heat Networks Planning Database interactive map produced by the Department for Energy Security & Net Zero displays both district and communal heat network deployment in the UK. The closest operational heat network system to the Site is located approximately 35km to the south-west. A new network is under construction approximately 15.5km north of the Site, just outside of the search radius. Future development of district heat networks within the vicinity of the site is not likely. This is demonstrated in figure 27 of the opportunity areas for district heating networks in the UK, published by the Department for Business, Energy & Industrial Strategy, which shows the Swadlincote Site and surrounding area not marked for future district heat network scheme development.

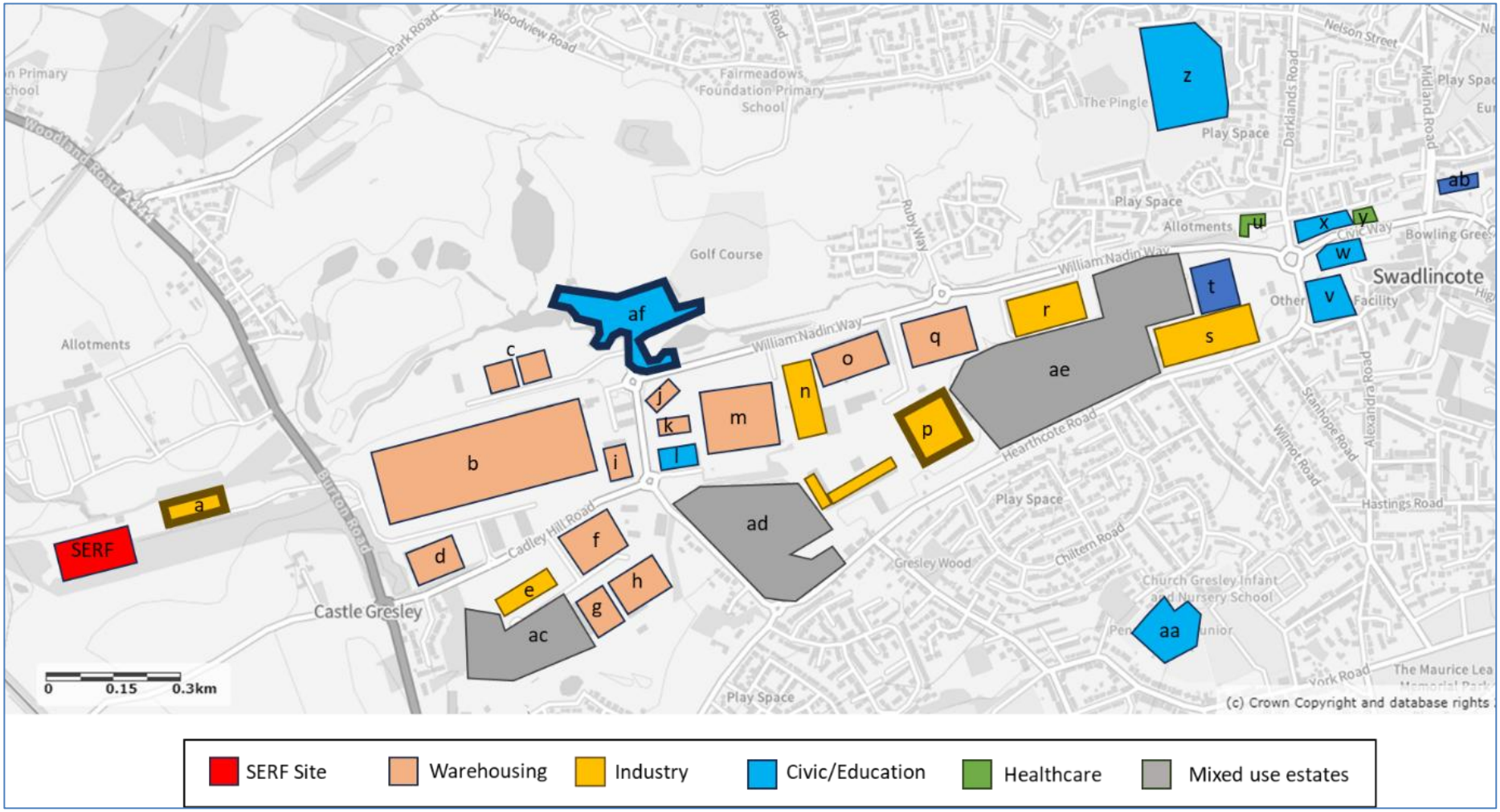

Figure 6 - Heat Demand Assessment Key

Table 1 - Heat Demand Assessment

Map Ref	Site Occupier	Assumed Use Category	Max Demand	Min Demand	Winter	Spring	Summer	Autumn	Total	Distance (Direct, approx)
			kW	kW	MWh	MWh	MWh	MWh	MWh	m
a	Wilshees	Wilshees MRF	3,310	45	1,774	936	99	1,330	4,139	220
b	Mulbery Logistics	Distribution Centre (in construction)	2,214	27	4,849	2,454	59	3,636	10,998	890
c	Not occupied	New business units	360	20	788	416	44	591	1,840	1,050
d	WestRock Packaging	Distribution	672	4	1,472	741	9	1,104	3,326	740
e	Trelleborg	Trelleborg Manufacturing & Distribution	846	47	1,853	978	103	1,390	4,323	970
f	A H Allen	Steel stockholding	446	3	976	491	6	732	2,204	1,080
g	Keystone Lintels	Distribution	502	3	1,100	553	7	825	2,485	1,120
h	IG masonary Support	Distribution	608	4	1,330	669	8	998	3,006	1,210
i	Various occupiers	Trade counters	810	45	1,774	936	99	1,330	4,139	1,170
j	IVC Brunel (Site 3)	Manufacturing (pharmacetical)	1,344	448	2,943	1,962	981	2,453	8,340	1,290
k	Various occupiers	Trade counters	432	24	946	499	53	710	2,208	1,300
