Bridgend Weir Hydroelectric Scheme

Transport Route Assessment

DRAFT

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Comments

Comments

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1. Executive Summary

1.1. This report has been prepared to support an application for an Archimedes screw hydroelectric scheme and considers the associated transport routing. The subject of the report is the transportation of large loads to the proposed site at Bridgend Weir, on the outskirts of Lochwinnoch, Renfrewshire.

1.2. This report provides a summary of the key transportation points considered within the proposed route and any subsequent areas of additional information which may be required based on Ordnance Survey mapping and site visits.

1.3. The proposed hydroelectric installation will be constructed from both sides of the River Calder, and the works include repairing the existing weir, refurbishment of the channel, the installation of the hydroelectric mechanism, housings and ancillary access. Construction traffic will access the site from the east bank of the river.

1.4. The site lies adjacent to an unclassified road that provides access to a number of residential properties and links Calder Street to the B786. The proposals include strengthening the verges of the unclassified road to allow equipment and materials to be lifted into the site. It is proposed to close the unclassified road during the construction period to accommodate a crane, short term closures to facilitate deliveries may also be required but access to residential properties will be maintained.

1.5. The proposed route uses the strategic trunk road network, including the A737, and the A760, Lochlip Road, Church Street, Calder Street and an unclassified road to access the site. Further consideration has been given to access northwards and returning via the B786.

1.6. The largest component will be the screw and its associated housing will be delivered using a standard HGV tractor and trailer being 16.5m long and other parts will be delivered on a standard flatbed truck. Construction vehicles will consist of aggregate and concrete lorries, a 16.5m low loader for plant and flatbed trucks. A 60T crane will be used to lift the turbine parts and materials into place within the site.

1.7. It is concluded that the route is generally suitable to support the proposed construction and delivery vehicles, subject to the potential mitigation below.

- Bridge loading capacity checks required for Glasgow / Largs railway, Lochal, Loch, Calder, Lade, Cloak Burn (2 locations) and Beech Burn;
- Discuss front and rear escort vehicles for several locations;
- Discuss temporary parking restrictions on Church Street in the vicinity of Lochlip Road, Church Street between Harvey Square and Main Street and Calder Street between Kildale Road and Calder Street;
- Remove pedestrian guardrail at Lochwinnoch Primary School and strengthen footways;
- Verge strengthening at site delivery point and B786 north verge (to the south of the unclassified road) and at various locations for northbound exiting including one location at the junction with the B786.
- Road closure on the unclassified road and advanced warning signage.
- Discuss site access strategy with Renfrewshire Council to agree reversing on Calder Street to Bridgend (LGV's), Spiers Road (MGV, HGV and Crane).

1.8. The crane operator and the contractor will be required to prepare a Traffic Management / Safety

Plan which will detail any checks, discussions and procedures necessary to agree the proposals with Renfrewshire Council and Police Scotland.

2. Introduction

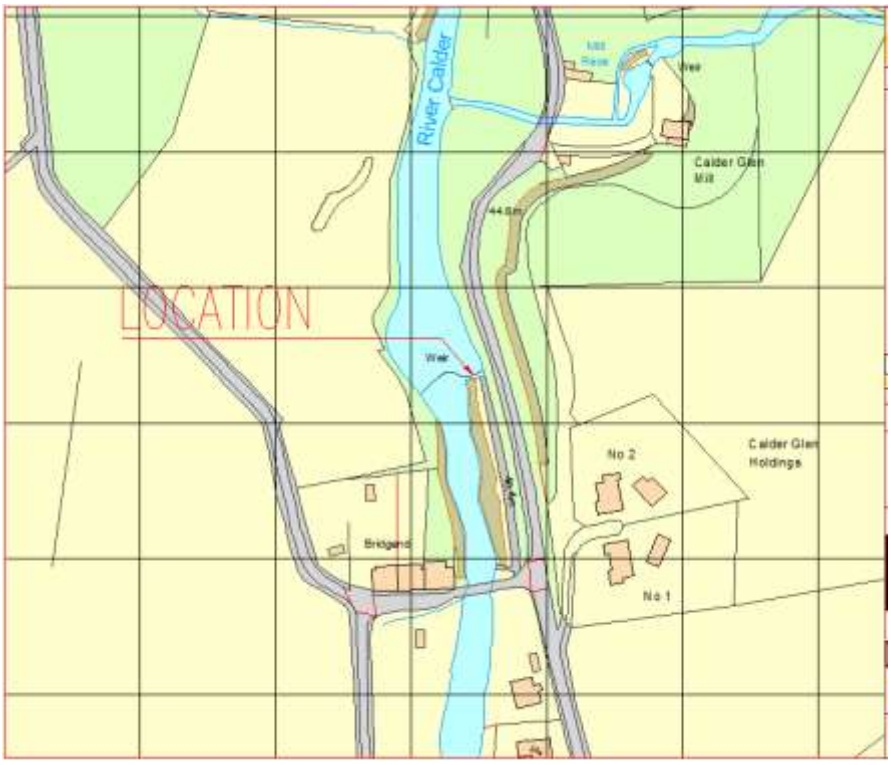
2.1. This report has been prepared to support an application for an Archimedes screw hydroelectric scheme and considers the associated transport routing. The subject of the report is the transportation of large loads to the proposed site at Bridgend Weir, on the outskirts of Lochwinnoch, Renfrewshire.

