

PROPOSED DRAINAGE STRATEGY

122-VDG-ZZ-ZZ-RP-C-5000 RevP1

LANCASHIRE FARM EXTENSION WORKS

LITTLEBOROUGH

OL15 8BZ



CONTROL SHEET

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Report Limitation

All comments and proposals contained in this report are based on information available to VDG during recent investigations.

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GLOSSORY

Term	Definition
AP	Annual Probability is the probability of a rainfall or tidal event occurring within any one year. For example, an event of a 1 in 100 year return period has an AP of 1:100 or 1%.
Flood Defences	Artificial structures maintained to a set operational level designed to protect land and people and property from tidal and fluvial flood sources to an established chance of happening in any year threshold.
Flood Source: Fluvial (River)	When flows within watercourses exceed the capacity of the watercourse causing out of bank flows.
Flood Source: Groundwater	Groundwater flooding is usually the result of prolonged wet weather causing groundwater levels to rise sufficiently to either emerge at surface or to cause flooding of below ground infrastructure, such as basements.
Flood Source: Surface Water	When rainfall causes overland flows which exceed the capacity of the drainage network, causing flooding to land that is normally dry.
Flood Source: Tidal	When high tide events overtop the shoreline to cause flooding to land behind.
Flood Zone 1	Low Probability. Land having a less than 0.1% annual probability of river or sea flooding
Flood Zone 2	Medium Probability. Land having between a 1.0% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.
Flood Zone 3 (A)	High Probability. Land having a 1.0% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea.
Flood Zone 3 (B)	Functional Floodplain. According to the Planning Practice Guidance (2022) this zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: - land having a 3.3% or greater annual probability of flooding, with any existing floodrisk management infrastructure operating effectively; or - land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

Flood Zone Map	The Environment Agency has produced a mapping data set which covers England and provides the general extents of Flood Zones 1, 2, and 3. However the national data set available online does not differentiate between Flood Zone 3 (A) and 3 (B).
Freeboard	In flood risk management Freeboard is a term used to identify the vertical difference between the design flood level, and the design height of any flood mitigation measures. For instance, if a pond had bank heights of 9.0m and the water level was at 8.6m the freeboard would be 0.4m (9.0-8.6). For river flooding, a freeboard of 0.3m is usually applied, for tidal 0.6m, and for surface water 0.15m.
LiDAR	Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. Up to 500,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at spatial resolutions of between 25cm and 2 metres.
FWEP	Flood Warning and Emergency Plan. This is a document that should set out the steps that shall be taken by those on site, to arrive at a point safe from flood risk.
Term	Definition
Non-Major Development	'Non major development' is any development falling below the above thresholds but excluding minor development. For example, a planning application for 8 dwellings an office building creating 750 square metres of floor space, or a development with a site area of 0.4 hectares.
Major Development	Means development involving any one or more of the following: a) the winning and working of minerals or the use of land for mineral-working deposits b) waste development c) the provision of dwellinghouses where – i. the number of dwellinghouses to be provided is 10 or more; or ii. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub- paragraph (c) (i) d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or e) development carried out on a site having an area of 1 hectare or more. As defined by the Town and Country Planning (Development Management Procedure) (England) Order 2015 (Article 2) https://www.legislation.gov.uk/uksi/2015/595/article/2/made
Main River	Defined on the Main River map and relate to rivers where the Environment Agency has the powers to carry out flood defence works.

Minor Development	Minor development means: • minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not more than 250 square metres. • alterations: development that does not increase the size of buildings, e.g. alterations to external appearance. • householder development: for example, sheds, garages, games rooms etc. within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling (e.g. subdivision of houses into flats) or any other development with a purpose not incidental to the enjoyment of the dwelling. Paragraph: 051 Reference ID: 7-051-20220825 Revision date: 25 08 2022 https://www.gov.uk/guidance/flood-risk-and-coastal-change
m AOD	Metres Above Ordnance Datum
OS	Ordnance Survey
Ordinary Watercourse	A watercourse which does not form part of a Main River. Works on Ordinary Watercourses usually require consent from either the Lead Local Flood Authority or the Internal Drainage Board.
QBAR	QBAR is the mean annual maximum flow rate, for a catchment which has an equivalent return period of 1 in 2.3 years
Return Period	The return period of a flood might be 100 years; otherwise expressed as its probability of occurring being 1 in 100, or 1% in any one year. If a flood with such a return period occurs, then this does not mean the next will occur in about one hundred years' time - instead, it means that, in any given year, there is a 1% chance that it will happen, regardless of when the last similar event was. Or, put differently, it is 10 times less likely to occur than a flood with a return period of 10 years (or a probability of 10%).
SuDS	Sustainable Drainage Systems, which are designed to manage surface water flows and mimic the Greenfield runoff from an undeveloped site.
Urban Creep	Urban creep is the conversion of permeable surfaces to impermeable over time e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas.

1 INTRODUCTION

This report has been prepared by VDG Limited on behalf of Lancashire Farm Diaries Ltd to support a planning application for an extension to the current factory.

This Sustainable Drainage Statement sets out the principles of the drainage design for the proposed development and summarises the reasoning behind the chosen design. This includes justification of specific flow rates, volumes of attenuation and the level of treatment provided to run-off.

1.1 Sources of Data

In accordance with the PPS25 practice guide, the report is based on the following information:

- Site Layout Plan.
- Architectural floor plans.
- OS Explorer Series mapping.
- Site visit undertaken by VDG.
- Phase 2 SI undertaken by Ground Risk.
- Topographic survey.
- Existing Utility plans

2 LOCATION & DESCRIPTION

2.1 Site Location

The site is situated within the existing site of boundary of Lancashire Farm Dairies Littleborough and the proposed site boundary is to the north of the site extending the factory which can be seen below:

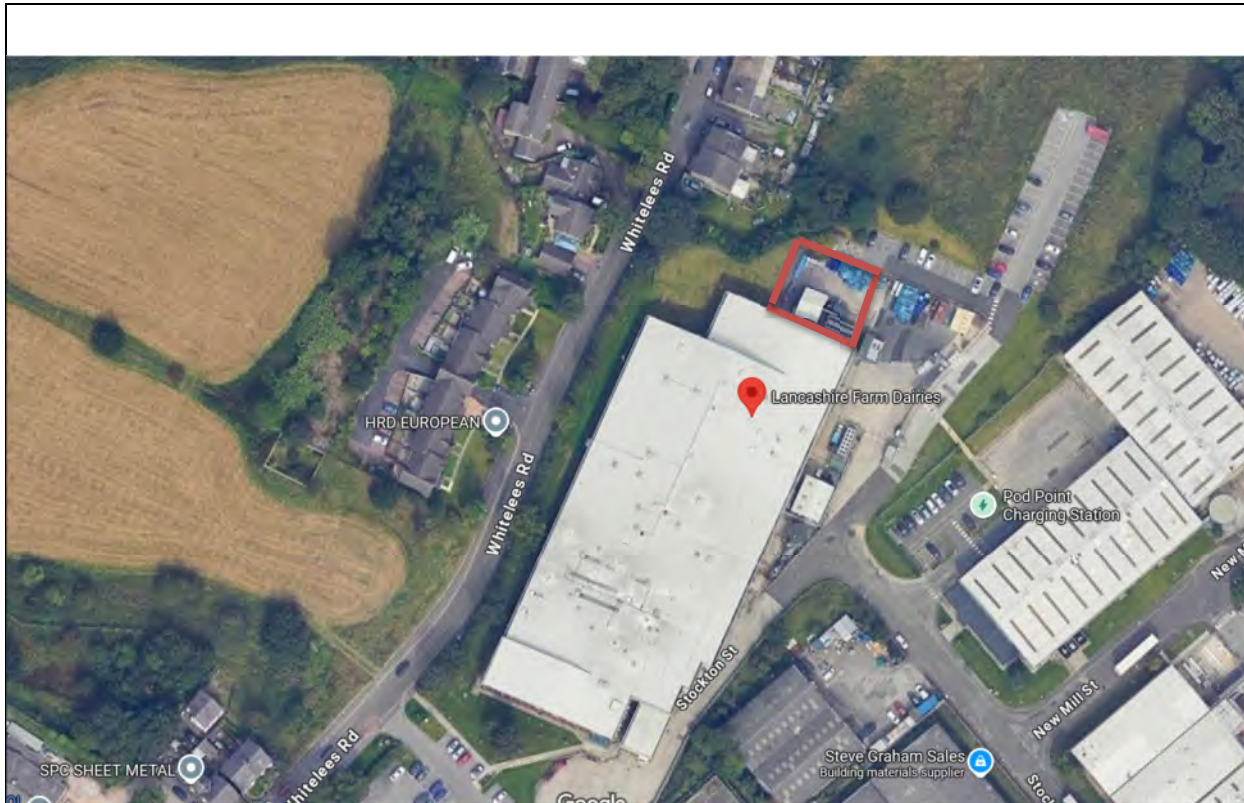


Figure 1-Site Location

2.2 Existing Development

A site location plan is included within the Appendix A within the Architect site plan.

The site is situated along Whitelee's Road which is a mix of Residential and Industrial properties in Littleborough, Rochdale. The proposal includes an extension to the Industrial unit.

The existing site boundary for the extension is approximately 533m², with approximately 533m² of impermeable areas shown in Appendix C.

The site itself is classified as Brownfield and hard surfaced being mostly impermeable, which has been previously developed.

A site summary and summary of the local agencies is found in the below table:

Site Name	Lancashire Farm Dairies
Location	Littleborough, Rochdale.
Application Site Area	0.053 ha
Development	Industrial
Lead Local Flood Authority	Rochdale Borough Council
Local Planning Authority	Rochdale Borough Council
Water Authority	United Utilities

2.3 Proposed Development

The Client plans to construct a new 523m square extension to the current warehouse to create a chiller unit for the existing factory. The proposals can be found in Appendix A.

2.4 Topography

The client has provided a topographical survey of the site, which is included in Appendix A. The survey indicates that the existing site is relatively flat.

2.5 Catchment Hydrology / Drainage

The existing site drainage records of the site can be found in (Appendix B). The drainage on site has two systems, surface water drainage which connects to the surface water sewer and a foul system which connects into the onsite effluent tank.

2.6 Ground Conditions

Ground risk has provided an SI reports with the site typically comprises made ground up to 1.30mbgl over cohesive superficial deposits of clay with Pennine lower coal measures (bedrock) at around 19m below ground level.

3 DRAINAGE REQUIREMENTS

3.1 National Planning Policy Framework Guidance

National Planning Policy Framework Guidance states 'Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer;
4. to another drainage system;
5. to a combined sewer.

Particular types of sustainable drainage systems may not be practicable in all locations.

3.2 Statutory undertaker's requirements

The statutory undertaker for the area is United Utilities, who state the following:

- Only foul sewerage will be permitted to be discharged into the public foul sewer.
- A connection agreement will be required prior to installation of the private drainage network and connection into a sewerage network.
- Surface water from new developments should not, unless there is no other option be connected to the public combined sewerage system.
- All options for SuDS must be explored prior to any application to connect to a public sewerage system.
- SuDS have the potential to be adopted.

There is no legal duty to accept highway drainage from new developments into the public sewerage system. However, in some cases highway drainage will be considered as part of the overall attenuated surface water drainage strategy.

3.3 Use of SuDS

The SuDS philosophy for any development site is the promotion of prevention and source control techniques.

It would therefore be beneficial to implement wider green space/Public Open Space area(s) in one or more locations within site, where SuDS features could be implemented. Opportunities should also be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off.

Promoting SuDS to deal with surface water at the source, will limit the required attenuation and in turn reduce the volume of surface water in the nearby watercourse. There may be the potential to utilise some SuDS features for conveyance/attenuation of surface water flows within the proposed drainage strategy measures including a pond/basin will be included to assist with the attenuation, opposed to the traditional below ground storage methods. Detailed design should confirm whether this site would be suitable for incorporation of SuDS

following more detailed analysis of levels, ground conditions and attenuation requirements.

3.4 The Non-Statutory Technical Standards for SuDS

It is best practice to develop drainage strategies to the DEFRA document 'The Non-Statutory Technical Standards for SuDS'.

The DEFRA document advises the following with respect to 'Peak Flow Control' and 'Volume Control':

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

- **S5** Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume for the development site prior to redevelopment for that event.

3.5 North West SuDS Pro-Forma

The North West SuDS Pro-forma, endorsed and recommended for use by North West Regional Flood and Coastal Committee and United Utilities has been reviewed. This document states that the capacity of SuDS must provide effective drainage for the development taking account of the likely impacts of climate change.

The lifetime expectancy of the development is 100 years. Table 2 of 'Flood risk assessments: climate change allowances' indicates the following recommendations for climate change allowance:

Maximum lifetime of the development	Climate change allowance to be applied
2050s (2040 – 2069)	40%
2070s (2070-2115)	45%
Irwell Management Catchment 1% annual exceedance event to prevent flooding offsite and to manage surface water flooding	

3.6 Site assessment for SuDS

Current policy and best practice encourage the use of SuDS and in particular, infiltration systems. SuDS techniques are not suitable for all sites; therefore, an assessment of the site is required so that SuDS limitations can be determined. Green SuDS are particularly favoured by Local Authorities.

Infiltration possibilities (local Soakaways)

Based on the geotechnical information outlined in Section 2.6 regarding local ground conditions and site constraints, initial assessments suggest that standard BRE infiltration soakaway methods may not be suitable due to the presence of clay strata. However due to the site constraints with close boundary, car parks and operations we deem local soakaways not practical.

A summary of the key points is provided below:

The table below summarises the potential for infiltration:

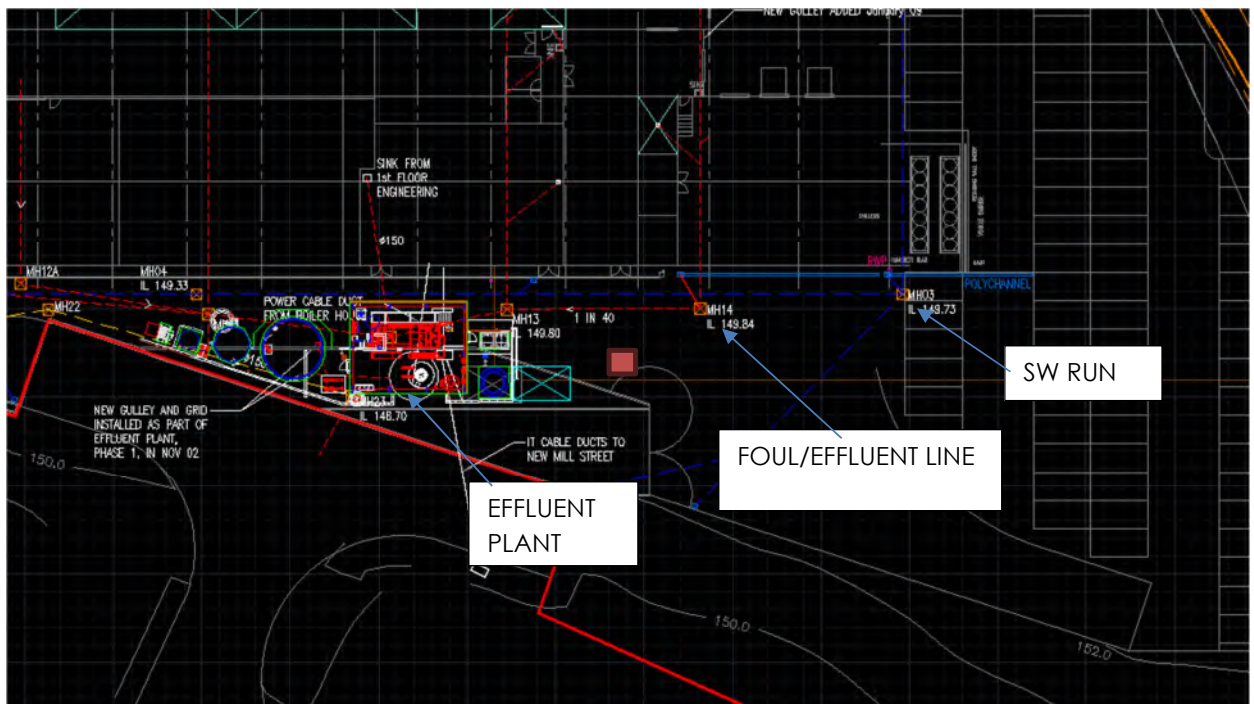
<u>Near surface infiltration potential:</u> The ground conditions suggest a low potential for infiltration near the surface, with stiff clay layers. The site location is close to boundaries which will not permit a soakaway. A soakaway below a car-park with clay strata is not recommended.	NO
<u>Deep surface infiltration(bore holes):</u> Not suitable due to intact coal seams.	NO
<u>Permeable paving-</u> Not suitable	NO

Consideration of SuDS within the constraints of a dense urban environment	
Element	Viability
Green roofs rather than standard roof construction.	Within the scope of the scheme, the use of green roofs is deemed not suitable due to the architectural design of the roofs and to reduce the overall construction costs.
Runoff harvesting in tanks for non-potable use.	N/A
Landscape irrigation and urban horticulture.	N/A
Use of permeable surfaces and/or sub-bases.	N/A
Use of bioretention systems, open water amenity features and tree pits.	N/A
Soakaway options to enable the runoff to infiltrate to the underlying sub strata	Localised direct discharge point for a soak away is not applicable due to on-site ground conditions, which show underlying clay strata with impeded drainage.
Flow control devices and attenuation measures included to store water and/or provide treatment in confined spaces.	An option is to provide a flow control and attenuation tank which outfalls to the existing surface water network on the site sewer at a restricted run off rate 10.0l/s.

4 PROPOSED DRAINAGE STRATEGY

4.1 Existing Drainage

Existing foul combined MH 14 is present which connects to the onsite effluent plant. MH03 is an existing surface water manhole and drainage line which connects to the onsite surface water drainage and outfall to the public sewer.



Drainage Adjacent to extension works



Surface water outfall on site



UU public sewer manholes in close proximity of site

4.2 Surface Water Management

The existing hardstanding site area 0.053ha has been modelled to derive the run-off rates from the existing site.

The results are as follows.

- 7.1 l/s for the 1 in 1 year event;
- 16.6 l/s for the 1 in 30 year event; and
- 21 l/s for the 1 in 100 year event.

The proposed flow rates will be improved further than the 50% betterment of the pre-development flow rates due to no positive outfall on site

To improve the brownfield run off we will restrict all storm events to the 1 in 100 year plus climate change rate to a discharge of 10.0 l/s, using a flow control hydro brake and an attenuation tank.

The flow rates currently modelled are less than the maximum recommended and therefore comply with both the SFRA and United utilities guidance.

4.3 Methods of Surface Water Managements

There are four methods that have been reviewed for the management and discharge of surface water which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed;

- Infiltration via soakaways
- Watercourse
- Surface Water Sewer

- Combined Water Sewer

The site's ground conditions, as indicated by the phase 2 SI consisting of clay strata suggest infiltration is not possible.

No water course is in close proximity of the site.

There is an existing surface water drainage on site with the intent to connect onto the line which leads to the public sewer.

Our drainage strategy focuses on limiting the discharge rate of the surface water leaving site by providing on site storage through below ground attenuation tank and a flow control to restrict the flow to 10.0l/s into the combined sewer. This flow will be more than 50% betterment of the current discharge from the existing site

Further details can be found in the Drainage strategy drawing in Appendix C.

4.4 Attenuation Requirements

The proposed restricted discharge rates outlined above and development runoff generated by proposed impermeable roof and hard standing areas results in a storage requirement during periods of intense rainfall.

The primary form of attenuation proposed for the site is through the storage provided by the cellular tank.

An infradrainage drainage model has been constructed for the entire site to ensure that below ground pipework and volumes of attenuation are sized accurately.

Infra-drainage calculations can be found in Appendix C.

4.5 Sustainable Drainage Systems

As discussed earlier in this document, infiltration-based drainage is considered unsuitable due to the nature of the ground conditions.

It is therefore proposed that non-infiltration-based Suds solutions alongside traditional drainage measures will be employed across the site, these include:

- Restricted run off.
- Silt traps & Catchpits.
- Attenuation tank

4.6 Residual Risk and Designing for Exceedance

In the event that the capacity of the attenuation is exceeded, flood water will be retained on site. The Infradrainage Model highlights for the 100 year event + 45% allowance for climate change that no exceedance occurs and all storage is within the network.

Beyond this storm event exceedance will be safely directed away from buildings and allowed to leave the site where it will follow natural flow paths. All FFL will be 150mm above external levels.

4.7 Maintenance

Requirements for ongoing maintenance of the drainage network will form part of the Operation and Maintenance manual for the site and will be undertaken by the building management. Any specialist or proprietary products that are specified at detailed design will have a manufacturer specific maintenance regime which will be included within the document.

All drainage features should be located in open areas which are accessible. All surface water arrangements outlined above are subject to detailed design.

