# The Grange Wind Farm CMS

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## 1.0 INTRODUCTION

This document outlines the methodology for the construction and decommissioning of The Grange Wind Farm Project in conformance with Town and County Planning Act 1990 and South Holland District Local Plan 2006 at land North East of Grange Farm Tydd St Marys Marsh, Wisbech Reference Application H21-0439-09.

RES Construction acknowledges that unless otherwise agreed with the planning authority, the development shall be carried out strictly in accordance with the submitted approved plans and conditions.

## 2.0 REFERENCE DOCUMENTS

Planning Application

Environmental Impact Statement 2009

RES Environmental Requirements of Subcontractors (Appendix 2)

RES Traffic Management Plan

SUDS design statement

Site Investigation

RES Water Quality Monitoring Procedure

RES Procedure In the Event of a Contaminant Spill

ICE Specification for Piling and Embedded Retaining Walls (SPERW)

"Manual of Contract Document for Highway Works – Volume 1

Chapter 8 of the Traffic Signs Manual

## 3.0 CONSTRUCTION PHILOSOPHY

Grange Wind Farm will be constructed in accordance with the Environmental Impact Statement 2009 prepared during the development stage of the project.

Where available the quietest plant and/or machinery will be employed and maintained in good working order with appropriate silencers, mufflers or acoustic covers fitted where applicable. Stationary noise sources will be sited as far away as possible from sensitive receptors and if necessary shielded by acoustic barriers.

Where appropriate and practicable, RES will use local contractors, plant and materials in order to maximise the benefit of the wind farm project to the local community. Throughout the construction period of the project RES will maintain an open dialogue with local residents and all other interested parties.

### *3.1 Timescale*

As required by South Holland District Council, the development must be begun not later than four years from the date of grand of planning permission. Therefore, construction of the wind farm will begin before 15 October 2014.

In accordance with Planning Condition 7, the hours of operation of the construction phase of the development and any traffic movements to or from the site associated with the construction of the development hereby permitted shall be limited to between 0600 hours to 2000 hours Monday to Saturday and no work shall take place on Sundays or Bank Holidays or as otherwise previously agreed in writing by the local planning authority. Outside these hours, development at the site shall not be audible from the boundary of any noise-sensitive property and be limited to turbine erection, commissioning, maintenance, emergency works

(provided that the developer retrospectively notifies the local planning authority of the emergency works within 24 hours), dust suppression and the testing of plant and equipment.

If any works are required outside these times, written details will be provided and agreed with the planning authority prior to commencing.

**Table 1.0** highlights the key dates and timescale for construction activities:

| Task | Anticipated Start | Anticipated Finish | Approximate Duration |
|---|---|---|---|
| Site Entrance | 23/11/2011 | 14/12/2011 | 15Days |
| Site Tracks & Hardstandings | 14/12/2011 | 12/04/2012 | 75days |
| Turbine Foundations | 14/03/2012 | 17/08/2012 | 5 Months |
| Control Building & Substation | 27/06/2012 | 20/12/2012 | 6 Months |
| Electrical and MV Cable Installation | 13/04/2012 | 25/01/2013 | 8 Months |
| Turbine Erection | 20/12/2012 | 13/02/2013 | 3 Months |

### *3.2 Archaeological Monitoring*

In conformance with Planning Condition 16, a Written Scheme of Works has been prepared and approved by Entec, this has been submitted to the LPA for approval at the time of writing and is available on request.

The Subcontractors shall ensure that their plant and employees do not disturb any archaeological features. If archaeology is discovered, then the RES Site Manager shall be notified immediately.

### *3.3 Ecological Management*

An ecologist will be contracted, in accordance with the scheme submitted under Condition 14 and will implement as approved by the LPA.

### *3.4 Spoil Management*

In line with construction best practice, the track design has been optimised to minimise the need to excavate soft soil where possible and therefore minimise spoil during construction. Prior to commencement of construction, a Spoil Management Plan will be developed and contain the following:

- There shall be no storage of excavated materials within a 20m buffer of any watercourse, stream or river on site to prevent possible wash-out of fine soils or risk of instability of the watercourse banks due additional surcharge loading.
- Suitable locations for spoil storage will be defined on site at the direction of the Construction Manager.
- It is envisioned that spoil will be stored locally to the works, allowed to dewater with appropriate environmental controls and then when in a suitable condition, re-spread on the adjacent land.
- Prior to commencement of construction, a Toolbox talk will be provided by the site management team. This presentation will highlight possible events causing slope instability and provide guidance on best practice when operating in areas identified as at risk.

## 4.0 DESIGN PHILOSOPHY

### *4.1 Public Highway Works Design Philosophy*

All works to be carried out within the public highway shall be designed in accordance with appropriate standards. All traffic management associated with the road network improvements shall be in accordance with Chapter 8 of the Traffic Signs Manual.

AutoTrack analysis has been carried out by RES on the following route from Newark to the site entrance;

This is shown on Figure 11.1 and Figure 11.2.

This analysis was carried out using the most up to date Ordnance Survey Superplan digital data 1:2500 obtained by RES. The swept path analysis has been carried out with a 45m vehicle and is shown on drawing 01582D2401-07.

A trial run will be carried out in May 2011 by Van Der VList using a full size blade trailer. The results of the trial run will be made available on request.

### *4.2 Site Track Design Philosophy*

All site tracks are to be been designed taking account of the typical loadings provided by the turbine manufacturer, and will consist of a compacted stone structure which is to be installed in accordance with the Manual of Contract Documents for Highway Works - Vol 1,Specification for Highway Works – Amendment November 2009.

The traditional track construction will be used within the site. This system will consist of either well graded local stone classified as 6F5 in Table 6/1 of the Specification for Highway Works, Volume 1 (SHW), with a Type 1 running surface(as specified in Clause 803 of SHW) or a lime or lime & cement stabilised chalk capping layer ( classified as 9A, 9D, 9E or 9F in table 6/1 SHW) with Type 1 running surface (as specified in Clause 803 of SHW) or proprietary portable heavy duty roadway system (for temporary turning heads only).

If the existing load bearing properties of the ground is insufficient, for example where soft alluvial soils exist, ground treatment works will be carried out to provide adequate bearing capacity and stiffness. Ground treatment is likely to comprise in-situ soil mixing using lime / cement stabilisation.

The access tracks will have a running width of 5m, with local widening on bends, at passing bays and around turbine bases. Shoulders each side of the track would be approximately 0.25m in width and would be reinstated post construction.

All bends have been designed using AutoTrack and the effective width at these locations has been widened to suit.

Under track drainage will be incorporated within the SUDs design as set out in section 5.2 Existing watercourses / drainage ditches will be culverted using an adequately sized pipe at locations where the proposed access track crosses.

### *4.3 Turbine Foundation Design Philosophy*

Wind turbine foundations are designed in accordance with the RES Basis Of Design - Wind Turbine Gravity Base Foundations which takes account of the guidance provided in EC2 and other relevant standards and has been approved by Det Norske Veritas (DNV). This basis of design is in the process of being updated to incorporate piled foundation design. RES will design the pile cap and a specialist contractor will design the piles.

Depending on the final turbine type selected, the turbine will be anchored to the foundation using a bolt assembly or a steel insert ring which shall be cast into the concrete.

The foundation geotechnical design will be based on the information contained in the site investigation report produced by Ground Engineering Ltd and factors of safety will be incorporated in accordance with European design standards. Preliminary analysis of the site investigation results indicate there will be up to two turbine foundation designs depending on soil conditions at a particular location. The site specific designs will be within the limits of the typical dimensions detailed on the Turbine Foundation General Arrangement (GA) Figure 4.3.

The wind turbine transformer and HV equipment is likely to be housed adjacent to the turbine on a reinforced concrete plinth. Power cables will be buried in HV compatible ducts between the turbine and transformer.

An earth mat will be buried around the turbine and transformer to provide protection to personnel in the event of an electrical fault.

The foundations have been designed in accordance with relevant UK safety legislation and design regulations. A design risk assessment has been carried out and risk mitigation measures have been incorporated into the design.

### 4.4 *Crane Pad Design Philosophy*

All crane pads have been designed taking account of the loadings provided by the turbine manufacturer, and will consist of a compacted stone hardstanding which is to be installed in accordance with the Manual of Contract Documents for Highway Works - Vol 1, Specification for Highway Works – Amendment November 2009.

All crane pads will be formed from a suitably stiff layer which provides a minimum strength of 200kN/m$^2$. Floated construction using geo textiles is not deemed to be acceptable for crane pads due to the flexibility of such structures and the inevitable settlement.

Crane pad formation will consist of either well graded local stone classified as 6F5 in Table 6/1 of the Specification for Highway Works, Volume 1 (SHW), with a Type 1 running surface (as specified in Clause 803 of SHW) or a lime or lime & cement stabilised chalk capping layer (classified as 9A, 9D, 9E or 9F in table 6/1 SHW) with Type 1 running surface (as specified in Clause 803 of SHW) or proprietary portable heavy duty roadway system. The main crane pads are 40m x 30m and have a maximum cross and longitudinal fall tolerance of 1% (1:100).

If the existing load bearing properties of the ground is insufficient, for example where soft alluvial soils exist, ground treatment works will be carried out to provide adequate bearing capacity and stiffness. Ground treatment is likely to comprise in-situ soil mixing using lime / cement stabilisation.

### 4.5 *Sub-Station Control Building Design Philosophy*

The substation and adjoining compound has been designed, sized and positioned to be sympathetic with the surroundings and to comply with the requirements set out in the approved layout. The building as a minimum will contains five rooms; Control Room; Switch Room; Grid Room; Rest Room; Store Room. A WC with an external entrance is also incorporated into the Control Room building. This detail is shown on 01582D2208-03. The foundations for the building will be designed based on the site investigation report.

At the sub-station location, it is recommended that strip foundations are used along with suspended floor slabs. In the event that excavate and replace earthworks are proposed to enable a ground bearing floor slab / raft foundation to be used, the near surface soils at this site are considered to be frost susceptible so it is recommended that ground bearing floor

slabs / rafts are founded on a minimum 300mm thick compacted non-frost susceptible granular layer. Alternatively, piled foundations may be used should they prove to be a more economic option.

The superstructure consists of a traditional cavity wall construction but with a double internal leaf which gives an overall wall thickness of 415mm. An alternative design may consider the use of wind posts. All door openings have been sized to comply with the current M&E requirements.

The ceiling for the switch room consists of pre-stressed pre-cast hollow core concrete units or anti-intruder plaster board. All other ceilings are foil backed plaster board.

The roof is a traditional pitch roof construction consisting of prefabricated timber trusses, 12mm plywood sheeting, sarking felt, timber battens, and roof tiles.

All doors will be made of steel or timber with steel sheeting for security prefabricated to fit structural openings.

Foul drainage will discharge to the proposed treatment plant. The treatment plant will have an outlet pipe for discharge of treated water. Surface water will be taken away by a perimeter drain which will discharge to an infiltration basin located north east of the compound at a lower level than the lowest point of the perimeter drain.