2.2. This report provides a summary of the key transportation points considered within the proposed route and any subsequent areas of additional information which may be required based on Ordnance Survey mapping and site visits.

Site Description

2.3. Bridgend Weir, PA12 4DH (NS348594) spans the River Calder and is located approximately 700m north east of Lochwinnoch's High Street, and some 50m downstream of the Calder Street Bridge.

Figure 1: Site Location



2.4. The proposed hydroelectric installation will be constructed from both sides of the River Calder, and the works include repairing the existing weir, refurbishment of the channel, the installation of the hydroelectric mechanism, housings and ancillary access. Construction traffic will access the site from the east bank of the river.

2.5. The site lies adjacent to an unclassified road that provides access to a number of residential properties and links Calder Street to the B786. The proposals include strengthening the verges of the unclassified road to allow equipment and materials to be lifted into the site. It is proposed to close the unclassified road during the construction period to accommodate a crane, short term closures to facilitate deliveries may also be required but access to residential properties will be maintained.

2.6. The remainder of the report is set out as follows:-

- Transportation Specification;
- Transport Route Assessment;
- Site Access Strategy;
- Summary and Conclusions.

3. Transportation Specification

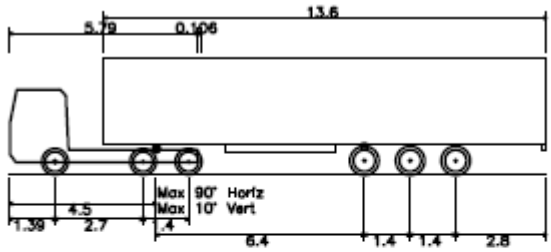
Delivery and Construction Vehicles

3.1. The largest component will be the screw and its associated housing will be delivered using a standard HGV tractor and trailer being 16.5m long and other parts will be delivered on a standard flatbed truck. Construction vehicles will consist of aggregate and concrete lorries, a 16.5m low loader for plant and flatbed trucks. The following constraints apply to transporting this type of equipment:

- A minimum clearance width of 2.8m
- A clearance height of 4.5m
- A maximum longitudinal slope of 10 degrees
- A maximum axle load of 4.7T (Based on 15T delivery vehicle carrying 7T Turbine part).

3.2. The proposed turbine delivery and construction vehicles are similar to those in common use today and not classified as abnormal loads.

Figure 2: Turbine Delivery Vehicle



Max Legal Articulated Vehicle (16.5m)	
Overall Length	16.500m
Overall Width	2.500m
Overall Body Height	3.632m
Min Body Ground Clearance	0.396m
Max Track Width	2.500m
Lock to Lock Time	6.00 sec
Kerb to Kerb Turning Radius	6.870m

3.3. The transportation requirements of the turbine are contained in *Appendix A* of this report.

Crane

The mobile crane that is to be used to lift the turbine parts in to position is likely to be a Liebherr Mobile Crane, LTM 1100/2. The details of this crane are as follows: -

- Length of 13.63m
- Width of 2.75m
- Height of 3.995m
- Total weight of 60T

Although the physical dimensions of this crane comply with the “Construction and Use” Regulations, its weight puts it into the Abnormal Load classification. Consequently, the crane operator will be required to submit a Transportation Management / Safety Plan to the Roads Authority and the Police for consideration and approval prior to site works for this project.

