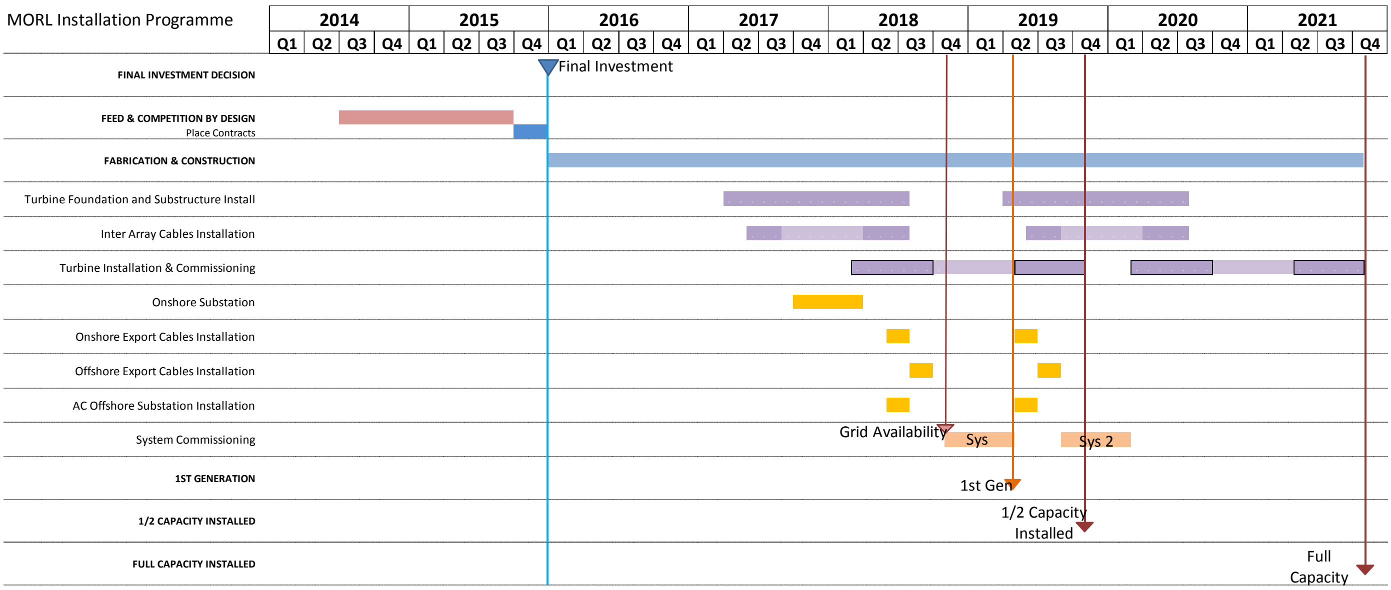
ML-003 – Additional Sheet 1

Moray Offshore Renewables Ltd Offshore Transmission Infrastructure

Section 5 (b) Description of the proposed schedule of work

The indicative programme below provides a high level construction programme for the three wind farms (Telford, Stevenson and MacColl) and associated transmission infrastructure. It shows some variations to the indicative programme included within the MORL 2012 ES (Chapter 2.2 of the Telford, Stevenson, MacColl Wind Farms and Associated Transmission Infrastructure Environmental Statement), but it is consistent with the worst case scenarios assessed in the ES.

The key issues which have driven the changes to the indicative programme were: (1) the decision by Scottish Electric & Transmission to impose a moratorium on new connections to the grid until 2018 (MORL's original connection was in 2016); and (2) the legislative changes as part of the Electricity Market Reform by UK Government which affects when and how projects are delivered and phased.



A construction schedule of 24 hours per day, 7 days a week and 365 days per year is anticipated.

The indicative programme shows that installation of the modified offshore transmission works is expected to commence in 2018. Offshore cabling works and AC Offshore Substation Platforms (OSPs) installation will be completed either in 2018 or 2019, depending upon the offshore wind farm construction schedule. The actual offshore installation period is anticipated to take less than a month per OSP.

A detailed construction method statement, including schedule, will be submitted with a construction management plan in advance of construction works commencing.

ML-003 – Additional Sheet 2

Moray Offshore Renewables Ltd Offshore Transmission Infrastructure

Section 5 (c) Types of work proposed

Offshore Transmission Infrastructure parameters

Infrastructure Type	Parameter	Parameter Range
AC OSPs	Number required	2
	Indicative topside width x length	100 x 100 m
	Indicative maximum height above LAT	70 m
Substructure & foundation for OSPs: Steel Lattice Jackets with Pin Piles or Suction Caissons Or Steel Lattice Jack–up with Pin Piles or Suction Caissons	Jacket base width	Up to 100 m
	Number of legs / piles or suction caissons (Jacket)	Up to 8 legged / 8 piles
	Number of legs / piles or suction caissons (Jack up)	4 legged / 16 piles
	Diameter of piles	3 m
	Length of piles	60 m
	Scour protection around each leg plus pile diameter	16 m
	Diameter of suction caissons	20 m
	Scour protection around each leg plus suction caisson diameter	40 m
	Inter–platform cabling Voltage	220 kV
Offshore Grid Connection		
Export cabling (offshore)	Cable configuration	4 cables
	Cable separation distance	4 x water depth (200 to 800 m), as per regulation
	Voltage of cabling	220 kV
	Entry / exit method from OSPs	J tube
	Target burial depth in seabed	1 m
	Protection where target burial not achieved	Concrete mattresses or rock placement
	Cable corridor width	Four x up to 6 m trench
	Length to shore	75 km from the centre of the EDA with micrositing allowance

ML-003 – Additional Sheet 3

Moray Offshore Renewables Ltd Offshore Transmission Infrastructure

Section 7 (c) Method Statement

A geophysical and geotechnical survey campaign will be carried out of the modified offshore transmission infrastructure (OfTI) corridor during 2014 to identify appropriate areas for installation of cables and platforms. The extent of the surveyed areas can be seen in the enclosed offshore transmission works plan. All OfTI will be located either within the Eastern Development Are (EDA) (as shown in Figure 1.1-1 of the Offshore Transmission Infrastructure Environmental Report) or within an offshore export cable corridor outwith the EDA.

AC Offshore Substation Platforms

Up to two alternating current (AC) offshore substation platforms (OSPs) will be required to collect the power generated by the three wind farms within the EDA. The exact locations of the OSPs are not currently known but will be within the EDA boundary The AC OSPs are enclosed structures housing heavy electrical equipment such as transformers, switchgear and control systems. The function of the AC OSPs is to transform the electricity generated by the turbines from voltages of 33–66 kV to 220 kV for export to the AC OSPs.