The compacted stone of the hardstanding surrounding control building will be of sufficient size and surfaced with a suitable running course to enable vehicular access and accommodate parking.

## 5.0 CONSTRUCTION METHOD

### *5.1 Access Roads*

The extent of the works to the public roads is detailed on the contract drawings included in Appendix 1 of this document and the traffic management plan submitted separately.

Prior to public road works, an agreement will be sought with the Local Authority. All works to public roads including re-construction of pavement, establishment of passing bays and verge works will be carried out in accordance with the appropriate "Consent to carry out excavation in, or break up the surface of a road". A detailed programme of all works and any required traffic management proposals shall be submitted to and agreed by South Holland District Council in accordance with Condition 6.

Suitable notification shall be given to local residents detailing the full sequence of work and contact details of key site personnel.

Except for the main site entrance, improvements required for abnormal loads delivery will be carried out one month prior to turbine deliveries in April 2012. A Traffic Management Scheme proposal for abnormal loads is included in Appendix 3.

### *5.2 Site Entrance*

For the avoidance of doubt, all construction traffic will be required to access the site area via the A1101 and North Road in accordance with Figure 11.1 and Figure 11.2 and appropriate traffic management at this point will be agreed in liaison with South Holland District Council.

Prior to the commencement of any other works, the site entrance layout will be constructed in accordance with Figure 11.1 and Figure 11.2.

The site entrance will be constructed in accordance with the contract drawings as follows: -

- Obtain necessary permits and approvals from the Highways Authorities
- Inform statutory services & identify any assets to be protected or diverted.
- This works will include road widening/ re-grading / improve visibility in accordance with Figure 11.1 and Figure 11.2 and supplementing other signs with additional warnings.
- In accordance with DMRB the visibility works at the site entrance will be checked and approved by the Local Authority prior to use of the improved entrance.
- Existing drainage will not be compromised by the entrance works and will be designed in accordance with the Flood Risk Assessment and SUDs
- Surfacing works at the site entrance will all be to the standard required by the Specification for Highway Works.
- Great care will be taken to ensure mud from the site roads does not become a hazard on the route. Wheel washing facilities will be set up at the main entrance to remove mud from the wheel of vehicles leaving the site. A monthly monitoring regime will be set up and the weekly site safety checklist will include a visual check once per week (minimum). The area will be visually inspected daily but recorded weekly.
- A full condition survey will be carried out in conjunction with the South Holland District Council/Highways Authorities to determine the condition of the route adjacent to the site prior to works commencing. This will involve a video survey of the proposed route and will identify any existing defects. This report will be used later to agree if the works have contributed to deterioration above and beyond normal wear and tear.

### *5.3 Site Roads*

The layout and typical construction details of the site roads are detailed on 01582D2205-02 and will be constructed as follows: -

- Establish alignment of the site roads from the construction drawings and mark out the centrelines with ranging rods or timber posts.
- The access tracks will have a running width of 5m, with local widening on bends, at passing bays and around turbine bases. Shoulders each side of the track would be approximately 1m in width and would be reinstated post construction.
- The site access tracks will be excavated construction in accordance with Figure 4.4.
- The excavated section will where practicable have topsoil stripped over the area of the excavation and stored growing side up for reuse. This area will be oversized to facilitate the excavated subsoil material. The subsoil material will subsequently be capped with topsoil to form an earth bund.
- All Machinery shall work within the construction corridors as indicated on the contract drawings. Vehicle movement will be restricted to site tracks except during track and base construction.
- Generally, excavated material will be used as backfill around building elements. However where this is not possible, re-profiling of the spoil in accordance with the Spoil Management Plan.

- The subsoil will be excavated down to a suitable formation layer of either firm clay or rock and the spoil deposited on either side of the track to form screening bunds.

- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the design which will take account of the characteristics of the material and the compaction plant to be used.

- Drainage ditches will be excavated adjacent to the tracks. Regular cross drains will be placed below the road surface to prevent excessive volumes of water collecting in the drainage ditches. The running surfaces of the site roads will be finished to a cross fall of no greater than 1% to reduce ponding. Surface water runoff will not be allowed to discharge directly into existing watercourses but will be routed through the SUDS system Appendix 4.

- Batters to have a slope of between 1:1 to 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

- Screening bunds will be formed along the edge of the site roads. The bunds will be formed using the excavated subsoil and reinstated with the vegetable soil set aside during the excavation. No planting or seeding will be undertaken to ensure alien species of flora are not introduced to the project.

- The wind farm owner shall take responsibility for the upkeep of the onsite access tracks to the standard required for the operation of the wind farm during the operational life of the wind farm. Monitoring of the condition of the tracks will be carried out by the wind farm owner by visual inspection when using the tracks on site any repairs required would be carried out by a qualified contractor.

### 5.4 *Management of Surface Water*

In compliance with Planning Condition 5, detailed measures to address surface water management, including methodology for dealing with water pumped from excavations is based upon the SUDS design criteria and philosophy prepared by McCloy Consulting can be found in Appendix 4.

Similarly refer to Appendix 7 - Emergency Procedure in the Event of a Contaminant Spill for the pollution contingency plans.

Water quality monitoring will be undertaken on nearby watercourses during the construction phase to assess and manage the performance of the SUDS system, making adjustments as necessary to ensure that site drainage does not impact on local water courses. There are no watercourses on site and there will be no discharging of foul or surface waters to any watercourses nearby. Water will be dealt with using infiltration basins as outlined in Appendix 4.

In any event pre- and post- construction water quality of watercourses within the site will be monitored using the procedure detailed in Appendix 6, to confirm that the control measures implemented have been effective.

### 5.5 *Temporary Site Compound*

The temporary contractor's compounds will be constructed at the location indicated on the contract drawings as per drawing 01582D2210-03.

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts

- The Compound will be established using a similar technique as the construction of the site tracks.

- Granular material will be spread and lightly compacted to provide a hard area to site offices and storage containers.

- Areas within the compound will be constructed as site roads and used as vehicle hard-standings during deliveries and for parking of site vehicles. The size and location of the hard-standings will be at the discretion of the site manager and the requirements of the contractors.

- An impermeable bunded area will be provided within the compound for the storage of fuel oils and is shown on 01582D2210-03.

- The compounds will require to be fenced all round and secured with locked gates as shown on drawing number 01582D2210-03.

- A site security cabin will be provided at the site entrance to prevent unwanted intruders and/or people accessing the site as a laydown area.

- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil and seeding as required.

### 5.6 *Turbine Foundations*

The turbine foundations will be constructed in accordance with typical drawing no. 01582D2207-02.

The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area.

- Where practicable the topsoil will be stripped over the area of the excavation and stored growing side up for reuse, the vegetable soil will be excavated and stored to one side for reuse during the landscaping around the finished turbine.

- The subsoil will be excavated to an average formation depth of 2.5m below Existing Ground Level (BEGL) to extract maximum benefit from the encountered ground conditions. A maximum structural backfill depth of 0.5m should be maintained, with any additional make-up provided with blinding concrete.

- Particular care should be taken on this site to avoid risk of slope failure.

- No material will be removed from site and storage areas cover in geotextile prior to stockpiling in line with best working practices.

Piled turbine foundations are to be constructed in accordance with indicative drawing no. 01582D3001-01 and as follows:

- The extent of the excavation and piling platform will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area.

- Piling platform approximately 20m x 20m will be extended from the crane hardstanding and will likely consist of compacted stone designed to comply with the requirements of

the piling rig being used and in accordance with Federation of Piling Specialists, Working Platform Certificate (WPC).

- Depending on piling level selected the platform will be either left in-situ (as a formation level for the piling cap) or placed over a geotextile and removed following installation of piles for reuse elsewhere on site.
- UXO mitigation will be detailed for each turbine dependant on the risk level, as described in Appendix 9.
- Pile reference markers and pile pins are to be marked out and all piling rig operations are to be directed by the Banksman.
- Piles are anticipated to be a mixture of CFA and cased CFA, possibility of driven piles has not been discounted and final selection will depend of proposed solution from contractor at detailed design stage..
- Detailed method statements will be produced by piling contractor subject to the pile type selected.
- If the non-displacement pile option is selected, the resulting spoil generation will be considered within the spoil management plan.
- Pile testing will be completed in accordance with SPERW and as specified by the RES civil designer.
- Following installation of the piles, the subsoil will be excavated to an approximate depth of 1.5m below Existing Ground Level (BEGL) subject to turbine interface arrangements specified by the turbine supplier.
- Particular care should be taken to avoid risk of slope failure within the excavation.
- Pile cropping will be carried out, as required, to ensure a suitable interface level with the pile cap.
- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation. It should be tamped and finished with a screed board to leave a flat level surface around the pile cut off level.

- High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding.

- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.

- Concrete will be placed using a crane, pump or other suitable lifting device and compacted when in the forms using vibrating pokers to the levels and profile indicated on the drawings, in accordance with good working practises.

- Upon completion of the concreting works the foundation base will be covered and allowed to cure.

- Following the curing period any formwork around the foundation will be stripped and stored for reuse. The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set-aside during the excavation. A gravel footpath will be formed from the access track to the turbine door and around the Turbine for maintenance.

### 5.7 *Substation Control Building and Compound*

In conformance with 01582D2209-02 and 01582D2208-03, the control building will be constructed in accordance with the following:

- The area of the Control Building and Compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to a temporary stockpile adjacent to the work site for use in landscaping. No material will be removed from site

and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.

- The dimensions of the Control Building and Compound area will be set to meet the requirements of Grid Operator and the necessary equipment to safely and efficiently operate the wind farm.

- The floor slab is constructed, having first located any ducts or trenches required, and then the walls will be built up from the footings to DPC.

- The block work will then be raised to wall plate level and the gables & internal partition walls formed.

- The roof trusses will be lifted into position using an adequately sized mobile crane, felted, battened, tiled and sealed against the weather.

- In accordance with Condition 12 the Control Building finishes to be in keeping with the local area: -

    - Walls to be rough cast grey render finish

    - Roof to be grey slate effect tiles

    - Doors to be made of steel or timber with steel sheeting for security.

  The doors will be fitted and the external & internal finishing's applied including any fitted furniture.

- The compound area will be re-graded, the electrical equipment plinths constructed and an over site carpet of single size clean granular material will be laid.

- A palisade fence will be erected around the compound and the area surrounding the building landscaped as submitted to discharge Condition 13, returning it as far as practicable to near original condition.

- PIR operated external lighting will be installed on the building to allow safe access during period of reduced light.

### *5.8 Turbine Erection*

In accordance with Condition 9, the turbine will be supplied with a light grey semi-matt finish (RAL No. 7035) and installed with a tip-height not exceeding 127m measured from existing ground levels to the blade tip in the vertical position. In conformance with Planning Condition 10, the rotors of the turbines shall all rotate in the same direction.

- Turbines are delivered in sections to the site.