4.8 Water Quality

In line with CIRIA Suds Manual C753, the following areas have been assigned pollution hazard levels:

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roof	Low	0.3	0.2	0.05

Pollution Hazard indices for different land use classification

We have classified the site to be low risk for the extension works as its only picking up surface water from the roof.

Catchment Pit manholes will be used to all surface water manhole to collect and debris or silt.

4.9 Management and Maintenance Plan

Based on Chapter 32 on the CIRIA report C753 The SuDS Manual and manufacturer recommendations a maintenance strategy has been outlined below.

The responsibility for maintenance will reside with the owner of the site until a facilities management company has been duly appointed which the cost will be shared between the house holders.

The development owner and planning applicants contact is stated below:

Lancashire Farm Dairies Limited

Kingsway West Business Park

Moss Bridge Road

Rochdale

Lancashire

OL16 5LX

System	Maintenance Type	Action	Frequency
General Drainage Systems: -Surface water drainage -Surface water Manhole -Gully -Channel train -Sprinkler tank drain down position -Rain water pipe connection	Routine Maintenance	Remove debris from catchment surface – any debris entering system may cause risks to performance.	Monthly or as required by inspection.
		Inspect sediment and silt accumulation rates.	Six monthly.
		Clearing catchpits.	Annually or as required by inspection.
		Clearing of drainage channels, gullies and their outlets.	Annually or as required by inspection.
	Remedial Actions	Repair pipework and manholes.	As required from inspection.
	Monitoring	CCTV survey of drainage system in full.	As required by inspection

Maintenance Frequency:General Drainage System

System	Maintenance Type	Action	Frequency
Attenuation Tank	Routine maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial actions.	Monthly for 3 months then annually.
		Remove debris from the catchment surface	Monthly
		Removal of Litter and Debris. Inspect chambers provided each end of tank for sediment, silt, oil and grease levels.	Six monthly and after every major storm event.
		Access pipe for catchpit.	As required based on inspection or following significant spill.
	Monitoring	Inspect for evidence of poor operation.	Six monthly and after every major storm event.
		Inspect sediment and silt accumulation rates and establish appropriate replacement frequencies based on usage and observations.	Monthly during initial use until a robust replacement regime can be established.

Maintenance frequency: Cellular storage tank

4.10 FOUL WATER DRAINAGE STRATEGY

It is proposed to install a new foul drainage system to serve the proposed development.

The foul water system will be designed and constructed in accordance with the current Building Regulations, BS EN:752 'Drainage and Sewer Systems Outside Buildings', the Local Authority Building Control specifications and requirements, Sewerage Sector Guidance (Appendix C) and the Civil Engineering Specification for the Water Industry.

The new foul drainage system from the washdown gulleys in the chiller is to discharge into the foul system on site which is directed to the effluent plant.

The following appliances has been taken into account:

APPLIANCE PER SITE	Total of 9 Houses
Gulley	3
SINK	12
KITCHEN SINK	7
DISHWASHER	7
WASHING MACHINE	7
BATH	4
SHOWER	4

Using Discharge Method presented in BS EN 752-4:1997

Foul Discharge from Proposed Building

Appliances	Min DU	Max DU	No Of Appli F1 - F2
Washbasin	0	0.3	
Shower	0	1.3	
Urinal	0	0.8	
Sink	0	1.3	
Bath	0	1.3	
Dishwasher	0	0.2	
Washing Machine (Household)	0	0.6	
Washing Machine (Commercial)	0.0	1.2	
WC	1.2	1.7	
Floor Drain	0	2.0	3
Min DU on Run			0
Max Du on Run			6
Total min DU			0
Total max DU			6
The typical frequency factor k_{DU} is			0.7
$Q = k_{DU} \cdot \sqrt{\sum DU}$ where Q is the wa			
Min Discharge Q			0.0
Max Discharge Q			1.7

The peak design flow discharge rate for proposed apartments is 1.7 l/s.

The proposed foul network is presented on the drainage general arrangement drawings located in Appendix C.

5 SUMMARY AND CONCLUSION

5.1 Risk Management

The proposed surface water system will be designed to incorporate SuDS principles and techniques to limit or prevent an increase in surface water discharge from the site.

For 'more vulnerable' development located within Flood Zone 1. It is typical to set the Finished Floor Levels (FFL) of dwellings to a minimum of 150mm above the existing ground levels.

5.2 Offsite Impacts

The new development does not impair the hydraulic continuity of any watercourse and the current "local hydraulics" of distributing watercourses / outfalls. The Development footprint does not cross or cover any existing or declared future catchment flood defences. Consequently, the applicant does not propose to augment or compromise the current catchment defences.

Surface water runoff will mimic better the predevelopment regime and utilises Suds solutions to satisfy the site constraints.

5.3 Residual Risk

With careful design of the drainage elements as described above there will be no residual flood related risks that will remain after the development has been completed.

Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place.

5.4 Post Planning Consents

Following Planning Consent, several Post Planning Consents may be required, which are likely to be informed by the findings of this document.

Sewer Connections

Any new sewer connection to the public sewer should be agreed with United Utilities for an indirect connection prior to starting work on site.

5.5 Drainage Strategy

To ensure the proposals do not increase flood risk to others, a principle focus of this assessment is on the appropriate management of surface water run-off in accordance with national and local planning policy.

Surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy.

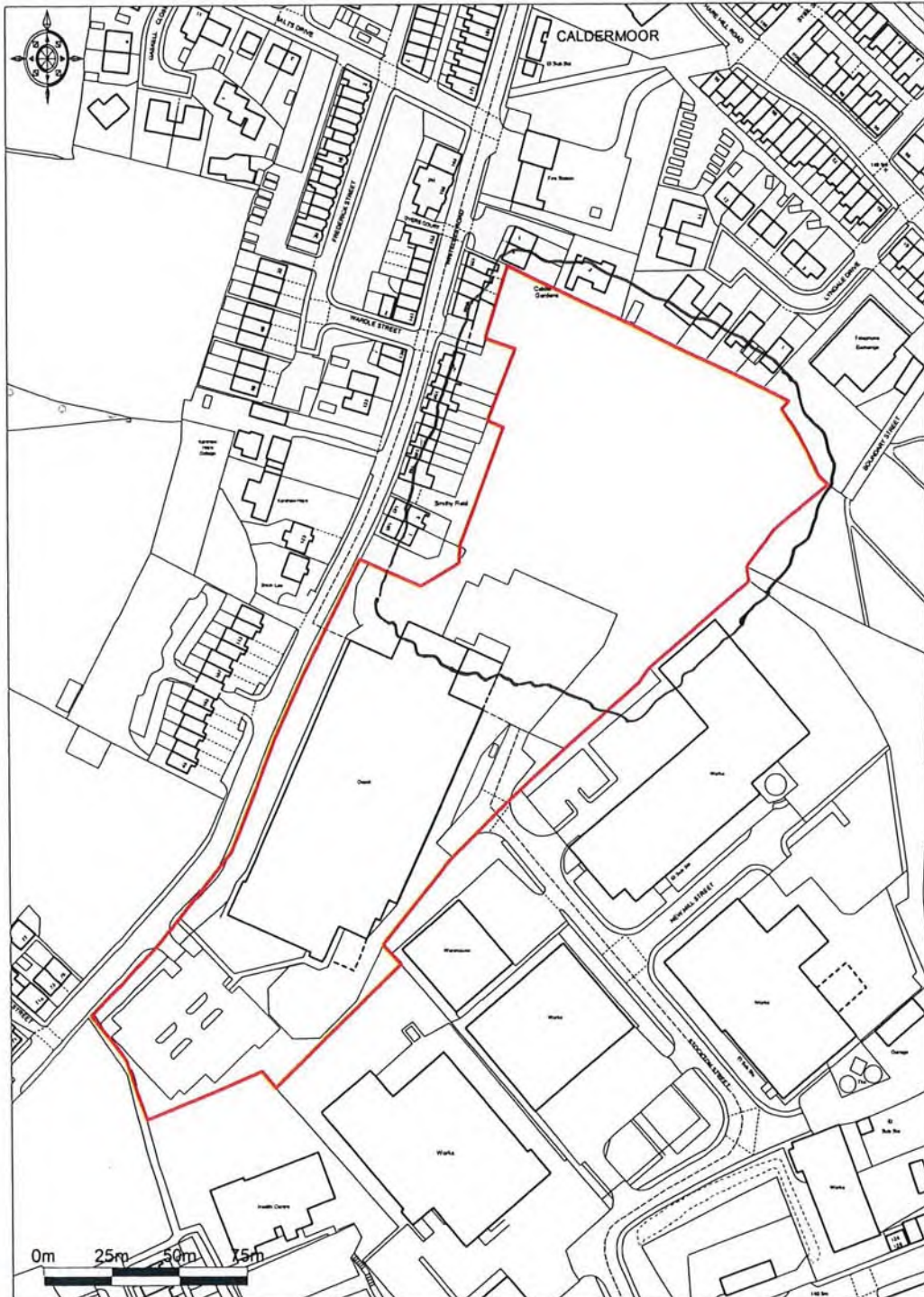
The surface water run-off generated by the proposed development is therefore proposed to mimic the existing situation and discharge surface water generated to the combined sewer.

The proposals are to restrict surface water run-off to mimic more than a 50% betterment of the brownfield run off rate.

5.6 Conclusion

1. This statement and supporting appendices demonstrate that the drainage design for the development will meet the discharge requirements of the LLFA.
2. A suds complaint scheme has been provided providing a betterment of more than 50% of the original run off rate. The surface water will be connected to the onsite surface water drain which connects into the UU Surface Water Sewer.
3. The proposed development will connect to the foul sewerage line on site which connects to the on- site effluent plant.

APPENDIX A – Architectural Drawings and Topo



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PROJECT

Lancashire Farm
Littleborough
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DRAWING TITLE

Proposed Site Plan

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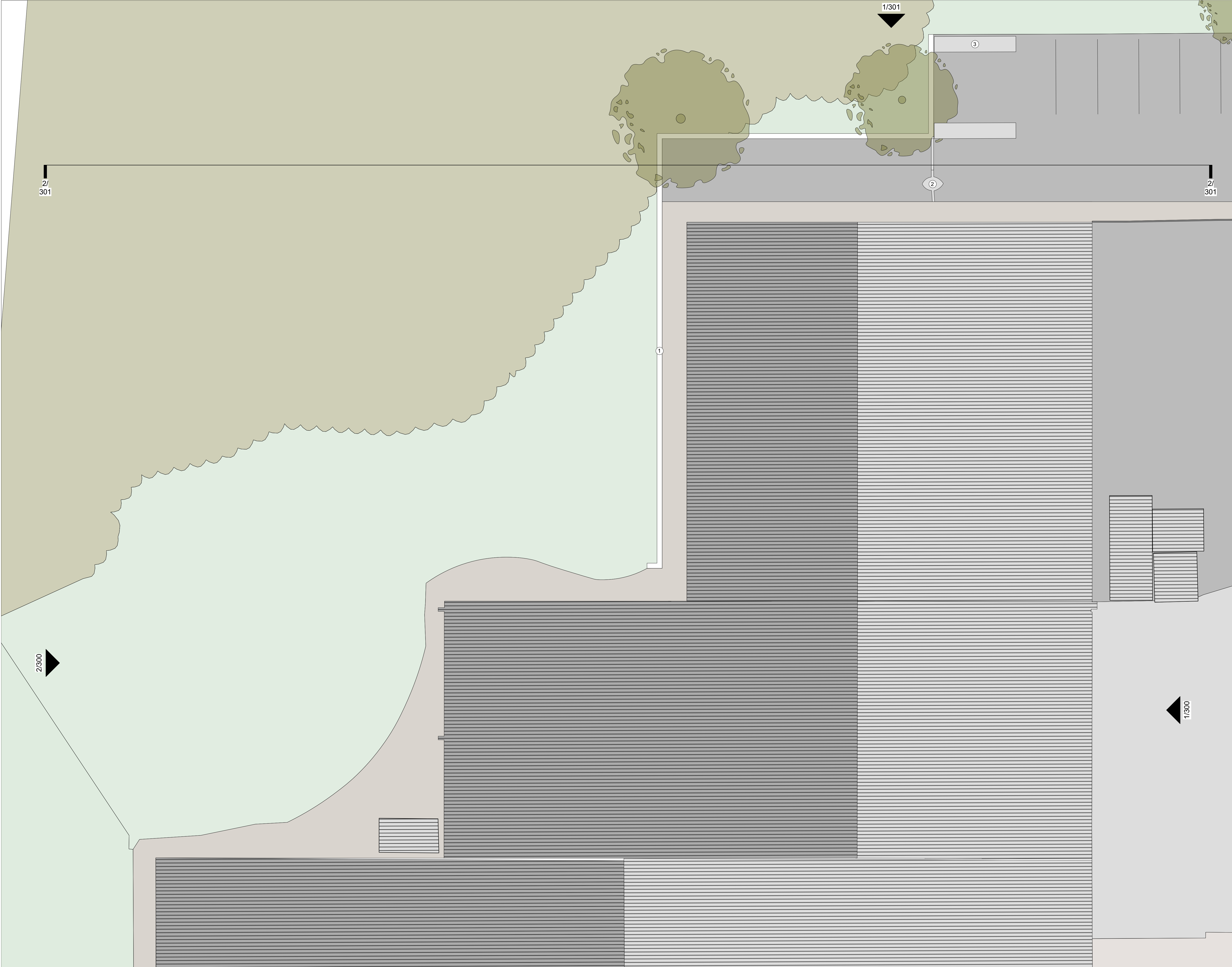
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All dimensions to be checked on site. Drawing to be read with all relevant Architectural, Interiors, Structural, M&E, Drainage/Public Health, Landscape, Civils and Interiors drawings and specifications. Any discrepancies between consultant's drawings to be reported to the Architect before any work commences. The Contractor's attention is drawn to the Health & Safety matters identified in the Health & Safety plan as being potentially hazardous. These items should not be considered as a full and final list. The Work Package Contractor's normal Health & Safety obligations still apply when undertaking constructional operations both on and off site. Define Architects take no responsibility for the location of legal boundaries indicated on this drawing and advise a separate drawing be completed by a specialist surveyor in order to establish exact boundaries. DWG files provided for information only. Refer to PDF record. The copyright of this drawing is held by Define Architects Ltd. Not to be used for any purpose without consent.

Notes

1. Proposed retaining wall

2. New pedestrian security access

3. New bike shelters

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define /

PROJECT

Lancashire Farm
Littleborough
OL15 8BZ

DRAWING TITLE

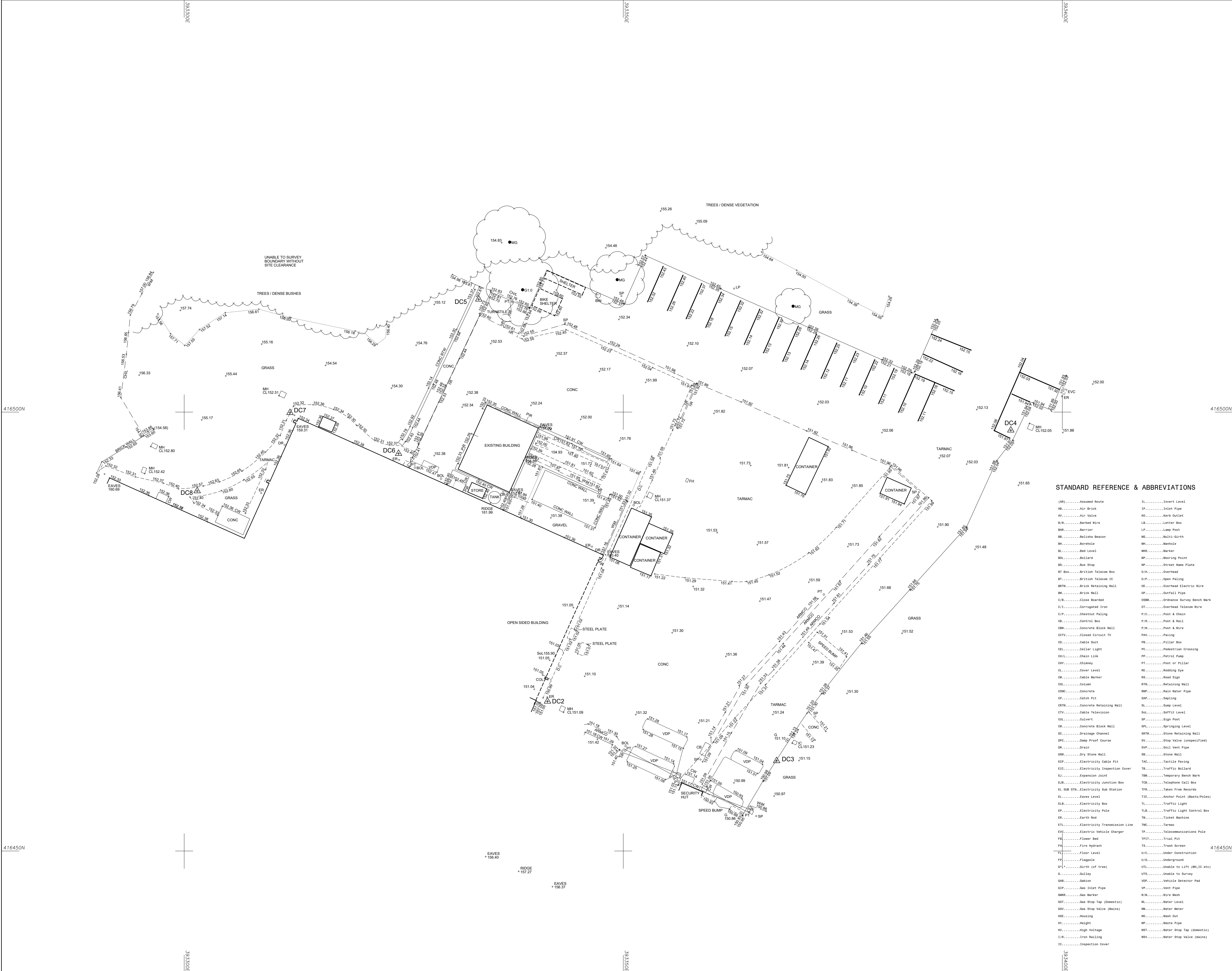
Proposed Roof Plan

REV	DATE	NOTES

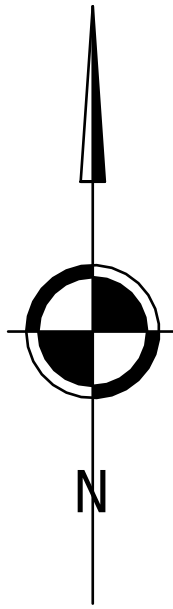
DRAWN BY	CHECKED BY
EP	GW

JOB NO.	STATUS
083	FOR INFORMATION

DRAWING NO.	REV
083_PLN_201	SKE



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Note:
The survey is plotted on a plane local
Grid. Orientation to National Grid.
All levels relate to Ordnance Datum,
achieved using the
OS National GPS Network.
Survey Control Markers established for
Mapping purposes only and should not be
used for Construction without the written
approval of Survey Operations Ltd.
Revision A- 13/06/2025:
Eaves and ridge levels added to drawing.

