TECHNICAL APPENDIX 12.1: ABNORMAL LOAD ROUTE ASSESSMENT

Kirkton Energy Park

Prepared for: Kirkton Wind Farm Ltd



Pell Frischmann

Kirkton Wind Farm

Abnormal Indivisible Load Route Survey



February 2022

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1 Introduction

1.1 Purpose of the Report

Pell Frischmann (PF) has been commissioned by Wind 2 Limited (Wind 2) to undertake a desk top survey of the possible delivery routes for wind turbine Abnormal Indivisible Loads (AIL) associated with the construction and development of Kirkton Wind Farm, located to the south of Melvich, Thurso.

The report has been prepared to help inform Wind 2 on the likely issues associated with the development of the site with regards to off-site transport and access for AIL traffic. The report identifies the key issues associated with AIL deliveries and notes that remedial works, either in form of physical works or as traffic management interventions will be required to accommodate the predicted loads.

The wider assessment and detailed designs of any remedial works are beyond the agreed scope of works between PF and Wind 2 at this point in time.

It is the responsibility of the wind turbine supplier to ensure that the entirety of the proposed access route is suitable and meets with their satisfaction. The turbine supplier will be responsible for ensuring that the finalised proposals meet with the appropriate levels of health and safety consideration for all road users has been made in accordance, in line with the relevant legislation at the time of delivery.

2 Site Background

2.1 Site Location

The development site is located to the south of Melvich, Thurso. Figure 1 illustrates the general site location.

Figure 1: Site Location Plan



2.2 Candidate Turbines

Wind 2 have indicated that they wish to consider the use of a turbine in the 130m – 136m rotor diameter range with a tip height of 180m. To provide a platform for the report, it has been assumed that a Vestas V136 be used as the candidate turbine to identify all of the likely issues.

Details of the V136 turbine blades and nacelle have been obtained directly from Vestas. The details of the components are summarised in Table 1.

Table 1: Turbine Size Summary

Component	Length (m)	Width (m)	Height (m)	Weight (t)
Blade	66.650	4.265	3.124	13.600
Nacelle	12.861	4.004	3.412	64.938
Hub	5.469	3.773	3.964	34.196
Drive Train	7.323	3.500	3.200	61.059

Tower loads have been based upon a generic tower of 4.3m in width by 30m in length. The generic tower and blade sections will be used for the subsequent swept path assessments of the proposed loads along the access route.

2.3 Proposed Delivery Equipment

To provide a robust assessment scenario based upon the known issues along the access route, it has been assumed that all blades would be carried on a hybrid trailer to reduce the need for mitigation in constrained sections of the route. Where constraints are significant, it is feasible to lift the blade tip using the 10m lift capacity of the scissor lift trailer. This allows loads to be either lifted over height constraints or to be slightly shortened in plan view.

Towers would be carried in a 4+7 clamp adaptor style trailer, whereas loads such as the hub, nacelle housing and top towers would be carried on a six axle step frame trailer.

Where constraints are extreme, loads would be transferred onto a Goldhofer blade lifting trailer. This trailer has the ability to lift blades up to a maximum angle of 60 degrees, lifting blades over potential constraints and shortening the length plan view.





Figure 3: Tower Trailer



Figure 4: Blade Lifter



3 Access Route Review

3.1 Port of Entry

The proposed Port of Entry (POE) is Scrabster. The port is the closest and only suitable port that can provide direct road access to site and as such is in line with the Government's "Water Preferred" policy towards AIL movements.

The port has been used by renewables deliveries in the past for a number of wind farms, including Strathy North.

The port has sufficient quay strength and is well located for the north coast road network. The layout of the port is illustrated below in Figure 5.

Figure 5: Scrabster Port Layout



Access from other ports in the north is not feasible given the nature of constraints that exist within the town of Thurso.

3.2 Proposed Access Route

A full site visit will be required at a later stage, should Wind 2 decide to pursue the site. All results described below are based upon a desk top assessment and will need to be confirmed following the site visit.

The proposed access route to site is as follows:

- Depart the port and enter the A9;
- Proceed southbound on the A9 to the junction of the A9 / A836;
- Turn right using the existing over run area at the A9 / A836 junction;
- Proceed westbound on the A836;

- Utilise one of two blade transfer / tower turning locations; and
- Turn into the Kirkton Road junction and continue south to the proposed site entrance.

The route is illustrated in Figure 6.

Figure 6: Proposed Route



3.3 Road Route Constraints

The constraints noted on the desk top review are detailed in Table 2. These cover all constraints from the port access gate through to the proposed site access junctions. No consideration of the transport issues within the port or within the development site have been undertaken and this includes the design of the site access junction.

Due to the constrained nature of the final section of road leading from the A836 to Kirkton Farm and the acute angle of the junction, it is proposed that loads will continue west to a location where the blades can be transferred from the superwing carrier trailers onto a blade lifter trailer and tower loads can turn to allow them to approach the junction from the north. Two locations have been identified for consideration and to allow land negotiations to take place.

Plans illustrating the location of the constraints and a detailed list of POI are provided in Appendix A.

A series of swept path assessments have been prepared at key locations noted by Wind 2. The drawings illustrating the assessment results are illustrated in Appendix B.

The colours illustrated on the swept paths are:

- Grey / Black OS / Topographical Base Mapping;
- Green Vehicle body outline (body swept path);
- Red Tracked pathway of the wheels (wheel swept path); and
- Purple The over-sail tracked path of the load where it encroaches outwith the trailer (load swept path).

Where mitigation works are required, the extents of over-run and over-sail areas are illustrated on the swept path drawings.

Please note that where assessments have been undertaken using Ordnance Survey (OS) base mapping, there can be errors in this data source.