Foundations and Substructures for the AC OSPs

The AC OSPs will be supported by substructures and foundations, of which there are four concepts identified as suitable for the area within the EDA:

- Jacket with pin piles;
- Jacket with suction caissons;
- Jack–up with pin piles; and
- Jack–up with suction caissons.

The choice of which concept is more appropriate is dependent upon the ground conditions within a particular site.

Jackets with Pin Piles or Suction Caissons

The jacket substructure with pin pile foundations is similar to that of a wind turbine (as described within Chapter 2.2 of the MORL ES). However, the jacket structure required to support an AC OSP will have up to 6 legs (see Plate 1). The alternative suction caisson foundation would be an open–ended steel cylinder up to 20 m diameter attached to each leg (see Plate 2 below). The principle is that water is sucked out of the cylinder which then embeds itself in a sandy seabed to a depth of up to 20 m. This option cannot be used in many locations within EDA because only 10 % of the seabed in this area is suitable for this concept.

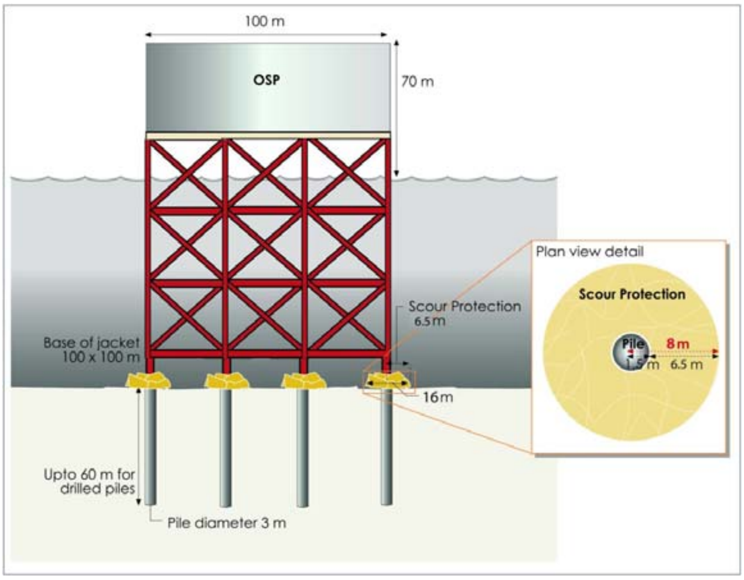


Plate 1 – Pin Pile Foundations

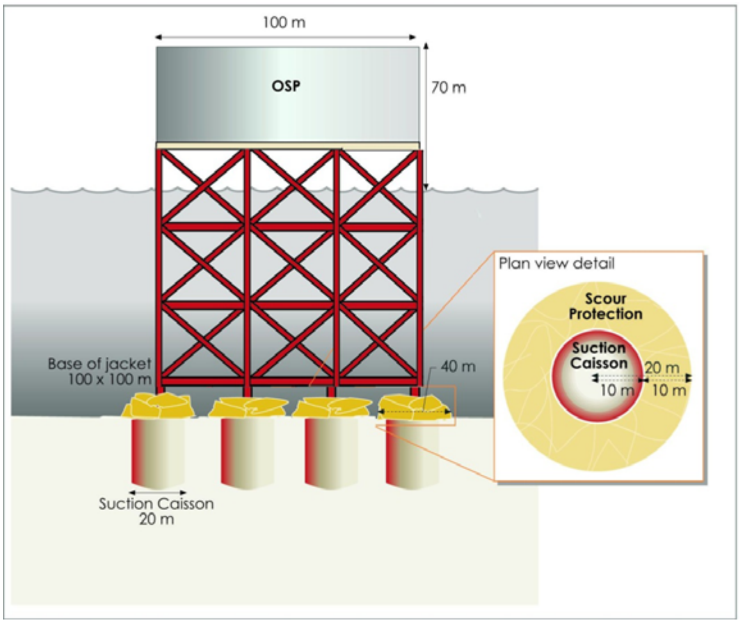


Plate 2 – Suction Caisson Foundations

Jack–ups with Pin Piles or Suction Caissons

The jack–up concept will have either pin pile or suction caisson foundations similar to those described above for the jackets concept. The jack–up substructure consists of a topside box with four support legs that can be raised or lowered using a powerful jacking system operating between each leg and the hull. Water ballast is taken by the jacking system to ensure the legs are fully loaded and secure in the seabed. At the base of each leg a 'spud can', such as a steel cone which penetrates the seabed, may be fitted. For long–term stability it may be necessary to install four pin piles per leg, each pin pile of up to 3 m diameter. Alternatively a suction caisson of 20 m diameter can provide stability. The area around the legs will require scour protection. Corrosion protection is likely to take the form of cathodic protection, painting and mechanical removal of deposits, there is potential for use of corrosion inhibitor chemicals inside the J tubes. An assessment of the requirement for corrosion protection and management of deposits on the substructures will be made later.

Inter–Platform Cabling

Cabling at 220 kV may be required to connect the two AC OSPs. Cables will be buried or protected as described in the 'Offshore Installation' section below.

Export Cable

AC export cables will be required to connect the AC OSPs to the chosen grid connection point. Two 220 kV export cables per AC OSP will be required resulting in a total of up to four export cables. There will be up to four trenches (one per cable) with a maximum trench affected width of 6 m in the offshore section.

Export Cable Route

The AC OSPs will be located within the EDA. The site selection work for the cable route identified Sandend or Inverboydie as potential landfall areas, which would allow the export cable to be taken onshore to the final connection point at New Deer. The width of the surveyed offshore export cable route, within which the export cables will be installed, is variable depending on the water depth, seabed conditions and seabed features. The cable corridor search area outwith the EDA is up to approximately 15 km in width as shown in the enclosed offshore transmission works plan.

For the subsea portion of the route, the AC cable would be buried to a target depth of 1 m based on site–specific seabed conditions. Where adequate burial cannot be achieved alternative protection methods, such as mattresses or rock placement will be used.

The cables will be spaced apart to reduce the potential for damage by unexpected activities such as anchor drag, and to allow safe repair of adjacent cables. The distance between the cables or cable bundles is expected to be four times the water depth, based on current industry best practice. From the bathymetric conditions anticipated in the surveyed area (based on admiralty charts and survey data) this will result in a cable separation of approximately 200 to 800 m.