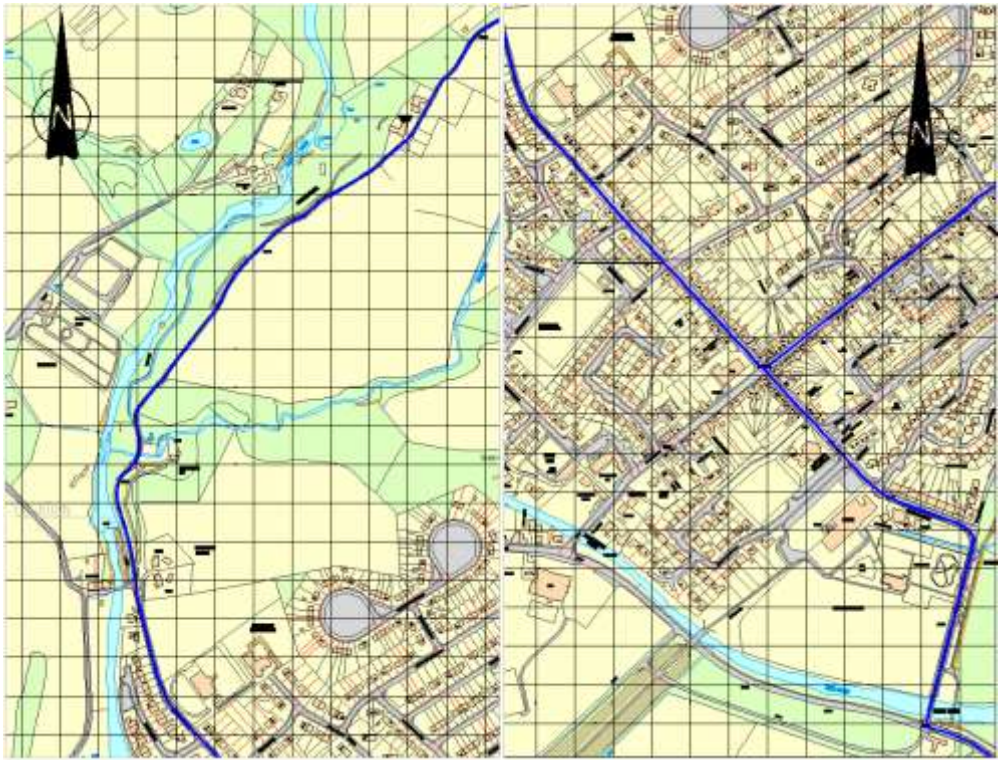
4. Proposed Route Assessment

4.1. The proposed route for the Archimedes screw and construction vehicles is indicated in Figure 3 below and is as follows:

- A737
- A760
- Lochlip Road / Church Street
- Calder Street
- Unclassified Road

4.2. The A737 is part of the strategic road network and considered suitable therefore no assessment has been undertaken to this point.

Figure 3: Proposed Transport Route



Route Section – A737 – Lochlip Road

4.3. The delivery and construction vehicles will leave the A737 at the Roadhead Roundabout (refer to Figure 4 below) and travel northwest on the A760 for approximately 1.3km before reaching Lochlip Road. The A760 is a two-way single carriageway road, approximately 8.3m in width, including 0.5m wide hard strips to both sides. There are traffic calming measures in the form of islands at two locations along this section of the route.

Figure 4: Roadhead Roundabout

4.4. There is a footway to one side and a grass verge to the other for the majority of this section of the route, a formal cycle route also runs parallel to the A760 and there is one uncontrolled and one pelican crossing point.

4.5. The A760 provides access to commercial and residential properties and Lochwinnoch railway station, and links the A737 to Lochwinnoch, Kilbirnie and Largs. There is a 40mph speed limit in force along this route section and is lit between the railway station access and Lochlip Road.

A760 Constraints and Mitigation

4.6. Horizontal and vertical geometry along this section of the route is generally considered suitable for use by the proposed delivery and construction vehicles. Localised bends in the road may require that vehicles cross the centreline of the carriageway; however, there will be no requirement for edge strengthening or to temporarily remove street furniture.

4.7. There are several bridges to cross as the route passes over the Glasgow to Largs railway in addition to several watercourses at Lochal and Loch bridges. Whilst there are no current weight limits highlighted by signing at these four locations, the haulage contractor should in conjunction with the local roads authority confirm that the bridges can accommodate the proposed vehicle loadings. The documents considered, discussions held and conclusions should be included within the Transportation Management / Safety Plan.