Table 2: Constraint Points and Details

POI	Key Constraint	Details
1	Exit Scrabster Harbour	Loads will exit the harbour westbound on the A9. A swept path assessment will be necessary to confirm the exact requirements. Loads are likely to over-sail into the parking area and street furniture modifications will be required.

POI	Key Constraint	Details
2	A9 / A836 Right Turn	Loads will turn right onto the A836. A swept path assessment has been undertaken and is presented in Appendix B. The existing over-run in the land to the south of the junction will be required and will need to be expanded. Use of this will need to be agreed with SSE who are understood to control the land.
		Three traffic signs and two lighting columns will need to be relocated. A section of wall will also need to be removed.
3	A836 Bends – North of Pennyland	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.
4	A836 Bends – North of Thurso Business Estate	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.
5	A836 Bends – South of Scrabster Lodge	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.

POI	Key Constraint	Details
6	A836 Overhead Utilities	At this location the height to overhead utilities should be confirmed by the utility providers to ensure that the minimum distances to the road are provided for in all weather conditions.
7	A836 Vegetation	Throughout the route, the tree canopy needs to be trimmed to provide a clear 5m head height. Trimming of the tree canopy can be subject to ecological constraints and it is suggested that early consultation with The Highland Council is undertaken to agree cutting times and permits.
8	A836 Series of Bends – Bridge of Forss	Loads will continue on the A836. A swept path assessment has been undertaken and indicates that the loads will over-sail the into and beyond the verge. A third party land review will be required to gain the necessary land rights. A small area of over-running surface on the exit bend will be required. Existing fences and safety barriers will need to be relocated.
9	A836 Bends – West of Forss	Loads will straddle the road through the bend. Loads are likely to over-sail the verge where existing street signage should be removed.
10	A836 Overhead Utilities	At this location the height to overhead utilities should be confirmed by the utility providers to ensure that the minimum distances to the road are provided for in all weather conditions.

POI	Key Constraint	Details
11	A836 Bends - Buldoo	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.
12	A836 Bends – Isauld Cottage	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.
13	A836 Right Bend - Quiet Waters	Loads will straddle the road through the right-hand bend. A swept path assessment has been undertaken. Loads will overrun and oversail the northern verge where a load bearing surface should be laid. One traffic sign should be removed. Loads will overrun and oversail the south eastern verge where a load bearing surface should be laid, and loads will oversail the bridge parapet. One utility pole and two traffic signs should be removed. All traffic bollards should be removed. Possible third-party land is required. Loads will overrun and oversail the southern verge where a load bearing surface should be laid, and the land should be reprofiled. One road sign and two traffic bollards should be removed. Possible third-party land is required.
14	A836 Right Bend – Reay	Loads will continue on the A836. A swept path assessment will be necessary to confirm the exact requirements. Loads are likely to over-sail the north footpath. Street furniture modifications are likely to be required.

POI	Key Constraint	Details
15	A836 Right Bend /Bridge – New Reay	Loads will continue on the A836. A swept path assessment will be necessary to confirm the exact requirements. An over-sail area is considered likely on the north verge. Third party land rights may be required to enable the over-sail.
16	A836 Vegetation	Throughout the route, the tree canopy needs to be trimmed to provide a clear 5m head height. Trimming of the tree canopy can be subject to ecological constraints and it is suggested that early consultation with The Highland Council is undertaken to agree cutting times and permits.
17	A836 Bends – East of Drum Hollistan	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.
18	A836 Bends – Drum Hollistan	Loads are likely to project over the road centre line at this location. In order to ensure the safety of the convoy and other road users, escort vehicles will need to be deployed ahead to hold traffic at a safe location for the loads to pass.

POI	Key Constraint	Details
19	A836 Potential Transfer / Turning Area 1	Blade loads in the Super Wing Carrier and tower loads will continue to the proposed transfer point. Once blades are transferred onto the drawbar lifting trailer and towers turned, loads will re-join the A836 southbound to the junction with the Kirkton Farm Road where they will turn right and proceed southbound with all other loads. The area of land required will need to include an access junction and two crane pads. Storage for up to three blades should also be available, with all infrastructure designed in accordance with turbine manufacturer standards. A temporary trackway will be provided to allow tower load turning. The blade can be lowered at less constrained points to reduce requirements for removal of overhead utilities along the remainder of the route. All overhead utilities and obstructions will need to be removed from this point to the site. A full consultation with all utility providers will be required to ensure that overhead obstructions are removed prior to deliveries.
20	A836 Melvich Bends	Swept path assessment Trans 1 is included in Appendix B. Loads will continue west to the proposed transfer / turning area. Loads will occupy the entire carriageway width through the bend band oversail the verge / footway to the east at various points however no physical mitigation is required.
21	A836 Baligill Burn Bend	Loads will continue west to the proposed transfer / turning area. Loads will occupy the entire carriageway width through the bend however no physical mitigation is required.

POI	Key Constraint	Details
22	A836 Potential Transfer / Turning Area 2	Blade loads in the Super Wing Carrier and tower loads will continue to the proposed transfer point. Once blades are transferred onto the drawbar lifting trailer and towers turned, loads will re-join the A836 eastbound to the junction with the Kirkton Farm Road where they will turn right and proceed southbound with all other loads.
		Third party land will be required to allow loads to enter and exit the proposed site with load bearing surfaces required. The land will need to be reprofiled and fences, walls and a bus shelter should be removed. A drainage ditch will need to be culverted.
		The area of land required will need to include an access junction and two crane pads. Storage for up to three blades should also be available, with all infrastructure designed in accordance with turbine manufacturer standards. A temporary trackway will be provided to allow tower load turning.
		The blade can be lowered at less constrained points to reduce requirements for removal of overhead utilities along the remainder of the route.
		All overhead utilities and obstructions will need to be removed from this point to the site. A full consultation with all utility providers will be required to ensure that overhead obstructions are removed prior to deliveries.
		Swept path assessment Trans 1 is included in Appendix D.
23	A836 / Kirkton Farm Road Junction	Loads will turn right onto Kirkton Road.
		Loads will overrun and oversail the verge on the inside of the right turn where a load bearing surface should be laid and one road sign and vegetation should be removed.

