Design Guidance for Waste Management Facilities for Plymouth City Council

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Introduction and Planning Context

Plymouth City Council’s Waste Development Plan Document (DPD) was submitted in August 2007 and has its Public Examination scheduled for 6 February 2008. The plan contains a number of sites allocated for future waste management facilities with two of the sites, Ernesettle and Coypool considered suitable for larger scale strategic facilities including waste to energy.

This report has been commissioned to provide an evidence base that sets out some initial design principles for both sites, consistent with site characteristics and surroundings and some initial ideas about what the facilities could look like. The purpose of this report is therefore to provide early guidance for the procurement and development of any more detailed scheme and to support any future communications strategies.

Whilst it is too early in the process to define the exact specification for the facilities that are needed, it is clear that the scale of the buildings and plant required will be beyond the average scale of many of the existing industrial facilities within Plymouth and certainly not of a domestic scale. It will therefore be important to set out a series of design parameters that takes this on board in a positive way.
This report is divided into a number of sections. It firstly looks at the character of both sites and draws out the key features of both, including access, topography, exposure and visibility which will influence the potential siting and design of any plant. It then sets out a number of key design objectives that would be relevant to the design of any plant, regardless of specific location. These are intended to be robust but flexible enough to allow creative solutions to be developed for each site. This section is then demonstrated by a number of project exemplars that have been built in the UK and abroad. Not all of these are Waste Management Facilities but they represent what are acknowledged as good examples of large building design.

The final section sets out a number of simple urban design rules that should be applied to the two sites. Whilst there will be a number of ways to develop each site, it then sets out two layouts that seek to demonstrate these rules.

The layouts and cross-sections have been based on the “Principal Facility Characteristics” set out in the Waste Management Site Feasibility Study produced by Entec December 2006. At this stage, it should be noted that for certain technologies a variety of facility characteristics (shapes, sizes, footprints) are currently available which means that there are a number of ways that Waste Treatment Plants can be arranged. The illustrations in this document have therefore been provided to illustrate first principles only in terms of design and layout. Before taking the next steps, comprehensive site assessments, including detailed visual appraisals will need to be carried out to verify the findings in this report.
Site context

looking at the character of both sites, key features
access, topography, exposure and visibility

Ernesettle

Site views from: Saltash Lander Road, Ernesettle behind Exeter Close

Coypool

Site views from: Plymbridge Road, Pattinson Drive, Aerial view
Ernesettle

Site views from: Ernesettle behind Exeter Close, Saltash Moorland View

Coypool

Site view from: Millwood Drive
Ernesettle

The site at Ernesettle is approximately 8.1ha. It comprises a sloping site that falls from south to north in an overall industrial area in the north-west of Plymouth overlooking the River Tamar. The site’s immediate context appears fairly uncoordinated and comprises a range of uses and character areas. The northernmost part is strongly associated with the surrounding industrial area. To the west is an area of open grass and scrub that comprises the former University Playing Fields. Much of the site’s boundary to the southwest is defined by the Defence Storage and Distribution Agency (DSDA) land which comprises a range of buildings and ancillary facilities that extend to the River Tamar.

Further afield, to the south and east lie areas of post war housing. Also to the south, lies Ernesettle Battery, hidden from the site by boundary vegetation of the fort.

The open nature of the surrounding context, along with the site’s sloping topography, mean that some of the site towards the south, will be prominent from a number of locations. These areas are likely to include Saltash and Caradon to the west, areas of housing within Ernesettle to the east and south as well as longer distance views from Cornwall and areas within the AONB such as Landulph.

Access to the site would be from Ernesettle Lane. Ernesettle Lane currently provides access to Lower Ernesettle Industrial area and a secondary access to the housing area to the east.
The site at Coypool is currently in use by Imerys as a China Clay Processing Plant. It comprises a series of industrial buildings as well as a Combined Heat and Power plant (CHP) and stack along with extensive areas of woodland buffer planting.

To the north of the site, lies open farming countryside with a golf course being created to the north east. To the south and south west is industrial land. Residential areas of Woodford lie to the south east, with a new housing development just completed about 400 metres to the south of the site. A cycle and recreational route runs along the River Plym corridor adjacent to the site’s west boundary.