Route Section – A760 – Calder Street

4.8. The delivery and construction vehicles will leave the A760 (see Figure 5 below), and travel north on Lochlip Road for approximately 250m before reaching Church Street at a priority T-junction continuing for a further 350m to Calder Street. Lochlip Road and Church Street are two-way single

carriageways approximately 7.3m in width that provides access to residential and commercial properties and the southern areas of Lochwinnoch. Lochlip Road is the signed alternative route into Lochwinnoch for goods vehicles to avoid the weak bridge at Main Street (limit 7.5T mgw).

Figure 5: A760 / Lochlip Road Junction

4.9. There are footpaths and/or grass verges on both sides of Lochlip Road on the majority of the route, the exception being Calder Bridge where there is no clearance to the sand stone block parapet.

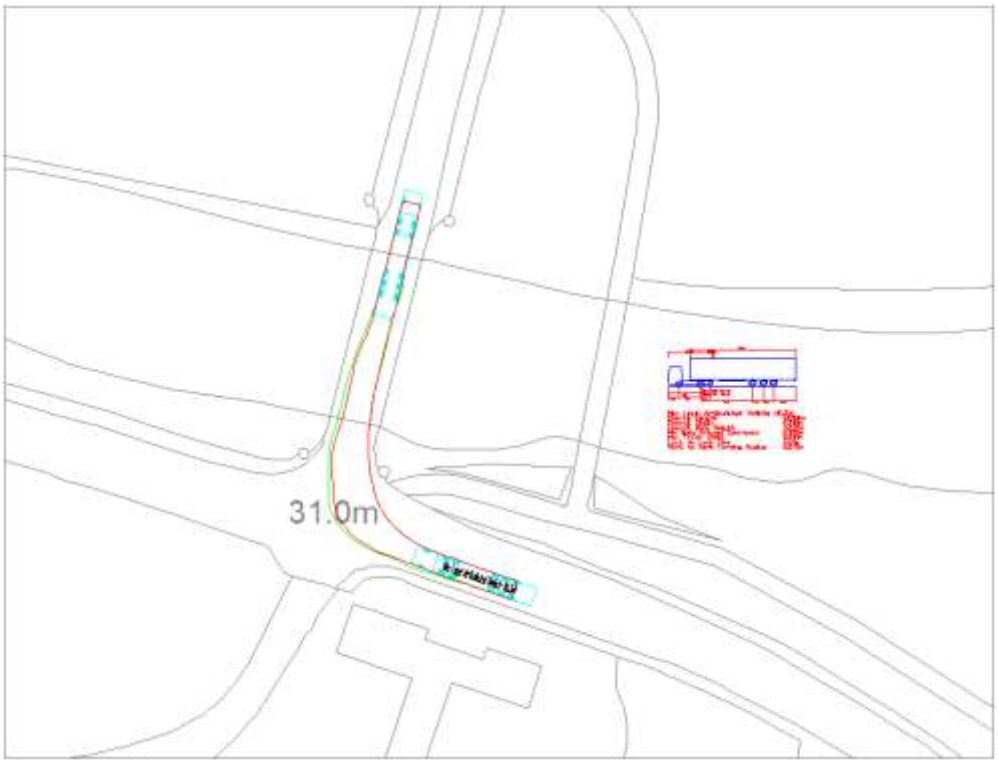
4.10. Lochlip Road and Church Street are subject to a 30mph speed limit and are lit throughout. There are also parking restrictions for approximately 12m in advance of the High Street junction to both sides in the form of double yellow lines that are indicative of no waiting / loading during working days.

Lochlip Road / Church Street Constraints and Mitigation

4.11. Horizontal and vertical geometry along this section of the route is generally considered suitable for use by the proposed delivery and construction vehicles. Localised bends in the road may require that vehicles cross the centreline of the carriageway; however, there will be no requirement for edge strengthening or to temporarily remove street furniture.

4.12. Consideration of the Archimedes Screw delivery vehicle has been assessed at the A760 / Lochlip Road junction as highlighted in Figure 6, below.