SURVEY STATIONS			
Home	Easting	Northing	Height
DC1	393309.42	416397.72	151.10
DC2	393341.37	416467.05	151.00
DC3	393367.46	416460.27	151.16
DC4	393394.13	416497.93	151.97
DC5	393333.54	416512.85	152.76
DC6	393324.41	416498.27	152.39
DC7	393312.05	416499.93	152.31
DC8	393301.48	416491.01	152.52

STANDARD REFERENCE & ABBREVIATIONS

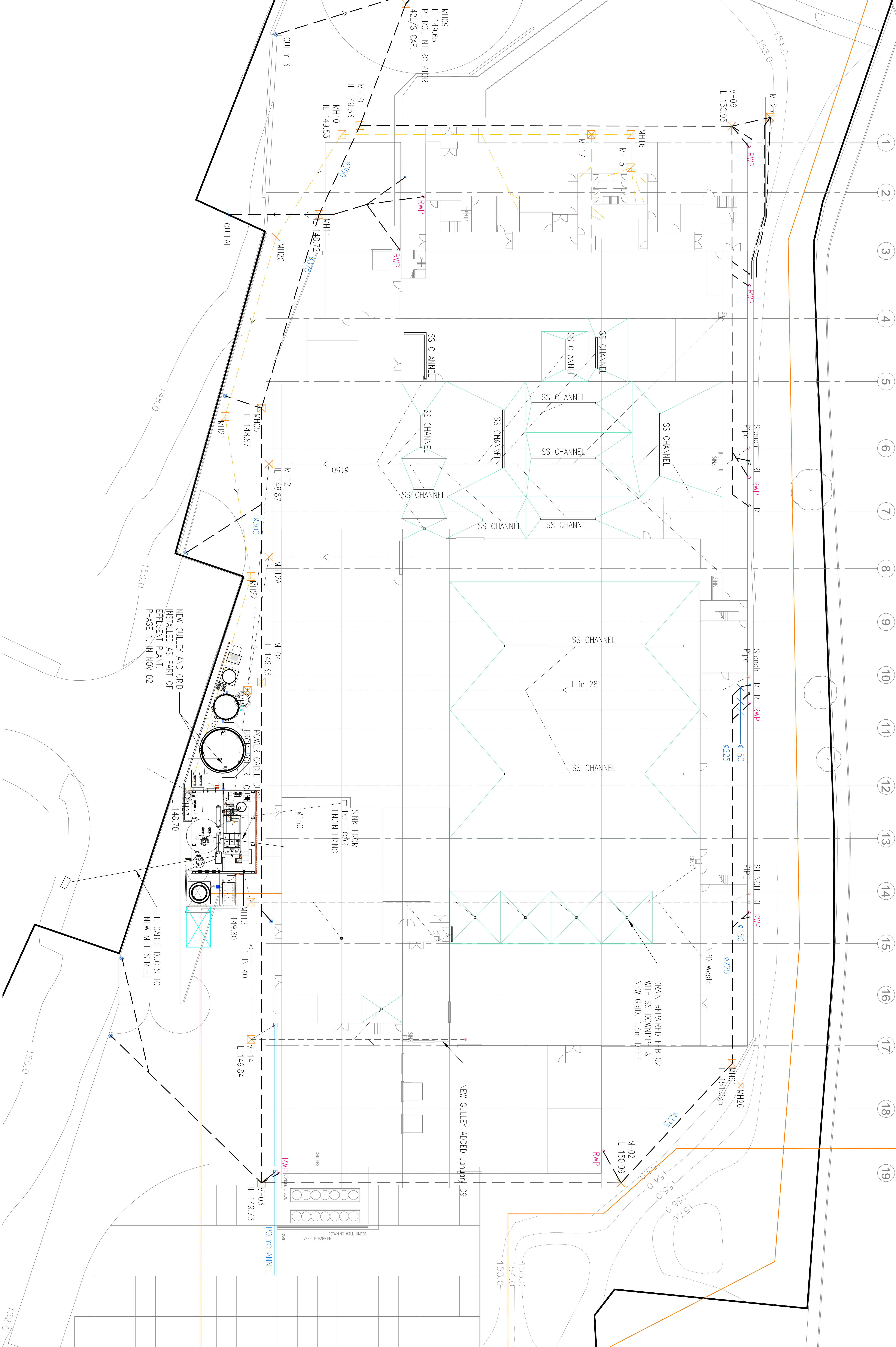
(AR).....Assumed Route	IL.....Invert Level
AB.....Air Brick	IP.....Inlet Pipe
AV.....Air Valve	KB.....Kerb Outlet
B/W.....Barbed Wire	LB.....Letter Box
BAR.....Barrier	LP.....Lamp Post
BB.....Bellish Beacon	MO.....Multi Girth
BH.....Borehole	MH.....Manhole
BL.....Bed Level	MCP.....Marker
BD.....Bollard	MP.....Moorling Point
BS.....Bus Stop	NP.....Street Name Plate
BT Box.....British Telecom Box	OH.....Overhead
BT Box.....British Telecom IC	O/P.....Open Paving
BRW.....Brick Retaining Wall	OE.....Overhead Electric Wire
BRW.....Brick Wall	OP.....Outfall Pipe
C/B.....Close Boarded	OSBM.....Ordnance Survey Bench Mark
C/I.....Corrugated Iron	OT.....Overhead Telecom Wire
C/P.....Chestnut Paving	P/C.....Post & Chain
CB.....Control Box	P/R.....Post & Rail
CBW.....Concrete Block Wall	P/W.....Post & Wire
CCTV.....Closed Circuit TV	PAY.....Paving
CD.....Cable Out	PB.....Pillar Box
CEL.....Cellar Light	PC.....Pedestrian Crossing
CH/L.....Chain Link	PP.....Petrol Pump
CHV.....Chimney	PI.....Post or Pillar
CL.....Cover Level	RE.....Rooding Eye
CM.....Cable Marker	RS.....Road Sign
CMW.....Concrete	RTW.....Retaining Wall
CP.....Catch Pit	RWP.....Rain Water Pipe
CRW.....Concrete Retaining Wall	SAP.....Sawing
CTV.....Cable Television	SL.....Sump Level
CU.....Culvert	SKL.....Soffit Level
CK.....Concrete Block Wall	SP.....Sign Post
DC.....Drainage Channel	SPL.....Springing Level
DPC.....Damp Proof Course	SRW.....Stone Retaining Wall
DR.....Dry Stone Wall	SV.....Stop Valve (unspecified)
EDP.....Electricity Cable Pit	SVP.....Sill Vent Pipe
EIC.....Electricity Inspection Cover	SW.....Stone Wall
EJ.....Expansion Joint	TAC.....Tactile Paving
EJB.....Electricity Junction Box	TB.....Traffic Bollard
EL SUB STN.....Electricity Sub Station	TBM.....Temporary Bench Mark
EL.....Eaves Level	TCL.....Telephone Call Box
ELB.....Electricity Box	TFR.....Taken From Records
EP.....Electricity Pole	TIE.....Anchor Point (Waste/Poles)
ER.....Earth Road	TL.....Traffic Light
ETL.....Electricity Transmission Line	TLM.....Traffic Light Control Box
EVC.....Electric Vehicle Charger	TM.....Ticket Machine
FB.....Flower Bed	TWC.....Tarmac
FI.....Fire Hydrant	TP.....Telecommunications Pole
FL.....Floor Level	TPIT.....Trial Pit
FP.....Flagpole	TS.....Trash Screen
G1.....Girth (of tree)	U/C.....Under Construction
G.....Gully	U/S.....Underground
GAB.....Garrison	UTL.....Unable to Lift (M,IC etc)
GIP.....Gas Inlet Pipe	UTS.....Unable to Survey
GMP.....Gas Marker	VDP.....Vehicle Detector Pad
GST.....Gas Stop Tap (Domestic)	VP.....Vent Pipe
GSV.....Gas Stop Valve (Mains)	WM.....Wire Mesh
HSE.....Housing	WL.....Water Level
HT.....Height	WM.....Water Meter
HV.....High Voltage	WO.....Wash Out
I/R.....Iron Railing	WP.....Waste Pipe
IC.....Inspection Cover	WSF.....Water Stop Tap (domestic)
	WSV.....Water Stop Valve (Mains)



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Client Phantom Construction UK Limited	
Drawing Title Topographical Survey of Land at: Whitelees Road Littleborough	
Scale(s) 1:200	Surveyor DC
Date Apr 25	Drawn OKS
Job Number 25D109	Checked TP
Sheet Size & Drg Number & Revision A1 25D109/001 A	

APPENDIX B – On site Utilities Drainage Maps



APPENDIX C – DRAINAGE STRATEGY AND CALCULATIONS



- BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
- ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
- COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
- ALL UNREFERENCED PIPES ARE TO BE 100mm DIA.
- ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SW) OR CONCRETE PIPES TO BE EN 1916 AND BS5911 PART 1.
- ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
- ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN SEWERS FOR ADOPTION 8th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
- ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
- THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
- STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
- IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUBSOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
- NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
- ALL EXISTING MANHOLE COVERS, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
- UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
- MANHOLE AND CHAMBER COVER GRADES:
 - 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
 - 'B125' IN ALL DRIVEWAYS
 - 'C250' IN PRIVATE PARKING AREAS
 - 'D400' IN CARRIAGEWAY/ACCESS ROAD

SITE SPECIFIC NOTES

- SURFACE WATER IS TO BE DISCHARGED INTO THE SURFACE WATER NETWORK AT A RESTRICTED DISCHARGE OF 10.0L/S.
- FOUL WATER SEWER IS TO BE DISCHARGED INTO THE SITE FOUL SYSTEM

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LEGEND

- SITE BOUNDARY
- CONCRETE SURROUND TO PIPEWORK
- PERVIOUS PAVING (TYPE C SYSTEM AND PERFORATED PIPES BELOW 2 BARRELS PER INDIVIDUAL DRIVEWAY 300mm OF SUBBASE)
- PROPOSED SURFACE WATER CARRIER DRAIN & MANHOLE
- PROPOSED FOUL WATER DRAIN & MANHOLE
- FOUL WATER RISER MAIN
- PROPOSED TRAPPED ROAD GULLY
- WATER BUTT
- EXTERNAL BACK DROP
- DIRECTION OF FLOW FOR SURFACE WATER FLOODING
- TREE PROTECTION FENCING
- EXISTING SURFACE WATER SEWER
- EXISTING ANGLIAN WATER SEWER
- ACO DRAINS
- PERVIOUS TARMAC (TYPE C SYSTEM AND PERFORATED PIPES BELOW 3 BARRELS PER ROAD BELOW OF SUBBASE)
- ACO CHANNEL
- GUTTER ABOVE SHOWING FLOW DIRECTION
- ACCESS CHAMBER TO COLLECT SILT FROM SUB-BASE
- CATCHPIPT MANHOLE

Rev	Date	By	Description
P1	11/08/25	PS	INITIAL ISSUE

REVISIONS

CODE	SUITABILITY DESCRIPTION
I	INFORMATION
STATUS	PURPOSE OF ISSUE
S2	INFORMATION

PROJECT

LANCASHIRE FARM,
LITTLEBOROUGH

TITLE

PROPOSED DRAINAGE LAYOUT

CLIENT

LANCASHIRE FARM,
LITTLEBOROUGH

DRAWN BY
FR

CHECKED BY
MW

DATE
11/08/25

SCALE (@ A1)
1:200

PROJECT NUMBER

DRAWING NUMBER
122-VDG-DR-XX-CI-5600

REV
P1

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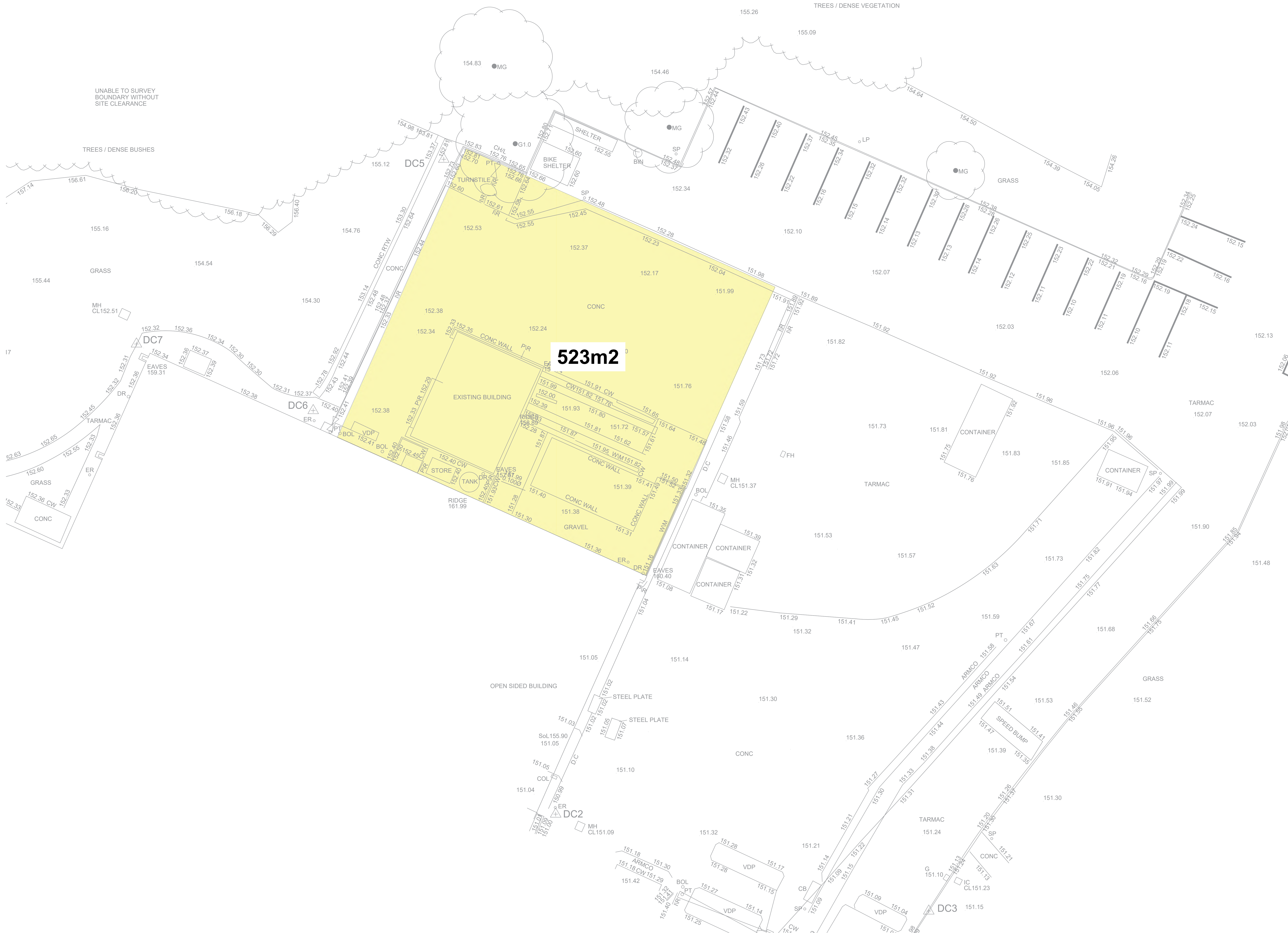
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- ALL DIMENSIONS SHOWN ARE IN METERS UNLESS NOTED OTHERWISE.

LEGEND

DRAINAGE NOTES

- NON PERMEABLE AREA=0.0523HA





DRAINAGE NOTES

- NON PERMEABLE AREA=0.0523HA

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P01	14.08.25	PS		INITIAL ISSUE
Rev	Date	By		Description

REVISIONS

CODE	SUITABILITY DESCRIPTION
S2	INFORMATION
STATUS	PURPOSE OF ISSUE
I	INFORMATION

PROJECT

LANCASHIRE FARM, LITTLEBOROUGH

TITLE

PROPOSED IMPERMEABLE SURFACE PLAN

CLIENT

LANCASHIRE FARM, LITTLEBOROUGH

DRAWN BY	CHECKED BY	DATE
FR	MW	
SCALE (@ A1)	PROJECT NUMBER	
1:200		

DRAWING NUMBER	REV
TR001 VDG XX XX DR C	5001 P01

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase (1)	Company Address:		



Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
Manhole	Manhole	89.985	153.602	151.000	0.800	150.200	Circular	0.600
Manhole (1)	Manhole	112.980	143.304	151.000	1.060	149.940	Circular	0.600
Manhole (2)	Manhole	103.804	122.944	151.370	1.640	149.730	Circular	1.200
Manhole (3)	Manhole	80.707	133.736	151.000	0.600	150.400	Circular	0.600

Name	Lock
Manhole	None
Manhole (1)	None
Manhole (2)	None
Manhole (3)	None

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Manhole	Outlet	Pipe (1)	Free Discharge
Manhole (1)	Outlet	Pipe (2)	Free Discharge
Manhole (2)	Outlet	(None)	Hydro-Brake®
	Invert Level (m)	149.730	
	Design Depth (m)	1.200	
	Design Flow (L/s)	10.0	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0135-1000-1200-1000	
Manhole (3)	Outlet	Pipe	Free Discharge

Lancashire Farm:	Date: 06/07/2022			
	Designed by: mark0	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Stormwater Controls Storm Phase: Phase (1)				



Cellular Storage

Type : Cellular Storage

Dimensions	
Exceedance Level (m)	151.000
Depth (m)	0.400
Base Level (m)	149.800
Number of Crates Long	3
Number of Crates Wide	14
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	8.780

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Connections Storm Phase: Phase (1)	Company Address:		



Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
Pipe	21.926	Pipe	109.630		0.6	225	151.000	150.400
Pipe (1)	25.195	Pipe	96.904		0.6	225	151.000	150.200
Pipe (2)	17.432	Pipe	124.513		0.6	225	151.000	149.940
Pipe (3)	5.695	Pipe	81.358		0.6	225	151.000	149.800

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock
Pipe	151.000	150.200		None
Pipe (1)	151.000	149.940		None
Pipe (2)	151.000	149.800		None
Pipe (3)	151.370	149.730		None

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase (1)	Company Address:		



1 IN 100 45%: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	1 IN 100 45%: 100 years: +45 %: 30 mins: Winter	151.000	150.200	150.713	0.513	12.1	0.145	0.000	12.1	11.660	Flood Risk
Manhole (1)	1 IN 100 45%: 100 years: +45 %: 30 mins: Winter	151.000	149.940	150.698	0.758	18.9	0.215	0.000	17.6	17.715	Surcharged
Manhole (2)	1 IN 100 45%: 100 years: +45 %: 30 mins: Winter	151.370	149.730	150.675	0.945	10.4	1.069	0.000	9.6	23.653	OK
Manhole (3)	1 IN 100 45%: 100 years: +45 %: 30 mins: Winter	151.000	150.400	150.692	0.292	5.3	0.083	0.000	5.3	5.083	Surcharged

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase (1)	Company Address:		





1 IN 30: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	1 IN 30: 30 years: +0 %: 15 mins: Winter	151.000	150.200	150.263	0.063	9.5	0.018	0.000	9.0	4.447	OK
Manhole (1)	1 IN 30: 30 years: +0 %: 15 mins: Winter	151.000	149.940	150.029	0.089	14.4	0.025	0.000	13.8	6.948	OK
Manhole (2)	1 IN 30: 30 years: +0 %: 15 mins: Winter	151.370	149.730	149.979	0.249	9.3	0.282	0.000	9.5	9.039	OK
Manhole (3)	1 IN 30: 30 years: +0 %: 15 mins: Winter	151.000	150.400	150.444	0.044	4.2	0.012	0.000	4.1	1.945	OK

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase (1)	Company Address:		



1 IN 1: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	1 IN 1: 1 years: +0 %: 15 mins: Winter	151.000	150.200	150.240	0.040	3.8	0.011	0.000	3.6	1.817	OK
Manhole (1)	1 IN 1: 1 years: +0 %: 15 mins: Winter	151.000	149.940	149.995	0.055	5.8	0.016	0.000	5.5	2.837	OK
Manhole (2)	1 IN 1: 1 years: +0 %: 15 mins: Winter	151.370	149.730	149.846	0.116	4.8	0.131	0.000	4.9	3.616	OK
Manhole (3)	1 IN 1: 1 years: +0 %: 15 mins: Winter	151.000	150.400	150.428	0.028	1.7	0.008	0.000	1.6	0.797	OK

Lancashire Farm:	Date: 06/07/2022		
	Designed by: mark0	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase (1)	Company Address:		





1 IN 100 45%: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank
By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residant Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	1 IN 100 45%: 100 years: +45 %: 30 mins: Winter	150.681	150.681	0.881	0.881	17.6	8.444	0.000	0.000	9.1	17.276	3.823	OK

Lancashire Farm:	Date: 06/07/2022			
	Designed by: mark0	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase (1)	Company Address:			



1 IN 30: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By:
Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residant Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	1 IN 30: 30 years: +0 %: 15 mins: Winter	149.981	149.981	0.181	0.181	13.8	3.624	0.000	0.000	7.8	6.613	58.725	OK

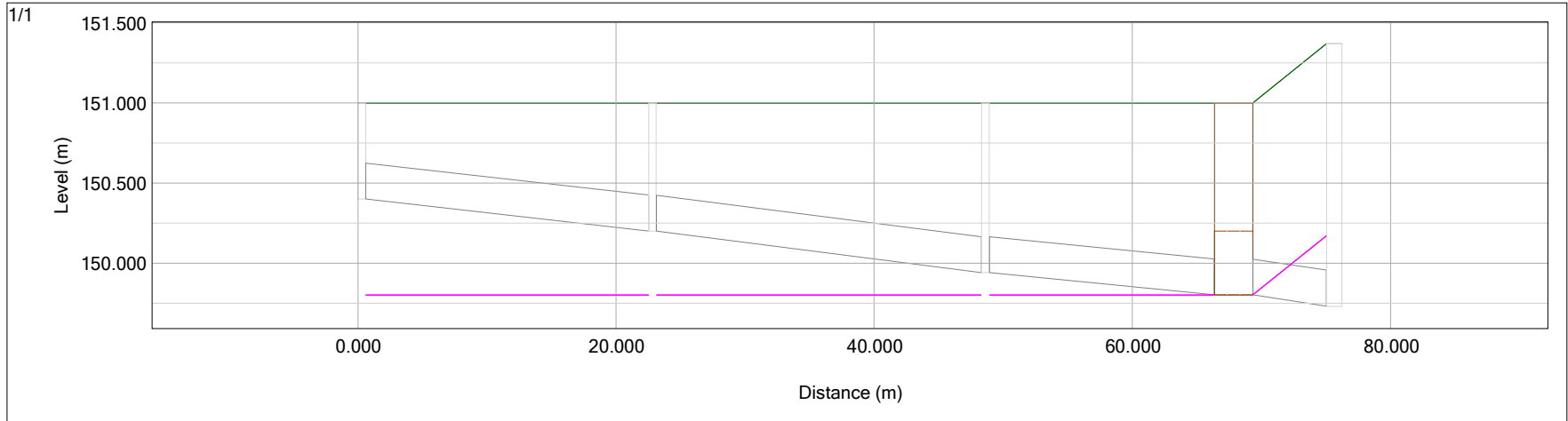
Lancashire Farm:	Date: 06/07/2022			
	Designed by: mark0	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase (1)	Company Address:			