3.4 Kirkton Farm Road

A full set of swept path assessments have been completed for the route along Kirkton Road to the site entrance. These can be found in Appendix D of this report.

The blade will be carried in the fully raised position from the chosen transfer point and all overhead utilities and obstructions will need to be removed. The swept path assessments show that the road will need to be fully widened to a minimum of 4.5m running width with a 5.5m clearance window. A topographical survey is proposed to fully determine the works and need for any additional and to enable access to the site.

The road will need to be fully upgraded to The Highland Council standards and detailed design pack for the upgrades will need to be agreed with the Council. The design works will need to be completed on topographical base plans.

Various utility pole modifications will be required and early engagement with the utility firms will be required.

All street furniture and obstructions should be removed from the oversail and overrun areas and swept path assessments should be repeated as part of the detailed design process.

3.5 Land Ownership

The limits of road adoption can vary depending upon the location of the site and the history of the Roads Agency. The adopted area is generally defined as land contained within a defined boundary where the road agency holds the maintenance rights for the land from the original land owner. In urban areas, this usually defined as the area from the edge of the footway across the road to the opposing footway back edge.

In rural areas the area of adoption can be open to greater interpretation as defined boundaries may not be readily visible. In these locations, the general rule is that the area of adoption is between established fence / hedges lines or a maximum 2m from the road edge. This can vary between areas and location.

3.6 Summary Issues

It is strongly suggested that following a review of the report, Wind 2 should undertake the following prior to the delivery of the first abnormal loads, to ensure load and road user safety:

- That topographical surveys are undertaken and the swept path results repeated to fully inform the detailed road design stage of the project;
- A revised review of axle loading on structures along the entire access route with the various road agencies is undertaken immediately prior to the loads being transported in case of last minute changes to structures;
- A review of clear heights with utility providers and the transport agencies along the route to ensure that there is sufficient space to allow for loads plus sufficient flashover protection (to electrical installations);
- That any verge vegetation and tree canopies which may foul loads is trimmed prior to loads moving;
- That a review of potential roadworks and or closures is undertaken once the delivery schedule is established in draft form:

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- That a test run is completed to confirm the route and review any vertical clearance issues;
- That a condition survey is undertaken to ascertain the extents of road defects prior to loads commencing to protect Wind 2 from spurious damage claims.

4 Summary

4.1 Summary of Access Review

PF has been commissioned by Wind 2 Limited to prepare a Desktop Route Survey Report to examine the issues associated with the transport of AIL turbine components to the development site at Kirkton Wind Farm.

This report identifies the key points and issues associated with the proposed route and outlines the issues that will need to be considered for successful delivery of components.

The access review has been based upon a worst case of Vestas V136 turbine sections and has considered road access from Scrabster.

The minor road leading to Kirkton Farm will need to be reviewed in detail using a topographical survey to fully inform the detailed design phase of the development and to confirm the need for any third party land rights.

The report is presented for consideration to Wind 2 Limited. Various road modifications and interventions are required to successfully access the site by road. If these are undertaken, access to the wind farm site is considered feasible.

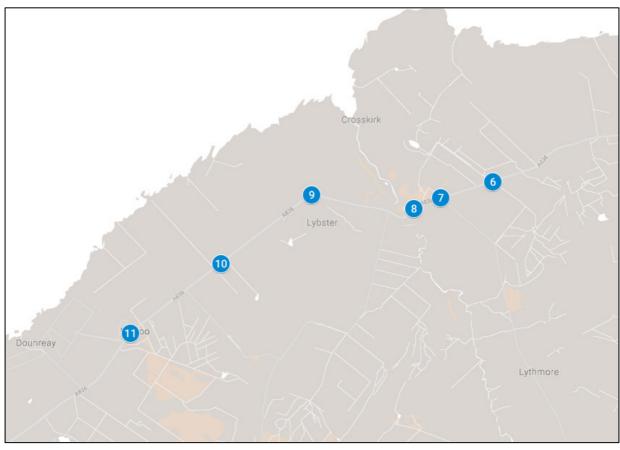
4.2 Further Actions

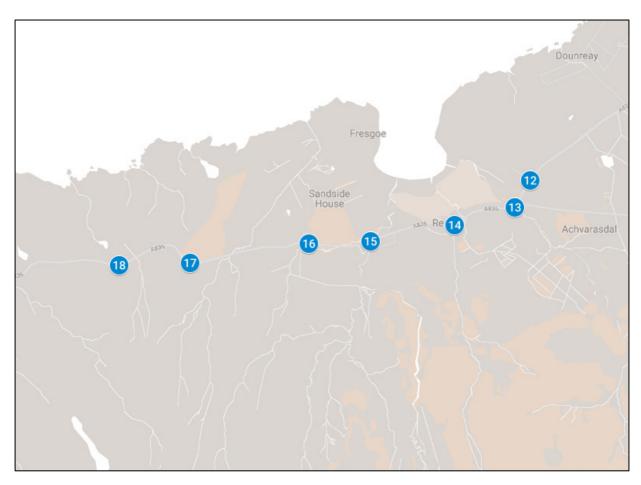
The following actions are recommended to pursue the transport and access issues further:

- Prepare detailed mitigation design proposals to help inform the land option / consultee discussions;
- Collect topographical data to prepare the detailed design phase of the project;
- Obtain any necessary land options;
- Undertake discussion with the affected utility providers and roads agencies;
- Obtain the necessary statutory licences to enable the mitigation measures; and
- Develop a detailed operational Transport Management Plan to assist in transporting the proposed loads.