l	Burton & Sourth Derbyshire College	Education	1,188	132	2,602	1,445	289	2,024	6,360	1,300
m	Clipper Logistics	Distribution	1,717	11	3,761	1,892	23	2,821	8,496	1,460
n	IVC Brunel (Site 2)	Manufacturing (pharmacetical)	1,920	640	4,205	2,803	1,402	3,504	11,914	1,610
o	TNT/Restore Records Management	Distribution/Records storage	105	1	231	116	1	173	521	1,740
p	Roger Bullivant	Manufacturing (concrete products)	4,200	340	3,723	2,234	745	2,978	9,680	1,600
q	Jenkins	Distribution	972	6	2,129	1,071	13	1,597	4,809	1,940
r	IVC Brunel (Site 1)	Manufacturing (pharmacetical)	2,880	960	6,307	4,205	2,102	5,256	17,870	2,180
s	Dellner	Manufacturing (Engineering)	1,530	170	3,351	1,862	372	2,606	8,191	2,520
t	Sainsbury's	Retail	1,789	99	3,919	2,068	218	2,939	9,143	2,580
u	Cadley Hill View	Healthcare (residential home)	1,512	504	3,311	2,208	1,104	2,759	9,382	2,690
v	Green Bank Leisure Centre	Green Bank Leisure Centre (includes pool)	1,224	408	2,681	1,787	894	2,234	7,595	2,820
w	South Derbyshire Distric Council	Civic Offices	1,035	58	2,267	1,196	126	1,700	5,289	2,880
x	Police Station	Civic Offices	151	8	331	175	18	248	773	2,900
y	Swadlincote Care Centre	Healthcare (care centre)	981	327	2,148	1,432	716	1,790	6,085	2,940
z	The Pingle Acedemy	Education (Primary and Secondary Schools)	4,620	550	10,118	5,661	1,205	7,588	24,572	2,650
aa	Pennine Way and Church Greasly Infan	Education (Primary School)	932	111	2,042	1,143	243	1,531	4,959	2,470
ab	Lidel	Retail	396	22	867	458	48	650	2,024	3,180
ac	Appleby Glade Ind Estate	Business units (mainly trade counters)	900	90	1,971	1,084	197	1,478	4,730	929
ad	Boardman Road Ind Estate	Business units (mainly engineering)	2,232	124	4,888	2,580	272	3,666	11,406	1,460
ae	Robian and George Holms Way	Business units (mixed)	8,100	450	17,739	9,362	986	13,304	41,391	2,370
af	New Civic Centre	Offices, civic rooms	1,004							1,200
	Leisure Centre	Swimming pool, gym, sports hall, offices, café	1,400							1,200