Offshore Installation

The following section describes the installation procedures likely to be utilised for installation of the modified OfTI. Final installation methods are subject to detailed engineering design and may be adapted based on the technology selected and technical advances.

Jacket with Pin–Piles or Suction Caissons

A jack–up barge or other suitable lift vessel would be used to transport the jackets to site and a crane would be used to install the substructure. Where pin–piles are used as the foundation technique, the piles may be installed before (pre–piling) or after (post–piling) the jacket is installed. For pre–piled foundations, a template is placed on the seabed to ensure the piles are installed in the correct locations. The template is then removed and moved to the next location and the jacket is landed onto the piles. For post–piling, the piles are installed through pile sleeves located at each corner of the jacket. Impact piling is the most common method of installing piles, using a piling hammer from a suitable vessel (e.g. jack–up). In some cases, it may be possible to drill the post–hole. However, this method is not currently commercially viable for large–scale use and is currently only expected to be used in exceptional circumstances. Another option would be to combine the two techniques in a drive–drill–drive pattern. This is usually used in areas with very hard geological strata and it is not currently expected to be used within any of the EDA unless piling alone has been unsuccessful.

Suction caissons may also be used as the foundation of the jacket legs. These may be installed either by pushing the caisson into the seabed or by creating a negative pressure within the skirt by "sucking the water out" which secures the caisson to the seabed.

Where required, grout will be used to provide a strong connection between jacket and pile. The grout will be installed using the pile sleeve and ROV observation. After grouting, scour protection may need to be installed around each leg / pile depending on local conditions. This may be controlled rock placement, concrete mattresses or anti–scour matting.

Jack–up Concept

The concept of using a jack–up to support an OSP offers the advantage that the entire jack–up including the topsides equipment box can be built in a shipyard. Once complete the hull of the jack–up, which is essentially a water tight steel box containing the equipment can be floated out of dry dock at the shipyard to the site with the four legs fully extended above the hull.

The principle of the jack up is that the support legs can be raised or lowered using a jacking system operating between each leg and the hull. On arrival at site the legs would be jacked down to contact the seabed, then the full weight of the hull plus water ballast would be taken by the jacking system to ensure the legs are fully loaded and secure in the seabed. After this the hydraulic jacking system would elevate the hull up the legs to its intended elevation. At the base of each leg a 'spud can' would be fitted, typically a steel cone.

To ensure stability over the operational life of the platform, it may be necessary to install four pin pile at the foot of each leg. This would be grouted to secure the connection to the leg structure. The J tubes for the OSP cable entries / exits will be positioned after the jacking operation is complete. Alternatively a suction caisson would be utilised as an alternative seabed fixing method, installed using similar methodology as described in the jacket concept section above.

Dimensions of the jack up concept would be within the envelope described for the jacket substructures.

Offshore Substation and Converter Platforms

Where the AC OSPs have a jacket substructure, the platform topsides are installed independently of the substructure themselves. The topsides will be transported to site and lifted into position using a crane from a heavy lift vessel. The topsides may be installed as a single unit or in separate modules.

Offshore Cabling

The following section describes cabling installation relevant to the transmission infrastructure where the cables are installed offshore (i.e. from the intertidal area to the OSPs and between OSPs).

Cable Burial

Cable lay vessels are used to lay and bury inter–platform and offshore export cables. Further analysis will be carried out on the site seabed conditions as part of the cable protection and burial study. The study will consider the technically and economically achievable burial depths based in the EDA (where the OSPs will be located) and export cable corridor site specific ground conditions. The target burial depth is 1 m. For most of the offshore export cable route it is expected that the cables will be in trenches for protection. However, for the section leading to shore it is likely that the seabed will contain areas of rock at, or close to the surface which is potentially unsuitable for trenching, so cables may be laid on the seabed. Where this occurs the cable will be protected by graded rock placement, concrete mattresses or other suitable protective coverings.

The available techniques for creating the cable trenches are ploughing, jetting, jet–assisted plough, tracked devices or mechanical cutting. The technique used is chosen so it is suitable for the seabed conditions. A short technical description of these techniques is detailed below:

Ploughing – A cable plough is a device towed behind a vessel. The plough sits on the seabed and as it is pulled forward, curved steel plough blades are driven into the seabed creating a trench.

Jetting – Jetting is performed by a remotely operated vehicle which sits on the seabed on a tracked wheel system. The jetting vehicle receives power and control signals via an umbilical from a surface vessel. The jetting vehicle lowers jetting swords into the seabed fluidising the substrate with high pressure water jets into the swords. The vehicle drives itself along the cable route using its tracked wheel system with the swords and the water jets creating a trench as it travels forward.

The operation itself may take one of two forms:

- Combined lay and bury: where the cable trench is created and immediately after the cable is laid in the trench using the same tool and therefore in the same operation; and
- Post–lay burial: where the cable is laid on the seabed in one continuous operation. Upon completion of this a second operation is done to create the trench into which the cable will fall through gravity.

Jet assisted plough – This technique is basically a hybrid method incorporating ploughing and jetting. Cable ploughs are towed by a vessel and at the surface specialised nozzles introduce water at the soil interface, fluidising the substrate, reducing the stresses involved in this process.

Tracked devices – These have tracks (like bulldozers) and are deployed on the seabed and usually powered by an umbilical from a vessel. The tracked vehicle can carry a range of equipment for trenching such as mechanical rock cutters or jetting equipment.

Mechanical cutting – Is used to cut a trench through rock or very stiff clay. It would be deployed on a tracked device and consist of rotating cutting heads.

Each cable laying operation is expected to be done continuously without the requirement for splicing. The maximum speed of progress is in the range 300 to 500 m / hr. In difficult conditions (e.g. very stiff clay or rocky sea beds), progress will be slower.

For either method used, the degree to which the trench naturally back–fills depends on the nature of the seabed and local metocean conditions or scour protection will be laid where cables cannot be buried to the target depth.

Where the cable has to cross existing infrastructure, such as other cables, special arrangements will be required. For example: a layer of concrete mattresses or grout bags may be fitted over the top of the existing cable. The new cable would be run over this protective layer and then itself protected with a further layer of mattresses or grout bags. The methodology for crossing arrangements will be developed in agreement with third party cable owner / operators where relevant.

The export cables will typically be laid starting at the landfall and finishing at the offshore site. It is likely that the two first export cables from the first AC OSP will be installed separately from the second set of two AC export cables. The second cable lay operation may be done directly after completion of the first two cables or a number of years after the first installation is complete dependant on the capacity phasing of the wind farm.