- The sections are lifted by adequately sized mobile cranes (1 main crane and a smaller tail crane to assist with the initial lift free of the transport) and positioned on the foundations / other turbine sections until the entire turbine is erected.

- Upon completion of the erection all fasteners will be tightened to the correct torque and the internal fit out of the turbine undertaken, and finally the mains power will be connected to the turbine controller.

- When the controller is 'booted up' the turbine commissioning will commence, and following the successful execution of the 'tests on completion' the turbines will be handed over as complete.

### 5.9 *Site Electrical Works*

- ***Substation and switchgear***: - The substation will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. This would be designed, installed and commissioned by registered electrical contractors. The high voltage switchgear is installed using a truck mounted hydraulic crane, the indoor equipment is then connected, wired tested and commissioned typically by engineers supplied by the switchgear manufacturer. The operation of this equipment is by suitably authorised operators who have undergone extensive training. The equipment will be decommissioned in the reverse of the above, removed from site, dismantled and disposed of in an approved manner.

- ***Underground Distribution*** - In accordance with Condition 8, all electricity and other service cables between the turbines and the sub-station / control building shall be placed underground. The ground is trenched typically using a mechanical digging machine. These machines will be regularly inspected for safety and condition and will be well maintained. The operators will have the required certification. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables is to meet all national and international requirements; a suitable marking tape is installed between the cables and the surface. On completion the ground will be reinstated as previously described above. The cables are terminated on the transformers at each turbine location. The terminations are of an outdoor watertight design. On decommissioning the cables will be cut away below ground level and sealed.

- ***Transformers***: - The transformers are delivered by the manufacturer. They are supplied full of oil and will not require topping up or filtering on site. The transformers will be of the sealed type and will be inspected for any damage prior to offloading. The units will be installed using a small mobile all terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons. The accessible MV & LV sections of the transformer will be protected within an enclosure which shall be locked at all times displaying appropriate warning signs. The units will be decommissioned in the same manner, removed from site and disposed of by a company certified to handle such materials. This specialist company will also dispose of any oil or residual waste products.

### 5.10 *Grid Connection*

- Connection to the utility's system shall be by an underground cable to a point determined by the utility in accordance with their recognised standards, planning conditions and any landowner agreements.

- All work associated with the grid connection will be undertaken to the utility company's specifications and requirements.

### 5.11 *Environmental Management*

For details of environmental management measures to be adopted during the construction phase, including details of wheel washing facilities and of the designated refuelling area, refer to Appendix 2 - Environmental Requirements of Subcontractors.

The following will be key undertakings of the Environmental Management on site.

- Wheel washing facilities will be provided at the site entrance. These are likely to be the waterless drive through type. These will be regularly maintained and road conditions monitored to ensure public roads are not contaminated with mud or dust.

- Fuel on site will be controlled in accordance with the RES Environmental Requirements for Subcontractors (Appendix 2).

- All works will be carried out in accordance with the relevant noise legislation and good working practise. Signage, as required will be posted at specific locations.

### *5.12 Pollution Control*

Refer to 01226R00001 - Emergency Procedure in the Event of a Contaminant Spill, Appendix 7 for details of the emergency procedure to be followed and actions to be taken in the event of a hazardous waste spillage such as oil, fuel and chemicals, occurring on a wind farm construction site or an operational wind farm site in order that the environmental impacts that may be associated with a hazardous waste spillage may be mitigated.

### *5.13 Transport Management*

Refer to Appendix 3 - Wind Farm Transport Management Plan

## 6.0 DECOMMISSIONING METHOD

In conformance with Planning Condition 4 the permission is for a period of 25 years from the date that the electricity from the development is first connected to the grid, such date to be notified to the planning authority within 1 month of such connection. Within 12 months of the end of the 25 year period all wind turbines, ancillary equipment and buildings shall be dismantled to ground level and removed from the site, and the land shall be restored in accordance with a restoration and after-care scheme to be submitted for the approval of the planning authority.

Additionally, in accordance with Planning Condition 3, on reasonable request of the planning authority, the developer will provide appropriate information concerning the supply of electricity to the grid from any turbine. If any turbine fails to supply electricity to the grid for a continuous period of 12 months, then, unless otherwise agreed in writing with the planning authority, a scheme for the decommissioning and removal of the turbine and any other ancillary equipment above ground level relating solely to that turbine, and including the restoration of the site involved, shall be submitted to the planning authority within 3 months of the end of the 12 month period of non-supply and carried out in accordance with the scheme approved.

### *6.1 Site Access Roads*

At the request of the landowner or other empowered body, the site tracks will be reinstated to the approximate pre-wind farm condition, otherwise the tracks may remain as an access route for other activities. Should the tracks be reinstated the following shall take:

- The granular material that forms the roads will remain in place

- The screening bunds along the sides of the tracks will be stripped of topsoil and used as backfill for the tracks

- Upon completion of the backfilling the topsoil stripped from the bunds will be used to landscape the backfilled track and reseeded as necessary, and

- Backfilling of tracks will be carefully planned to avoid having to travel plant and equipment on freshly reinstated land.

### 6.2 *Wind turbines*

- The decommissioning of the wind turbines will be the reverse of the erection process involving the same lifting plant and equipment.
- It is anticipated that the turbines will be taken down and loaded straight onto the back of transport and removed from site for reconditioning or breaking.
- The turbines may be broken down into smaller component parts than during erection, in particular the rotor blades may be cut up into more manageable sections prior to removal from site.

### 6.3 *Turbine Foundations*

- Following the removal of the wind turbine the concrete foundation will be chopped back to 1m below existing ground level.
- The steel foundation insert or bolt ring and any reinforcement exposed will also be cut back and treated with a proprietary corrosion protection system.
- Upon completion of the corrosion protection the foundation will be backfilled with material generated local to the foundation, covered with topsoil and reseeded as required.

There is no appreciable effect on the local environment from buried reinforced concrete structures left in-situ over many decades past the 20-25 year working life of the wind farm.

### 6.4 *Site Electrical installation*

The electrical equipment will be decommissioned in the reverse of the installation method described in 5.11 above, removed from site, dismantled and disposed of in an approved manner. Cables may be left in the ground if recovery is not reasonably practicable.

## 7.0 RECORDS

Records, as-built drawings, specifications, operational maintenance manuals and residual risks will be collated and filed in the Project Health & Safety file based upon the requirements Construction (Design & Management.) 2007.

In accordance with Planning Condition 25, unless otherwise agreed in writing the wind farm operator shall log wind speed and wind direction data continually and shall retain data which has been obtained for a period of no less than the previous 12 months. The data shall include the average wind speed in metres per second for each 10-minute period.

## 8.0 APPENDICES

## APPENDIX 1 - CONTRACT DRAWINGS

*SCHEDULE OF DRAWINGS*

**The Grange Farm Wind Farm**

***Layouts***

| | | | |
|---|---|---|---|
| Infrastructure Layout | RES | 01582D1001-08 | Figure 4.2 |
| Turbine Layout | RES | 01582D2106-03 | Figure 4.1 |

***Civil Works***

| | | | |
|---|---|---|---|
| Temporary Construction Compound | RES | 01582D2210-03 | Figure 4.9 |
| Typical Wind Turbine Piled Foundation | RES | 01582D3001-02 | Figure 4.6 |
| Control Building & Sub-Station Building Elevations | RES | 01582D2209-03 | Figure 4.8 |
| Crane Hard Standing General Arrangement | RES | 01582D2206-02 | Figure 4.5 |
| Permanent Wind Monitoring Mast | RES | 01582D2211-02 | Figure 4.11 |
| Typical Access Track Design | RES | 01582D2205-03 | Figure 4.4 |
| Gas Pipeline Protection Slab | RES | 01582D2302-01 | Figure 4.13 |
| Temporary Piling Platform | RES | 01582D2306-02 | |

***Electrical Works***

| | | |
|---|---|---|
| Cross Section of Underground Cabling | RES | 01582D2303-01 |
| MV Cable Layout | RES | 01582D4301-02 |

# THE GRANGE WIND FARM

## FIGURE 4.2

## INFRASTRUCTURE LAYOUT

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KEY

- TURBINE
- UPGRADED TRACK
- NEW TRACK
- ADDITIONAL TEMPORARY TRACK REQUIREMENTS
- SUBSTATION
- TEMPORARY CONSTRUCTION COMPOUND
- CRANE HARDSTANDING – PERMANENT AREAS
- CRANE HARDSTANDING – AREA TO BE COVERED OVER WITH TOPSOIL
- TEMPORARY MET MAST
- REFERENCE MET MASTS (LOCATIONS TAKEN FROM DRAWING 01582D0103–01)
- PERMANENT MET MAST (LOCATION AS DRAWING 01582D0102–02)
- COMMUNICATIONS MAST
- GAS PIPELINE PROTECTION SLAB

| LAYOUT DWG | 01582D0001-08 | T-LAYOUT NO. | PENGgra029 |
|---|---|---|---|

DRAWING NUMBER **01582D1001-08**

**SCALE - 1:10,000**

**ENVIRONMENTAL STATEMENT 2009**

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T1 T2 T3 T4 T5 T6 T7

SITE ENTRANCE

Turbine Mast

Reference Mast

Tydd St Mary's Ma

Tydd St Mary

Tydd Gote

The Grange

South Holland Lodge

South Holland Main Drain

Hundred Drain

Shire Drain

Oldfield Drain

Nene Outfall Cut

Mijoma

Oak House

Gunthorpe Farm

Long House Farm

Pumping Station Cottages

Station House

Eau Dyke Bank Farm

Tydale Farm

Westwood

Romanhurst

Westfield

Old Field

Allotment Gardens

The Angle

Common Pit (Wildlife Sanctuary)