3.1.2 Willshee's MRF (mixed recycling facility) (a)

This building houses waste processing and sorting equipment that are intended to be supplied with electricity by the SERF under a private wire agreement. Subsequent to the publication of the original HOR (January 2024), which identified a seasonal space heating requirement within the processing hall, the company has identified an additional heat requirement that would account for approximately 2.5MWth of heat to dry the waste feedstock which is generated by the waste processing facility. Given the proximity of the MRF to SERF, this would be a straightforward connection. Future techniques undertaken at the MRF may also expand to include the processing, refinement of depolymerisation of plastics which require heat to be applied.

3.1.3 Mulberry Logistics (b)

This significant warehouse and distribution centre is situated in proximity to the site and could be easily accessed via a buried main. It is understood that the warehouse is currently intended to include a radiant heating system where natural gas is combusted within distributed heaters. Therefore, the warehouse would require the fitting not only of the heat interface units but also retrofitting of a wet central heating system throughout the building. Such a retrofit would be prohibitively expensive and disruptive to the operations of the facility and is therefore unlikely to be viable on its own.

However, should a district heating network be established, it may in future be considered alongside other heat customers, or at a point when the facility is refurbished.

3.1.4 IVC Brunel – Sites 2 and 3 (n, r)

IVC Brunel is a multiproduct pharmaceutical company, specialising on a wide range of vitamin and other over-the-counter pharmaceuticals under customer own label brands. As such, heat demands are likely to range from those relating directly to product preparation, but also to packing and storage areas within their facilities. IVC Brunel have three sites within the vicinity of a proposed heat distribution line, and therefore as an anchor customer could provide an incentive for the wider establishment of a network.

3.1.5 Roger Bullivant – Concrete products (p)

This user operates a piling and foundation product manufacturing process on a large site to the south of Tetron Point. In a similar manner to the MRF, in addition to seasonal space heating requirements, the company has identified a demand of up to 2.5MWth for improving their production process. Connection to this site would be relatively straightforward but would require a proportion of pipework to be laid within the existing roadways.

3.1.6 Civic Centre (u-y)

The potential at this location combines demand of the key civil buildings in the town centre which is significant and could be delivered as a single scheme, potentially with grant support. In addition, these demands include the Cadley Hill Care Home, Health Centre and Green Bank Leisure Centre (which includes a swimming pool), which indicates that there would also be a level of heat demand at all times of the year – which is important to realise the full benefits of a heat network connection.

However, there would be complexities in aligning the equipment retrofits required as well as reaching an agreement where all parties involved would be able to participate at the same time. However, the municipal authority (South Derbyshire District Council) would be in a strong position to coordinate a response and potential lead funding bids based on the decarbonisation targets for the public estate.

3.1.7 Civic Centre and Leisure Centre Proposals (af)

Whilst SDDC have confirmed their intention to develop a new site for the civic centre and leisure facility to the north of Tetron Point, details of this are currently being finalised in consultation with stakeholders and users. Therefore, details of the energy demands of the design are not currently available. However, if it is assumed that these facilities will be equivalent in scale and services to those they replace, the total annual heat demand is likely to be in the region of 10-15 GWh/year with a maximum demand of around 2.3MWth[7].

Although it would be expected that new facilities of this type will be specified to higher energy efficiency levels than those they replace, leading to lower space heating requirements particularly outside of the winter heating season, the swimming pools and associated facilities will have a year-round demand.

3.1.8 The Pingle Academy (z)

The Pingle Academy is a large, co-educational secondary school established on a site to the north of the Swadlincote town centre. It is a member of the de Ferrers Trust group of schools and occupies a range of buildings across a campus site. Whilst most buildings on the site are over 25 years old, they have been supplemented by more modern structures as the school has expanded. Whilst the school does include a swimming pool, the majority of heat demand will be for space heating in winter and therefore predominantly seasonal in nature.

The pipeline route to the school would need to run partially along the main access road to Swadlincote (A514) but could possibly branch underground across green spaces to the school along a proportion of its length.