The route would be aligned parallel with the first cable route but sufficiently separated to avoid damage (see section Export Cable Route).

Cable Pull–in

At each OSP it will be necessary to pull a number of cables depending on the size of the array strings. A row of J tubes will be pre–installed along sides of the substructure to accept the cable from each of several array strings. Typically a system using messenger wires and cable guides allows pull–in to proceed without diver intervention. Once the cable is pulled in and secured, any exposed areas may be protected (e.g. by mattresses or rock dumping).

Export Cable Landfall

The techniques which could be used for the offshore export cable landfall and intertidal area include open cut trenching, ploughing, dredging, mechanical cutters and horizontal directional drilling (HDD).

Open cut trenching consists of excavating a trench across the landfall location and down below low tide level to a point where marine vessels and equipment can operate and continue trenching. Construction of a temporary causeway across the beach and down through the low tide level may be required to provide a base for excavation equipment to dig a trench alongside the causeway. On the beach or in shallow water a back–hoe dredger may be used. In deeper water specialist dredging / trenching equipment could be used.

In the case of sandy beaches, it may be possible to locate a marine trenching plough above high tide connected to the cable installation vessel lying near to shore. The vessel can then pull the trenching plough down the beach and out to sea installing the cable in the foot of the trench as it goes.

If rocky conditions are encountered, it may be possible to use a mechanical cutter which uses a rotary cutting wheel to excavate a narrow trench. Such machines may operate above or below water.

HDD may be used to avoid cutting an open trench. This involves drilling a hole from the landward side of the landfall to a point below low tide where marine equipment can operate. The diameter of the hole is sized to take a conduit through which the cable(s) are pulled. The maximum distance of cable pull depends on the design strength of the cable. For standard cables, the limit of pull and, therefore, of the HDD approach is 500 m. However, specially strengthened cable can be used to extend this distance to 1 km in exceptional circumstances.

Construction Phase Safety Zones

In accordance with the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007, it is expected that a 500 m safety zone around each OSP and cable installation activity will be applied for under Section 95 of the Energy Act 2004 during the period of construction. In order to minimise disruption to navigation by users of the sea, safety zones are expected to be established around such areas of the total site that have activities actually taking place at a given time. As such the safety zones are expected to follow throughout the different areas of the site as construction work is undertaken. The exact locations are to be determined at a later stage and would be notified to mariners. Safety Zones in place on the Project will be implemented and communicated though standard protocol (i.e. Notice to Mariners).

Transport to Site

It is anticipated that most infrastructure elements will be transported to site or the construction port by sea although some elements may be transported via road before transfer to a vessel. The construction port has not yet been identified, although it is expected to be based on the eastern coast of Scotland or northern England.

Operation and Maintenance

Operational activities, such as monitoring of OSP activity, will either be carried out primarily from a shore base or from an offshore location.

Maintenance activities will include the following types of activities:

- Major interventions include overhauls of OSP equipment which may be required periodically during the operational life of the wind farms. Unplanned failures within OSP equipment or cables may also require major repairs, which require the use of equipment and methods originally used to install the relevant infrastructure;
- Preventive maintenance comprising scheduled activities including plant and equipment scheduled maintenance, necessary safety inspections and testing of safety related equipment, inspections of primary and secondary structures, scheduled overhauls;
- Corrective maintenance to address equipment failures, primary alarms, or actions arising from results of inspections; and
- Opportunistic maintenance in cases where maintenance personnel and access vessels are available at site and some precautionary inspections or preventive maintenance can usefully be carried out.

The types of vessels that will be used during operation are yet to be decided and will be provided within a construction method statement that will be submitted in advance of works commencing.

Operational Safety Zones

Under the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007, the standard dimensions for a safety zone during the operational phase is a radius of 50 m measured from the outer edge at sea level of the proposed or existing OSP. Depending on the safety case, a larger area may be requested in the application to DECC.

Decommissioning

Under the Energy Act (2004), a wind farm and associated transmission infrastructure must be decommissioned at the end of their lifetimes. Guidance is currently available on decommissioning liabilities and standards (DECC, 2011) and a preliminary decommissioning programme has been prepared to support the Section 36 consent applications (see MORL ES for details). However, the decommissioning programme would be updated in accordance with relevant legislation and guidance available at the time of decommissioning.

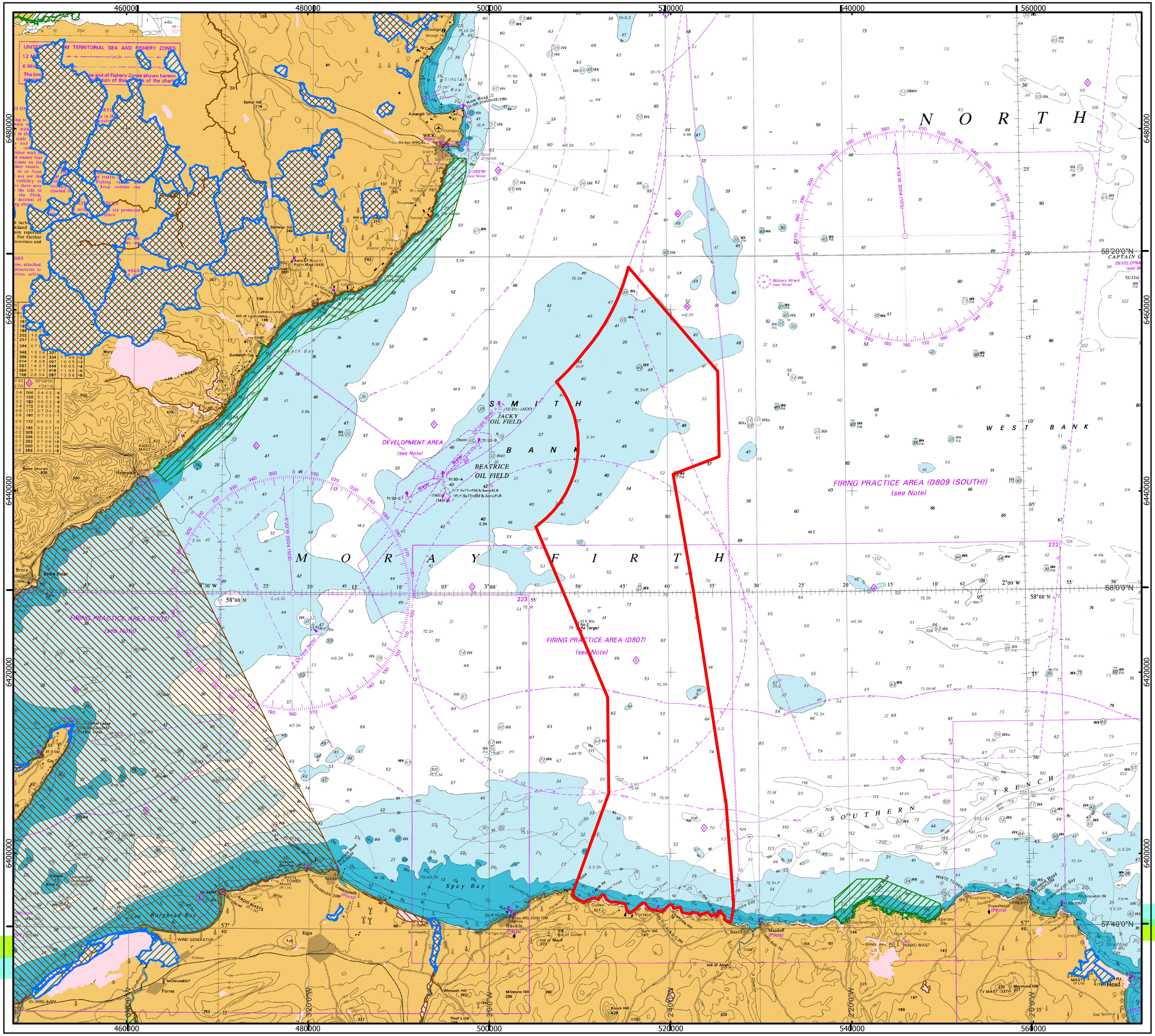
Decommissioning will most likely include the removal of non buried–elements (OSPs) and associated substructures. It is anticipated that buried elements such as foundations and cables will be left in situ.