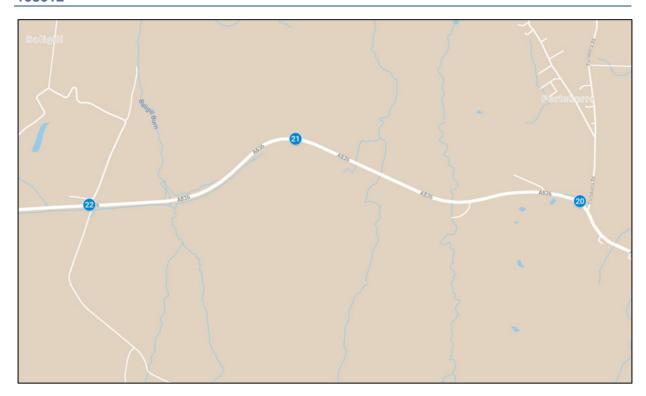
Appendix A Points of Interest Locations





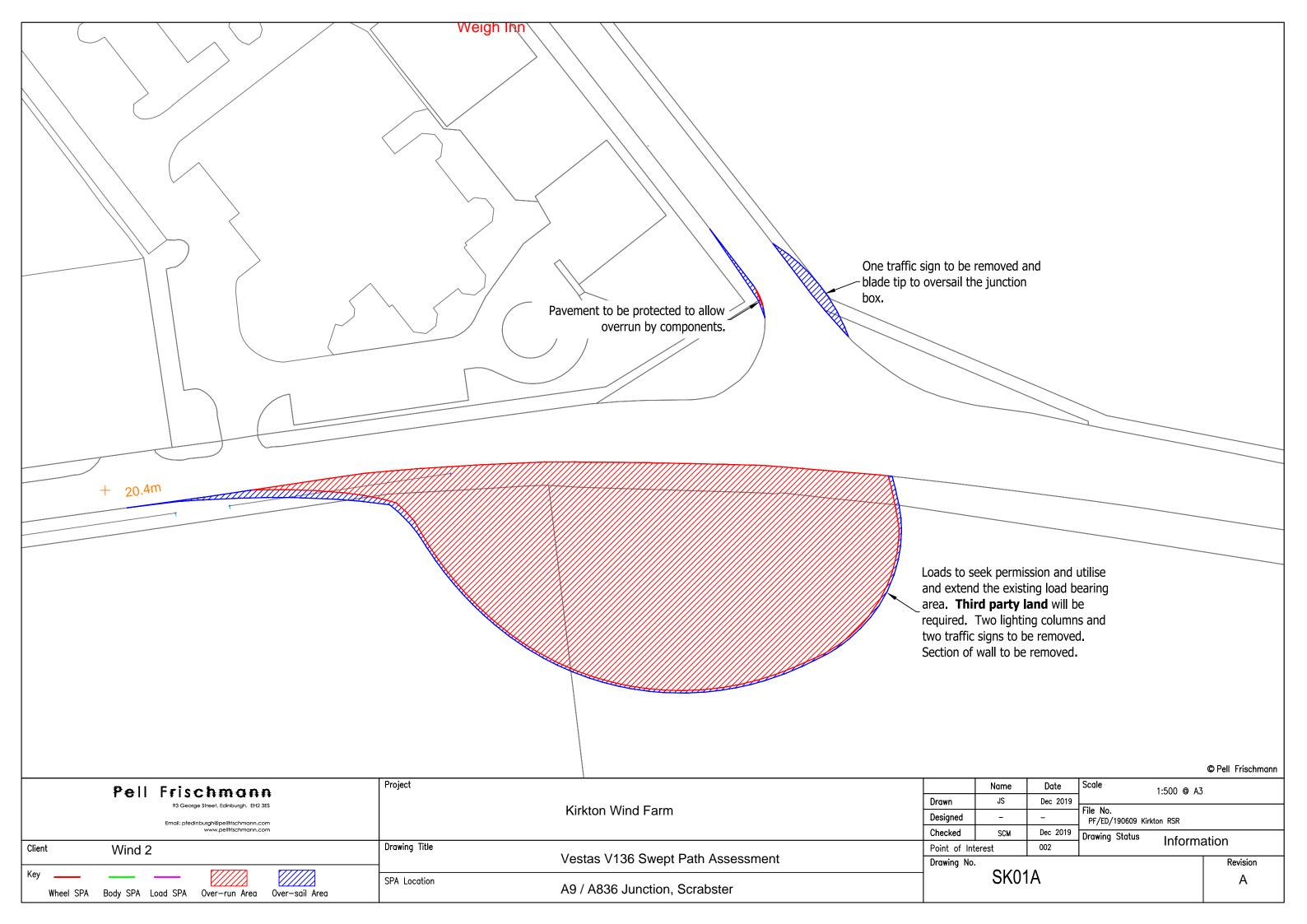




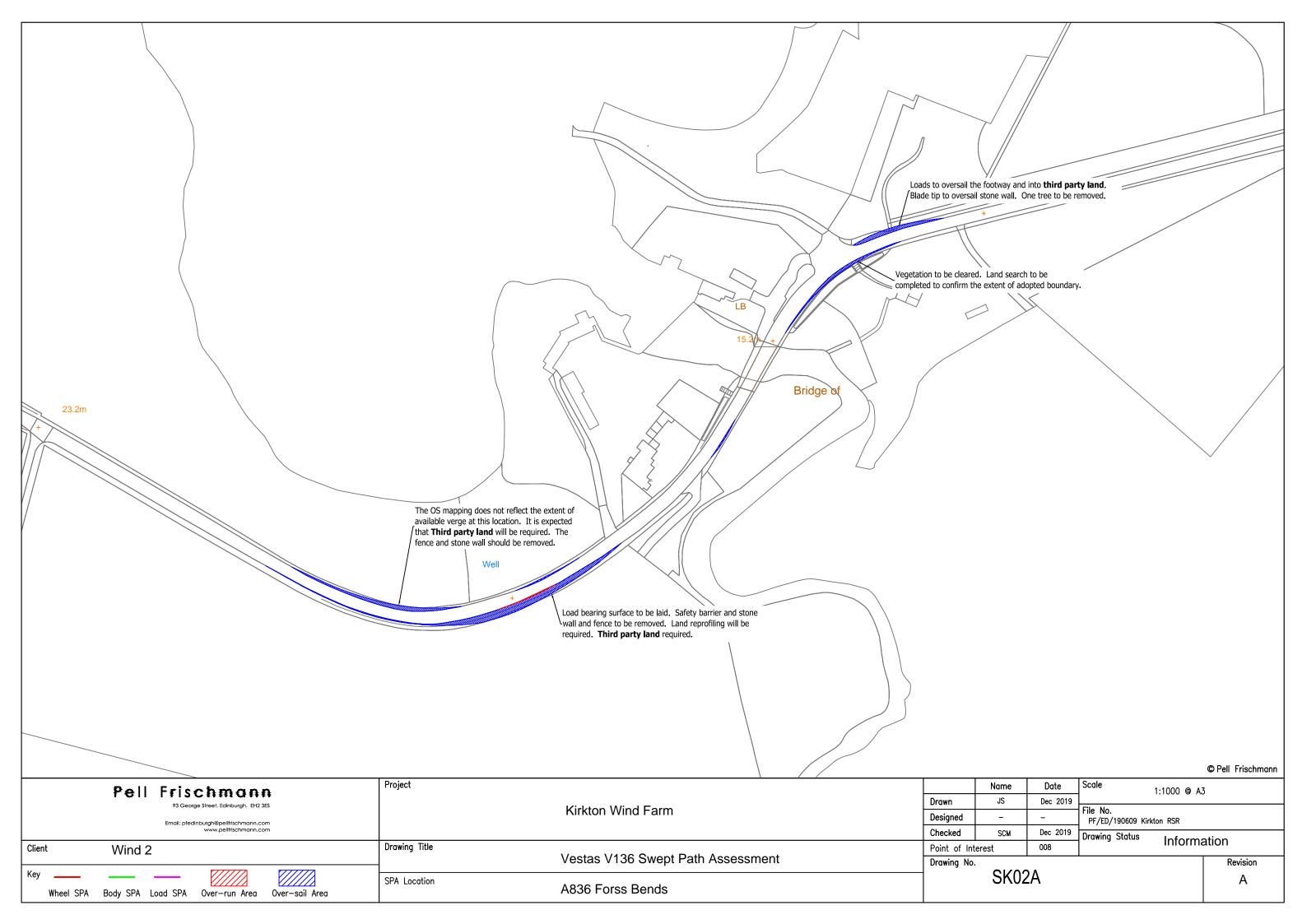


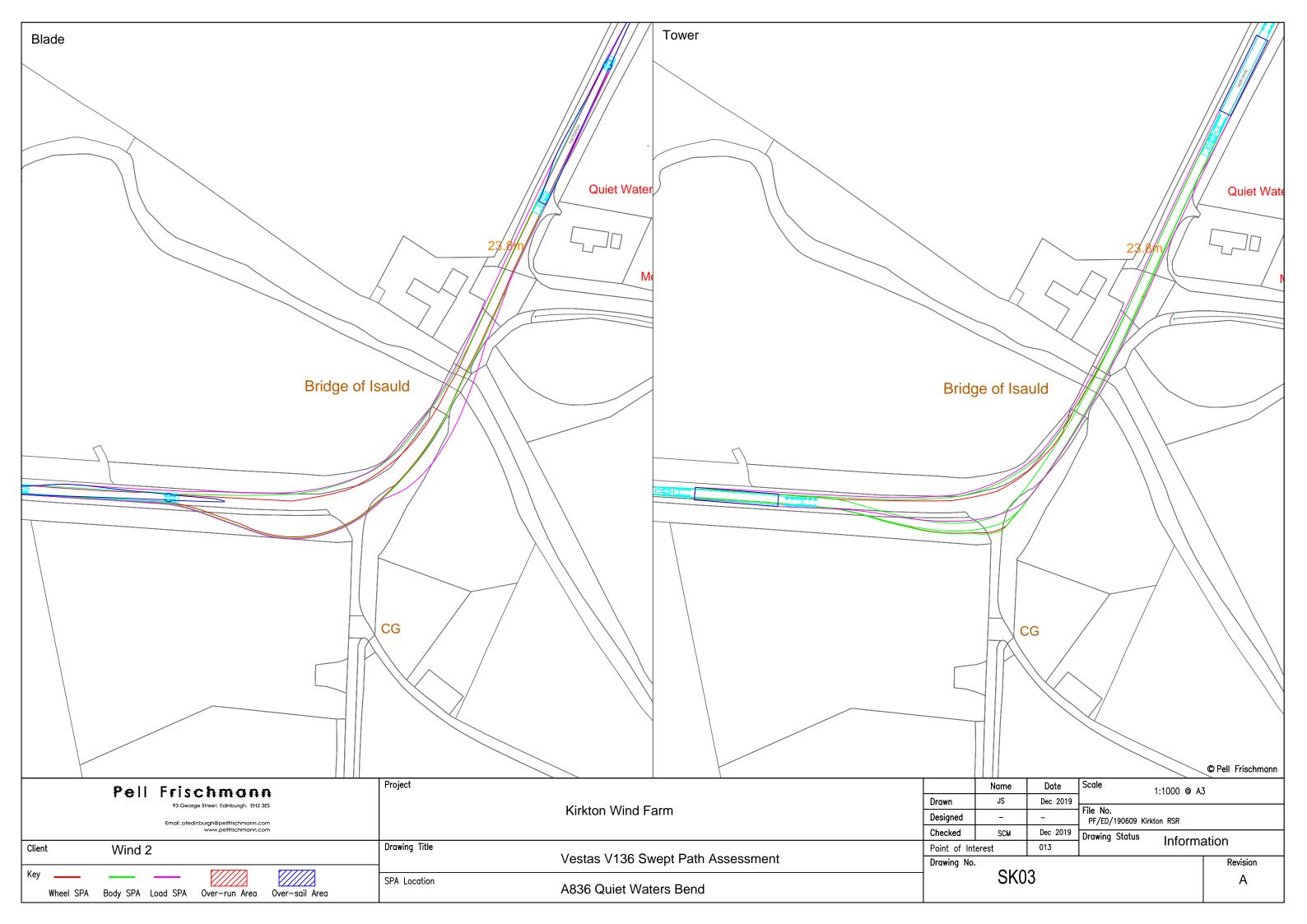