The site lies within a natural topographical bowl with the Plym river valley running north south to the west of the site and the land rising up around to the north and east. At close range, the site is fairly well contained by woodland on these immediate hill slopes, however, from further afield, there are some panoramic views of the site from residential areas on higher ground to the west; from here, the industrial buildings and the CHP stack are clearly visible, and appear as a fairly dense, linear cluster of buildings surrounded by woodland in both the foreground and background.

Only the northern section of the China Clay Processing Plant has been identified for potential waste management uses and this would comprise approximately 6 ha of developable land. This area of land has been modified into a number of broad terraces, estimated at 8m vertical intervals allowing buildings with extensive footprints to be accommodated.

Access to the site is from the B3416 along a route shared with a range of facilities including industrial units, a small retail park and the new housing by the site entrance.
Introduction

At this early stage in both the design and procurement process, the key design aims can be distilled into 4 overriding objectives as set out below. These are simple but broad ranging objectives that should inform all stages of the design process for the creation of any waste management facility and potentially for any large scale industrial building or complex.

Sense of Place

All development should respond to its context. This means firstly understanding what makes up the character of the surrounding area: the scale of the place, the topography and how this might have an influence on existing and potential views of the development. It should also understand any influence that surrounding land uses might have and what future changes of use are planned in the area. An understanding of the context may include both hidden elements such as the social or historical relevance of a context as well as the more physical elements such as ecology and microclimate.

The response should be the creation of development that reflects its surrounding character. This could be in a fairly abstract way and may reflect the form of the landscape or act as a positive contrast to the landscape. It does not necessarily have to be in scale with its context, and could represent an intentional contrast of scale. However in this latter scenario the building form becomes more important and dominant in its setting and needs to be of high design quality. At a more practical level, it is vital to ensure that the development responds to its urban context: in other words, that it clearly identifies where its entrance is so there is a clear sense of arrival. It will also be important to identify where site frontages should be and where there may be a need for a more abstract “back” to the development. The transition between the site and adjacent uses...
will also be important to ensure that these are treated positively and not as “left over spaces.”

It is likely that these large scale buildings will require a strong and positive landscape setting – crude enclosing bunding of earth mounds should be avoided and instead levels can be manipulated to work seamlessly with the surrounding landscape and built forms. In all solutions a robust and simple landscape setting would be sought.

The particular site conditions may mean that cut and fill to reduce the scale of the building is important – again, the design of this should be considered carefully to integrate fully into the wider form of the landscape.

**Scale & Massing**

Clearly the buildings and plant related to waste management processes will not be of a domestic scale and are unlikely to even be of a scale of the surrounding industrial uses; instead the scale and massing of the development will need to be dealt with in a positive way, and the idea of the creation of an iconic building or series of buildings should be embraced.

Much of the impact of massing is based on the perception of the scale, and there are a number of ways to treat large mass buildings. An important element is the treatment of the rooftscape that must appear as a simple and elegant form. The ways that the component buildings relate to each other is important and the layout should be designed so that there can be a sense of rhythm and order created between buildings of different scale. The surrounding context will have a influence on the perception of scale, and the avoidance of easily recognisable elements of a domestic scale in close proximity or elements that create a sense of general level clutter should be avoided.

There may be the opportunity to deconstruct a single mass building into a series of separate, smaller scale component buildings.

**Aesthetics**

One of the important rules is for there to be an honesty of form. The building or buildings should have a sense of rhythm, order and simplicity. There is a fine line between simplicity and blandness and the distinction is something that will evolve from a careful brief and a talented designer. The treatment of ancillary buildings and other infrastructure should not be forgotten and these rules should be equally applied. Overall there should be an efficient use of land to create a complex of buildings that can be perceived as a positively designed whole.

**Materials**

Given the likely scale of the buildings, the materials to be used should be light and fresh, with mid tone colours shown to be the most appropriate. The juxtaposition of materials and attention to detail will also be important. For the Ernesettle site the challenge presented by the blast arc will need to be sensitively handled.