ML-003 – Additional Sheet 4

Moray Offshore Renewables Ltd Offshore Transmission Infrastructure

Section 8 (a) Quantity of permanent (and temporary, where applicable) material to be deposited below MHWS

Type of Deposit	Nature of Deposit (P = Permanent, T = Temporary)	Deposit Quantity
Steel/Iron	P	Approximately 13,250 Tonnes for the steel substructures (total weight)
Timber	N/A	N/A
Plastic/Synthetic	P	Approximately 500 Tonnes (total weight)
Concrete	P	Approximately 175 Tonnes for the steel substructures (total weight)
Silt	N/A	N/A
Sand	P	N/A
Stone/Rock/Gravel	P	Size Range (mm): 50 - 200 Total m^3: Approximately 13,600 m^3 for the steel substructures. Also, up to 17,000 m^3 for protection of cables.
Concrete bags/mattresses	P	No.: Approximately 2,500 Maximum Dimensions: 6 m x 3 m x 1.5 m per concrete bags/mattresses Total m^3: Up to 65,000 m^3 for protection of cables
Cable	P	Maximum Length (m): 310,000 m



Moray Offshore Renewables Ltd

KEY

- Offshore Transmission Works Licence Area
- Special Protected Area (SPA)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- RAMSAR

Horizontal Scale: 1:400,000 A3 Chart

0 10,000 20,000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: SP

Date: 03/04/2014 Revision: A

REF: 8460001-PSL0060-MOR-MAP-002

Moray Offshore Transmission Works

Moray Offshore Renewables Ltd

Moray Offshore Transmission Boundary Coordinates

ID	WGS84 UTM Zone 30N		WGS84 Latitude-Longitude					
	X-Easting (m)	Y-Northing (m)	Lat (D.d)	Long (D.d)	Lat (DM.m)	Long (DM.m)	Lat (DM S)	Long (DM S)
1	505117.1271	6436034.636	58.065759°	-2.913270°	58° 3.945539'	-2° 54.796212'	58° 3' 56.732364"	-2° 54' 47.772738"
2	506316	6437015	58.074549°	-2.892924°	58° 4.472947'	-2° 53.575457'	58° 4' 28.376796"	-2° 53' 34.527415"
3	507040	6437767	58.081293°	-2.880628°	58° 4.877557'	-2° 52.837664'	58° 4' 52.653396"	-2° 52' 50.259828"
4	507795	6438707	58.089723°	-2.867795°	58° 5.383378'	-2° 52.067673'	58° 5' 23.002692"	-2° 52' 4.060384"
5	508442	6439746	58.099043°	-2.856784°	58° 5.942598'	-2° 51.407033'	58° 5' 56.555880"	-2° 51' 24.422000"
6	508994	6440936	58.109721°	-2.847374°	58° 6.583252'	-2° 50.842425'	58° 6' 34.995132"	-2° 50' 50.545489"
7	509349	6441886	58.118246°	-2.841312°	58° 7.094777'	-2° 50.478695'	58° 7' 5.686608"	-2° 50' 28.721713"
8	509560	6442760	58.126092°	-2.837694°	58° 7.565514'	-2° 50.261666'	58° 7' 33.930840"	-2° 50' 15.699973"
9	509672	6443375	58.131613°	-2.835768°	58° 7.896798'	-2° 50.146053'	58° 7' 53.807880"	-2° 50' 8.763151"
10	509788	6444177	58.138814°	-2.833764°	58° 8.328850'	-2° 50.025858'	58° 8' 19.731012"	-2° 50' 1.551451"
11	509820	6445320	58.149080°	-2.833173°	58° 8.944780'	-2° 49.990369'	58° 8' 56.686812"	-2° 49' 59.422116"
12	509733	6446526	58.159914°	-2.834601°	58° 9.594819'	-2° 50.076034'	58° 9' 35.689140"	-2° 50' 4.562023"
13	509562	6447386	58.167642°	-2.837471°	58° 10.058503'	-2° 50.248275'	58° 10' 3.510156"	-2° 50' 14.896489"
14	509370	6448231	58.175235°	-2.840701°	58° 10.514126'	-2° 50.442048'	58° 10' 30.847548"	-2° 50' 26.522869"
15	509202	6448727	58.179694°	-2.843537°	58° 10.781635'	-2° 50.612243'	58° 10' 46.898112"	-2° 50' 36.734582"
16	509202	6448727	58.179694°	-2.843537°	58° 10.781635'	-2° 50.612243'	58° 10' 46.898112"	-2° 50' 36.734582"
17	509071	6449114	58.183173°	-2.845750°	58° 10.990354'	-2° 50.744984'	58° 10' 59.421252"	-2° 50' 44.699024"
18	508647	6450078	58.191840°	-2.852924°	58° 11.510370'	-2° 51.175438'	58° 11' 30.622200"	-2° 51' 10.526278"
19	508084	6451087	58.200913°	-2.862465°	58° 12.054766'	-2° 51.747896'	58° 12' 3.285936"	-2° 51' 44.873777"
20	507393.029	6452043.959	58.209520°	-2.874190°	58° 12.571202'	-2° 52.451411'	58° 12' 34.272144"	-2° 52' 27.084637"
21	507463.6426	6452106.119	58.210077°	-2.872987°	58° 12.604630'	-2° 52.379192'	58° 12' 36.277776"	-2° 52' 22.751508"
22	507750.5357	6452367.393	58.212419°	-2.868096°	58° 12.745133'	-2° 52.085736'	58° 12' 44.708004"	-2° 52' 5.144174"
23	508031.9212	6452634.274	58.214811°	-2.863298°	58° 12.888655'	-2° 51.797855'	58° 12' 53.319276"	-2° 51' 47.871288"
24	508308.5806	6452905.669	58.217243°	-2.858579°	58° 13.034603'	-2° 51.514752'	58° 13' 2.076168"	-2° 51' 30.885095"
25	508581.6053	6453181.658	58.219717°	-2.853922°	58° 13.183021'	-2° 51.235312'	58° 13' 10.981236"	-2° 51' 14.118700"
26	508849.0458	6453462.234	58.222232°	-2.849359°	58° 13.333906'	-2° 50.961526'	58° 13' 20.034372"	-2° 50' 57.691561"