1 IN 1: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residant Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	1 IN 1: 1 years: +0 %: 15 mins: Winter	149.852	149.852	0.052	0.052	5.5	1.035	0.000	0.000	4.2	2.636	88.208	OK

Lancashire Farm:		Company Address:	I DRN
Modified date 06/07/2022 File Calculations.iddx	Designed by mark0 Checked by		
InfoDrainage 2024.5.1			
Profile - Flow Path		Horizontal Scale 1:472, Vertical Scale 1:39	



Junction	Manhole (3)	Manhole	Manhole (1)	Manhole (2)
Type	Manhole	Manhole	Manhole	Manhole
CL (m)	151.000	151.000	151.000	151.370
IL (m)	150.400	150.200	149.940	149.730
Connection	Pipe	Pipe (1)	Pipe (2)	Pipe (3)
Type	Pipe	Pipe	Pipe	Pipe
Curved	No	No	No	No
Length (m)	21.926	25.195	17.432	5.695
Diam (mm)	225	225	225	225
Height (mm)				
U/S IL (m)	150.400	150.200	149.940	149.800
D/S IL (m)	150.200	149.940	149.800	149.730
C. Splay (mm)				
SWC				Cellular Storage
Type				Cellular Storage
EL (m)				151.000
BL (m)				149.800

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area;	Manchester
Storm duration;	D = 5 min
Return period;	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period;	r = 0.360
5-year return period rainfall of 60 minutes duration;	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming;	p _{climate} = 0 %
Factor Z1 (Wallingford procedure);	Z1 = 0.36
Rainfall for 5min storm with 5 year return period;	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure);	Z2 = 0.62
Rainfall for 5min storm with 1 year return period;	M1_5min = Z2 × M5_5min _i = 4.0 mm
Design rainfall intensity;	I _{max} = M1_5min / D = 48.0 mm/hr

Maximum surface water runoff

Catchment area;	A _{catch} = 533 m ²
Percentage of area that is impermeable;	p = 100 %
Maximum surface water runoff;	Q _{max} = A _{catch} × p × I _{max} = 7.1 l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area;	Manchester
Storm duration;	D = 5 min
Return period;	Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period;	r = 0.360
5-year return period rainfall of 60 minutes duration;	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming;	p _{climate} = 0 %
Factor Z1 (Wallingford procedure);	Z1 = 0.36
Rainfall for 5min storm with 5 year return period;	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure);	Z2 = 1.45
Rainfall for 5min storm with 30 year return period;	M30_5min = Z2 × M5_5min _i = 9.4 mm
Design rainfall intensity;	I _{max} = M30_5min / D = 112.4 mm/hr

Maximum surface water runoff

Catchment area;	A _{catch} = 533 m ²
Percentage of area that is impermeable;	p = 100 %
Maximum surface water runoff;	Q _{max} = A _{catch} × p × I _{max} = 16.6 l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area;	Manchester
Storm duration;	D = 5 min
Return period;	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period;	r = 0.360
5-year return period rainfall of 60 minutes duration;	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming;	p _{climate} = 0 %
Factor Z1 (Wallingford procedure);	Z1 = 0.36
Rainfall for 5min storm with 5 year return period;	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure);	Z2 = 1.83
Rainfall for 5min storm with 100 year return period;	M100_5min = Z2 × M5_5min _i = 11.8 mm
Design rainfall intensity;	I _{max} = M100_5min / D = 142.0 mm/hr

Maximum surface water runoff

Catchment area;	A _{catch} = 533 m ²
Percentage of area that is impermeable;	p = 100 %
Maximum surface water runoff;	Q _{max} = A _{catch} × p × I _{max} = 21.0 l/s

APPENDIX D – Ground Risk SI Report

Phantom Construction UK Ltd

Unit 2F
Jersey Street
Manchester
M4 6JG

GR000192-LR-1.0

For the Attention of Declan Rhodes,

Lancashire Dairies, Littleborough - Ground Investigation Letter Report

Ground Risk was commissioned by Phantom Construction UK Ltd to undertake a Ground Investigation at a site referred to as Lancashire Dairies, Littleborough (the "site") located at Lancashire Farm Dairies, 138 Whitelees Rd, Littleborough, OL15 8BZ. A site location plan is presented in Drawing No. GR000192-GIR-01 within Appendix A. It is understood that 2 No. discreet areas of the site are to be redeveloped, with the construction of 4 No. c.14m high milk silos towards the southwest of the site, in the vicinity of the carpark and office area, and the construction of a new extension to the northeast of the warehouse building in the vicinity of the service yard area. The proposed development is presented in Drawing No. X4-140,000 LTR and GR000192-LR-03 within Appendix A.

The site investigation was conducted between 5th and 9th May 2025. This letter report presents the factual information attained during the investigation.

Rationale and Methodology

The Littleborough area has a history of coal mining that dates back to the 16th century, and continued for c 350 years, with the main decline set during the mid to late 19th century once coal could be easily transported from the growing Lancashire and Yorkshire Coalfields. The earliest record of coal mining in Littleborough is c.1582, in the form of a lease document, with records of further leases in both the 16th and 17th centuries. Many of the earliest mines in the area accessed the coal via visible seams within the hillside, with later bell pits advanced to access coal within the area.

A review of freely available OS Maps from 1888- 1913, and 1951-1961 indicate the Site has seen little redevelopment prior to the construction of the current on-site structures. The presence of the 2 No. mine shafts shown to the west/ northwest of the site are not shown on either of these maps. No historical shafts are shown within the property boundary on mapping records; this suggests that any on-site coal mining would pre-date the earliest available records.

Based on the site's history, a ground investigation was deemed necessary to assess the ground conditions beneath the site and to inform geotechnical design. The objectives of this Site investigation were to:

- Determine the ground conditions across the Site including;
 - o The depth and nature of Made Ground, superficial drift deposits and bedrock,
 - o Any potential signs of historic unrecorded shallow coal mining beneath the site,
 - o Any potential signs or sources of contamination,
 - o Any subsurface obstructions.
- Enable the collection of soil samples for subsequent geotechnical testing; and,
- Enable in situ geotechnical testing.

It must be noted that the ground investigation works were limited to the proposed locations of the redevelopment works across the 2 No discreet areas of the wider site.

Fieldwork

The Site Phase of the Ground Investigation comprised:

- The advancement of 2 No. rotary geobore and openhole follow-on boreholes to a depth of 51m bgl for the investigation of shallow Made Ground, natural soils and bedrock and enable in situ testing.

An exploratory hole location plan is presented in Appendix A (Drawing No. GR000190-GIR-02). The exploratory hole logs are presented Appendix B.

Ground Conditions

Table 1 provides a summary of the ground conditions encountered across the site during the Ground Risk exploratory investigation.

Table 1 - Summary of Ground Conditions underlying the site.

Stratum Group	Stratum SubGroup	Depth Top m bgl	Depth base m bgl	Thickness m	Locations	Generalised Description
Surface Cover	Reworked Topsoil	GL	0.10	0.10	BH01	Grass over dark brown slightly gravelly slightly clayey fine to coarse organic SAND. Gravel is angular to subangular, fine to coarse of mixed natural lithologies, rare brick, concrete and plastic. Frequent fine rootlets throughout.
	Hardstanding	GL	0.20	0.20	BH02	Comprising a strong grey CONCRETE with 10mm reinforcement bars.
Made Ground	All Made Ground	0.10 - 0.20	1.0 – 1.8	0.8-1.7	All	Made Ground soils.
	Granular Made Ground	0.10	1.8	1.7	BH01	Grey and dark grey slightly sandy to sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick, concrete, sandstone and siltstone. Sand is fine to coarse.
	Subbase	0.2	1.0	0.8	BH02	Brownish grey to grey slightly clayey sandy locally very sandy angular to subangular fine to coarse GRAVEL of predominantly siltstone and sandstone.
Superficial Deposits	All Superficial Deposits	1.0 – 1.8	19.7 – 20.0	17.9 – 19.0	All	Natural soils.
	Cohesive Glacial Till	1.0 – 1.8	13 – 20	11.2 – 19.0	All	Firm rarely stiff brown locally mottled bluish grey, becoming reddish brown and brown slightly sandy to sandy slightly gravelly to gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of sandstone, siltstone, mudstone and coal occasional subangular cobbles of sandstone and siltstone throughout. Locally frequent sand bands were noted within BH02 from 10.45m bgl.
	Granular Glacial Till	13.0	19.7	6.7	BH01	Brown and reddish brown slightly gravelly slightly to very silty fine to coarse SAND. Gravel is subangular to subrounded, fine to medium of sandstone and siltstone. Occasional thin bands of very clayey sand (<55mm). Rare thin black interlaminae throughout.
Bedrock	All Bedrock	19.7 – 20	51.0	31.0 – 31.30	All	Pennine Lower Coal Measure Formation – Base not proven in any location.
	Weathered Pennine Lower Coal	19.7	21.0	1.30	BH01	Grey to dark grey SILTSTONE. Recovered as slightly sandy to sandy clayey to very clayey gravel. Gravel is angular to subangular, fine to

Stratum Group	Stratum SubGroup	Depth Top m bgl	Depth base m bgl	Thickness m	Locations	Generalised Description
	Measures Formation					coarse predominantly interlocking fragments of siltstone and mudstone within a clay matrix. Completely weathered.
	Pennine Lower Coal Measures Formation	20 – 21	51.0 Base Not Proven	31.0 – 31.3 Base Not Proven	All	Weak to moderately weak dark grey clayey SILTSTONE with frequent dark grey silty MUDSTONE. Moderately locally highly weathered. Occasional to frequent thin bands of very strong greyish brown iron-rich siltstone throughout overlying dark grey siltstone and light grey mudstone to a depth of 51m bgl. An intact coal seam was encountered at BH01 only, from 35.00 - 36.20m bgl.

Groundwater Observations

The findings of the ground investigation indicate that shallow perched groundwater is localised within granular Made Ground at approximately 0.80m bgl - 1.60mbgl, it is also noted that saturated sand bands were reported on Drillers logs within the Granular Glacial Till.

Table 2 - Groundwater seepage and strike summary.

Location ID	Depth of Groundwater (m bgl)	Elevation of Groundwater (m AOD)	Nature of Groundwater	Notable Changes Level	Groundwater Bearing Strata
BH01	1.60m		Perched	N/A	Granular MG
BH02	0.80m		Perched	N/A	Subbase

Obstructions

No obstructions were encountered during the investigation works; however, given the redeveloped nature of the site the presence of relic foundations or floor slabs cannot be discounted.

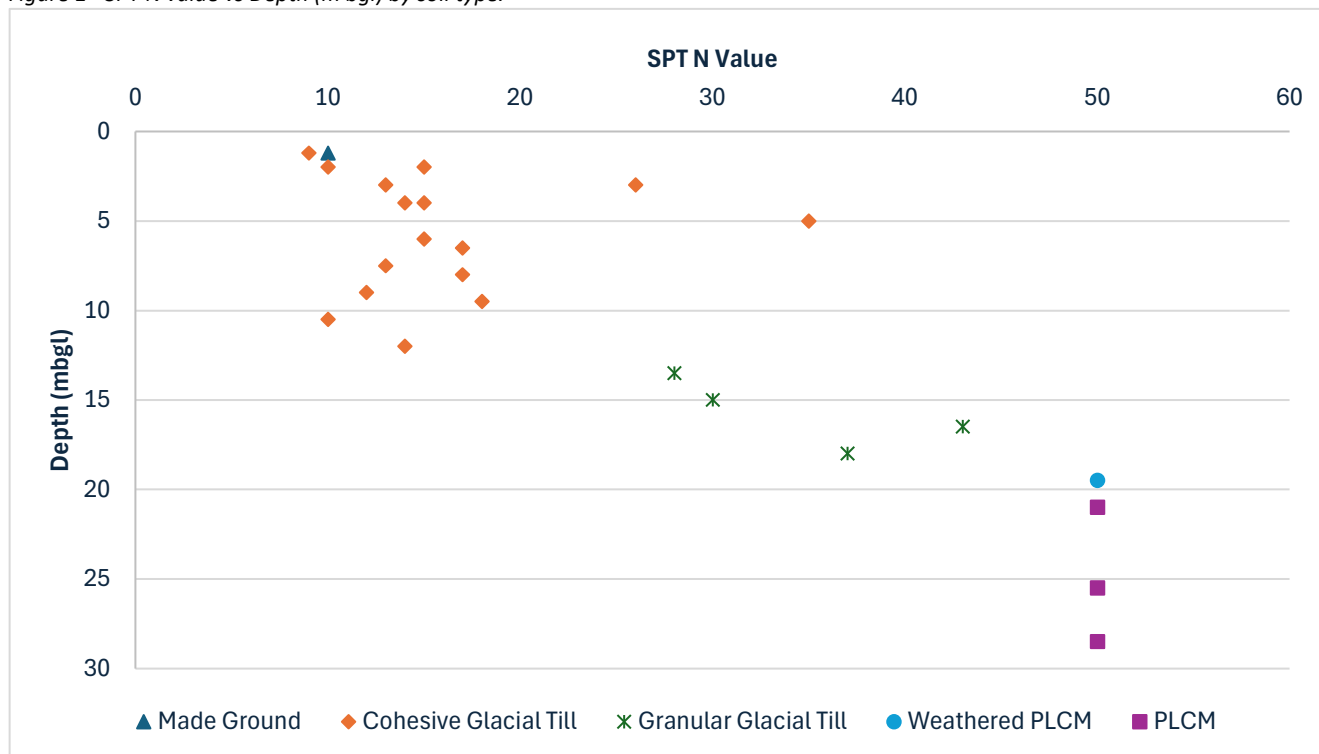
Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was encountered during the investigation works.

In Situ Geotechnical Testing

Standard penetration Tests (SPTs) were undertaken at borehole locations. Figure 1 illustrates the SPT N values by depth

Figure 1 - SPT N value vs Depth (m bgl) by soil type.



Material Properties

Geotechnical laboratory testing was scheduled for soil samples recovered from across the site, with vertical and lateral spread, targeting the various soils populations encountered. Table -3 - Geotechnical Properties of Cohesive Till Deposits **Table -3 Error! Reference source not found.** to Table 6 summarise the geotechnical properties of the various soil populations encountered across the investigation areas. At the time of writing, the results of geotechnical laboratory analysis are awaited, the results of which will form part of the Grand Investigation Report.

It is considered that Made Ground soils are not a suitable founding stratum for the proposed development.

Table -3 - Geotechnical Properties of Cohesive Till Deposits

Property	No. Results	Direct Value Range	Derived Value Range	Mean Value	Remarks
SPT N	16	9 - 35		16	
Shear Strength (Cu)	16		38 - 145	66	SPT N Value multiplied by 4.2 (from Stroud) based on a conservative plasticity index >40.

Table -4 - Geotechnical Properties of Granular Till

Property	No. Results	Direct Value Range	Derived Value Range	Mean Value	Remarks
SPT N	4	28 - 43		35	
Phi Angle (°)	4		35 - 39	37	

Table 5 Geotechnical Properties of Weathered Bedrock

Property	No. Results	Direct Value Range	Derived Value Range	Mean Value	Remarks
SPT N	1	50	67		
Phi Angle (°)	1		41		

Table 6 Geotechnical Properties of PLCM Formation

Property	No. Results	Direct Value Range	Derived Value Range	Mean Value	Remarks
SPT N	3	50 (for 20 to 50mm)			It is not reasonable to extrapolate values based on limited penetration achieved.

Proposed New Silos - Foundations

It is understood that an area to the southwest of the site, in the vicinity of the office area and main carpark is to be redeveloped with the construction of a total of 4 No. c.14m tall milk silos, which will be emplaced on a concrete pad c.11m x 10m. It is understood that when fully laden, each of the milk silos will have a mass of approximately 155t, giving a combined mass of approximately 620t when fully laden.

Given the presence of sloping ground and change in level between the site and the surrounding land to the south, it is considered that a slope stability assessment is undertaken, given the associated loads of the proposed development.

The design of foundations for the proposed new silos is complex, given that the foundations will need to be designed to account for variable loading, including but not limited to vertical loading, cyclical loading, differential loading, horizontal loading and impact/ transient loads, each of which brings a unique set of challenges.

Ground conditions within this area of the site were found to comprise Made Ground from ground level to 1.80m bgl, overlying cohesive Glacial Till to a depth of 13.0m bgl, overlying Granular Glacial Till to a depth of 19.70m bgl. Bedrock of the Pennine Lower Coal Measures Formation was recorded from 19.70m bgl as a c.1.30m weathered horizon, overlying weak to moderately weak dark grey clayey SILTSTONE with frequent dark grey silty MUDSTONE and occasional to frequent thin bands of very strong greyish brown iron-rich siltstone throughout.

A preliminary conservative allowable bearing capacity of 75kN/m² has been derived for the cohesive Glacial Till.

Given that the proposed design for the silos incorporates a concrete pad, it is considered that this pad should be designed to be incorporated as a piled raft foundation, given the ground conditions encountered, and the likely loads associated with the proposed development.

It is considered that precast driven piles may be a viable solution advanced to engineering rockhead; however, the presence of nearby buildings and sloping ground in the vicinity of the proposed development may preclude their use. If the implementation of precast driven piles is not deemed appropriate, then cased CFA piles will likely be a suitable alternative, given the presence of granular Glacial soils at depth; however, confirmation of this will be presented within the Coal Mining Risk Assessment and Ground Investigation Report.

Proposed Warehouse Extension - Foundations and Floor Slabs

It is understood the area to the northeast of the site, in the vicinity of the service yard is to be redeveloped, with an extension constructed to the existing warehouse building.

At the time of writing, no design information has been presented to Ground Risk; however, an extension to a warehouse building is likely to incorporate relatively low loads, when compared to the construction of the new milk silos.

Ground conditions in this area of the site were found to comprise predominantly cohesive Glacial Till deposits from 1.00m bgl to c.20m bgl, with varying proportions of sand lenses throughout. Given the relatively low loads anticipated for the proposed new warehouse extension, it is considered that pad foundations set in to the firm underlying Glacial Till will be a suitable founding stratum. A preliminary conservative allowable bearing capacity of 75kN/m² has been derived for the cohesive Glacial Till.

Given the proposed development, it is considered that a ground bearing floor slab will likely be the most suitable solution.



Ground Aggressivity

Soil chemistry tests to determine the potential for aggressive ground were performed on 8 No. samples of soil and bedrock recovered during the GI. At the time of writing, the results of this testing are awaited and will form part of the Ground Investigation Report.

Closing Statement and Contact

I trust this information suits your current requirements; please do not hesitate to contact me if you require any further information in the meantime.

Kind Regards,



Callum Jones MSc, BSc (Hons)

callum.jones@groundrisks.co.uk

Appendices

Appendix A – Site Plans and Drawings

Appendix B – Exploratory Hole Logs

Limitations

For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive; further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and require advice from legal professionals.