Figure 6: Swept Path Analysis A760 / Lochlip Road Junction



4.13. Figure 6 identifies that the swept path of the delivery vehicle requires the full width of the carriageway to undertake the manoeuvre. Calder Bridge is also convex in its vertical profile and in combination with the bridge parapets this reduces the visibility for southbound traffic to large vehicles accessing Lochlip Road from the A760. As this is an existing accepted operation, the impact of the proposed delivery and construction vehicles is not likely to affect existing traffic. It is proposed that delivery times to take this into account and avoid the highest southbound demand (likely to be weekday morning peak hour and afternoon local school finishing times). Weekend Country Park visitors may also generate higher demands during fine weather conditions.

4.14. Church Street has the first residential properties within Lochwinnoch and it is noted that the street hosts over-night parking for resident's cars to both sides of the road in the vicinity of the junction with Lochlip Road, a view of the street is shown in Figure 7, below. This reduces the available carriageway space for traffic movements, effectively to one way shuttle working and the alignment of the road and restricted forward visibility makes navigation of this section of the road difficult. Church services attract further parking on a Sunday for a greater extent along the road, and it is proposed that the contractor takes these conditions into account when devising the delivery schedule. Discussions with Renfrewshire Council to identify whether a temporary parking restriction to the southern side of Church Street may be of benefit, between Lochlip Road and Station Rise should be undertaken and documented within the Transportation Management / Safety Plan.

Figure 7: View from Lochlip Road onto Church Street

4.15. In addition the commercial premises on Church Street and Main / High Street generate day-time parking on Church Street from Harvey Square to both sides of the road, again reducing the available carriageway to delivery and construction vehicles, as highlighted in Figure 8. Whilst the junction is protected by parking restrictions and stop lines, discussions with Renfrewshire Council to identify whether a temporary parking restriction to the south side of Church Street may be of benefit to key deliveries and construction activities, between Harvey Square and High Street should be undertaken and documented within the Transportation Management / Safety Plan.

Figure 8: Church Street at Main Street Junction

4.16. This section of the route crosses Lade Bridge and whilst there are no current weight limits highlighted by signing at this location, the haulage contractor should in conjunction with the local roads authority confirm that the bridges can accommodate the proposed vehicle loadings. The documents considered, discussions held and conclusions should be included within the Transportation Management / Safety Plan.

4.17. It is noted that the low point on Lochlip Road contains signs warning of flooding, whilst this is only likely to occur during extreme weather events and only affect large vehicles once the water has reached a significant depth, the contractor shall have in place a contingency plan to suspend large scale deliveries and construction traffic as there is no place to turn vehicles at this location.

Route Section - Church Street – Unclassified Road

4.18. The route continues from the Church Street / Main Street / High Street junction North West for approximately 610m to the Unclassified Road upon Calder Street. There is a footway to both sides of the road for the majority of the route, however, a filter drain replaces the northern footway between Lochwinnoch Primary School and the Unclassified Road.

4.19. Calder Street varies in width through this section of the route from approximately 6m to 10m. The road is subject to a 30mph speed limit in which it has street lights, there is an advisory 20mph speed limit from Calder Street to the northern boundary of Lochwinnoch Primary School in the form of ‘Safe Routes to Schools’ signage. The final 130m is unlit and subject to the national speed limit.

4.20. Calder Street provides access to the northern residential areas of Lochwinnoch and provides a link between High Street and Bridgend Hill / Ravens Craig. Through this section of the route there are many side streets, driveways and Calder Street supports resident’s on-street overnight parking. There are parking restrictions at Lochwinnoch Primary School main entrance in the form of ‘School