Tilbrook's Tunnel

Allot Gdns

Ydd St Mary's Common

SHAWS LANE

HOSPITAL DRIVE

MARSH ROAD

MIDDLE ROAD

CHURCH LANE

STATION ROAD

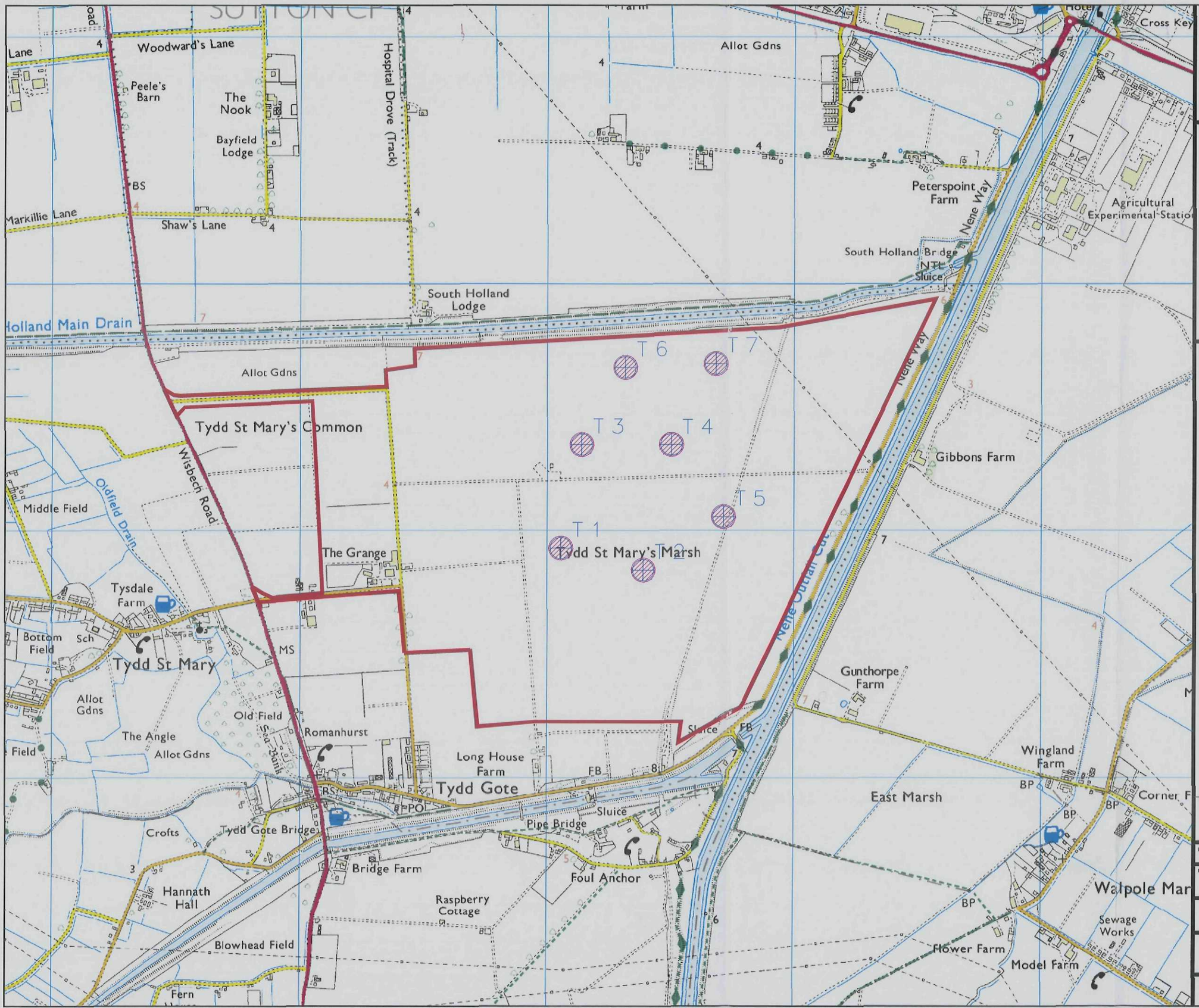
CROSS ROAD

Track

Drain

Path

Stone




# THE GRANGE WIND FARM

## FIGURE 4.1

## TURBINE LAYOUT WITH MICROSITING

- Site boundary
- Turbine locations
- 50m micrositing buffer

* Note: No turbine will be microsited within any environmentally constrained areas as defined in Figure 3.1.

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| LAYOUT DWG | 01582D0001-09 | T-LAYOUT NO. | PENGgra029 |
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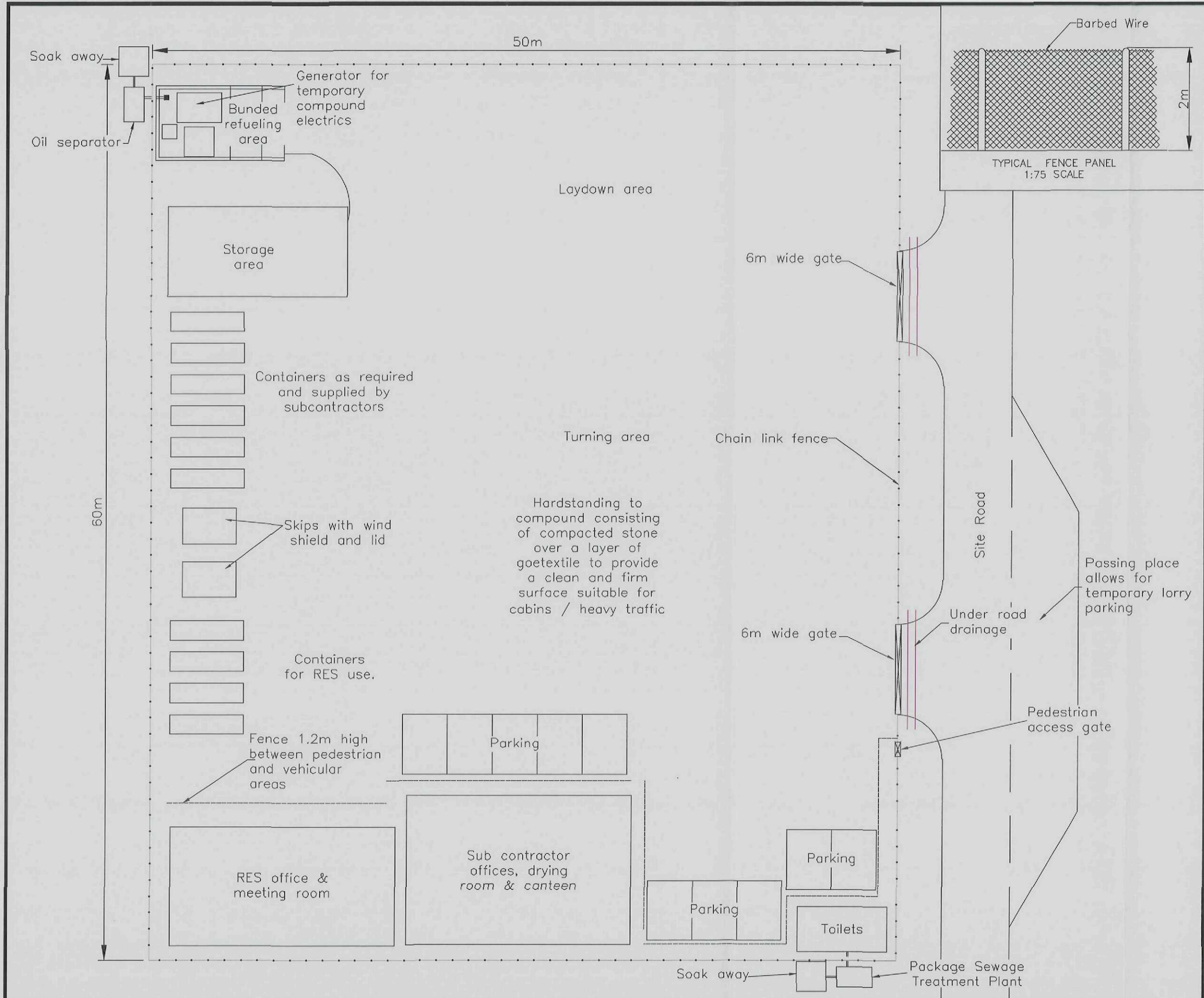
DRAWING NUMBER

**01582D2106-03**

**SCALE - 1 : 15,000**

**ENVIRONMENTAL STATEMENT 2009**

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# THE GRANGE WIND FARM

## FIGURE 4.9

## TYPICAL CONSTRUCTION COMPOUND LAYOUT

NOTES

NUMBER AND LOCATION OF COMPOUND EQUIPMENT AND FACILITIES ARE INDICATIVE ONLY

STRUCTURE TO BE TEMPORARY AND TO BE REMOVED AFTER CONSTRUCTION.

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|---|---|
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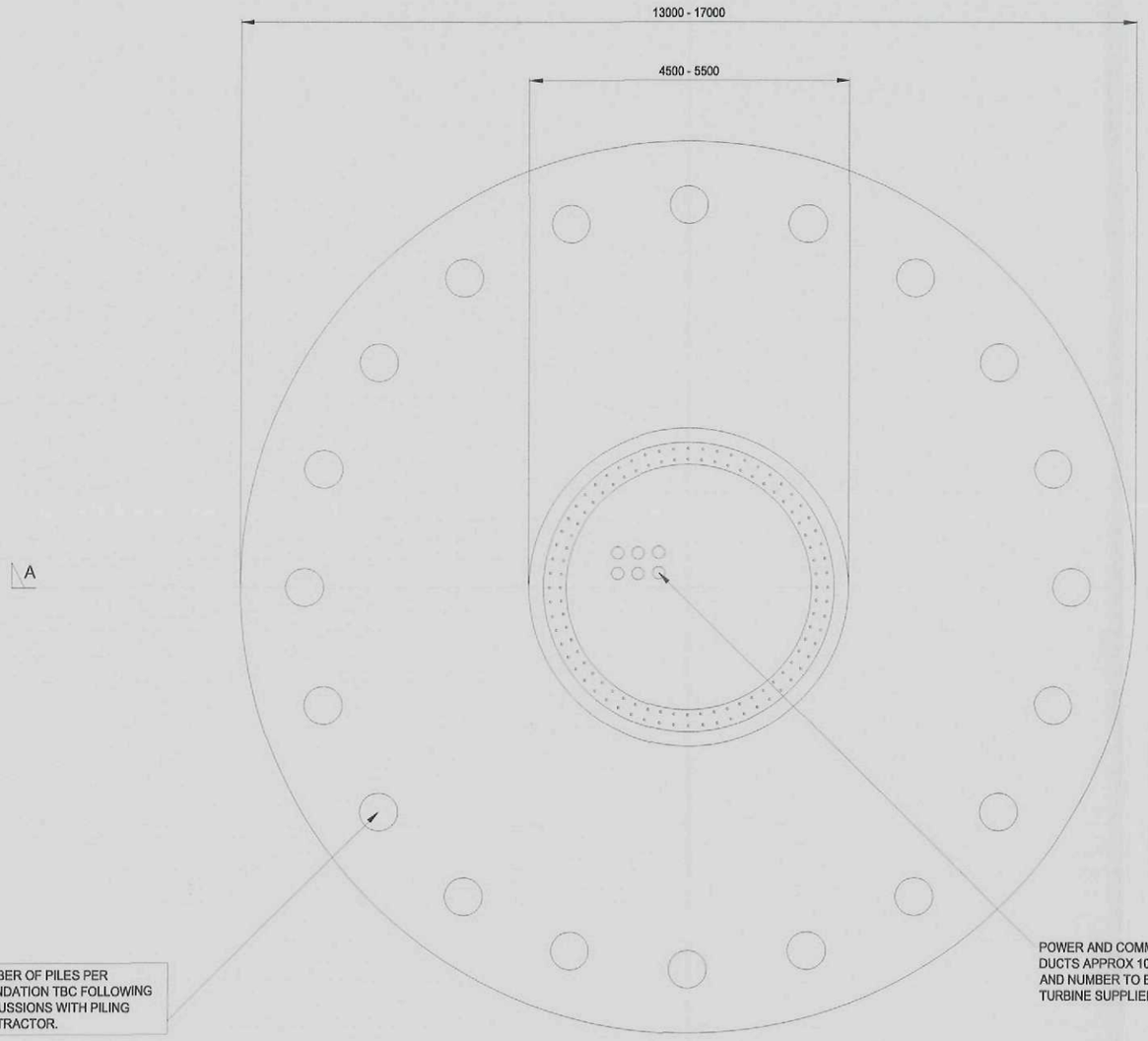
DRAWING NUMBER