27	509110.9028	6453747.396	58.224788°	-2.844890°	58° 13.487261'	-2° 50.693394'	58° 13' 29.235648"	-2° 50' 41.603658"
28	509173.1901	6453816.378	58.225406°	-2.843827°	58° 13.524358'	-2° 50.629606'	58° 13' 31.461456"	-2° 50' 37.776365"
29	509386.4617	6454057.299	58.227565°	-2.840186°	58° 13.653921'	-2° 50.411167'	58° 13' 39.235260"	-2° 50' 24.670021"
30	509639.0202	6454351.629	58.230203°	-2.835874°	58° 13.812209'	-2° 50.152432'	58° 13' 48.732528"	-2° 50' 9.145939"
31	509886.0736	6454650.461	58.232882°	-2.831655°	58° 13.972921'	-2° 49.899272'	58° 13' 58.375272"	-2° 49' 53.956340"
32	510127.5473	6454953.011	58.235594°	-2.827529°	58° 14.135637'	-2° 49.651766'	58° 14' 8.138220"	-2° 49' 39.105944"
33	510364.4516	6455260.062	58.238346°	-2.823481°	58° 14.300776'	-2° 49.408879'	58° 14' 18.046572"	-2° 49' 24.532716"
34	510409.2609	6455319.797	58.238882°	-2.822715°	58° 14.332904'	-2° 49.362929'	58° 14' 19.974228"	-2° 49' 21.775742"
35	510489.7529	6455411.81	58.239706°	-2.821340°	58° 14.382376'	-2° 49.280427'	58° 14' 22.942536"	-2° 49' 16.825595"
36	510742.1432	6455706.033	58.242343°	-2.817028°	58° 14.540567'	-2° 49.021692'	58° 14' 32.434008"	-2° 49' 1.301502"
37	510989.0285	6456004.831	58.245020°	-2.812809°	58° 14.701224'	-2° 48.768532'	58° 14' 42.073440"	-2° 48' 46.111910"
38	511107.9004	6456153.825	58.246356°	-2.810777°	58° 14.781338'	-2° 48.646611'	58° 14' 46.880268"	-2° 48' 38.796631"
39	511231.2672	6456308.284	58.247740°	-2.808668°	58° 14.864388'	-2° 48.520070'	58° 14' 51.863280"	-2° 48' 31.204188"
40	511467.9268	6456615.297	58.250491°	-2.804621°	58° 15.029471'	-2° 48.277262'	58° 15' 1.768248"	-2° 48' 16.635726"
41	511699.083	6456926.879	58.253284°	-2.800667°	58° 15.197017'	-2° 48.040029'	58° 15' 11.821032"	-2° 48' 2.401751"
42	511924.6618	6457242.173	58.256109°	-2.796807°	58° 15.366565'	-2° 47.808450'	58° 15' 21.993912"	-2° 47' 48.506971"
43	512144.663	6457561.021	58.258967°	-2.793042°	58° 15.538031'	-2° 47.582525'	58° 15' 32.281848"	-2° 47' 34.951484"
44	512359.1631	6457884.433	58.261866°	-2.789370°	58° 15.711959'	-2° 47.362174'	58° 15' 42.717528"	-2° 47' 21.730448"
45	512568.0901	6458210.616	58.264790°	-2.785791°	58° 15.887383'	-2° 47.147478'	58° 15' 53.242956"	-2° 47' 8.848655"
46	512771.5169	6458541.282	58.267754°	-2.782306°	58° 16.065226'	-2° 46.938356'	58° 16' 3.913572"	-2° 46' 56.301362"
47	512968.4393	6458874.713	58.270743°	-2.778931°	58° 16.244566'	-2° 46.735843'	58° 16' 14.673936"	-2° 46' 44.150567"
48	513159.7875	6459211.766	58.273764°	-2.775650°	58° 16.425861'	-2° 46.538985'	58° 16' 25.551660"	-2° 46' 32.339089"
49	513345.6413	6459552.44	58.276819°	-2.772462°	58° 16.609113'	-2° 46.347702'	58° 16' 36.546780"	-2° 46' 20.862091"
50	513525.0715	6459895.797	58.279897°	-2.769382°	58° 16.793817'	-2° 46.162947'	58° 16' 47.629020"	-2° 46' 9.776849"
51	513698.8529	6460242.848	58.283009°	-2.766399°	58° 16.980519'	-2° 45.983928'	58° 16' 58.831140"	-2° 45' 59.035666"
52	513798.0728	6460448.436	58.284852°	-2.764695°	58° 17.091123'	-2° 45.881676'	58° 17' 5.467380"	-2° 45' 52.900582"
53	513887.1453	6460637.48	58.286547°	-2.763164°	58° 17.192830'	-2° 45.789857'	58° 17' 11.569776"	-2° 45' 47.391433"
54	514049.0149	6460989.887	58.289707°	-2.760382°	58° 17.382431'	-2° 45.622941'	58° 17' 22.945848"	-2° 45' 37.376489"
55	514204.387	6461345.048	58.292892°	-2.757711°	58° 17.573525'	-2° 45.462636'	58° 17' 34.411524"	-2° 45' 27.758135"
56	514352.4076	6461702.802	58.296100°	-2.755164°	58° 17.766028'	-2° 45.309816'	58° 17' 45.961692"	-2° 45' 18.588935"
57	514495.8787	6462063.314	58.299334°	-2.752694°	58° 17.960023'	-2° 45.161615'	58° 17' 57.601356"	-2° 45' 9.696870"
58	514631.923	6462426.571	58.302592°	-2.750350°	58° 18.155509'	-2° 45.020979'	58° 18' 9.330516"	-2° 45' 1.258726"
59	514761.4796	6462791.563	58.305866°	-2.748116°	58° 18.351941'	-2° 44.886953'	58° 18' 21.116448"	-2° 44' 53.217161"
60	514885.5573	6463159.228	58.309164°	-2.745975°	58° 18.549821'	-2° 44.758501'	58° 18' 32.989248"	-2° 44' 45.510076"
61	515002.2948	6463528.625	58.312477°	-2.743959°	58° 18.748648'	-2° 44.637535'	58° 18' 44.918856"	-2° 44' 38.252126"
62	515113.482	6463899.912	58.315808°	-2.742037°	58° 18.948502'	-2° 44.522224'	58° 18' 56.910132"	-2° 44' 31.333420"
63	515217.3294	6464273.783	58.319163°	-2.740240°	58° 19.149763'	-2° 44.414397'	58° 19' 8.985756"	-2° 44' 24.863834"
64	515289.4338	6464548.715	58.321630°	-2.738991°	58° 19.297771'	-2° 44.339457'	58° 19' 17.866236"	-2° 44' 20.367427"