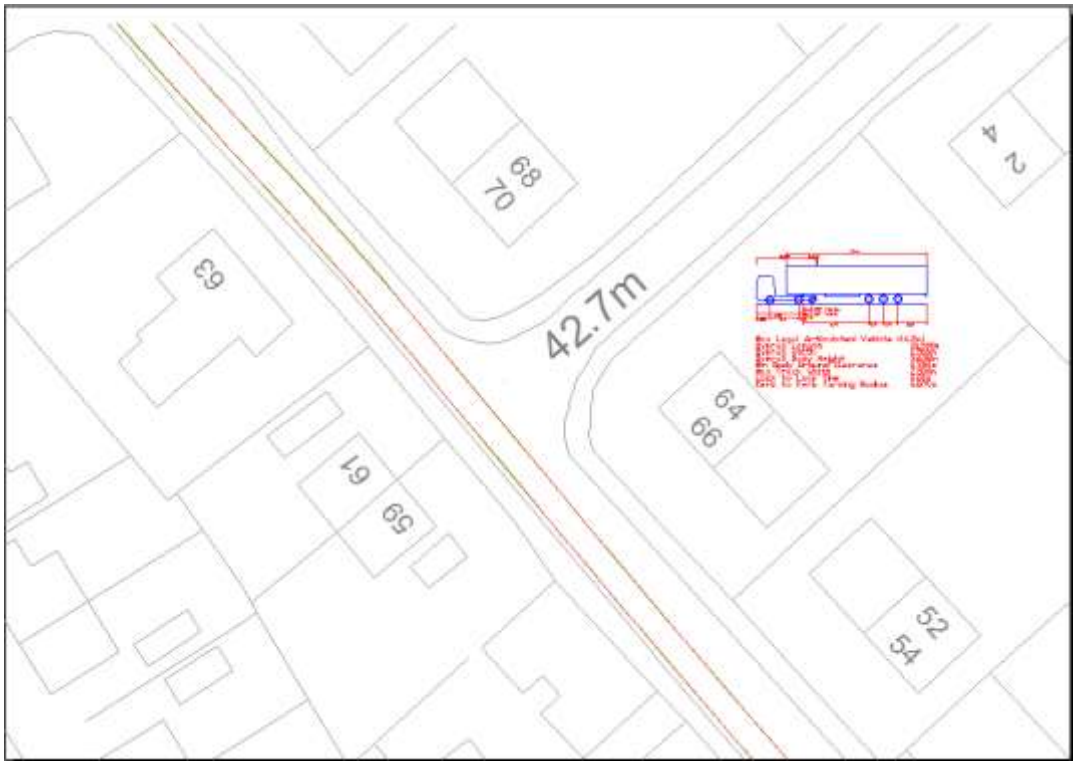
Keep Clear' yellow zig-zags and double yellow lines from High Street to a point south of Cooperage Yard.

Calder Street – Constraints and Mitigation

4.21. Horizontal and vertical geometry along this section of the route is generally considered suitable for use by the proposed delivery and construction vehicles. Localised bends in the road may require that vehicles cross the centreline of the carriageway; however, there will be no requirement for edge strengthening or to temporarily remove street furniture.

4.22. It is noted that the road is signed as 'not suitable for long vehicles', however, swept path assessment highlights that the delivery vehicle can navigate through this section of the route, as shown in Figure 9 below. However, on-street parking may cause some short term congestion, particularly between Kildale Road and Calder Drive, as the delivery and construction vehicles progress along Calder Street. Discussions with Renfrewshire Council to identify whether a temporary parking restriction on Calder Street may be of benefit to key deliveries and construction activities are recommended and will be documented within the Transportation Management / Safety Plan.

Figure 9: Calder Street Swept Path Analysis



4.23. It is anticipated that there will be drop-off/pick-up trips and parking by parents on Calder Street in the vicinity of Lochwinnoch Primary School during term-time and it is proposed that deliveries are organised to avoid these potential constraints.

Route Section – Calder Street – Site Access

4.24. From Calder Street, at Bridgend and the point where the road crosses the River Calder, an unclassified road heads north toward the site access. The delivery and construction vehicles travel

approximately on the Unclassified Road to the purpose built site access facility.

4.25. The Unclassified Road is subject to the national speed limit, is approximately 4m in width and has verges to both sides. The road provides access to a number of isolated residential properties and connects to the B786 in the vicinity of Boghead.

Unclassified Road – Constraints and Mitigation

4.26. Horizontal and vertical geometry along this section of the route is generally considered suitable for use by the proposed delivery and construction vehicles. Localised bends in the road may require that vehicles cross the centreline of the carriageway; however, there will be no requirement for edge strengthening or to temporarily remove street furniture.

4.27. The unclassified road is too narrow to establish a drop-off / crane operation point and achieve traffic flow. The proposed mitigation is to close the road during the construction period between a point to the north of Bridgend and a point to the south of Calder Glen Mill. A wider series of signing will provide advance notice of the road closure and appropriate diversion routes will be identified, to the approval of Renfrewshire Council, and detailed within the Transportation Management / Safety Plan.

4.28. Details of the site's transport arrangements are considered in the following section of this report.

5. Site Access Strategy

5.1. The site will operate with a temporary material delivery area which will be developed using the existing carriageway and suitable strengthening to the existing verges to either side of the road. Materials will predominantly lifted by crane into position within the river area, small deliveries will be deposited at the unclassified road and lifted by suitable means to the river area.