7 Chartered Institution of Building Services Engineers (CIBSE) Guide F Energy efficiency in buildings; Energy Benchmarks

4 Heat Network Routing

The layout of the district heat network will require routing through an industrial zone which is accessible by public highways. The network will require a new planning application, which would be pursued once heat offtakers and the heat pipe connections were known. The routing for these initial connections could be split into four sections as illustrated in Figure 8.

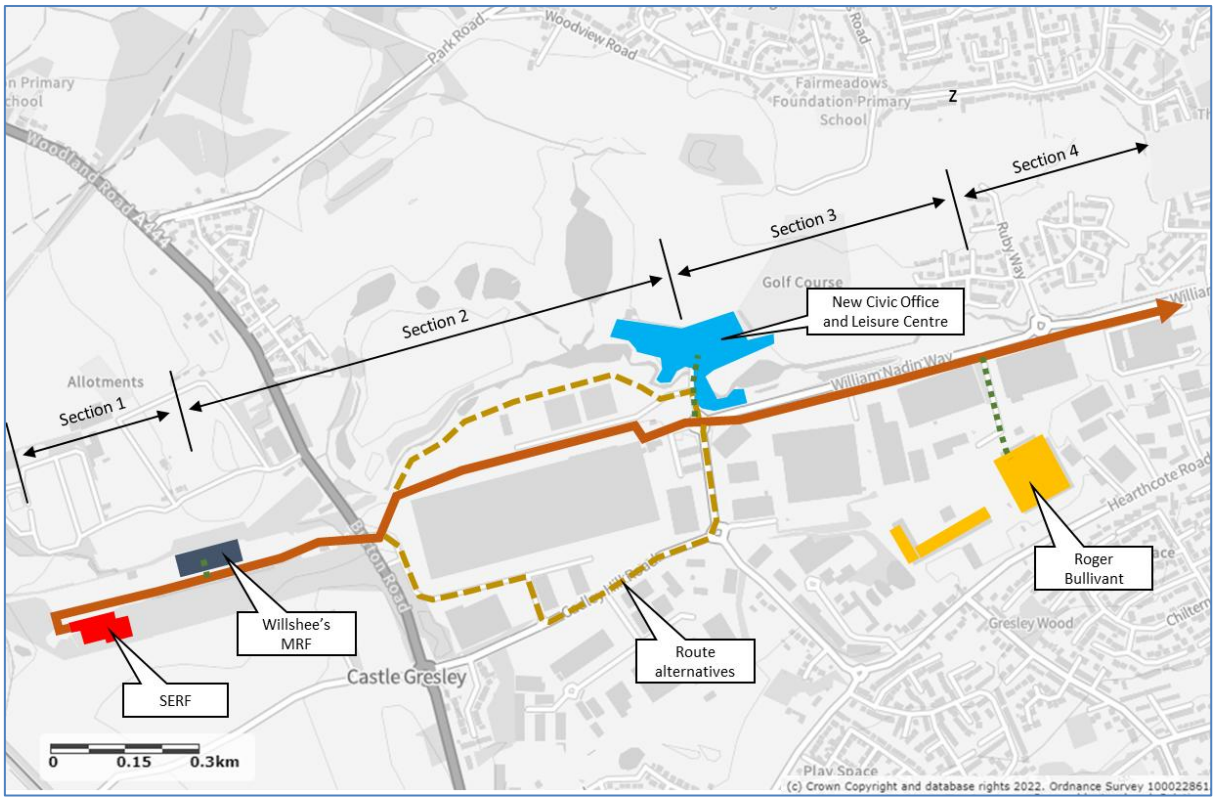

Figure 8 - Potential heat network routing

Given the need to secure sufficient heat customers prior to investment in the network, it may be necessary to complete the network as far as the New Spine Road/William Nadin Way junction as a first phase. The network would be structured with a 'trunk line' installed as illustrated which would be equipped with valving and flanging to allow for additional offtakes to be installed at a later date. In addition, provisions could be made for the installation of an extension to the trunk line onwards into Swadlincote town centre, where heat could potentially be supplied to the future redevelopment of the current civic offices and leisure centre.