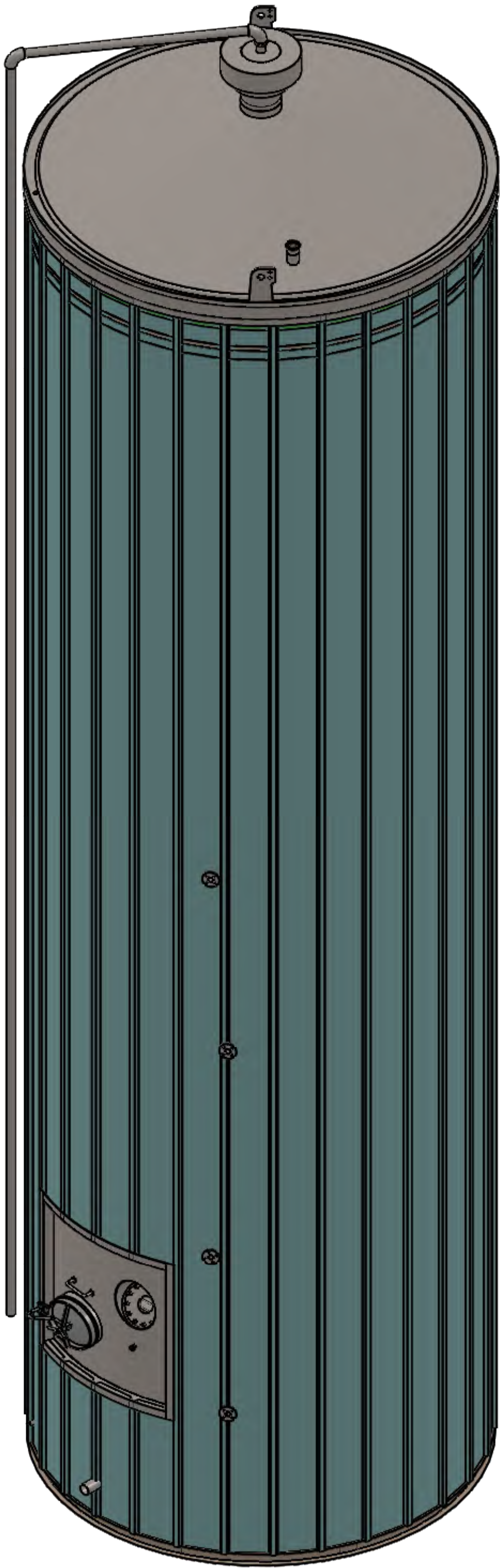
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APPENDIX A – SITE PLANS AND DRAWINGS

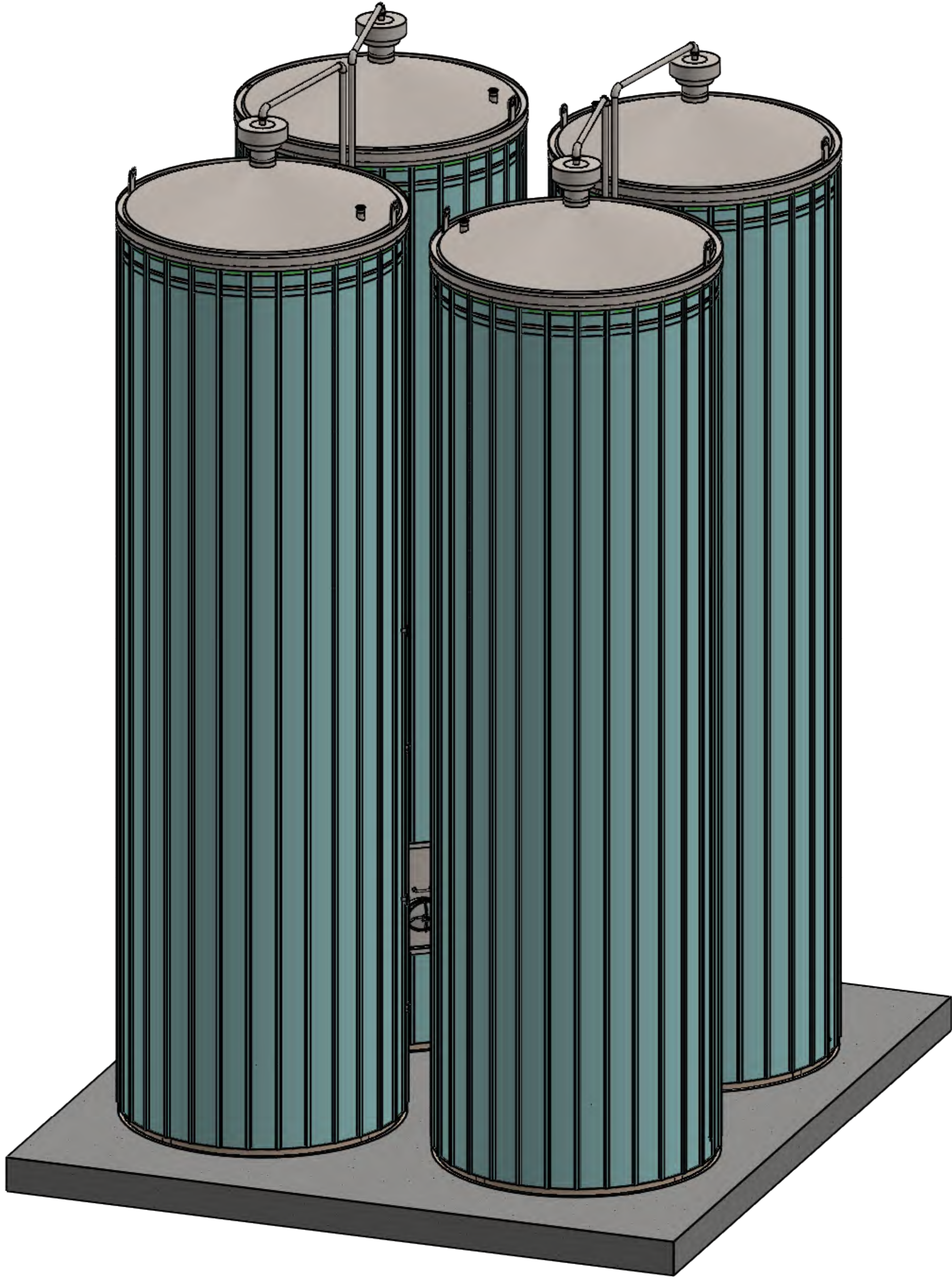
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ISOMETRIC VIEW SILO



SITE ASSEMBLY MODEL



PENDING CUSTOMER APPROVAL

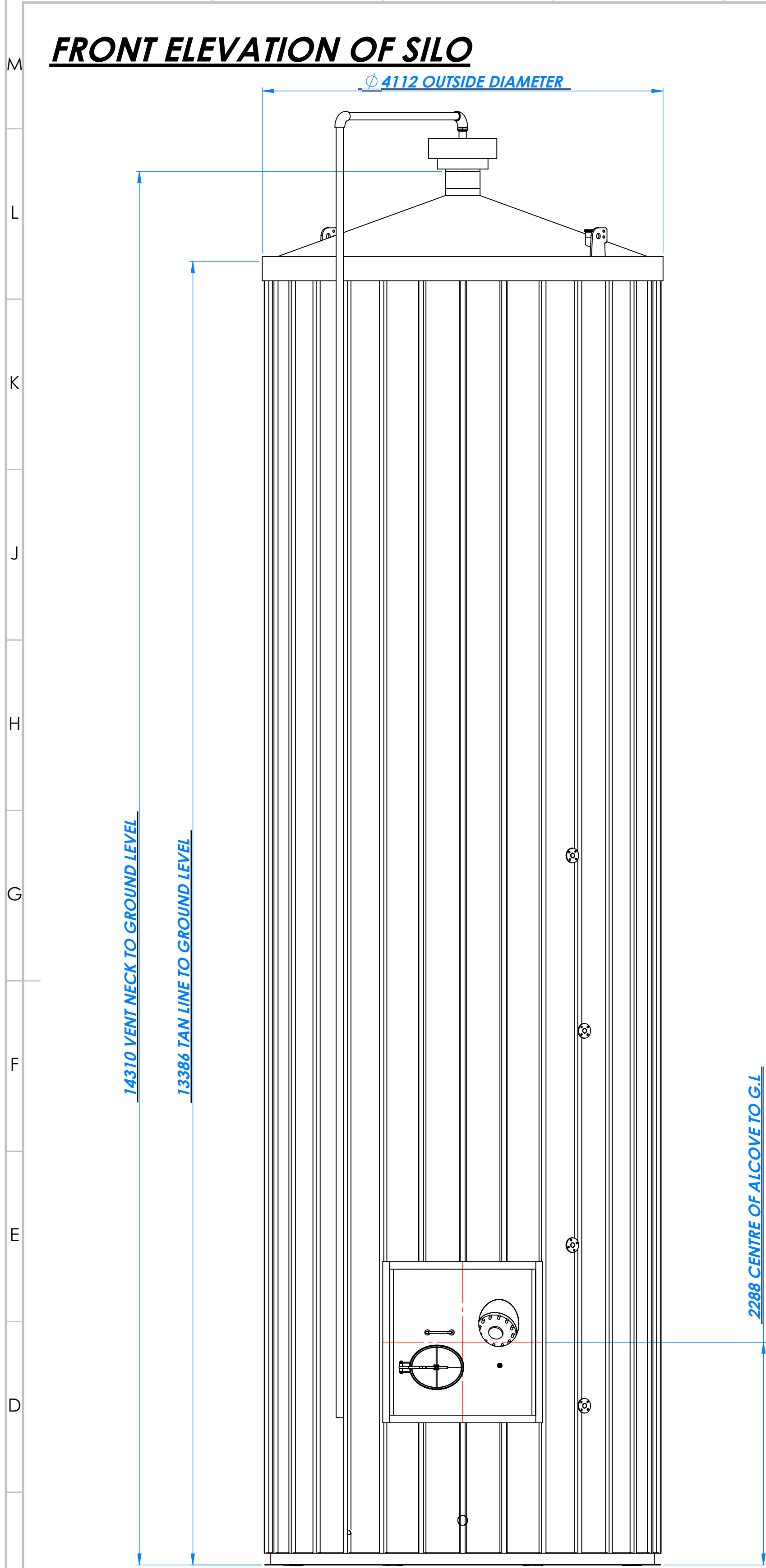
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PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT	
DESIGN CODE : SEP REF ASME 8 DIV 1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP °	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED	
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED	
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:					
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDIUM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										

2				
1				
0				
ISSUE NO:	MODIFICATION	DRAWN	CHK,D	DATE
TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C				
DRAWN : DS	SCALE : NTS			
CHECKED :				
SHEET NO : 1	JOB NO : 11857			

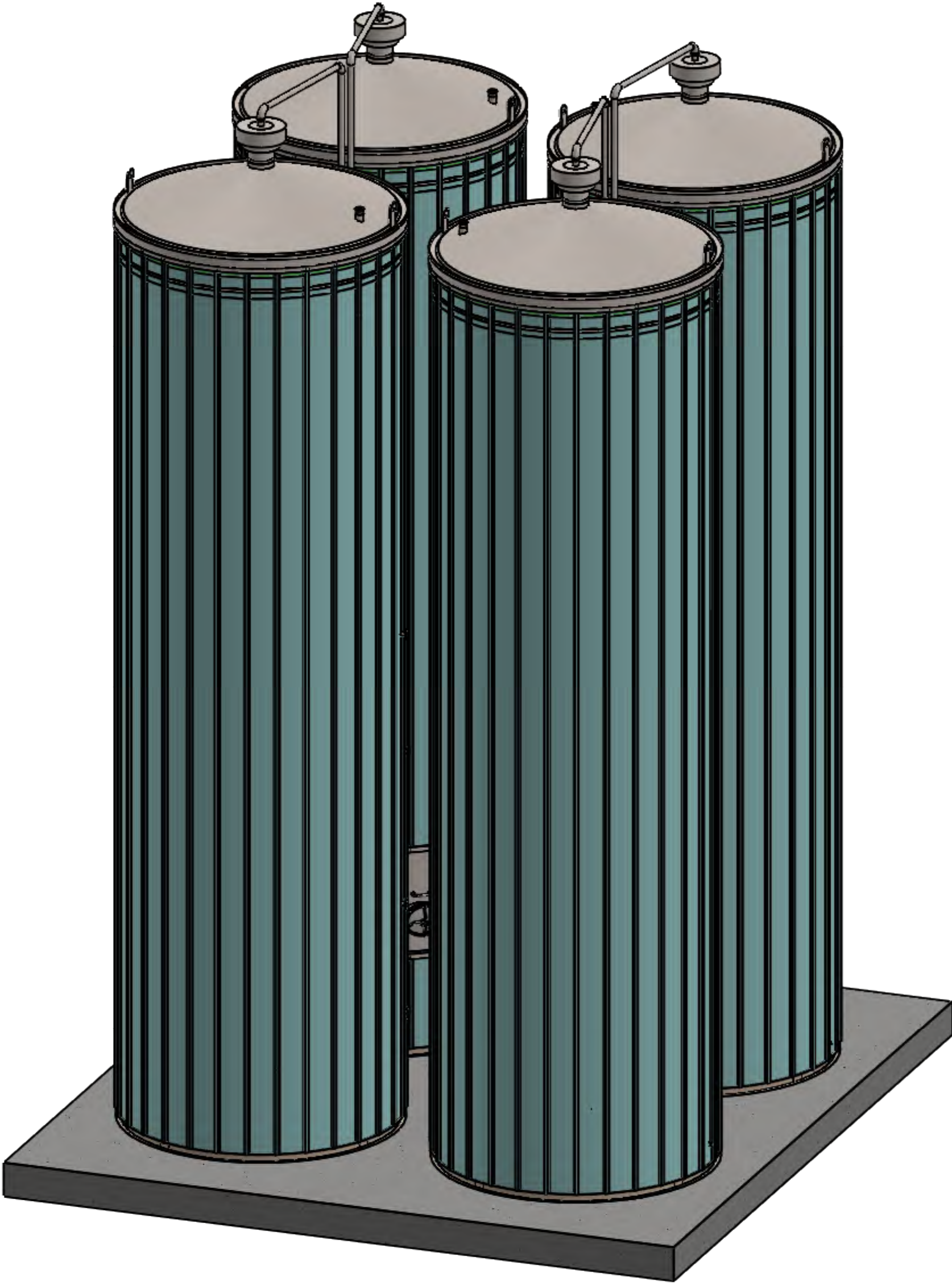
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FRONT ELEVATION OF SILO

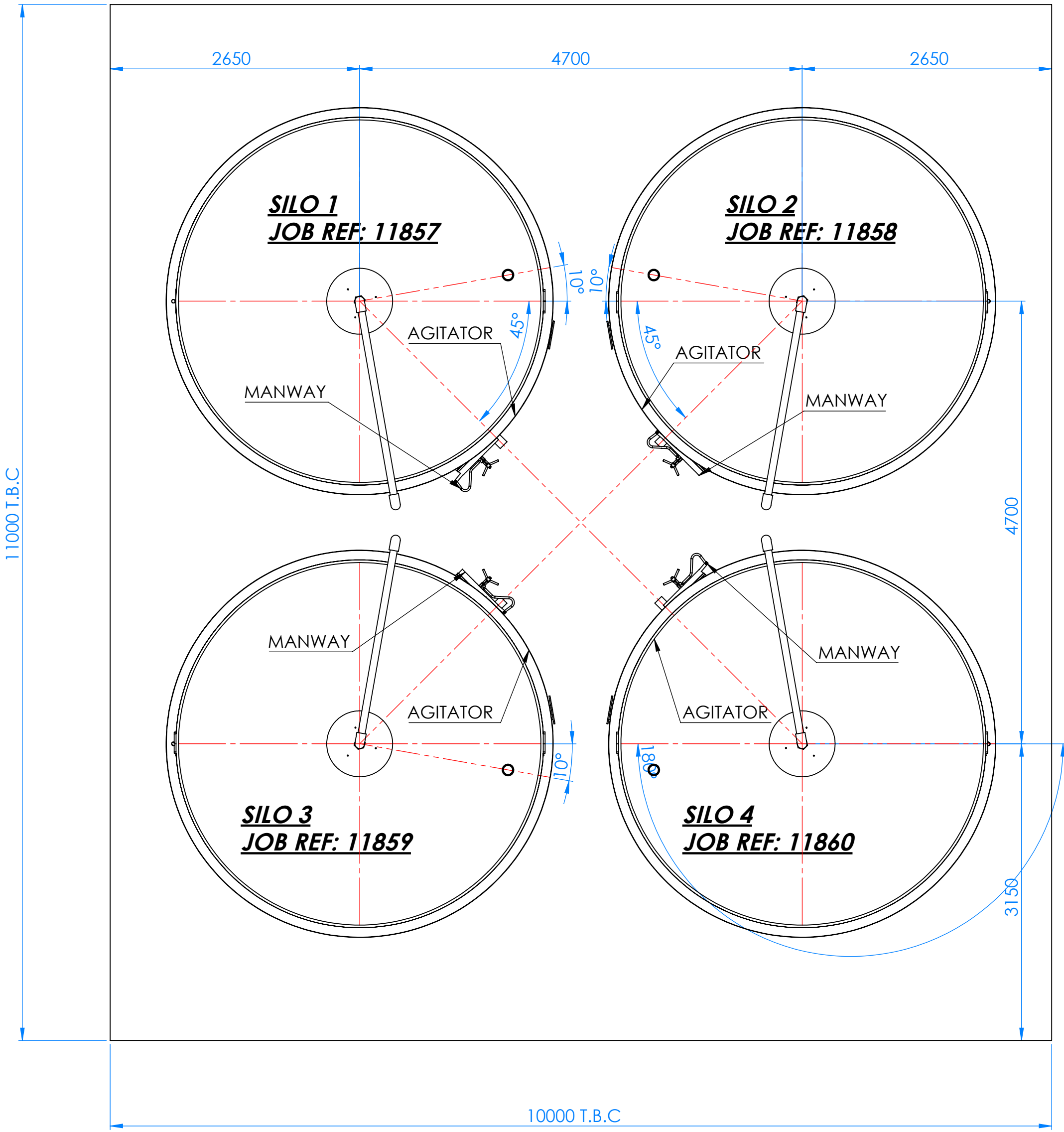


SITE ASSEMBLY MODEL



OVERALL SILO DIMENSIONS - SITE LAYOUT

PLAN VIEW SITE LAYOUT



PENDING CUSTOMER APPROVAL

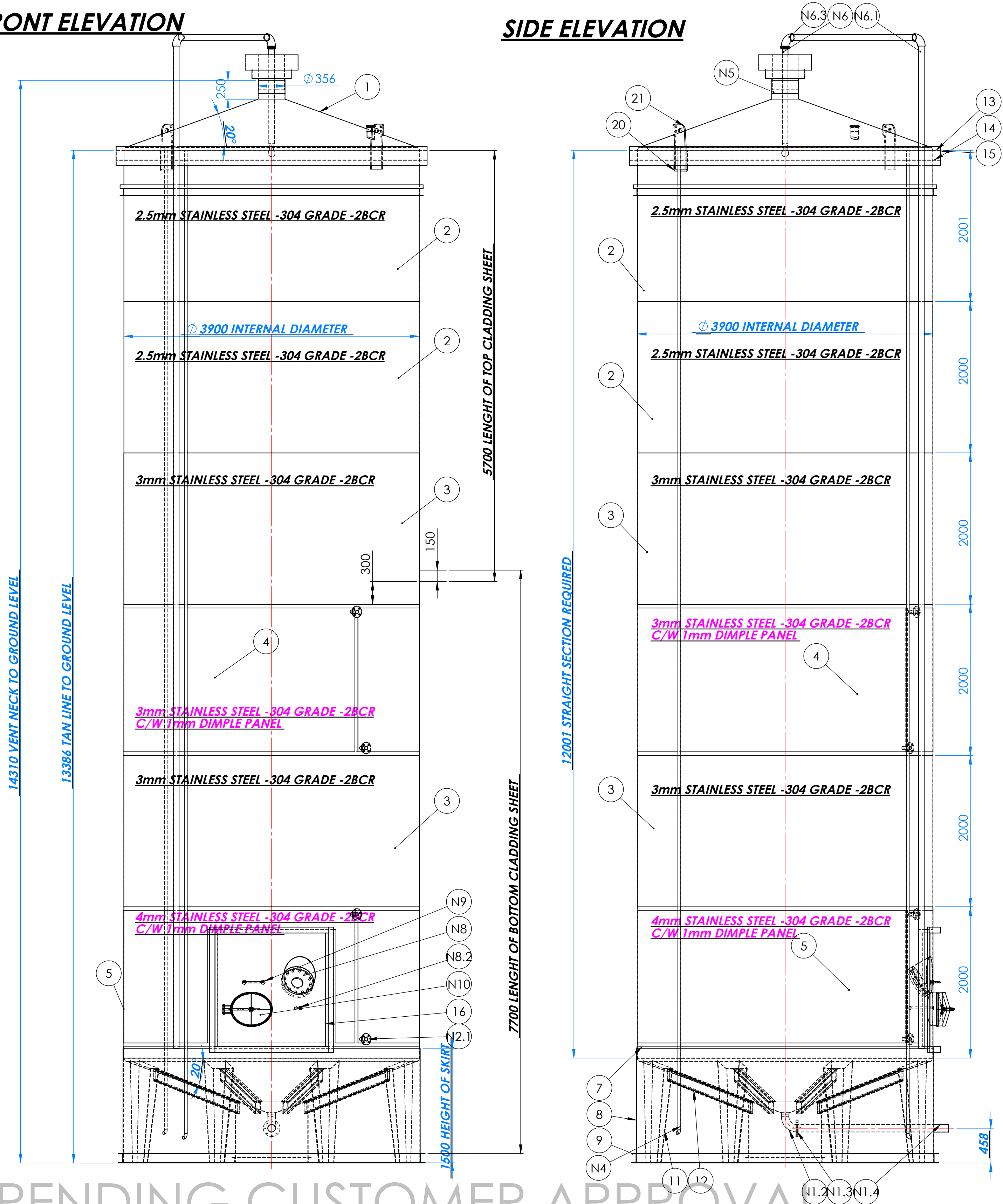
GENERAL SPECIFICATION			DESIGN DATA / CAPACITY			PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION			SURFACE PREPERATION			
PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :			SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT		
DESIGN CODE : SEP REF ASME 8 DIV 1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP °	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED		
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED		
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:						
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDUIM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :						
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO											