**01582D2210-03**

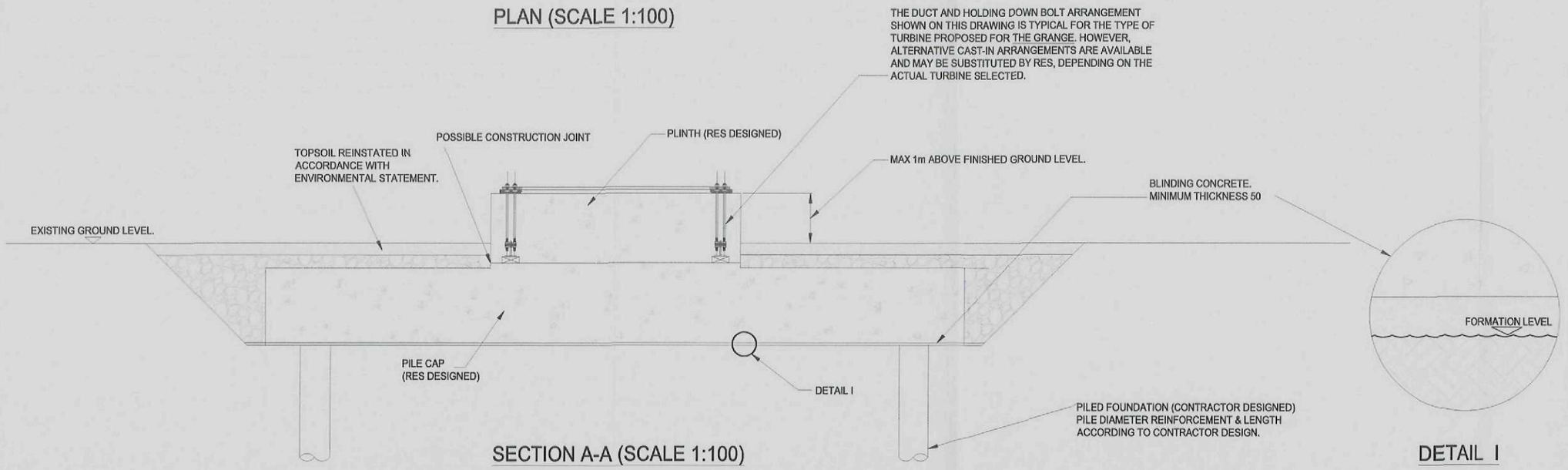
**SCALE - 1:250**

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PLAN (SCALE 1:100)




SECTION A-A (SCALE 1:100)

DETAIL I

# THE GRANGE WIND FARM

## FIGURE 4.6

## INDICATIVE PILED FOUNDATION DESIGN GENERAL ARRANGEMENT

NOTES

1. ALL DIMENSIONS IN MM.

2. PILES & PILE CAP TO BE CONSTRUCTED THROUGH & WITHIN PREVIOUSLY INSTALLED PILING PLATFORM RESPECTIVES (DETAILS TO BE CONFIRMED).

3. PILES AND TESTING REGIME TO BE CONTRACTOR DESIGNED IN ACCORDANCE WITH RES PILING SPECIFICATION

4. WORKING LOAD CAPACITY OF PILES TBC

5. BACKFILL ABOVE BASE TO BE SELECTED GRANULAR FILL, ROCK OR HARDCORE TO APPROVAL OF RES SITE MANAGER. HARDSTANDING TO BE REINSTATED AS PER RES SPECIFICATION.

6. DIMENSIONS AND DETAILS ARE INDICATIVE ONLY AND MAY VARY DUE TO SPECIFIC TURBINE OR GROUND CONDITIONS

7. PILE CAP AND PLINTH TO BE DESIGNED BY RES

8. INTERFACE BETWEEN CONTRACTOR DESIGNED PILES AND RES DESIGNED PILE CAP TO BE AGREED BETWEEN BOTH PARTIES.

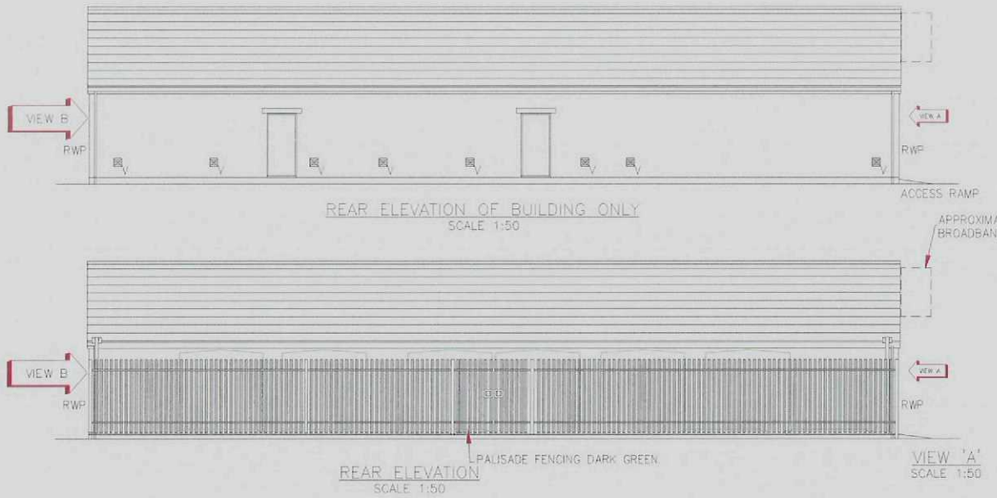
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DRAWING NUMBER

01582D3001-02

SCALE - AS SHOWN

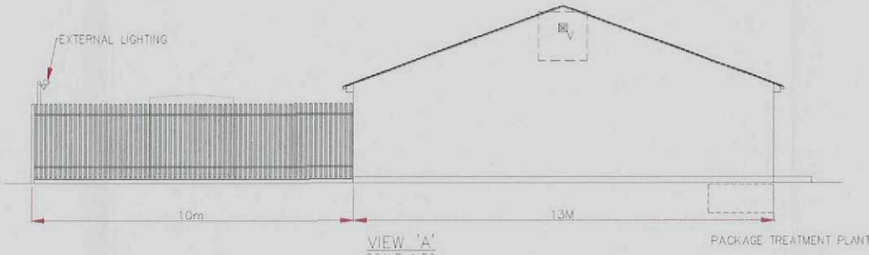
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REAR ELEVATION OF BUILDING ONLY
SCALE 1:50



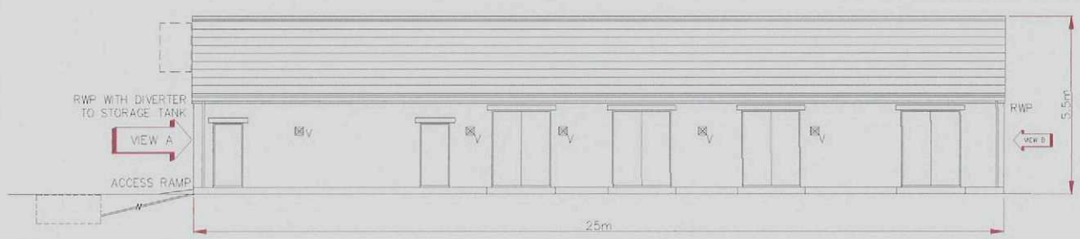

REAR ELEVATION
SCALE 1:50




VIEW 'A'
SCALE 1:50

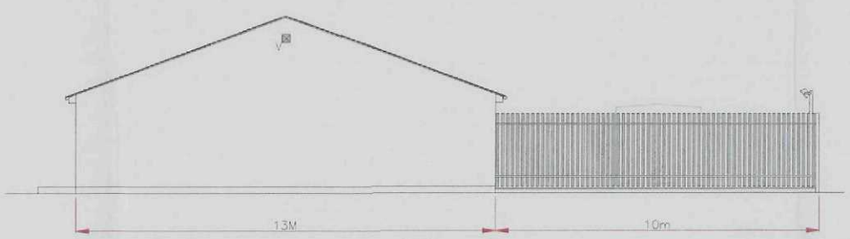
PACKAGE TREATMENT PLANT

NOTE: SUITABLE SAFETY SIGNAGE FOR HV ELECTRICAL INSTALLATION TO BE INSTALLED ON DOORS




PACKAGE TREATMENT PLANT

FRONT ELEVATION
SCALE 1:50




VIEW 'B'
SCALE 1:50

# THE GRANGE WIND FARM

## FIGURE 4.8

## TYPICAL CONTROL BUILDING & SUBSTATION ELEVATION

POSITION OF DOORS AND GATES, ARE INDICATIVE ONLY AND ARE SUBJECT TO REQUIREMENTS OF THE TURBINE SUPPLIER AND GRID COMPANY