65	515300.7249	6464591.768	58.322016°	-2.738795°	58° 19.320947'	-2° 44.327721'	58° 19' 19.256844"	-2° 44' 19.663256"
66	515315.6328	6464648.611	58.322526°	-2.738537°	58° 19.351549'	-2° 44.312225'	58° 19' 21.092916"	-2° 44' 18.733510"
67	515316.5407	6464654.99	58.322583°	-2.738521°	58° 19.354984'	-2° 44.311270'	58° 19' 21.299052"	-2° 44' 18.676190"
68	515330.8259	6464697.914	58.322968°	-2.738274°	58° 19.378086'	-2° 44.296467'	58° 19' 22.685160"	-2° 44' 17.788006"
69	516099.13	6463801.599	58.314890°	-2.725221°	58° 18.893421'	-2° 43.513242'	58° 18' 53.605260"	-2° 43' 30.794491"
70	516184.1001	6463702.472	58.313997°	-2.723777°	58° 18.839815'	-2° 43.426643'	58° 18' 50.388876"	-2° 43' 25.598590"
71	525197.9974	6453186.542	58.219124°	-2.571079°	58° 13.147457'	-2° 34.264754'	58° 13' 8.847408"	-2° 34' 15.885228"
72	525198.1685	6453175.003	58.219021°	-2.571078°	58° 13.141237'	-2° 34.264654'	58° 13' 8.474232"	-2° 34' 15.879238"
73	525198.1685	6453175.003	58.219021°	-2.571078°	58° 13.141237'	-2° 34.264654'	58° 13' 8.474232"	-2° 34' 15.879238"
74	525337.4793	6443784.174	58.134668°	-2.569726°	58° 8.080106'	-2° 34.183576'	58° 8' 4.806384"	-2° 34' 11.014550"
75	520968.3764	6442109.657	58.119857°	-2.644069°	58° 7.191428'	-2° 38.644158'	58° 7' 11.485704"	-2° 38' 38.649491"
76	520313.2879	6441858.587	58.117633°	-2.655211°	58° 7.057958'	-2° 39.312644'	58° 7' 3.477504"	-2° 39' 18.758660"
77	520270.7997	6441842.303	58.117488°	-2.655933°	58° 7.049300'	-2° 39.355999'	58° 7' 2.958024"	-2° 39' 21.359916"
78	522545.4726	6428685.535	57.999207°	-2.618587°	57° 59.952433'	-2° 37.115193'	57° 59' 57.145992"	-2° 37' 6.911584"
79	526943.6946	6394443.914	57.691404°	-2.548050°	57° 41.484266'	-2° 32.883027'	57° 41' 29.055984"	-2° 32' 52.981624"
80	526830.3362	6393465.618	57.682624°	-2.550061°	57° 40.957436'	-2° 33.003645'	57° 40' 57.446184"	-2° 33' 0.218693"
81	526815.5078	6393337.648	57.681475°	-2.550324°	57° 40.888522'	-2° 33.019419'	57° 40' 53.311296"	-2° 33' 1.165111"
82	526715.5954	6392814.715	57.676784°	-2.552057°	57° 40.607051'	-2° 33.123419'	57° 40' 36.423084"	-2° 33' 7.405117"
83	526626.788	6392142.427	57.670751°	-2.553620°	57° 40.245048'	-2° 33.217211'	57° 40' 14.702880"	-2° 33' 13.032634"
84	526472.077	6392466.885	57.673674°	-2.556178°	57° 40.420457'	-2° 33.370686'	57° 40' 25.227408"	-2° 33' 22.241189"
85	526242.7446	6392498.195	57.673969°	-2.560019°	57° 40.438137'	-2° 33.601169'	57° 40' 26.288220"	-2° 33' 36.070132"
86	525926.655	6392743.428	57.676190°	-2.565292°	57° 40.571400'	-2° 33.917546'	57° 40' 34.284000"	-2° 33' 55.052784"
87	525946.0122	6393067.66	57.679101°	-2.564933°	57° 40.746073'	-2° 33.895980'	57° 40' 44.764392"	-2° 33' 53.758829"
88	525481.4406	6393595.142	57.683866°	-2.572667°	57° 41.031944'	-2° 34.360021'	57° 41' 1.916664"	-2° 34' 21.601279"
89	525050.7441	6393043.463	57.678935°	-2.579947°	57° 40.736075'	-2° 34.796823'	57° 40' 44.164524"	-2° 34' 47.809398"
90	524779.744	6393232.195	57.680645°	-2.584472°	57° 40.838690'	-2° 35.068300'	57° 40' 50.321424"	-2° 35' 4.098026"
91	524518.4226	6393048.303	57.679007°	-2.588872°	57° 40.740442'	-2° 35.332339'	57° 40' 44.426532"	-2° 35' 19.940312"
92	524073.2082	6393488.678	57.682987°	-2.596294°	57° 40.979219'	-2° 35.777612'	57° 40' 58.753128"	-2° 35' 46.656715"
93	523197.2973	6393169.285	57.680164°	-2.611013°	57° 40.809845'	-2° 36.660771'	57° 40' 48.590724"	-2° 36' 39.646256"
94	523066.6365	6393222.517	57.680649°	-2.613199°	57° 40.838937'	-2° 36.791922'	57° 40' 50.336220"	-2° 36' 47.515327"
95	523032.7615	6393391.892	57.682172°	-2.613751°	57° 40.930324'	-2° 36.825033'	57° 40' 55.819416"	-2° 36' 49.501987"
96	522384.2971	6393508.035	57.683248°	-2.624614°	57° 40.994881'	-2° 37.476838'	57° 40' 59.692836"	-2° 37' 28.610278"