2				
1				
0				
ISSUE NO:	MODIFICATION	DRAWN	CHK,D	DATE
TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C				
DRAWN : DS	SCALE : NTS			
CHECKED :				
SHEET NO : 2	JOB NO : 11857			

SILO FABRICATION DRAWING - NON CLADDED

FRONT ELEVATION

SIDE ELEVATION



ITEM NO.	PART	QTY.	Pipe Size	Type	DESCRIPTION	THICKNESS	Material	Finish
1	ROOF	1			3mm STAINLESS STEEL - CONICAL	3MM	304L STAINLESS STEEL	2B COLD ROLLED
2	SHELL SECTION 1	2			2.5mm STAINLESS STEEL -2M COIL	2.5MM	304L STAINLESS STEEL	2B COLD ROLLED
3	SHELL SECTION 2	2			3mm STAINLESS STEEL COIL -2m	3MM	304L STAINLESS STEEL	2B COLD ROLLED
4	SHELL SECTION C/W PANEL	1			3mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	3MM	304L STAINLESS STEEL	2B COLD ROLLED
5	BASE SHELL SECTION	1			4mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	4MM	304L STAINLESS STEEL	2B COLD ROLLED
6	BASE	1			5mm STAINLESS STEEL - CONICAL	5MM	304L STAINLESS STEEL	2B COLD ROLLED
7	SKIRT PATCH PLATE	1			4mm STAINLESS STEEL	4MM	304L STAINLESS STEEL	2B COLD ROLLED
8	SUPPORT SKIRT	1			6mm MILD STEEL -SBP	6MM	MILD STEEL	
9	BASE SUPPORT CHANNEL	1			5"X21/2" MILD STEEL CHANNEL -SBP		MILD STEEL	
10	INNER SUPPORT RING	1			6mm MILD STEEL -SPB C/W 3"X1.5" CHANNEL		MILD STEEL	
11	SUPPORT LEG	8			6mm MILD STEEL FOLDED LEG	6MM	MILD STEEL	
12	BASE CHANNEL SUPPORTS	8			6"X3" MILD STEEL CHANNEL C/W 4MM P/P		MILD STEEL	
13	UPPER TOP LIP SEGMENT	1			3mm STAINLESS STEEL	3MM	304L STAINLESS STEEL	2B COLD ROLLED
14	LOWER TOP LIP SEGMENT	1			6mm STAINLESS STEEL	6MM	304L STAINLESS STEEL	2B COLD ROLLED
15	TOP LIP OUTSIDE BAND	1			3mm STAINLESS STEEL	3MM	304L STAINLESS STEEL	2B COLD ROLLED
16	ALCOVE	1			3mm STAINLESS STEEL	3MM	304L STAINLESS STEEL	2B COLD ROLLED
17	VENT PART 3	1	14"	SCH10	3mm STAINLESS STEEL		304L STAINLESS STEEL	
18	VENT PART 2	1	14"	SCH10	3mm STAINLESS STEEL		304L STAINLESS STEEL	
19	VENT PART 1	1	14"	SCH10	3mm STAINLESS STEEL		304L STAINLESS STEEL	
20	LIFTING LUG PATCH PLATE	2			4mm STAINLESS STEEL -2BCR	4MM	304L STAINLESS STEEL	2B COLD ROLLED
21	LIFTING LUG	1			20mm STAINLESS STEEL		304L STAINLESS STEEL	HOT ROLLED
22	LIFTING LUG	1			20mm STAINLESS STEEL		304L STAINLESS STEEL	HOT ROLLED
23	CLADDING SUPPORT RING	1			4"X2" MILD STEEL CHANNEL -SBP		MILD STEEL	
24	INSULATION	1			50MM ROCKWOOL INSULATION			
25	PROFILE CLADDING	1			R32 PROFILE CLADDING - COLOUR T.B.C			
45	4" Welding Male	1	4"	DAIRY	4" Welding Male Part RJT 316		316L STAINLESS STEEL	

ITEM NUM	PART	QTY.	Pipe Size	Type	DESCRIPTION	THICKNESS	Material	FILE NAME
N1	OUTLET PIPE BASE	1	31/2"	SCH10	31/2" SCH10 PIPE		304L STAINLESS STEEL	0001227
N1.2	31/2" SCH10 ELBOW	1	31/2"	SCH10	31/2" SCH10 ELBOW		304L STAINLESS STEEL	0001230
N1.3	4" FLANGE CONNECTION	2	4"	DAIRY	4" FLANGE - SUIT DAIRY PIPE		304L STAINLESS STEEL	0001229
N1.4	OUTLET PIPE	1	4"	DAIRY	4" DAIRY PIPE FINISH PLAIN END		304L STAINLESS STEEL	0001232
N2	JACKET CONNECTION	4	11/2"	SCH10	11/2" SCH 10 PIPE		304L STAINLESS STEEL	0001233
N2.1	11/2" FLANGE CONNECTION	4	11/2"	SCH10	11/2" TABLE E FFSO FLANGE		304L STAINLESS STEEL	0001291
N3	DRAIN PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW		304L STAINLESS STEEL	0001240
N4	CONDUIT PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW		304L STAINLESS STEEL	0001247
N5	VENT NECK	1	14"	SCH10	14" SCH10 PIPE		304L STAINLESS STEEL	0001248
N6	CIP PIPE	1	3"	DAIRY	3" CIP LINE C/W 90 DIA SPRAY BALL		304L STAINLESS STEEL	0001252
N6.1	3" DROP DOWN PIPE	1	3"	DAIRY	3" DAIRY PIPE - FINISH PLAIN END		304L STAINLESS STEEL	0001253
N6.2	3" RJT Union	1	3"	DAIRY	3" RJT Union DAIRY	3"	316L STAINLESS STEEL	0000459
N6.3	3" 90 Elbow	2	3"	DAIRY	3" 90 Elbow 1.5D 304	2MM	304L STAINLESS STEEL	0000416
N7	FILTER CONNECTION	1	4"	DAIRY	4" DAIRY PIPE		304L STAINLESS STEEL	0001264
N8	AGITATOR FLANGE -COWL	1			25mm STAINLESS STEEL FLANGE C/W 4mm COWL		304L STAINLESS STEEL	0001265
N8.1	AGITATOR CIP	1	1"	DAIRY	1" DAIRY PIPE C/W 40 DIA SPRAY BALL		304L STAINLESS STEEL	0001266
N8.2	1" Welding Male	1	1"	DAIRY	1" Welding Male Part RJT 316		316L STAINLESS STEEL	0000432
N9	GRAB HANDLE	1	1"	DAIRY	1" DAIRY PIPE		304L STAINLESS STEEL	0001267
N10	SIDE ENTRY MANWAY	1			LAVEGGI A15 MANWAY		304L STAINLESS STEEL	A15.4PR02
N7.1	4" Welding Male	1	4"	DAIRY	4" Welding Male Part RJT 316		316L STAINLESS STEEL	0003357

PENDING CUSTOMER APPROVAL

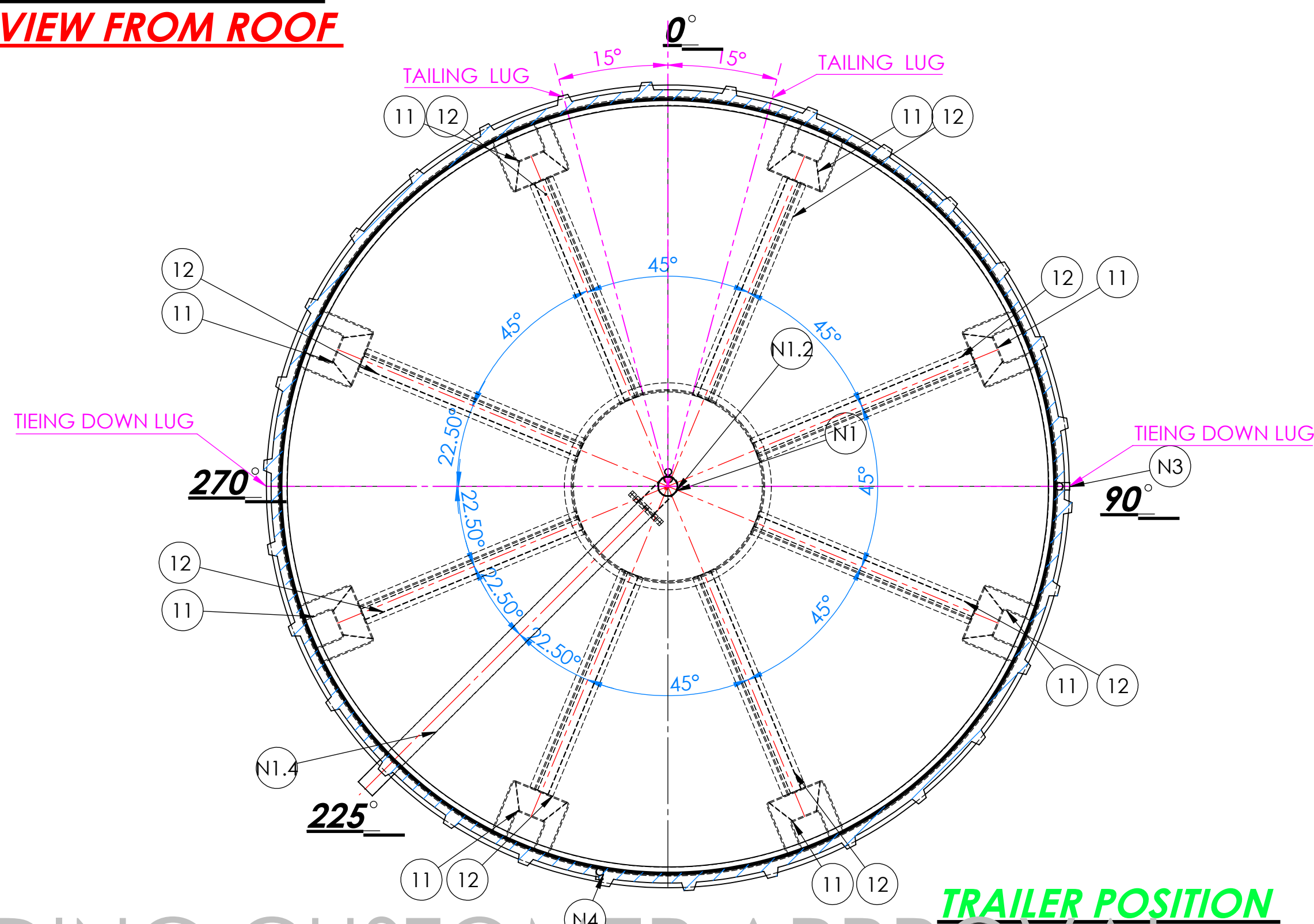
GENERAL SPECIFICATION			DESIGN DATA / CAPACITY			PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION		SURFACE PREPARATION			
PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT	
DESIGN CODE : SEP REF ASME 8 DIV 1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP *	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED	
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED	
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:					
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDIUM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										

2					
1					
0					
ISSUE NO:	MODIFICATION		DRAWN	CHK,D	DATE
TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C					
DRAWN : DS		SCALE : NTS			
CHECKED :					
SHEET NO : 3		JOB NO : 11857			
		 Blackwater <i>Excellence in Stainless Steel Since 1968</i>			

SILO FABRICATION DRAWING - NON CLADDED

[illegible]

NOTE: VIEW FROM ROOF LEVEL



TRAILER POSITION

ITEM NO.	PART	QTY.	PIPE SIZE	TYPE	DESCRIPTION	MATERIAL	FINISH
1	ROOF	1			3mm STAINLESS STEEL - CONICAL	304L STAINLESS STEEL	2B COLD ROLLED
2	SHELL SECTION 1	2			2.5mm STAINLESS STEEL -2M COIL	304L STAINLESS STEEL	2B COLD ROLLED
3	SHELL SECTION 2	2			3mm STAINLESS STEEL COIL -2m	304L STAINLESS STEEL	2B COLD ROLLED
4	SHELL SECTION C/W PANEL	1			3mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	304L STAINLESS STEEL	2B COLD ROLLED
5	BASE SHELL SECTION	1			4mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	304L STAINLESS STEEL	2B COLD ROLLED
6	BASE	1			5mm STAINLESS STEEL - CONICAL	304L STAINLESS STEEL	2B COLD ROLLED
7	SKIRT PATCH PLATE	1			4mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
8	SUPPORT SKIRT	1			6mm MILD STEEL -SBP	MILD STEEL	
9	BASE SUPPORT CHANNEL	1			5"X21/2" MILD STEEL CHANNEL -SBP	MILD STEEL	
10	INNER SUPPORT RING	1			6mm MILD STEEL -SPB C/W 3"X1.5" CHANNEL	MILD STEEL	
11	SUPPORT LEG	8			6mm MILD STEEL FOLDED LEG	MILD STEEL	
12	BASE CHANNEL SUPPORTS	8			6"X3" MILD STEEL CHANNEL C/W 4MM P/P	MILD STEEL	
13	UPPER TOP LIP SEGMENT	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
14	LOWER TOP LIP SEGMENT	1			6mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
15	TOP LIP OUTSIDE BAND	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
16	ALCOVE	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
17	VENT PART 3	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
18	VENT PART 2	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
19	VENT PART 1	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
20	LIFTING LUG PATCH PLATE	3			4mm STAINLESS STEEL -2BCR	304L STAINLESS STEEL	2B COLD ROLLED
21	LIFTING LUG	1			20mm STAINLESS STEEL	304L STAINLESS STEEL	HOT ROLLED
22	LIFTING LUG	1			20mm STAINLESS STEEL	304L STAINLESS STEEL	HOT ROLLED

ITEM NUM	PART	QTY.	PIPE SIZE	TYPE	DESCRIPTION	MATERIAL
N1	OUTLET PIPE BASE	1	31/2"	SCH10	31/2" SCH10 PIPE	304L STAINLESS STEEL
N1.2	31/2" SCH10 ELBOW	1	31/2"	SCH10	31/2" SCH10 ELBOW	304L STAINLESS STEEL
N1.3	4" FLANGE CONNECTION	2	4"	DAIRY	4" FLANGE - SUIT DAIRY PIPE	304L STAINLESS STEEL
N1.4	OUTLET PIPE	1	4"	DAIRY	4" DAIRY PIPE FINISH PLAIN END	304L STAINLESS STEEL
N2	JACKET CONNECTION	4	11/2"	SCH10	11/2" SCH 10 PIPE	304L STAINLESS STEEL
N2.1	11/2" FLANGE CONNECTION	4	11/2"	SCH10	11/2" TABLE E FFSO FLANGE	304L STAINLESS STEEL
N3	DRAIN PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N4	CONDUIT PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N5	VENT NECK	1	14"	SCH10	14" SCH10 PIPE	304L STAINLESS STEEL
N6	CIP PIPE	1	3"	DAIRY	3" CIP LINE C/W 90 DIA SPRAY BALL	304L STAINLESS STEEL
N6.1	3" DROP DOWN PIPE	1	3"	DAIRY	3" DAIRY PIPE - FINISH PLAIN END	304L STAINLESS STEEL
N6.2	3" RJT Union	1	3"	DAIRY	3" RJT Union DAIRY	316L STAINLESS STEEL
N6.3	3" 90 Elbow	2	3"	DAIRY	3" 90 Elbow 1.5D 304	304L STAINLESS STEEL
N7	FILTER CONNECTION	1	4"	DAIRY	4" DAIRY PIPE	304L STAINLESS STEEL
N7.1	4" Welding Male	1	4"	DAIRY	4" Welding Male Part RJT 316	316L STAINLESS STEEL
N8	AGITATOR FLANGE -COWL	1			25mm STAINLESS STEEL FLANGE C/W 4mm COWL	304L STAINLESS STEEL
N8.1	AGITATOR CIP	1	1"	DAIRY	1" DAIRY PIPE C/W 40 DIA SPRAY BALL	304L STAINLESS STEEL
N8.2	1" Welding Male	1	1"	DAIRY	1" Welding Male Part RJT 316	316L STAINLESS STEEL
N9	GRAB HANDLE	1	1"	DAIRY	1" DAIRY PIPE	304L STAINLESS STEEL
N10	SIDE ENTRY MANWAY	1			LAYEGGI A15 MANWAY	304L STAINLESS STEEL

2				
1				
0				
ISSUE NO:	MODIFICATION	DRAWN	CHK,D	DATE

TITLE : X4-140,000 LTR Finished Milk Silos
PROJECT NUMBER : 11857 -11860
CUSTOMER :
COMPLETION DATE : T.B.C

DRAWN : DS

SCALE : NTS

CHECKED :