The way a building is lit should be considered, although this should be balanced with issues of energy efficiency and light pollution. Signage and presentation of the building is important and can define the way a building is represented to the public.

Improving the sustainability of buildings in terms of energy and resource efficiency should be considered at the early stages in the design of the buildings with consideration given to earth sheltered buildings and green roofs.
Introduction

The project exemplars in this section seek to illustrate some of the key design objectives set out above; they also demonstrate how large scale buildings can be well designed, with an aim to portray different types of architecture that could be achieved.

Frontages & entrances, scale & form, materials

Project Examplars

Examplars of large building design, from around the world

Industrial

Sculptural

Sustainable

Breslaw Tower

Ashbridges Bay Toronto, Pumping Station

Antigua fábrica de electricidad situada, Barcelona
Materials

Material choices will have an influence on visual impact. Horizontal layers break up the bulk of building mass, another approach has been used at the Dyson Headquarters where reflective materials have been used to reflect the surrounding trees.

Scale & Form

Night time appearance
Shading impact
Reflectivity of building

1. Spinnaker Tower, Portsmouth
2. 3. Western Morning News Headquarters and print works, Plymouth
4. Municipal waste incineration, Rotterdam
5. Dyson Ltd Headquarters, Wiltshire
© ZZA Ltd Morley von Sternberg
6. TR2, Plymouth
7. Neandertal museum, Düsseldorf, Germany
8. Material examples
Roof Profiles

above: National Marine Aquarium, Plymouth
below: L'Historial de la Vendée, Western France

above: Windsor House, Derriford, Plymouth
below: University of Winchester
Design Engine
Case Studies

Mersey Valley Processing Centre, Shell Green, Widnes

Client: United Utilities (formerly North West Water)

- A complex of 15 000m2.
- A building footprint of 200m x 80m and a maximum height of 30m.
- Five main materials have been used: flat panel cladding, profile cladding, faced dense masonry and ribbed aluminium.
- The building looks well planned, intentionally designed and elegant.
- From a distance the appeal comes from the elegant profiles of its major components with their curved roofs as well as the choice of materials used.
- The respective processes were treated discretely and each was enclosed individually rather than creating a single large box.
- The colours of the external materials are in the mid tone range – mainly light and reflective shades of grey with buff coloured masonry.
- There is consistency of design and materials across the buildings giving the centre a sense of visual control.

(Extracted from CABE website.)

In contrast to the predominantly rectilinear industrial buildings in Widnes, this design approach produced a softer building outline that helped its assimilation into the wider landscape of the Mersey valley.

- The functional separation of processes in the incinerator building is accentuated visually by the articulation of the roof and walls. This further reduces the apparent building bulk and scale when viewed from a short distance.
- A central element housing the electrostatic precipitators is partly roofed over but not enclosed, allowing glimpses of the process and views through the buildings.
Abbey Mills Pumping Station, East London

Client: Thames Water

- Site lies within the curtilage of two listed Gothic Pumping Stations and within a Conservation Area.
- Despite restricted access, the client chose to procure fine architecture. The planning authority insisted on an architectural competition.
- Despite the heritage setting, it was agreed at the outset that this should be of contemporary design.
- A complex steel framework supports an envelope constructed almost entirely of aluminium.
- Despite a lavish appearance, the building accounted for only 8% of the total project costs.
- A creative culture established at an early stage helped to reduce budget costs at each successive stage of the design.

(Extracted from CABE website.)
Blackwall Tunnel Ventilation Towers

Client: LCC

- Designed as ventilation towers for the new Thames Tunnel.
- Each group of towers consists of two distinct elliptical plans that taper upwards and intersect to form a valley before separating into two funnels.
- The exhaust shaft is 27m high while the inlet shaft is 12m high.
- The towers’s curved form was inspired by Oscar Niemeyer’s work at Brasilia, then appearing in the Architectural press. The curved form makes a strong contrast with the nearby buildings including Reuters HQ by Richard Rogers and the Balfrom Tower flats by Erno Goldfinger.