LOCAL BUILDING MATERIALS AND FINISHES ARE PROPOSED TO ENSURE THAT THE BUILDING IS IN KEEPING WITH OTHERS IN THE AREA

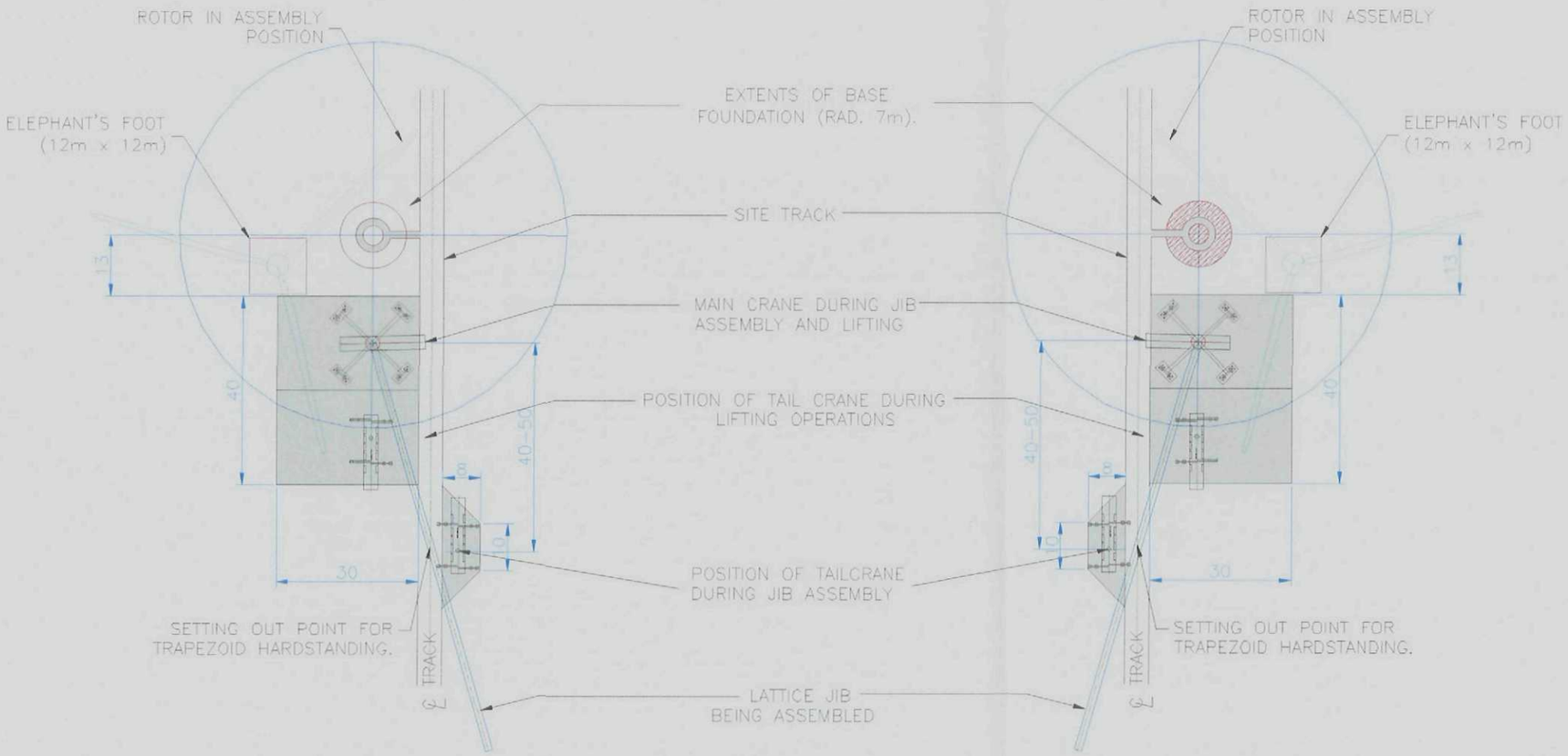
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DRAWING NUMBER

**01582D2209-03**

**SCALE - 1:200 @ A3**

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HARDSTANDING AND CRANE CONFIGURATION FOR TURBINES TO L.H.S. OF TRACK

HARDSTANDING AND CRANE CONFIGURATION FOR TURBINES TO R.H.S. OF TRACK

# THE GRANGE WIND FARM

## FIGURE 4.5

## TYPICAL CRANE HARDSTANDING

NOTES

1. ALL DIMENSIONS IN METERS.
2. CRANE ARRANGEMENT BASED ON 1000T CAPACITY MOBILE CRANE WITH LATTICE JIB.
3. ALL HARD STANDINGS TO BE CONSTRUCTED IN CRUSHED ROCK & FORMING A POROUS SURFACE.
4. ALL HARD STANDING AREAS TO BE BUILT UP FROM HARD UNDERLYING MATERIAL TO BE SUITABLE TO SUPPORT CRANE OUTRIGGERS.
5. PRECISE SETTING OUT OF CRANE PAD TO BE VERIFIED AGAINST SPECIFIC WIND TURBINE SUPPLIER REQUIREMENTS PRIOR TO PREPARATION OF CONSTRUCTION DRAWINGS

AREA DISTURBED DURING FOUNDATION CONSTRUCTION

AREA PREPARED FOR ROTOR HUB(TEMPORARY)

HARDSTANDING AREA (POSSIBLY PILED SUBJECT TO DETAILED SITE INVESTIGATION)

ROTOR OVERFLY ZONE.

| LAYOUT DWG | T-LAYOUT NO. |
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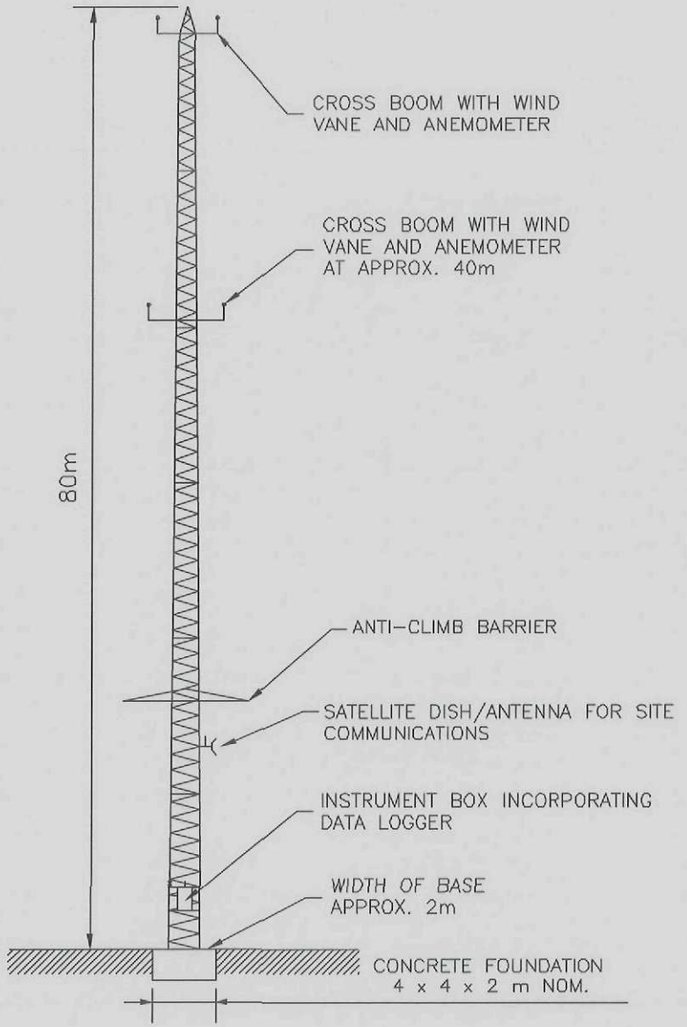
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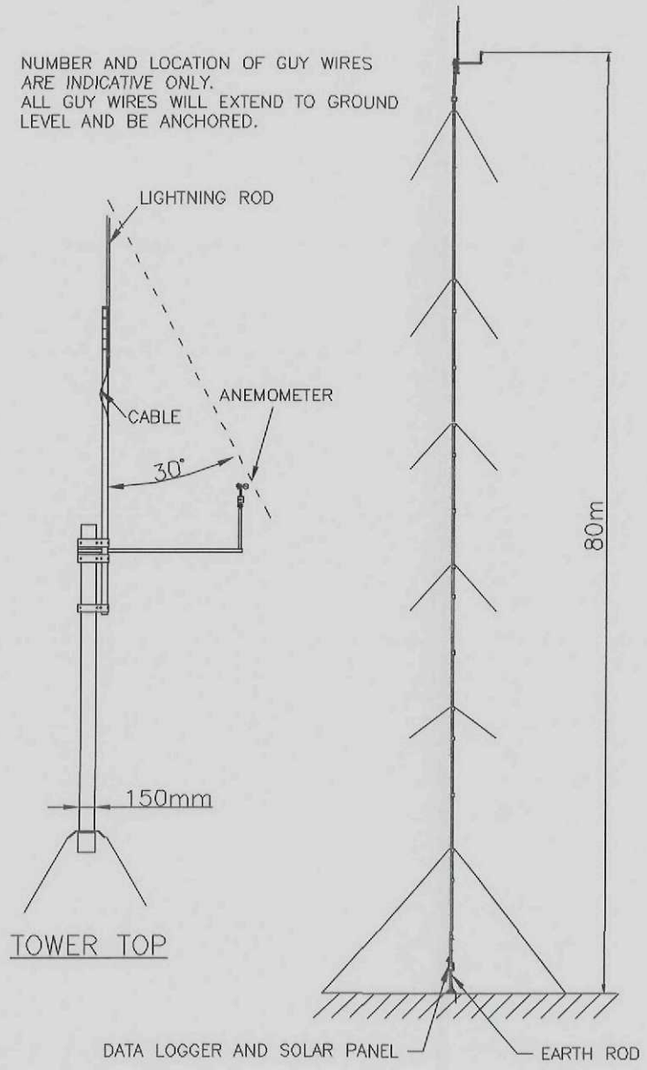
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**ENVIRONMENTAL STATEMENT 2009**

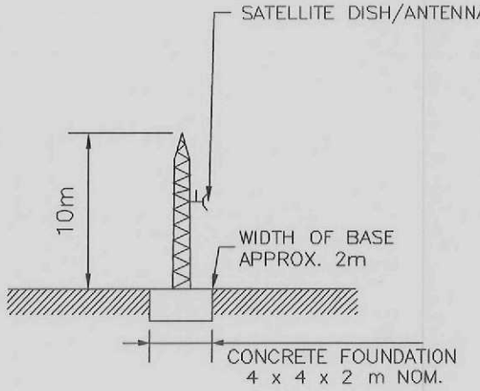
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PERMANENT MET MAST




TEMPORARY AND SITE CALIBRATION MET MASTS




COMMUNICATIONS MAST

**THE GRANGE WIND FARM**

**FIGURE 4.11**

**MET MASTS**

NOTE:

COMMUNICATIONS MAST DETAILS TO BE CONFIRMED BY UTILITY AND TURBINE SUPPLIER

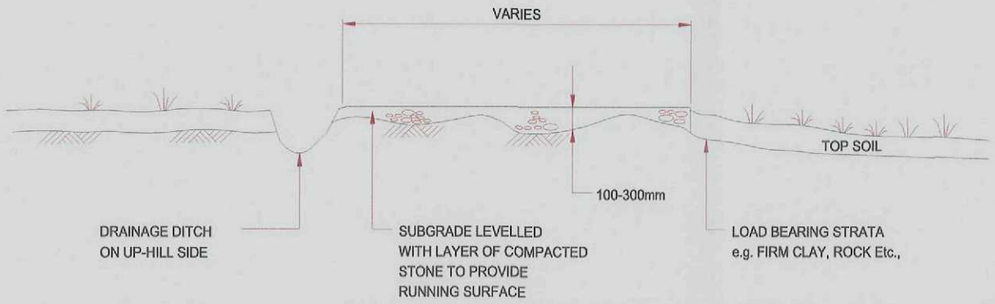
| LAYOUT REV. | N/A | T LAYOUT REV. | N/A |
|---|---|---|---|

DRAWING NUMBER: **01582D2211-02**

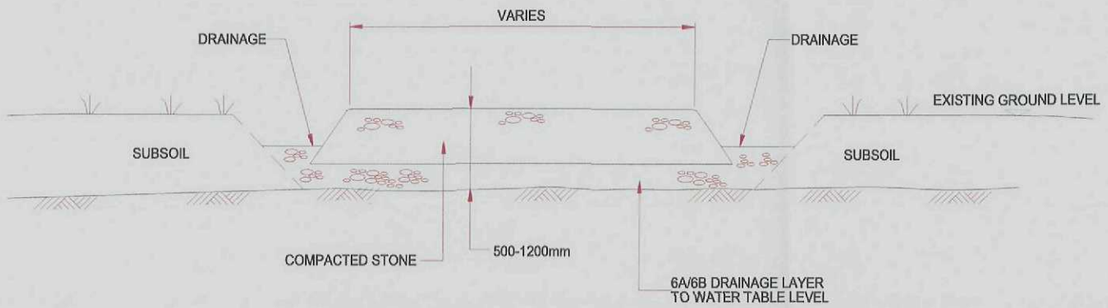
SCALE - 1:400

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EXCAVATED TRACK - FIRM GROUND




EXCAVATED TRACK - WET GROUND

# THE GRANGE WIND FARM

## FIGURE 4.4

## TYPICAL ACCESS TRACK DESIGN

NOTE

TRACK STONE TO BE DEPARTMENT OF TRANSPORT TYPE 1 GRADE OR OTHER SIMILAR STONE APPROVED BY ENGINEER.