Appendix B Swept Path Assessments

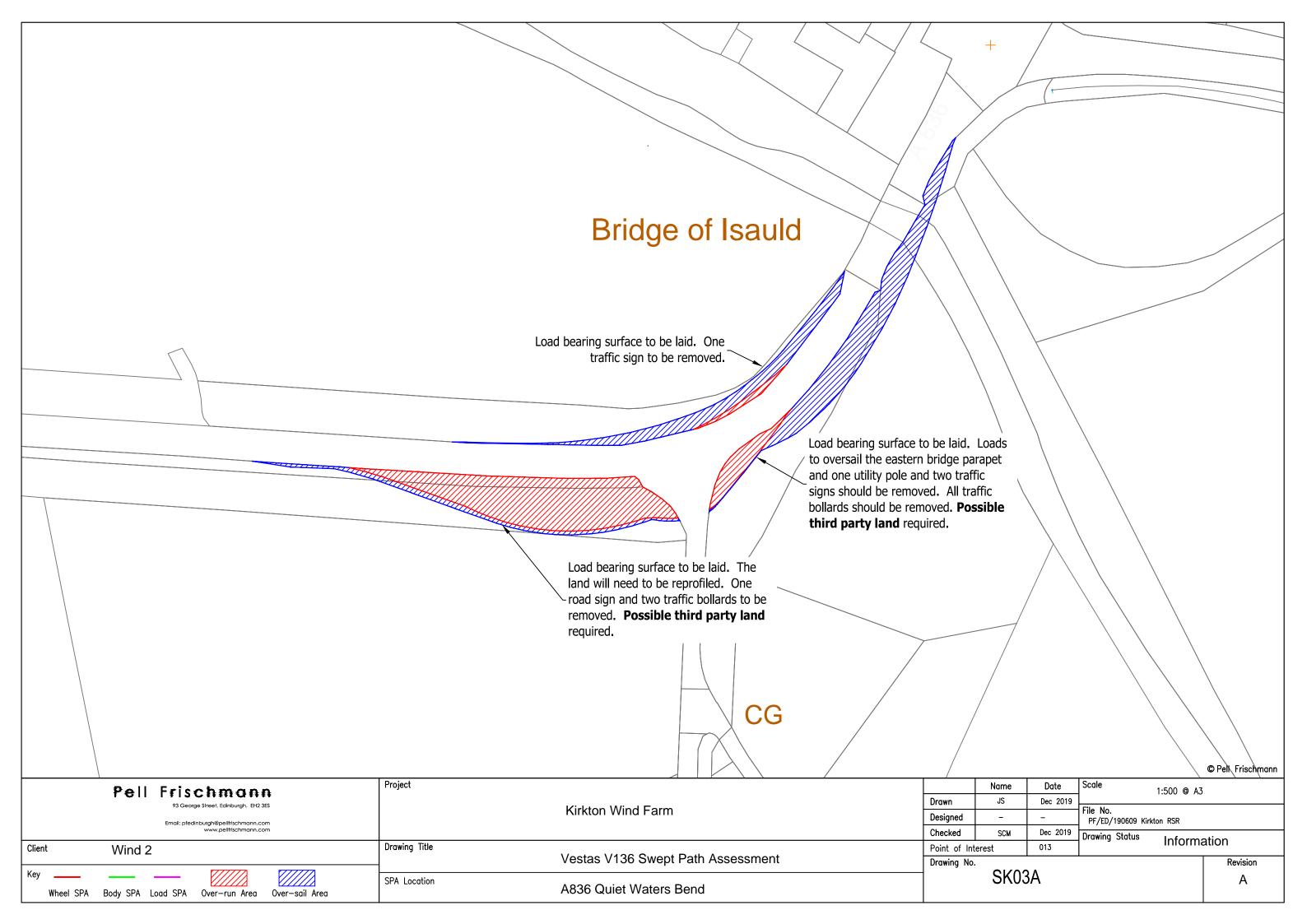