The sizing of the pipework would need to be part of a more detailed technical study that would balance the total potential heat distribution along with the capital and operating costs of the network. Table 2 below provides a summary of the proposed route sections from the SERF to the potential sites that could benefit from the heat loads generated by the SERF.

Table 2 - Phase 1 heat network sections

Route Section	Description	Length (approx.) m	Considerations
1	From SERF heat exchangers to Willshee's MRF building	200	Laid either in verge or in roadway. Land owned by Willshee's from whom the Appellant will lease the plot for the ERF.
	Spur to Willshee's	30	A short spur would be under existing roadway into the MRF plant room.
2	From Willshee's MRF to Tetron Point	1,010 1,200 1,440	This section continues through Willshee's site and could cross the A444 Burton Road via the existing underpass via Keith Willshee Way. Land all owned by Willshee's. From here the most direct route would be via the unpaved northern boundary of the distribution centre. Alternative routes are via the land to the north of Tetron Way units (1,200m, also unpaved) or via Keith Willshee Way the A514 Cadley Hill Road (1,440m, in the roadway).
	Spur to Civic Office and Leisure Centre	150	A spur from the main network would continue up the golf centre access route to serve the new development in the verge
3	Tetron Point to New Spine Road	600	This section could run within the road or verge of A544 William Nadin Way.
	Spur to Roger Bullivant	230	A spur from the main network would be possible up the New Spine Road to the boundary of the Roger Bullivant site. It is unclear if this is an adopted road or private access.
4	New Spine Road to town centre	1,000	The main distribution network could continue in future along William Nadin Way to the town centre and health centres etc. and open the opportunity to serve the redevelopment of the existing civic centre and Greenbank Leisure Centre.

Whilst there are limited heat use potentials to the west of the site, there are significant opportunities to the east of the A444, Burton Road. These include not only seasonal space heating demand but also process demands for major manufacturing works that would be year-round. Such year-round users of heat are particularly valuable for heat networks as they help ensure the infrastructure investment can be repaid within commercial terms.

In addition, the planned relocation of SDDC civic offices and the leisure centre to the former Cadley Hill mine site is a significant opportunity. Not only would these civic buildings be able to utilise the low carbon heat from the facility, but this would also provide long term price stability for the Council.

Whilst heat demands at these civic facilities would only account for a proportion of heat available, they would be all year and may provide the catalyst for the installation of the required heat exchangers and initial pipeline route. This would have the impact of derisking and lowering the costs for each subsequent connection and increasing the viability of subsequent commercial and industrial connections.

5 Heat Opportunity Conclusion

There are significant potential heat loads that could be served by the SERF within a 15km radius of the site. There are an increasing number of opportunities for larger scale users to the east which include not only seasonal space heating demand but also process demands that would be year-round. Such year-round users of heat are particularly valuable for heat networks as they ensure the infrastructure investment can be repaid.

The proximity to the A514 junction and availability of land on the site of the former Cadley Hill coal mining area has meant that much of the substantial development in the immediate vicinity of the site is for warehouse and distribution use. A local school campus is within the area of search.

The site has engaged with operators within the area including Willshee's Waste & Recycling, Roger Bullivant, and have each signed a Letter of Intent to commit to further exploration to receive heat from the facility. Furthermore, the proposed new locations of the civic centre and leisure centre have been identified as a possible major user, following relocation of these facilities, and it is planned to continue to review this as an emerging opportunity for supply of heat to an offsite user.

In addition, being situated on the outskirts of Swadlincote town centre, there are opportunities for heat supply to existing users beyond the urban area. Whilst the establishment of residential district heating network could have been included in the development and regeneration plans for the district, new housing in the vicinity has been equipped predominantly with gas central heating. Regeneration opportunities are also limited, as most housing is detached and/or semi-detached and therefore considered low density and therefore not currently cost effective for retrofitting of alternative heating systems.

The site is relatively constrained by the presence of infrastructure to the north and west of the site that would pose technical challenges to cross, but in any event, heat development efforts would be focussed on the east where most heat demand is located, and connecting up such potential heat offtakers should not represent a major technical challenge.

Finally, as the delivery of sustainable heat has a strong policy objective for the UK Government, it can be expected that new measures structured as either obligations or incentives will be forthcoming in the future, it is recommended that opportunities should be regularly reviewed.