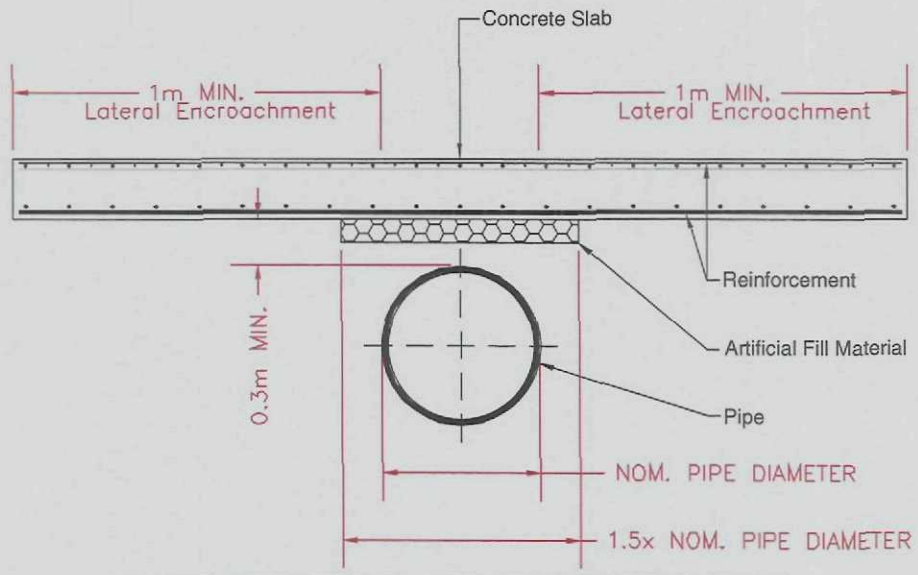
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DRAWING NUMBER

01582D2205-03

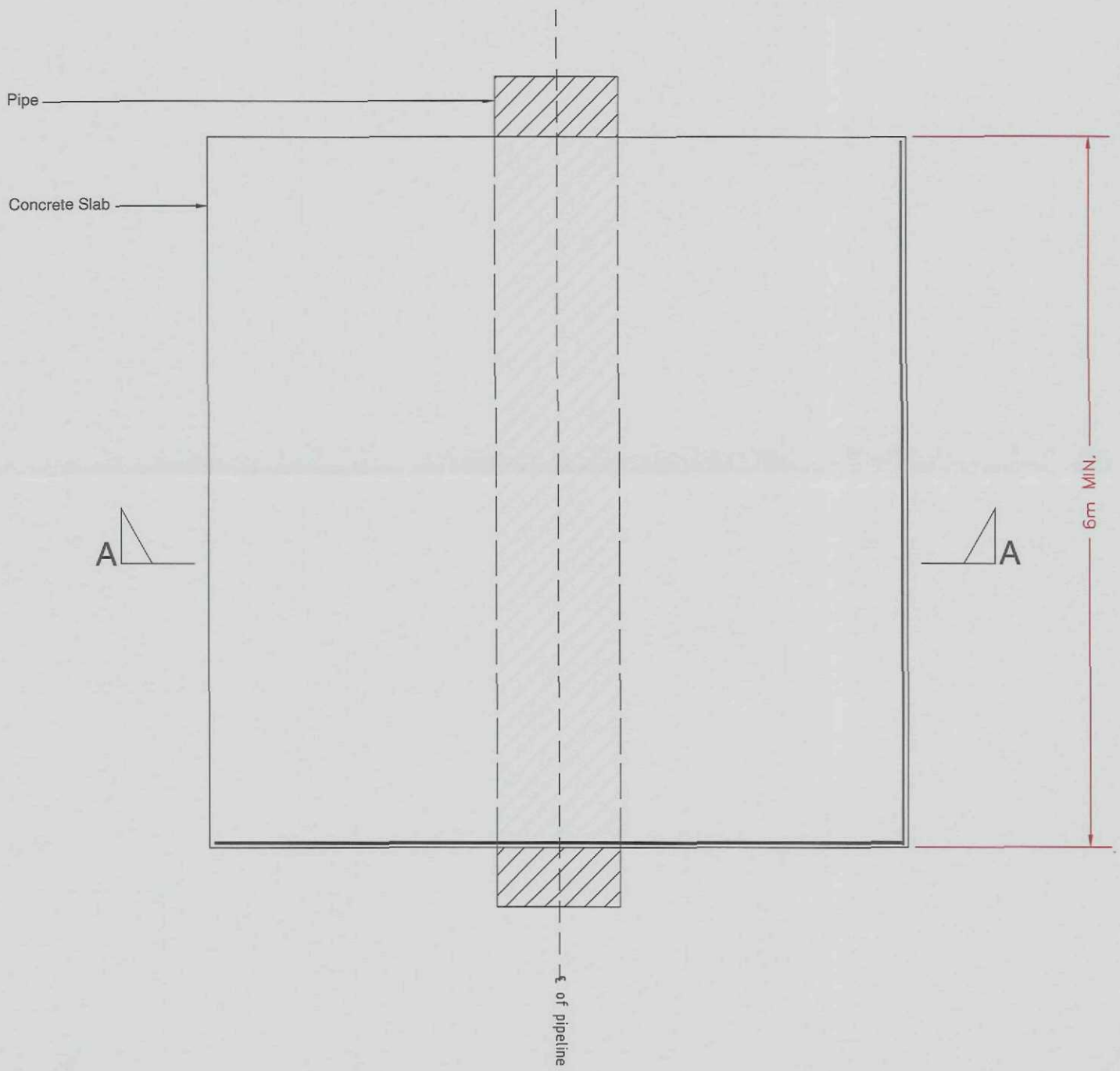
SCALE - 1:75 @ A3

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Arrangement of pipeline protection slab over pipeline.
Impact and crossing-point slabs.

## Section A-A




## Plan

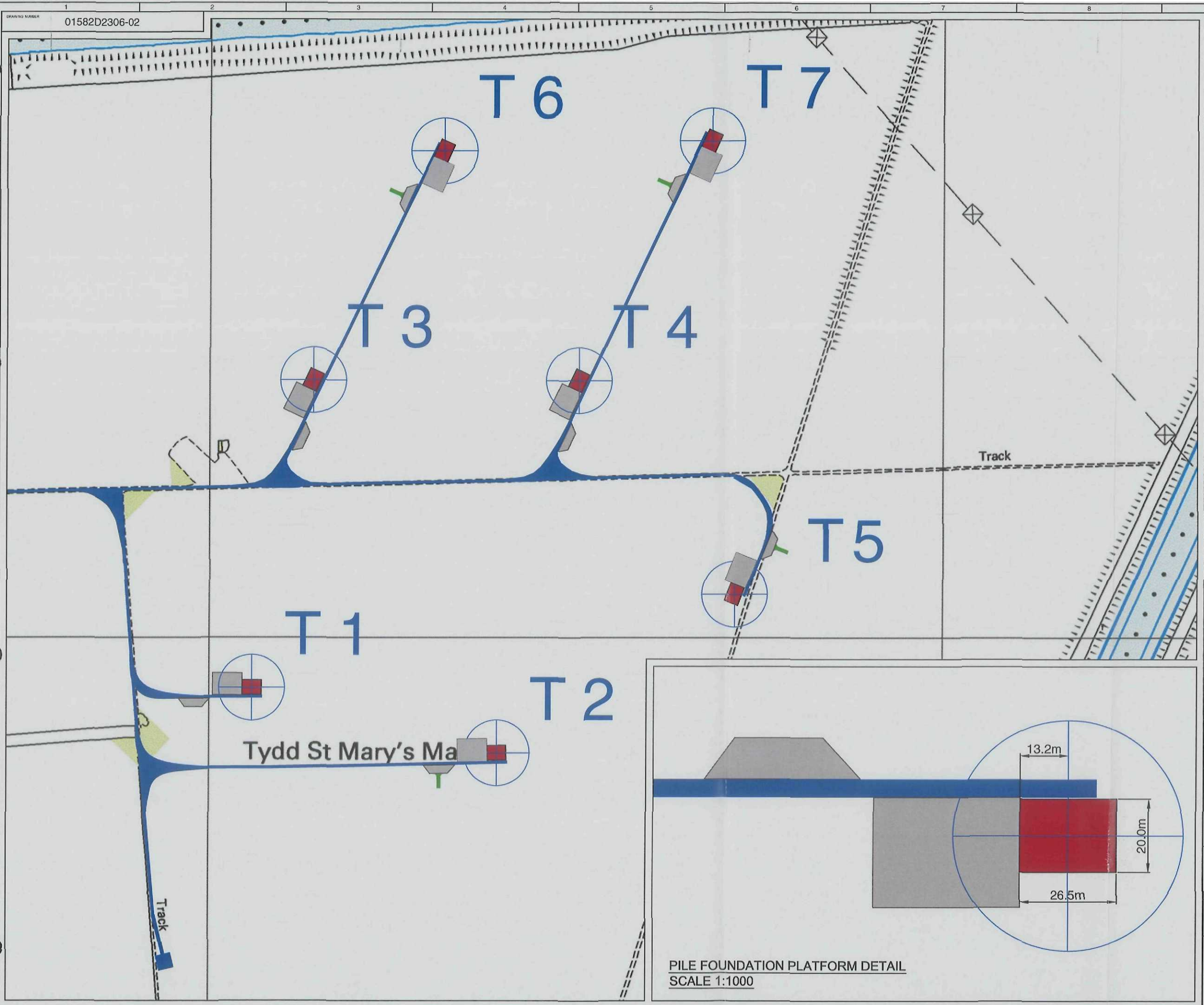
Bottom Mat Only
Shown For Clarity

DIMENSIONS SUBJECT TO DETAIL DESIGN IN ACCORDANCE WITH RELEVANT GAS PIPELINE PROTECTION SLAB DESIGN SPECIFICATION

| | | | |
|---|---|---|---|
| res | **THE GRANGE WIND FARM**<br>**FIGURE 4.13**<br>**GAS PIPELINE PROTECTION SLAB** | SCALE – 1:50<br>01582D2302–01<br>LAYOUT DWG: N/A<br>T-LAYOUT NO.: N/A | **ENVIRONMENTAL STATEMENT**<br>**2009** |