97	522254.6042	6393285.428	57.681255°	-2.626809°	57° 40.875295'	-2° 37.608565'	57° 40' 52.517712"	-2° 37' 36.513908"
98	521252.8718	6393483.838	57.683086°	-2.643590°	57° 40.985131'	-2° 38.615384'	57° 40' 59.107872"	-2° 38' 36.923060"
99	521068.9789	6394069.392	57.688354°	-2.646622°	57° 41.301229'	-2° 38.797342'	57° 41' 18.073716"	-2° 38' 47.840525"
100	520333.4073	6393919.374	57.687040°	-2.658972°	57° 41.222408'	-2° 39.538325'	57° 41' 13.344468"	-2° 39' 32.299495"
101	520202.7466	6394267.803	57.690176°	-2.661134°	57° 41.410543'	-2° 39.668055'	57° 41' 24.632592"	-2° 39' 40.083278"
102	519890.1286	6394345.231	57.690885°	-2.666371°	57° 41.453108'	-2° 39.982282'	57° 41' 27.186504"	-2° 39' 58.936932"
103	519072.2892	6393561.267	57.683879°	-2.680151°	57° 41.032722'	-2° 40.809075'	57° 41' 1.963320"	-2° 40' 48.544518"
104	517610.8246	6393885.499	57.686851°	-2.704636°	57° 41.211038'	-2° 42.278186'	57° 41' 12.662304"	-2° 42' 16.691162"
105	517162.2227	6394515.574	57.692528°	-2.712115°	57° 41.551653'	-2° 42.726916'	57° 41' 33.099180"	-2° 42' 43.614965"
106	516910.5798	6394510.735	57.692494°	-2.716337°	57° 41.549617'	-2° 42.980201'	57° 41' 32.976996"	-2° 42' 58.812077"
107	515676.5616	6393475.128	57.683236°	-2.737104°	57° 40.994163'	-2° 44.226216'	57° 40' 59.649780"	-2° 44' 13.572949"
108	515405.5616	6393547.717	57.683897°	-2.741644°	57° 41.033846'	-2° 44.498615'	57° 41' 2.030784"	-2° 44' 29.916902"
109	515163.5972	6393717.092	57.685427°	-2.745691°	57° 41.125623'	-2° 44.741442'	57° 41' 7.537380"	-2° 44' 44.486542"
110	515000.9972	6394404.271	57.691605°	-2.748375°	57° 41.496301'	-2° 44.902492'	57° 41' 29.778072"	-2° 44' 54.149539"
111	513994.4255	6394622.039	57.693594°	-2.765246°	57° 41.615612'	-2° 45.914771'	57° 41' 36.936744"	-2° 45' 54.886248"
112	513413.7111	6394602.681	57.693437°	-2.774989°	57° 41.606242'	-2° 46.499313'	57° 41' 36.374496"	-2° 46' 29.958758"
113	512940.4289	6394862.067	57.695781°	-2.782914°	57° 41.746868'	-2° 46.974824'	57° 41' 44.812068"	-2° 46' 58.489421"
114	512669.4288	6395370.192	57.700353°	-2.787433°	57° 42.021182'	-2° 47.245993'	57° 42' 1.270944"	-2° 47' 14.759552"
115	512427.4645	6395408.907	57.700708°	-2.791491°	57° 42.042452'	-2° 47.489450'	57° 42' 2.547144"	-2° 47' 29.367028"
116	511924.1786	6394910.46	57.696244°	-2.799960°	57° 41.774634'	-2° 47.997578'	57° 41' 46.478040"	-2° 47' 59.854693"
117	511658.031	6395053.465	57.697535°	-2.804418°	57° 41.852125'	-2° 48.265055'	57° 41' 51.127476"	-2° 48' 15.903306"
118	511599.9464	6395084.674	57.697817°	-2.805391°	57° 41.869035'	-2° 48.323432'	57° 41' 52.142100"	-2° 48' 19.405940"
119	511198.2856	6394949.174	57.696610°	-2.812135°	57° 41.796619'	-2° 48.728122'	57° 41' 47.797116"	-2° 48' 43.687303"
120	510629.1855	6394765.281	57.694972°	-2.821691°	57° 41.698339'	-2° 49.301445'	57° 41' 41.900316"	-2° 49' 18.086729"
121	510508.2033	6394595.906	57.693454°	-2.823728°	57° 41.607225'	-2° 49.423660'	57° 41' 36.433500"	-2° 49' 25.419590"
122	509809.8647	6394897.245	57.696176°	-2.835430°	57° 41.770576'	-2° 50.125787'	57° 41' 46.234572"	-2° 50' 7.547212"
123	509317.7388	6395278.246	57.699609°	-2.843671°	57° 41.976544'	-2° 50.620254'	57° 41' 58.592616"	-2° 50' 37.215258"
124	509233.4436	6395715.377	57.703537°	-2.845068°	57° 42.212238'	-2° 50.704104'	57° 42' 12.734280"	-2° 50' 42.246258"
125	513174.5478	6406614.541	57.801339°	-2.778341°	57° 48.080347'	-2° 46.700470'	57° 48' 4.820832"	-2° 46' 42.028205"
126	513051.2462	6417218.482	57.896589°	-2.779835°	57° 53.795369'	-2° 46.790115'	57° 53' 47.722164"	-2° 46' 47.406907"
127	505117.1271	6436034.636	58.065759°	-2.913270°	58° 3.945539'	-2° 54.796212'	58° 3' 56.732364"	-2° 54' 47.772738"