5.2. As detailed above, there is insufficient width within the existing road and verge space to allow vehicles to pass and therefore a strategy will be established by the contractor to manage vehicle access during the construction period.

5.3. In broad terms, when the crane is in place all traffic will need to return via the same route as described above. There is no room for a three-point turn and therefore all vehicles will have to reverse to a suitable point.

5.4. When there are no obstructions, construction and delivery vehicles can progress northbound and return to route via the unclassified road a right turn onto the B786 following onto Johnshill / High Street and completed by a left turn onto Church Street.

5.5. The northbound section of the Unclassified Road has been assessed for swept paths and the route is considered suitable for use by the proposed delivery and construction vehicles. As the road width is narrow, large vehicles use the majority of the carriageway and therefore traffic management will required. Initial tracking of the route highlights that there could be a requirement for edge strengthening, although it should be noted that the swept path analysis below has been undertaken on Ordnance Survey mapping and on-site checks are required to finalise the proposals.

5.6. Table 1, below, highlights the envisaged access strategy, which will be finalised in discussion with Renfrewshire Council and the contractor and detailed in the Transportation Management / Safety Plan.

Table 1: Potential Access Strategy

	Exit Route	
Vehicle Type	**No Obstruction**	**Crane / other obstruction**
Light Goods	North on unclassified road to B768 / Johnshill / High Street and Church Street.	Reverse to Bridgend and turn on bridge, returning south on Calder Street.
Medium Goods	North on unclassified road to B768 / Johnshill / High Street and Church Street.	Reverse to Spiers Road and turn in junction, returning south on Calder Street.
Heavy Goods	Reverse to Spiers Road and turn in junction, returning south on Calder Street.	Reverse to Spiers Road and turn in junction, returning south on Calder Street.
Crane	Reverse to Spiers Road and turn in junction, returning south on Calder Street.	Reverse to Spiers Road and turn in junction, returning south on Calder Street.