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DRAWING NUMBER 01582D2306-02




PILE FOUNDATION PLATFORM DETAIL
SCALE 1:1000




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KEY

- TURBINE
- SITE TRACK
- ADDITIONAL TEMPORARY TRACK REQUIREMENTS
- CRANE HARDSTANDING - PERMANENT AREAS
- TEMPORARY PILE FOUNDATION PLATFORM

INFRASTRUCTURE BASED ON DRAWING 01582D1001-08

| ISSUE | DRAWN | DATE | APPD | DATE | REVISION NOTES |
|---|---|---|---|---|---|
| 02 | TW | 090511 | MPW | 090511 | TEMPORARY TRACKS ADDED |
| 01 | TW | 060511 | MPW | 060511 | FIRST ISSUE |

LAYOUT DWG 01582D0001-08
T-LAYOUT NO. PENGgra029

DRAWING NUMBER 01582D2306-02

COORDS BRITISH NATIONAL GRID

PURPOSE FOR DESIGN

SCALE 1:5000
ORIGINAL PLOT SIZE A3

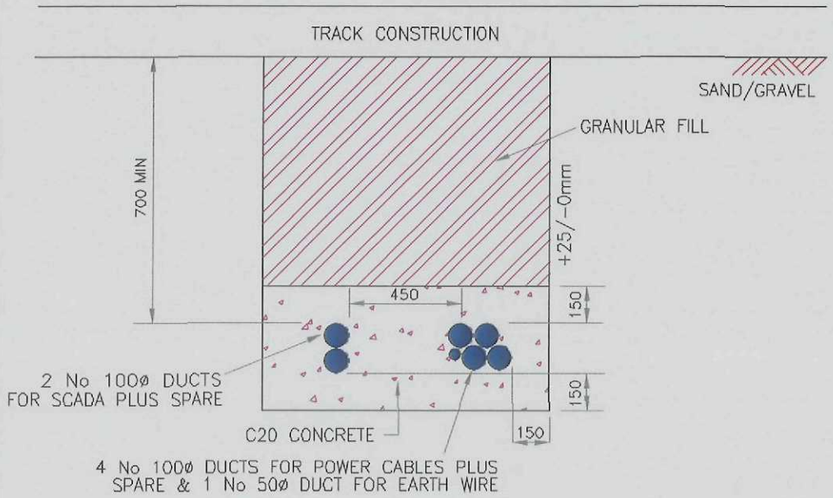
PROJECT TITLE
THE GRANGE WIND FARM

DRAWING TITLE
TEMPORARY PILING PLATFORM LAYOUT

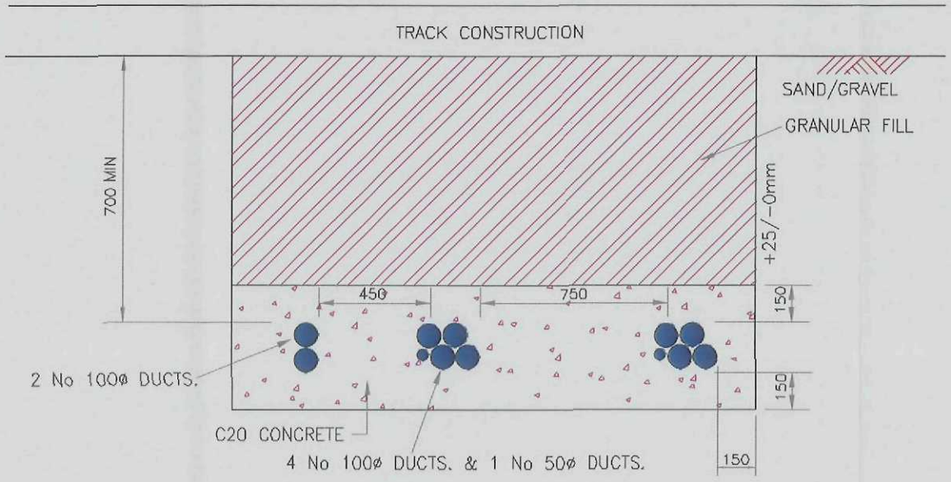
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BEAUFORT COURT, EGG FARM LANE, KINGS LANGLEY, HERTS WD4 8LR
TEL +44 (0) 1923 299200
FAX +44 (0) 1923 299299

## CABLE DUCT CROSSING TO BE INSTALLED BY CIVILS SUBCONTRACTOR

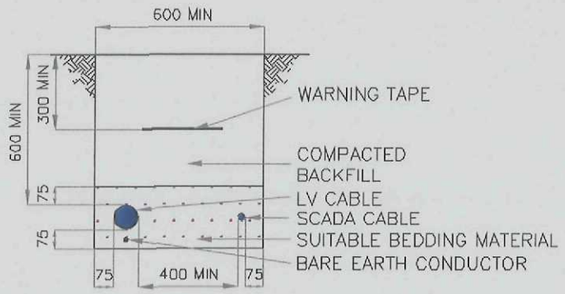



TYPICAL SINGLE CIRCUIT DUCT CROSSING

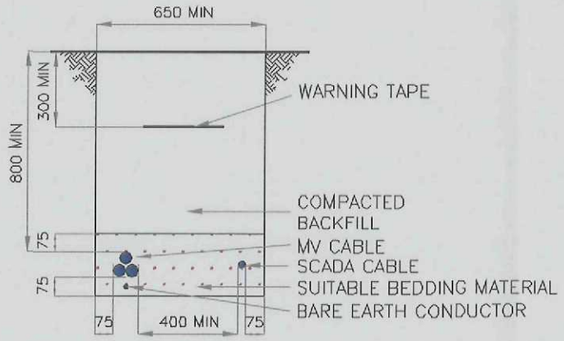



TYPICAL DOUBLE CIRCUIT DUCT CROSSING

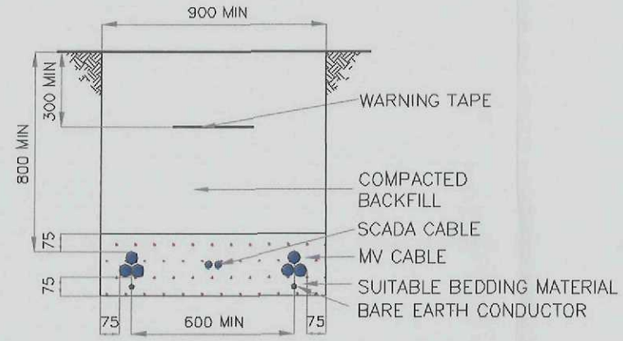
## TRENCHING AND CABLE INSTALLATION TO BE CARRIED OUT BY ELECTRICAL CONTRACTOR




SINGLE CIRCUIT CABLE TRENCH
(MET MAST SUPPLY)




SINGLE CIRCUIT CABLE TRENCH




DOUBLE CIRCUIT CABLE TRENCH

**THE GRANGE WIND FARM**

**FIGURE 4.14**

**CROSS SECTION OF UNDERGROUND CABLING**

NOTES

1. RES SITE MANAGER TO BE INFORMED PRIOR TO ANY EXCAVATING TAKING PLACE.

2. 'PERMIT TO DIG' TO BE OBTAINED PRIOR TO ANY EXCAVATING TAKING PLACE.

3. SURVEY PROPOSED CABLE ROUTE, STOP WORK IMMEDIATELY AND CONTACT SITE MANAGER SHOULD ANY EXISTING CABLES BE ENCOUNTERED. UPON APPROVAL HAND DIG ONLY ADJACENT TO EXISTING SERVICES.

4. CABLES TO BE INSTALLED IN A SUITABLE AGREED BEDDING MATERIAL.

5. MANUFACTURER'S CABLE INSTALLATION GUIDELINES MUST BE USED WHEN INSTALLING CABLES.

6. ALL DIMENSIONS IN MM.

| LAYOUT DWG | T-LAYOUT NO. |
|---|---|
| N/A | N/A |

DRAWING NUMBER
**01582D2303-01**

**SCALE - 1:25**

**ENVIRONMENTAL STATEMENT 2009**

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DRAWING NUMBER 01582D4301-02

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KEY

- TURBINE
- SITE TRACK
- SUBSTATION
- TEMPORARY TRACK
- TEMPORARY CONSTRUCTION COMPOUND
- CRANE HARDSTANDING – PERMANENT AREAS
- CRANE HARDSTANDING – AREA TO BE COVERED OVER WITH TOPSOIL
- TEMPORARY MET MAST
- REFERENCE MET MASTS (LOCATIONS TAKEN FROM DRAWING 01582D0103-01)
- PERMANENT MET MAST (LOCATION AS DRAWING 01582D0102-02)
- COMMUNICATIONS MAST
- GAS PIPELINE PROTECTION SLAB
- LV CABLE–MET MAST SUPPLY

NOTES

1. ISSUE 02 OF THIS DRAWING BASED ON INFRASTRUCTURE DRAWING 01582D1001-08

2. ALL 33 kV CABLE LENGTHS STATED ON THIS DRAWING ARE 2-DIMENSIONAL, POINT TO POINT, LENGTHS TAKEN DIRECTLY FROM AUTOCAD AND AS SUCH DO NOT ALLOW FOR ANY TOLERANCE FACTOR'S, TERMINATION LENGTHS OR ELEVATION TOPOGRAPHY, AND AS SUCH SHOULD NOT BE USED AS PURCHASING LENGTHS.

| CIRCUIT 1 | |
|---|---|
| FROM/TO | ROUTE LENGTH (m) |
| SS–T1 | 643 |
| T1–T2 | 846 |

| CIRCUIT 2 | |
|---|---|
| FROM/TO | ROUTE LENGTH (m) |
| SS–T3 | 217 |
| T3–T6 | 406 |
| T3–T4 | 706 |
| T4–T7 | 420 |
| T4 –T5 | 640 |

| ISSUE | DRAWN | DATE | APPD | DATE | REVISION NOTES |
|---|---|---|---|---|---|
| 02 | SPM | 100511 | NM | 100511 | MINOR AMENDMENTS, LV CABLE ADDED |
| 01 | SPM | 080211 | NM | 080211 | FIRST ISSUE |

LAYOUT DWG 01582D0001-08 | T-LAYOUT NO. PENGgra029

DRAWING NUMBER 01582D4301-02

COORDS N/A

PURPOSE PRELIMINARY

SCALE 1:10000 | ORIGINAL PLOT SIZE A3

PROJECT TITLE
THE GRANGE WIND FARM

DRAWING TITLE
MV CABLE LAYOUT

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