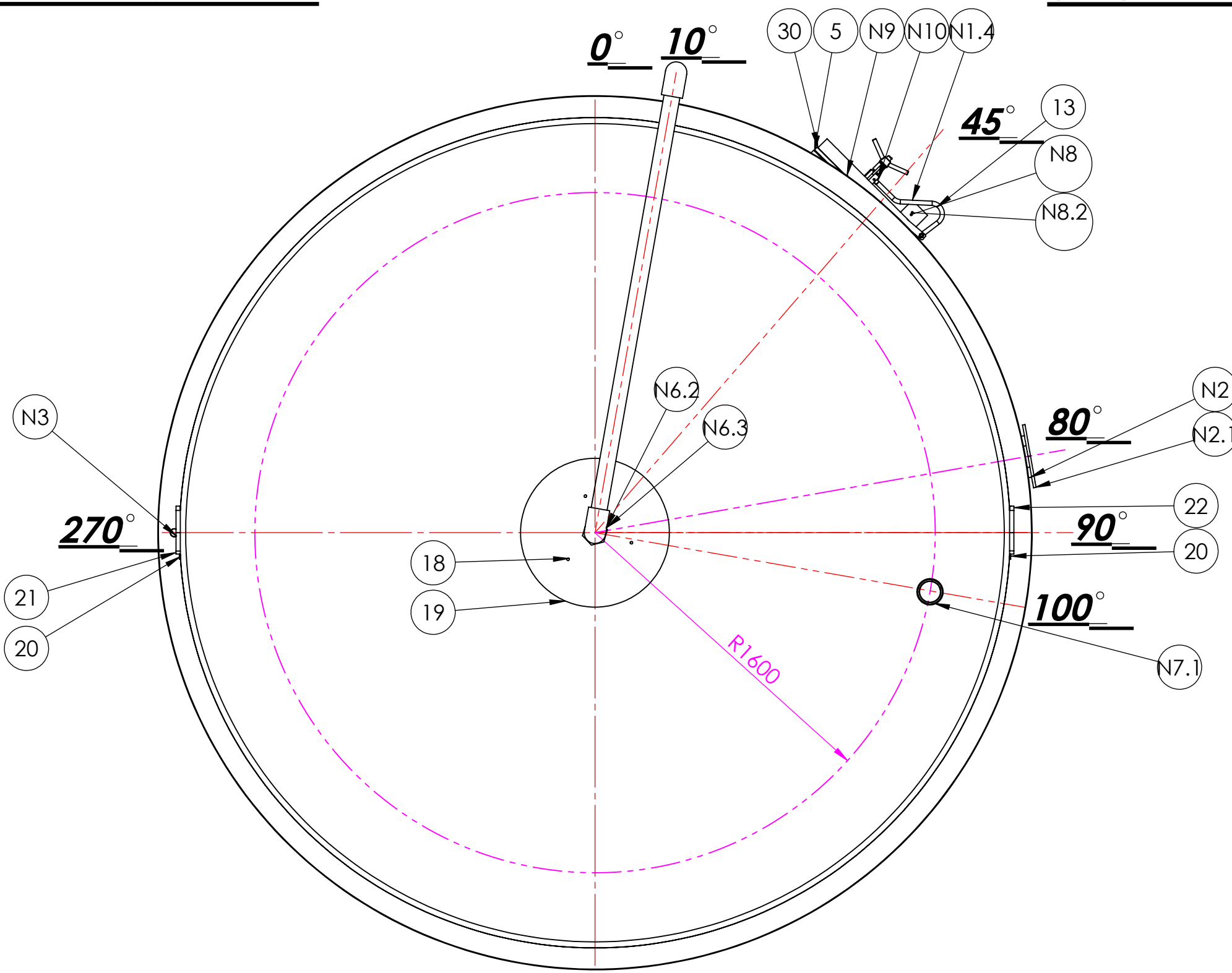
JOB NO : 11857



PENDING CUSTOMER APPROVAL

Silo No.3 JOB No.11859

PLAN VIEW - ROOF LEVEL

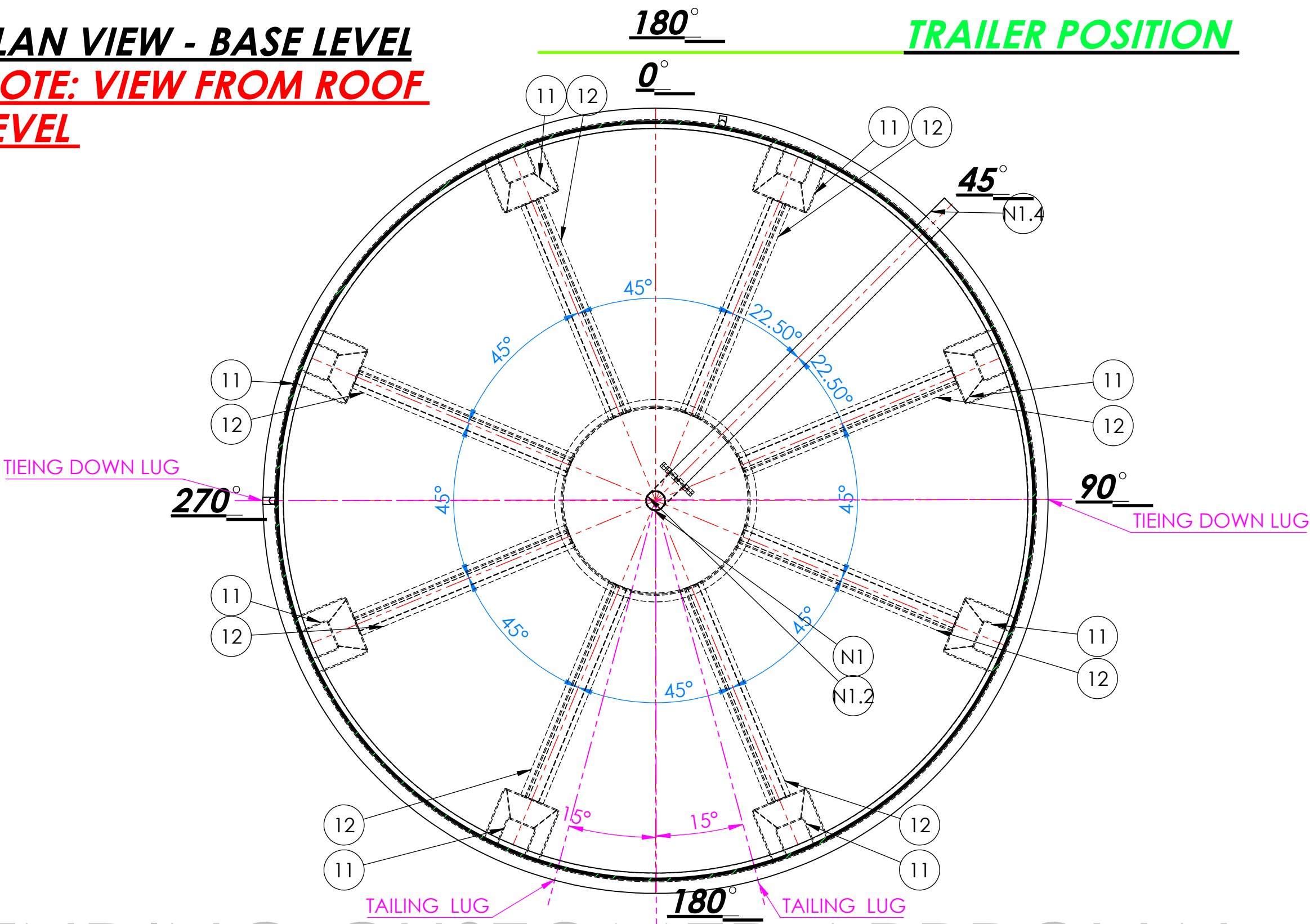


SILO FABRICATION DRAWING - NON CLADDED

ITEM NO.	PART	QTY.	PIPE SIZE	TYPE	DESCRIPTION	MATERIAL	FINISH
1	ROOF	1			3mm STAINLESS STEEL - CONICAL	304L STAINLESS STEEL	2B COLD ROLLED
2	SHELL SECTION 1	2			2.5mm STAINLESS STEEL -2M COIL	304L STAINLESS STEEL	2B COLD ROLLED
3	SHELL SECTION 2	2			3mm STAINLESS STEEL COIL -2m	304L STAINLESS STEEL	2B COLD ROLLED
4	SHELL SECTION C/W PANEL	1			3mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	304L STAINLESS STEEL	2B COLD ROLLED
5	BASE SHELL SECTION	1			4mm STAINLESS STEEL C/W 1mm DIMPLE PANEL	304L STAINLESS STEEL	2B COLD ROLLED
6	BASE	1			5mm STAINLESS STEEL - CONICAL	304L STAINLESS STEEL	2B COLD ROLLED
7	SKIRT PATCH PLATE	1			4mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
8	SUPPORT SKIRT	1			6mm MILD STEEL -SBP	MILD STEEL	
9	BASE SUPPORT CHANNEL	1			5"X21/2" MILD STEEL CHANNEL -SBP	MILD STEEL	
10	INNER SUPPORT RING	1			6mm MILD STEEL -SPB C/W 3"X1.5" CHANNEL	MILD STEEL	
11	SUPPORT LEG	8			6mm MILD STEEL FOLDED LEG	MILD STEEL	
12	BASE CHANNEL SUPPORTS	8			6"X3" MILD STEEL CHANNEL C/W 4MM P/P	MILD STEEL	
13	UPPER TOP LIP SEGMENT	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
14	LOWER TOP LIP SEGMENT	1			6mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
15	TOP LIP OUTSIDE BAND	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
16	ALCOVE	1			3mm STAINLESS STEEL	304L STAINLESS STEEL	2B COLD ROLLED
17	VENT PART 3	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
18	VENT PART 2	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
19	VENT PART 1	1	14"	SCH10	3mm STAINLESS STEEL	304L STAINLESS STEEL	
20	LIFTING LUG PATCH PLATE	2			4mm STAINLESS STEEL -2BCR	304L STAINLESS STEEL	2B COLD ROLLED
21	LIFTING LUG	1			20mm STAINLESS STEEL	304L STAINLESS STEEL	HOT ROLLED
22	LIFTING LUG	1			20mm STAINLESS STEEL	304L STAINLESS STEEL	HOT ROLLED

PLAN VIEW - BASE LEVEL

NOTE: VIEW FROM ROOF LEVEL



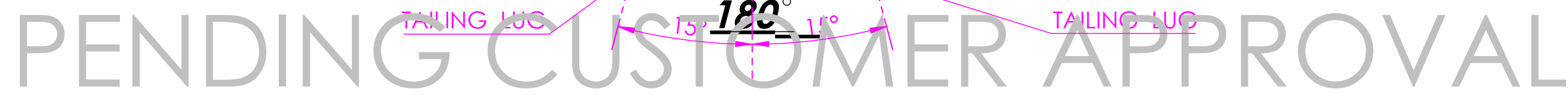
ITEM NUM	PART	QTY.	PIPE SIZE	TYPE	DESCRIPTION	MATERIAL
N1	OUTLET PIPE BASE	1	31/2"	SCH10	31/2" SCH10 PIPE	304L STAINLESS STEEL
N1.2	31/2" SCH10 ELBOW	1	31/2"	SCH10	31/2" SCH10 ELBOW	304L STAINLESS STEEL
N1.3	4" FLANGE CONNECTION	2	4"	DAIRY	4" FLANGE - SUIT DAIRY PIPE	304L STAINLESS STEEL
N1.4	OUTLET PIPE	1	4"	DAIRY	4" DAIRY PIPE FINISH PLAIN END	304L STAINLESS STEEL
N2	JACKET CONNECTION	4	11/2"	SCH10	11/2" SCH 10 PIPE	304L STAINLESS STEEL
N2.1	11/2" FLANGE CONNECTION	4	11/2"	SCH10	11/2" TABLE E FFSO FLANGE	304L STAINLESS STEEL
N3	DRAIN PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N4	CONDUIT PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N5	VENT NECK	1	14"	SCH10	14" SCH10 PIPE	304L STAINLESS STEEL
N6	CIP PIPE	1	3"	DAIRY	3" CIP LINE C/W 90 DIA SPRAY BALL	304L STAINLESS STEEL
N6.1	3" DROP DOWN PIPE	1	3"	DAIRY	3" DAIRY PIPE - FINISH PLAIN END	304L STAINLESS STEEL
N6.2	3" RJT Union	1	3"	DAIRY	3" RJT Union DAIRY	316L STAINLESS STEEL
N6.3	3" 90 Elbow	2	3"	DAIRY	3" 90 Elbow 1.5D 304	304L STAINLESS STEEL
N7	FILTER CONNECTION	1	4"	DAIRY	4" DAIRY PIPE	304L STAINLESS STEEL
N7.1	4" Welding Male	1	4"	DAIRY	4" Welding Male Part RJT 316	316L STAINLESS STEEL
N8	AGITATOR FLANGE -COWL	1			25mm STAINLESS STEEL FLANGE C/W 4mm COWL	304L STAINLESS STEEL
N8.1	AGITATOR CIP	1	1"	DAIRY	1" DAIRY PIPE C/W 40 DIA SPRAY BALL	304L STAINLESS STEEL
N8.2	1" Welding Male	1	1"	DAIRY	1" Welding Male Part RJT 316	316L STAINLESS STEEL
N9	GRAB HANDLE	1	1"	DAIRY	1" DAIRY PIPE	304L STAINLESS STEEL
N10	SIDE ENTRY MANWAY	1			LAVEGGI A15 MANWAY	304L STAINLESS STEEL

PENDING CUSTOMER APPROVAL

GENERAL SPECIFICATION			DESIGN DATA / CAPACITY			PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION		SURFACE PREPERATION			
PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT	
DESIGN CODE : SEP REF ASME 8 DIV1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP *	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED	
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED	
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:					
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDUIM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										

2				
1				
0				
ISSUE NO:	MODIFICATION		DRAWN	CHK,D
DATE				
TITLE : X4-140,000 LTR Finished Milk Silos				
PROJECT NUMBER : 11857 -11860				
CUSTOMER :				
COMPLETION DATE : T.B.C				
DRAWN : DS		SCALE : NTS		
CHECKED :				
SHEET NO : 6		JOB NO : 11857		
 Blackwater Excellence in Stainless Steel Since 1968				

Silo No.4 JOB No. 11860
SILO FABRICATION DRAWING - NON CLADDED



ITEM NUM	PART	QTY.	PIPE SIZE	TYPE	DESCRIPTION	MATERIAL
N1	OUTLET PIPE BASE	1	31/2"	SCH10	31/2" SCH10 PIPE	304L STAINLESS STEEL
N1.2	31/2" SCH10 ELBOW	1	31/2"	SCH10	31/2" SCH10 ELBOW	304L STAINLESS STEEL
N1.3	4" FLANGE CONNECTION	2	4"	DAIRY	4" FLANGE - SUIT DAIRY PIPE	304L STAINLESS STEEL
N1.4	OUTLET PIPE	1	4"	DAIRY	4" DAIRY PIPE FINISH PLAIN END	304L STAINLESS STEEL
N2	JACKET CONNECTION	4	11/2"	SCH10	11/2" SCH 10 PIPE	304L STAINLESS STEEL
N2.1	11/2" FLANGE CONNECTION	4	11/2"	SCH10	11/2" TABLE EFFSO FLANGE	304L STAINLESS STEEL
N3	DRAIN PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N4	CONDUIT PIPE	1	11/2"	DAIRY	11/2" DAIRY PIPE C/W ELBOW	304L STAINLESS STEEL
N5	VENT NECK	1	14"	SCH10	14" SCH10 PIPE	304L STAINLESS STEEL
N6	CIP PIPE	1	3"	DAIRY	3" CIP LINE C/W 90 DIA SPRAY BALL	304L STAINLESS STEEL
N6.1	3" DROP DOWN PIPE	1	3"	DAIRY	3" DAIRY PIPE - FINISH PLAIN END	304L STAINLESS STEEL
N6.2	3" RJT Union	1	3"	DAIRY	3" RJT Union DAIRY	316L STAINLESS STEEL
N6.3	3" 90 Elbow	2	3"	DAIRY	3" 90 Elbow 1.5D 304	304L STAINLESS STEEL
N7	FILTER CONNECTION	1	4"	DAIRY	4" DAIRY PIPE	304L STAINLESS STEEL
N7.1	4" Welding Male	1	4"	DAIRY	4" Welding Male Part RJT 316	316L STAINLESS STEEL
N8	AGITATOR FLANGE -COWL	1			25mm STAINLESS STEEL FLANGE C/W 4mm COWL	304L STAINLESS STEEL
N8.1	AGITATOR CIP	1	1"	DAIRY	1" DAIRY PIPE C/W 40 DIA SPRAY BALL	304L STAINLESS STEEL
N8.2	1" Welding Male	1	1"	DAIRY	1" Welding Male Part RJT 316	316L STAINLESS STEEL
N9	GRAB HANDLE	1	1"	DAIRY	1" DAIRY PIPE	304L STAINLESS STEEL
N10	SIDE ENTRY MANWAY	1			LAVEGGI A15 MANWAY	304L STAINLESS STEEL

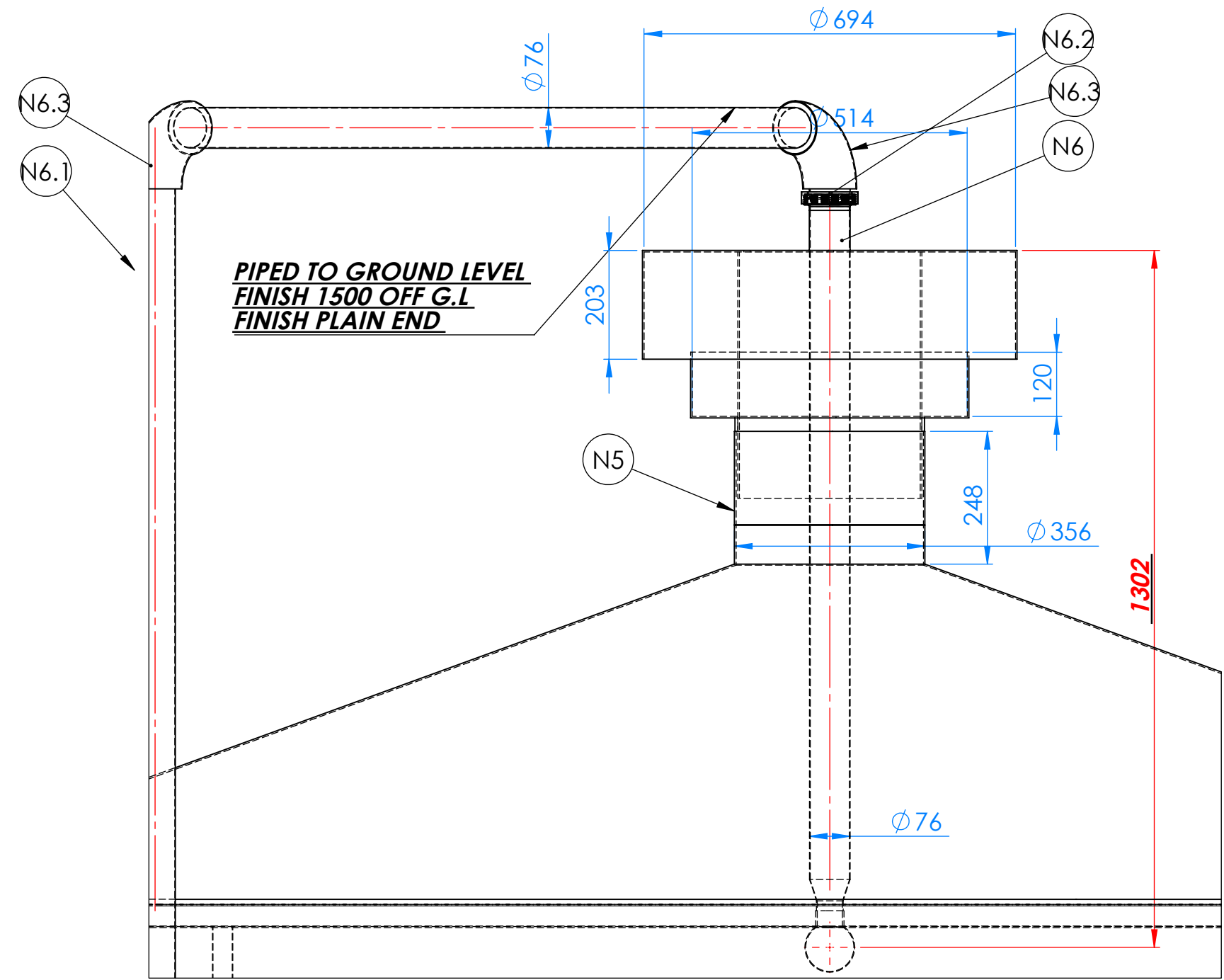
TITLE : X4-140,000 LTR Finished Milk Silos
PROJECT NUMBER : 11857 -11860
CUSTOMER :
COMPLETION DATE : T.B.C

DRAWN : DS	SCALE : NTS	 Blackwater <i>Excellence in Stainless Steel Since 1968</i>
CHECKED :		
SHEET NO : 7	JOB NO : 11857	