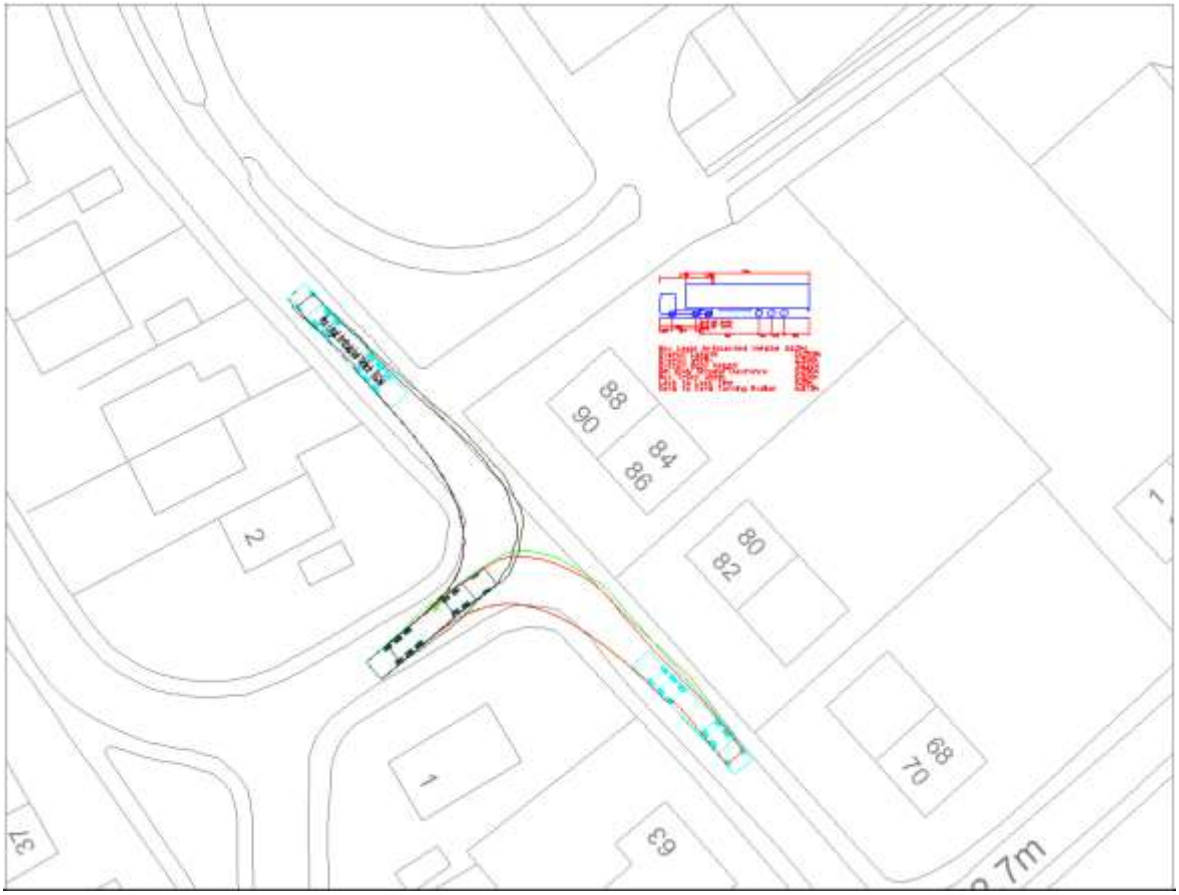
Mitigation

5.7. The obstruction of the unclassified road requires all vehicles to reverse, which is a dangerous manoeuvre increasing in risk the larger the vehicle. The exclusion of general traffic by means of road closure and the introduction of banksmen to aid the reversing vehicles would be forms of mitigation. However, the distance to the turning point is around 300m from the delivery point,

therefore careful consideration of the vehicle type and the safety of any pedestrians and the banksmen will need to be made during the setup stage and documented in the Transport Management Plan.

5.8. Strengthening to existing footways and removal of the pedestrian guardrails at the primary school will need to be considered as the transport vehicles are selected by the haulage contractor. Swept path analysis of a maximum legal articulated heavy goods vehicle is highlighted in Figure 9, below.

Figure 10: Calder Street / Spiers Road Swept Path Analysis



5.9. The above operation will also require a temporary closure of the Lochwinnoch Primary School access and Spiers Road and restriction of access to three residential properties at Bridgend. A wider plan will be required to ensure pedestrians are also excluded if the largest HGV is to be used and consultation should be undertaken with the affected frontage properties on Calder Street.

5.10. Access to the construction area is very constrained and any vehicle within the return route will block any reversing vehicles. It is proposed that a muster area with sufficient capacity to allow parking and manoeuvre large vehicles be considered by the contractor in consultation with the haulage contractor to minimise disruption to local roads.

5.11. It is noted that that should vehicles proceed northwards, that the unclassified road is narrow in many places. This study is based on Ordnance Survey mapping and further measurements would be required to finalise the appropriateness of this road to support construction and delivery vehicles. It is likely that private vehicles not associated during the construction would not be able to access the various properties whilst larger site vehicles are travelling to the B786.

5.12. It is likely that there are several sections of the unclassified road that would require some strengthening of the verges and potentially some earthworks to stabilise embankments.

5.13. The unclassified road junction with the B786 will require strengthening works to the soft verge to accommodate the construction and delivery vehicle swept paths.

5.14. In summary it is concluded that the route is generally suitable to support the proposed construction and delivery vehicles, subject to the potential mitigation below.

- Bridge loading capacity checks required for Glasgow / Largs railway, Lochal, Loch, Calder, Lade, Cloak Burn (2 locations) and Beech Burn;
- Discuss front and rear escort vehicles for several locations;
- Discuss temporary parking restrictions on Church Street in the vicinity of Lochlip Road, Church Street between Harvey Square and Main Street and Calder Street between Kildale Road and Calder Street;
- Remove pedestrian guardrail at Lochwinnoch Primary School and strengthen footways;
- Verge strengthening at site delivery point and B786 north verge (to the south of the unclassified road) and at various locations for northbound exiting including one location at the junction with the B786.
- Road closure on the unclassified road and advanced warning signage.
- Discuss site access strategy with Renfrewshire Council to agree reversing on Calder Street to Bridgend (LGV's), Spiers Road (MGV, HGV and Crane).

5.15. The crane operator and the contractor will be required to prepare a Traffic Management / Safety Plan which will detail any checks, discussions and procedures necessary to agree the proposals with Renfrewshire Council and Police Scotland.

UK and Ireland Office Locations