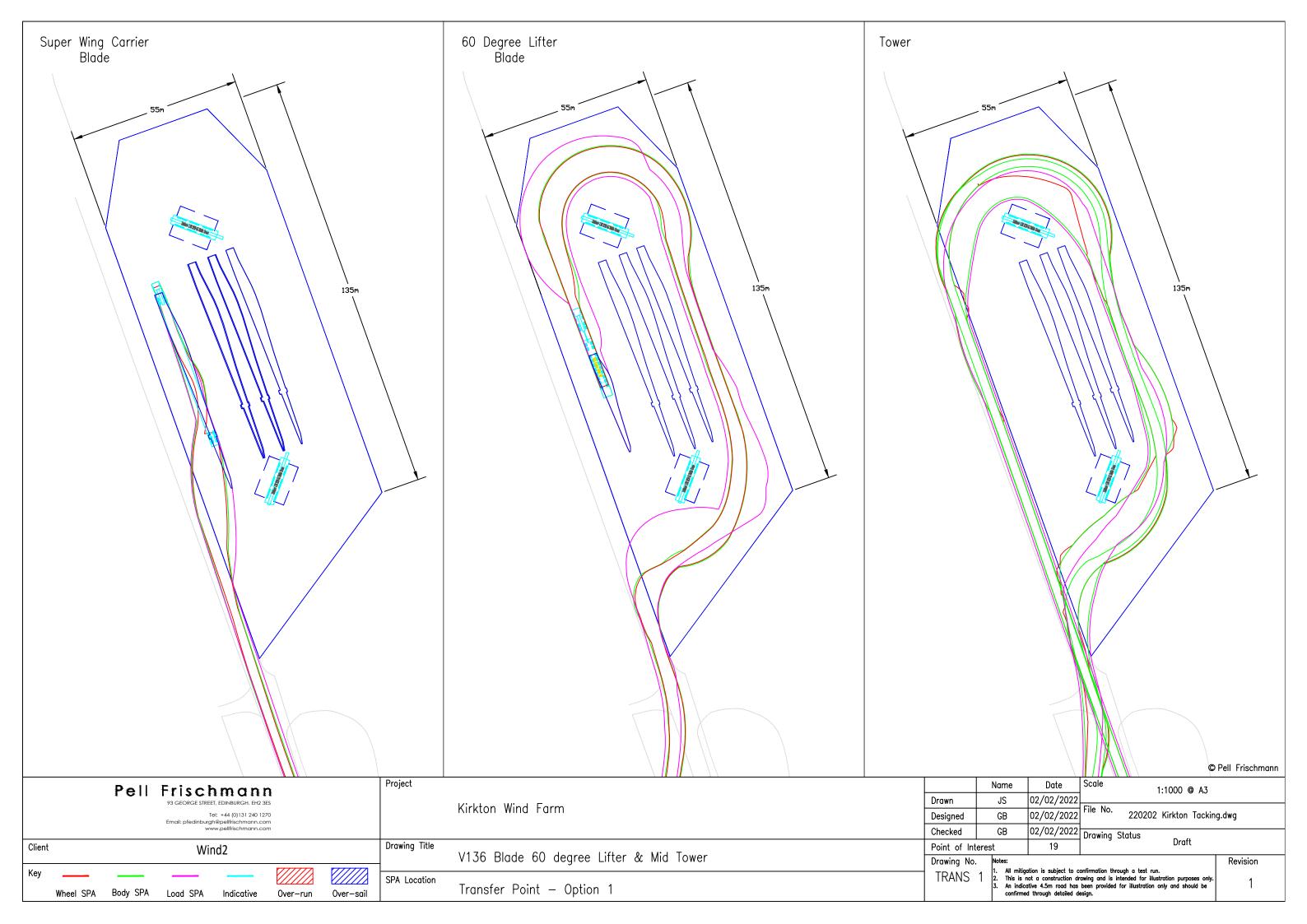




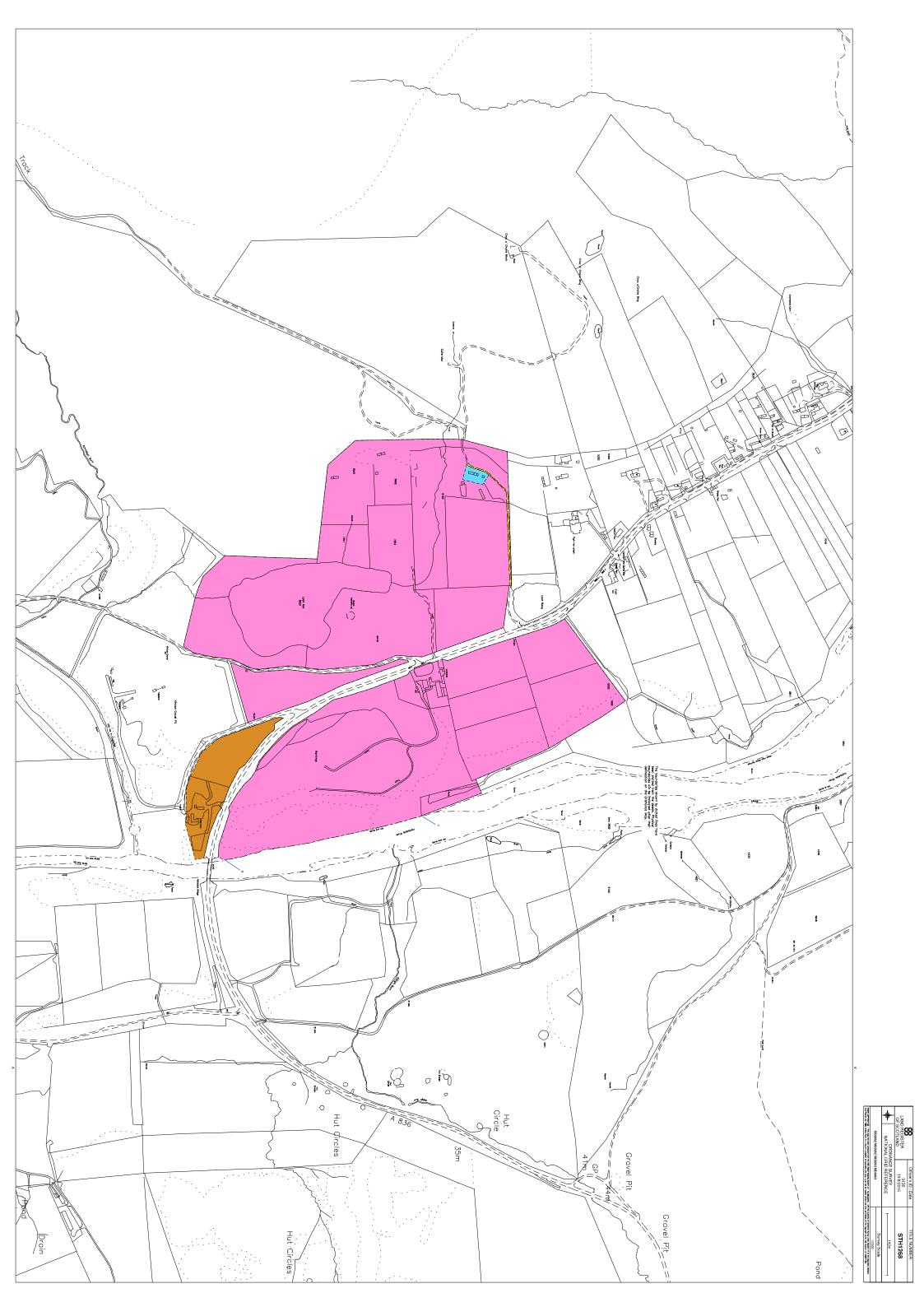