Waste Incinerator of Spittelau, Vienna

- Designed by Friedensreich Hundertwasser 1988-1992
- The previous incinerator had caught fire and caused great uncertainty among residents about environmental risks.
- The solution to gain public confidence was to persuade the artist, architect and environmentalist to design a new incinerator.
- Combining Hunterwasser’s colourful bold approach with one of upfront communication and creating a visitor centre to encourage understanding of the processes.

Isle of Man Incinerator, Richmond Hill, Douglas

Client: Government

- A landmark building with striking architecture.
- The stack remiscent of a Viking Sail and its curving form expressing the surrounding landscape of rolling hills.
Design principles: Ernesettle

The site at Ernesettle currently comprises a sweeping green swathe that extends down from the area around Ernesettle Fort towards a more mixed landscape of industry and rough grassland at a lower level in the north and west. It will be important to keep some sense of this open landscape, respecting the setting of the Ernesettle Battery where the land is at a higher level. Ensuring that the buildings are located as far north as possible, where the land is lower is likely to result in minimising visual impact of the various plant that will be required. Creating a strong landscape setting that seeks to give the site an identity and to define its boundaries and extent will also be crucial in creating a meaningful identity to the plant. Associated with this should be a clear sense of where the arrival point to the plant is and to ensuring that there is a strong and clear frontage over looking Ernesettle Lane. The arrangement of the buildings in relation to each other will be important to help create a coordinated sense of scale and height to the complex. There should be a generous and welcoming entrance to the riverside footpath route outside the site boundary. The openness and exposure of the site will require a response of exceptional architectural quality set in a generally open and simple landscape setting. It will need
to acknowledge the views into and through the site from residential areas to the south and east as well as the longer distance views from Saltash and the ANOB.

**Layout examples: Ernesettle**

The site boundary has been defined by the blast zone limits of the (Royal Navy Armaments depot) RNAD resulting in a fairly long and narrow site. Option 1 allows for the EfW building to be located to the lower, northern end of the site. The footprint shows that a portion of this lies within the blast zone, however, with modification it may be possible to alter the footprint of the building, possibly to a non uniform shape to accommodate the limitations of the site. This would have the advantage of allowing the largest scale building to be located at the lowest point of the site within an already industrial context. Ancillary buildings can then be located to the south, with open, low level processing areas (assumed design) located on or cut into the highest ground.

Option 2 shows the EfW building located on a wider area of the site, with the building orientated so that the narrowest width faces onto the Tamar. Ancillary buildings and facilities have then been arranged in an ordered manner northwards. This option positions the EfW at approximately 10m above the ground level of Option 1 and will require more consideration from a visual point of view. However opportunities exist to cut the building into the slope reducing its impact.
Plan, Option 2

View of Ernesettle from Saltash

- EFW facilities and offices
- IVC facilities
- Existing ground level
- Proposed ground levels
- Landscaping
**Design principles: Coypool**

The existing industrial buildings at Coypool form a fairly dense mass and jumble of different scales. The aim for the Coypool site is to create a compact and ordered development that can sit within a strong landscape setting that can effectively “cocoon” it in from all sides. The view from the west must be considered and the plant should aim to provide a positive frontage onto this edge through the alignment of buildings and entrances. The existing site has had extensive cut and fill resulting in 3 terraces of approximately 8m difference. Unless, further cut and fill exercises are carried out, the buildings would need to follow the alignment of these terraces. There should be a clear arrival point to the site located at the entrance to the site to the south.
Layout examples: Coypool

The layout options for the Coypool site will be to a significant extent defined by the terraced topography of the site. Option 1 layout shows the EfW located at the lowest terrace adjacent to the existing railway tracks, with the ancillary buildings and facilities located on the upper terraces. This will ensure that the impact of the scale of the largest unit is minimised. Offices are located at the southern edge of the site at the entrance to the site. The landscape setting has become more defined.

Option 2 shows an alternative arrangement with the EfW at an upper terrace level, with the ancillary facilities on the lower levels. This arrangement is less successful in design terms as it raises the height of the largest building but may be necessary for operational reasons.