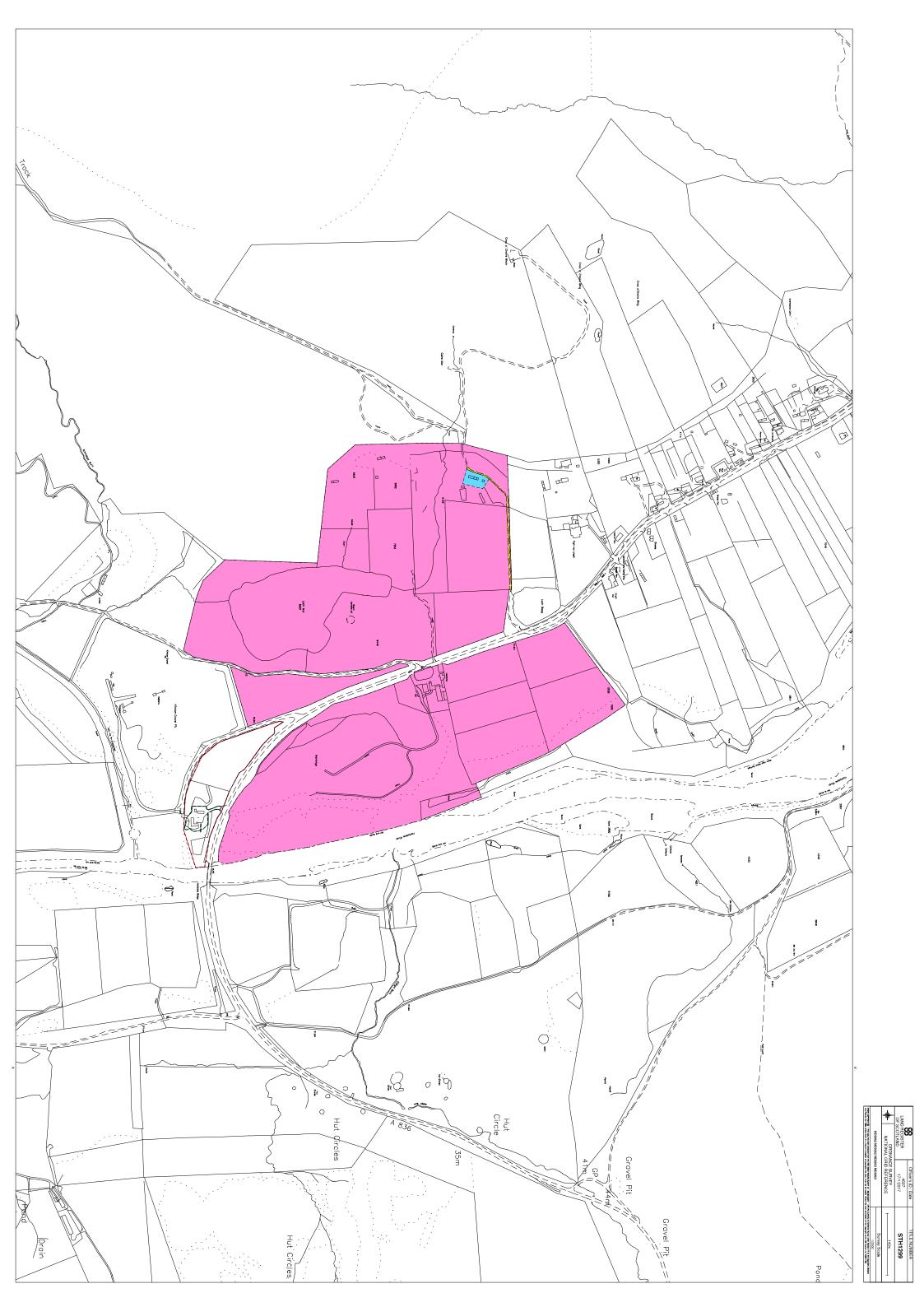






Appendix C Title Plans





Appendix D Kirkton Road Drawings