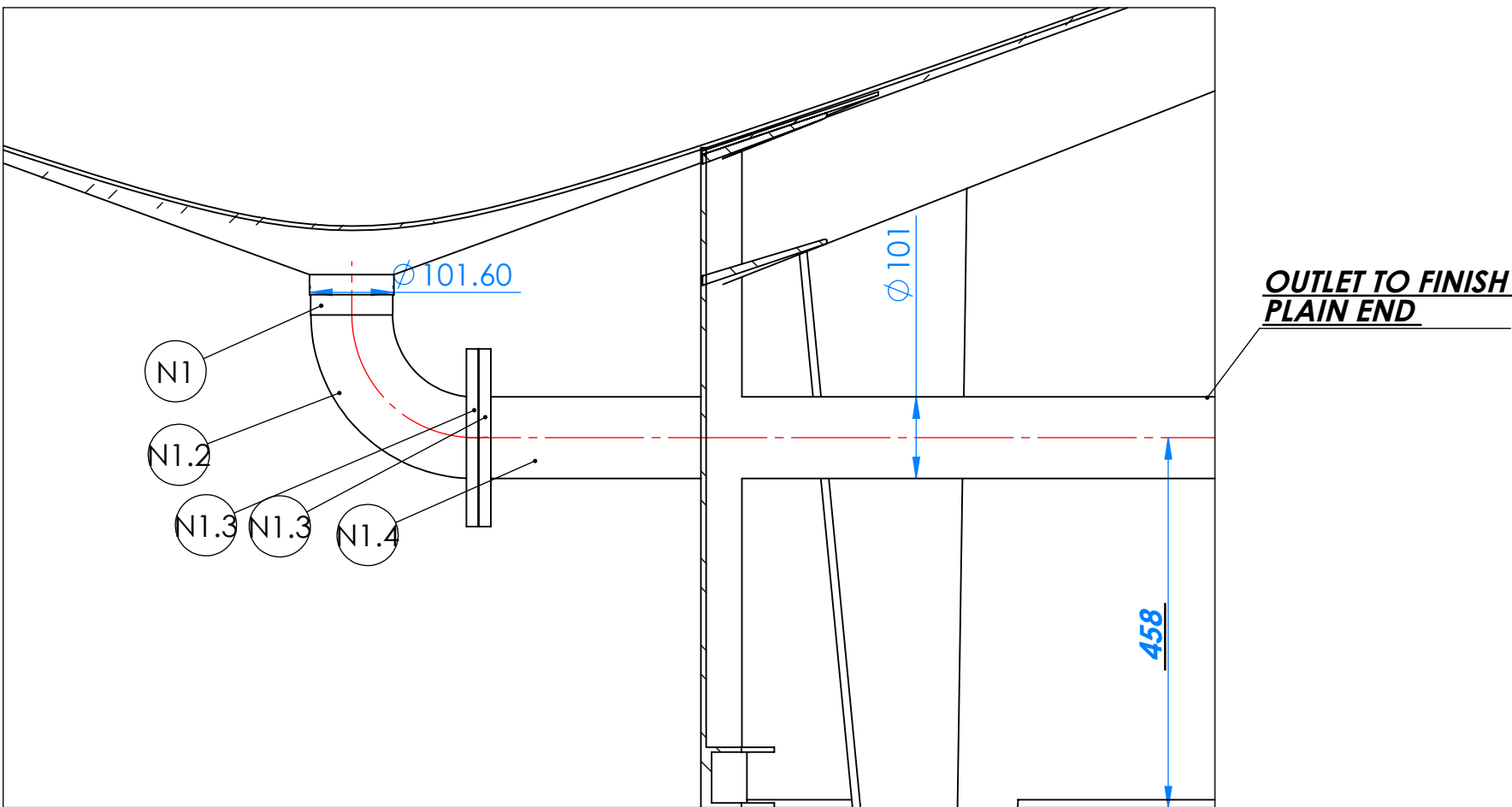


SILO FABRICATION DRAWING -DETAIL PAGE

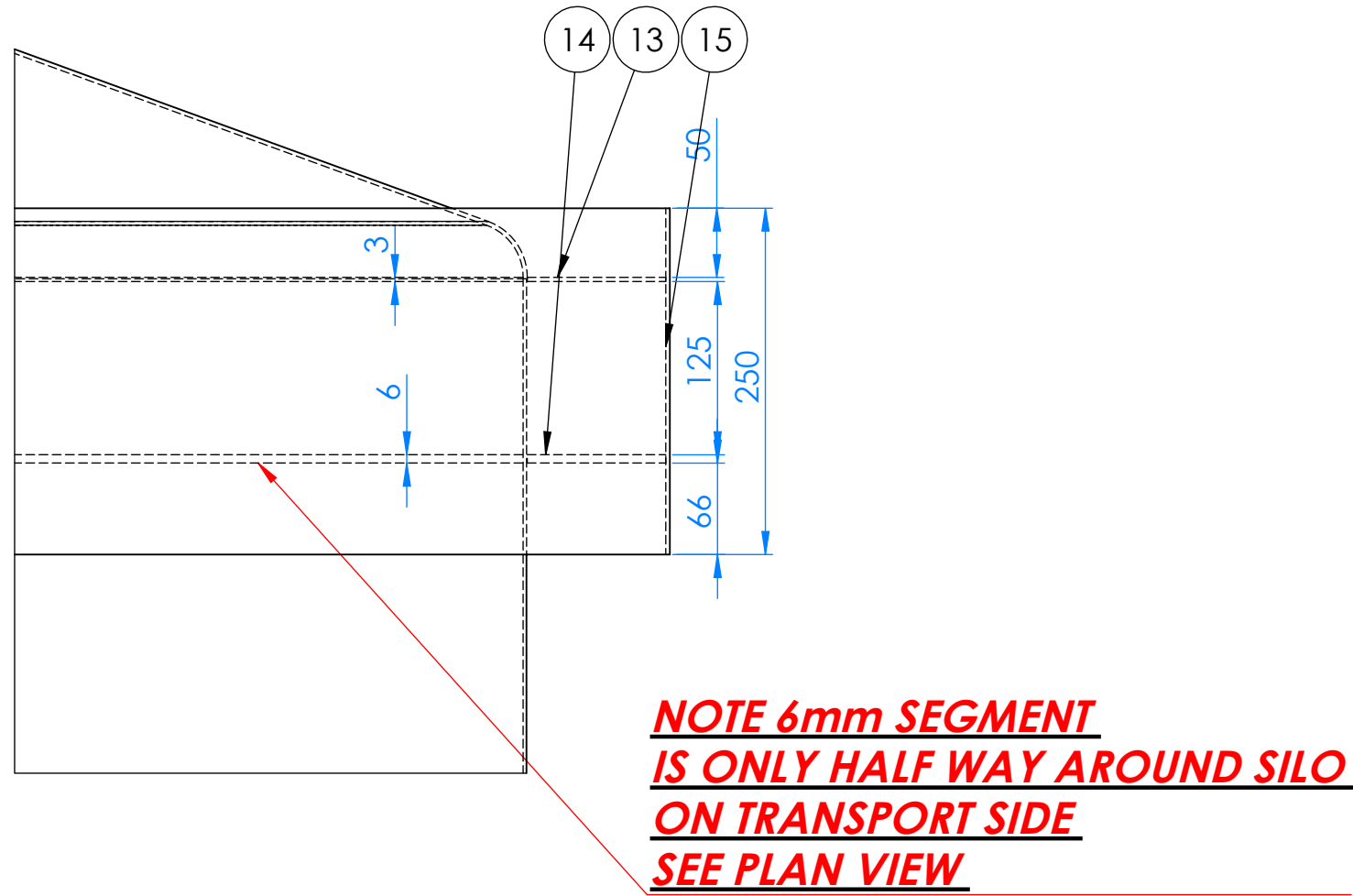
VENT/CIP DETAIL



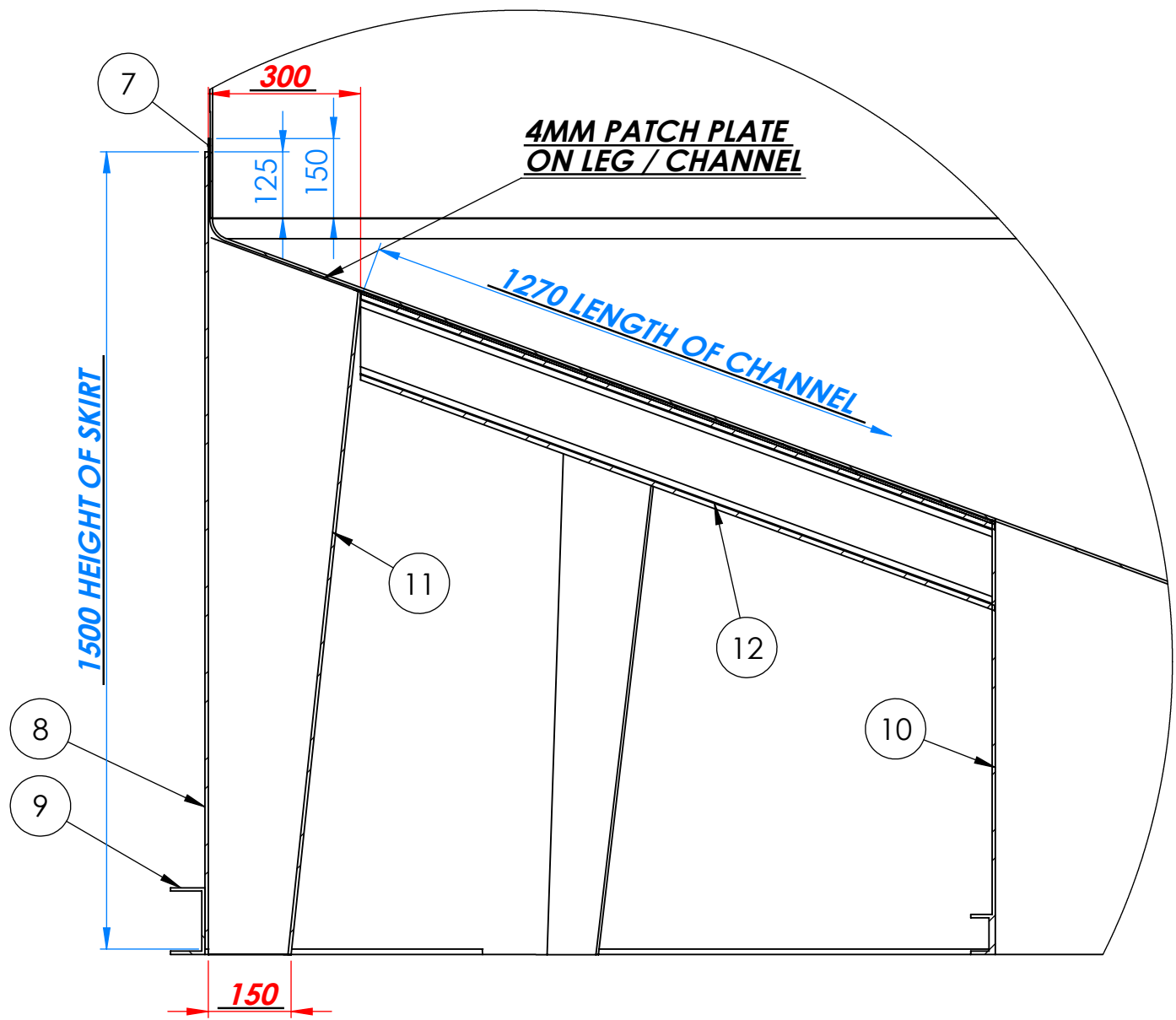
OUTLET DETAIL



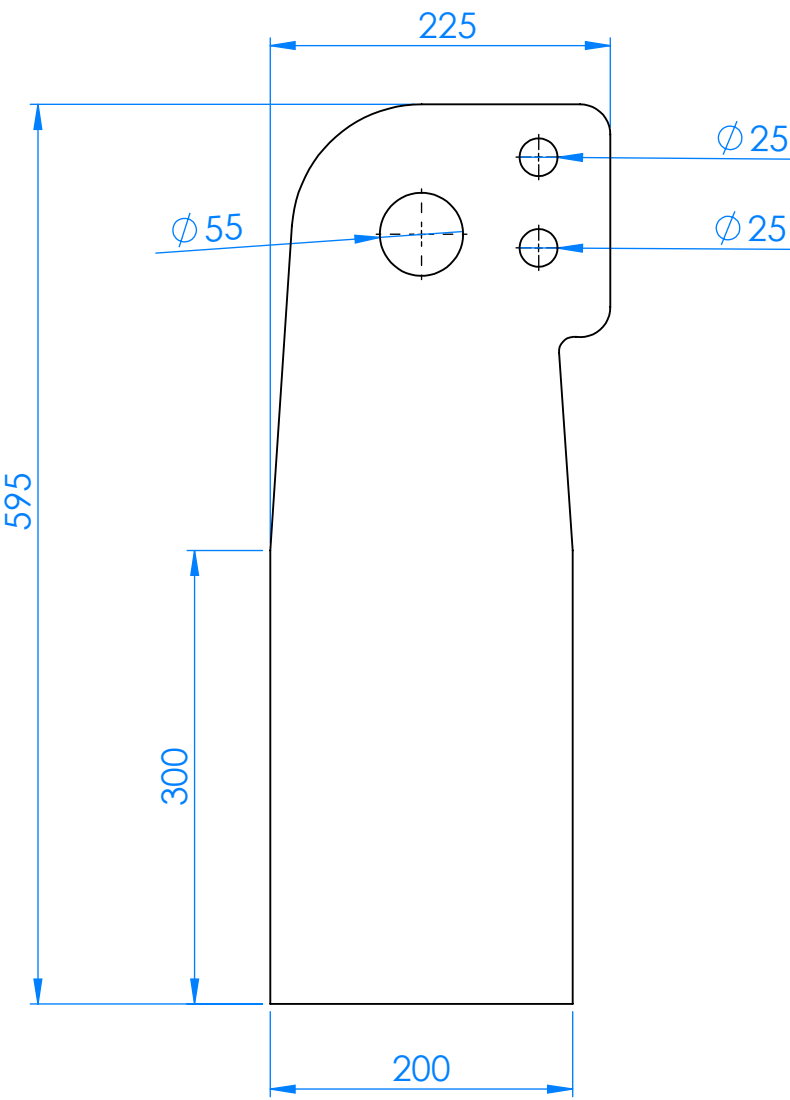
TOP LIP SEGMENT DETAIL



BASE REINFORCEMENT DETAIL



LIFTING LUG DETAIL



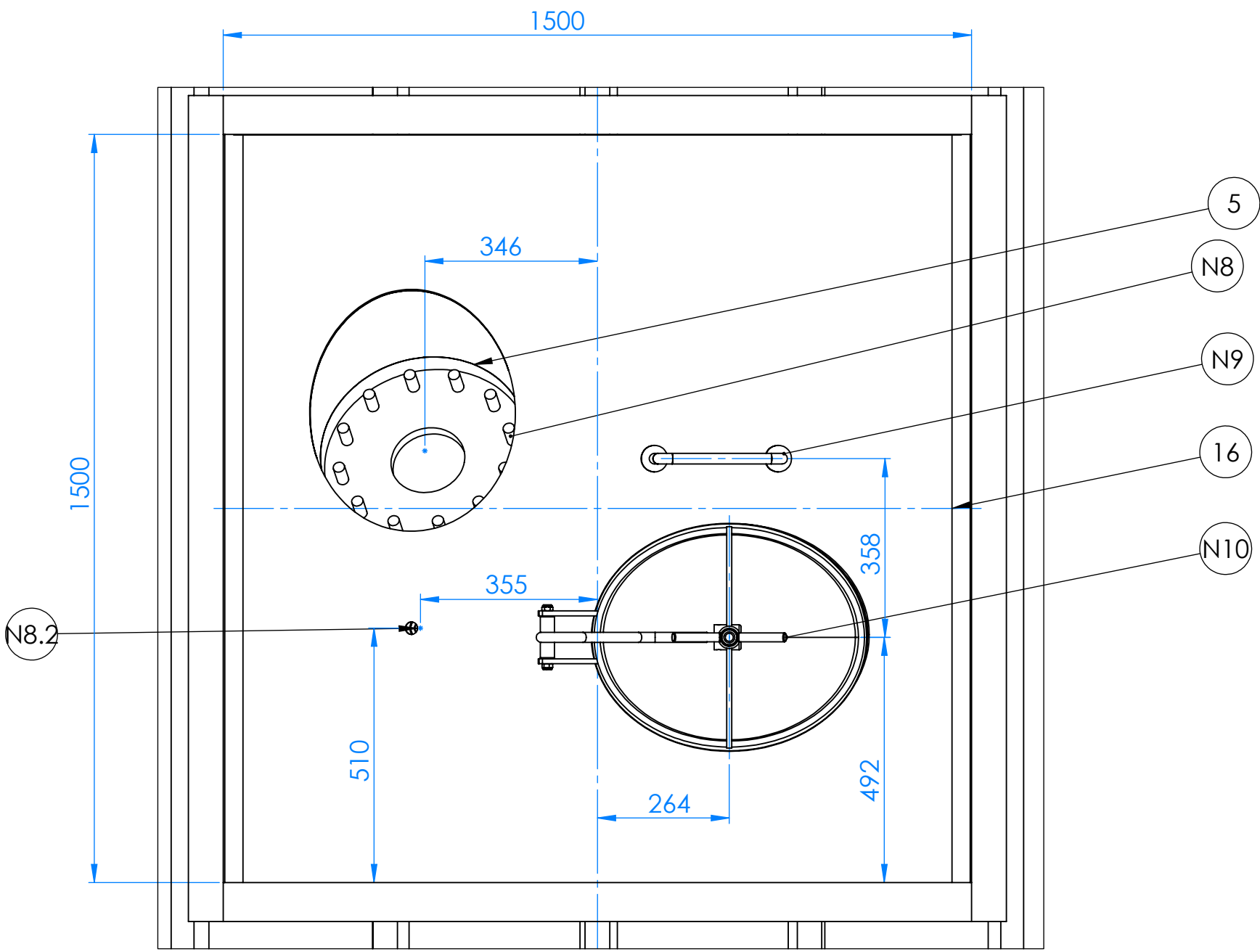
PENDING CUSTOMER APPROVAL

GENERAL SPECIFICATION		DESIGN DATA / CAPACITY				PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION		SURFACE PREPERATION			
PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT	
DESIGN CODE : SEP REF ASME 8 DIV 1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP *	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED	
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED	
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:					
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDUIM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										

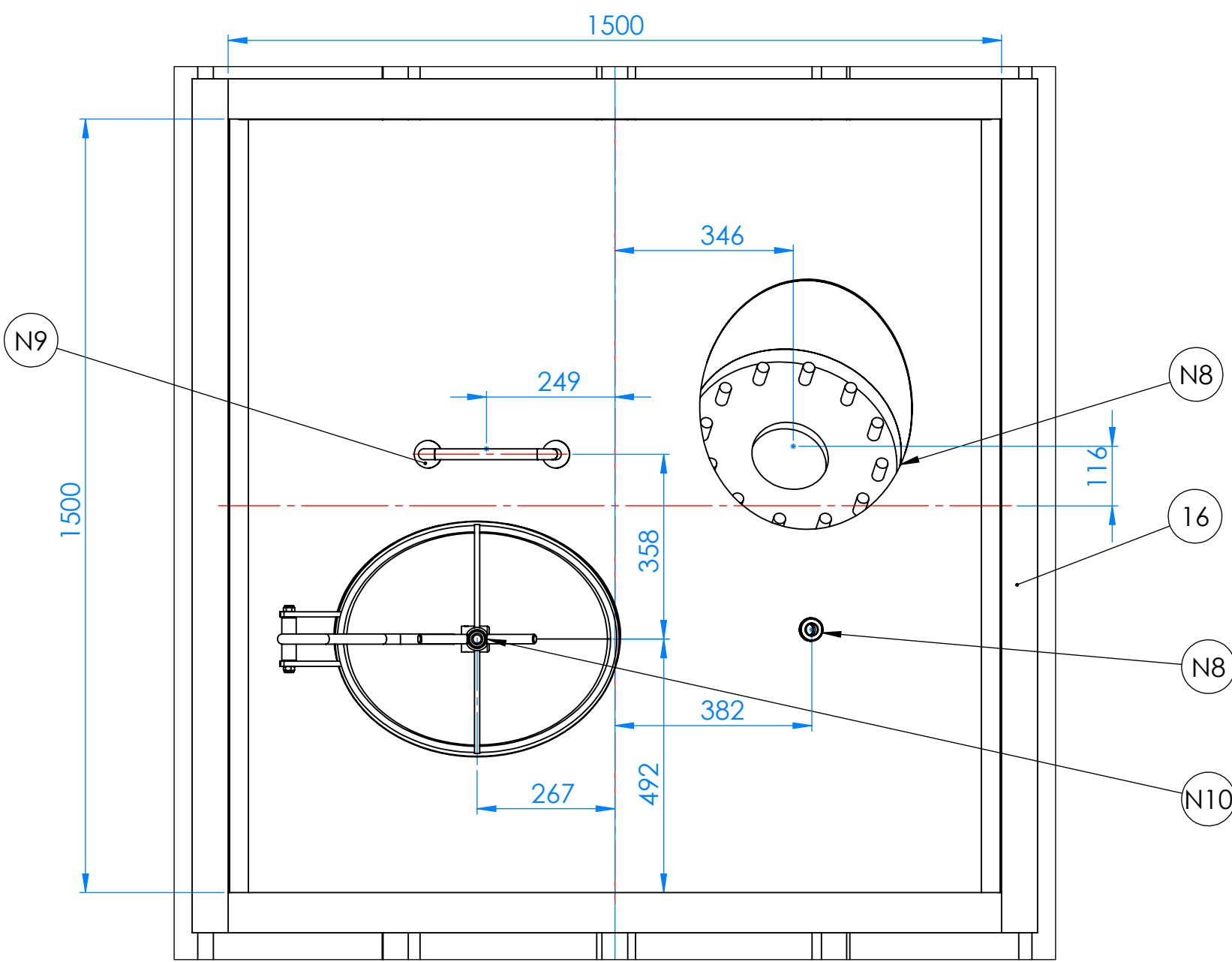
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TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C				
DRAWN : DS	SCALE : NTS			
CHECKED :				
SHEET NO : 8	JOB NO : 11857			

SILO FABRICATION DRAWING -DETAIL PAGE

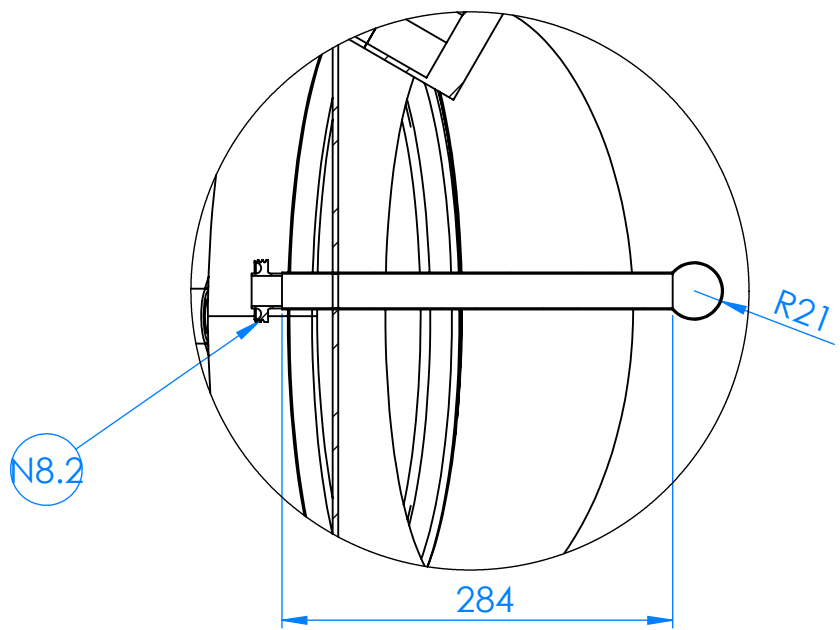
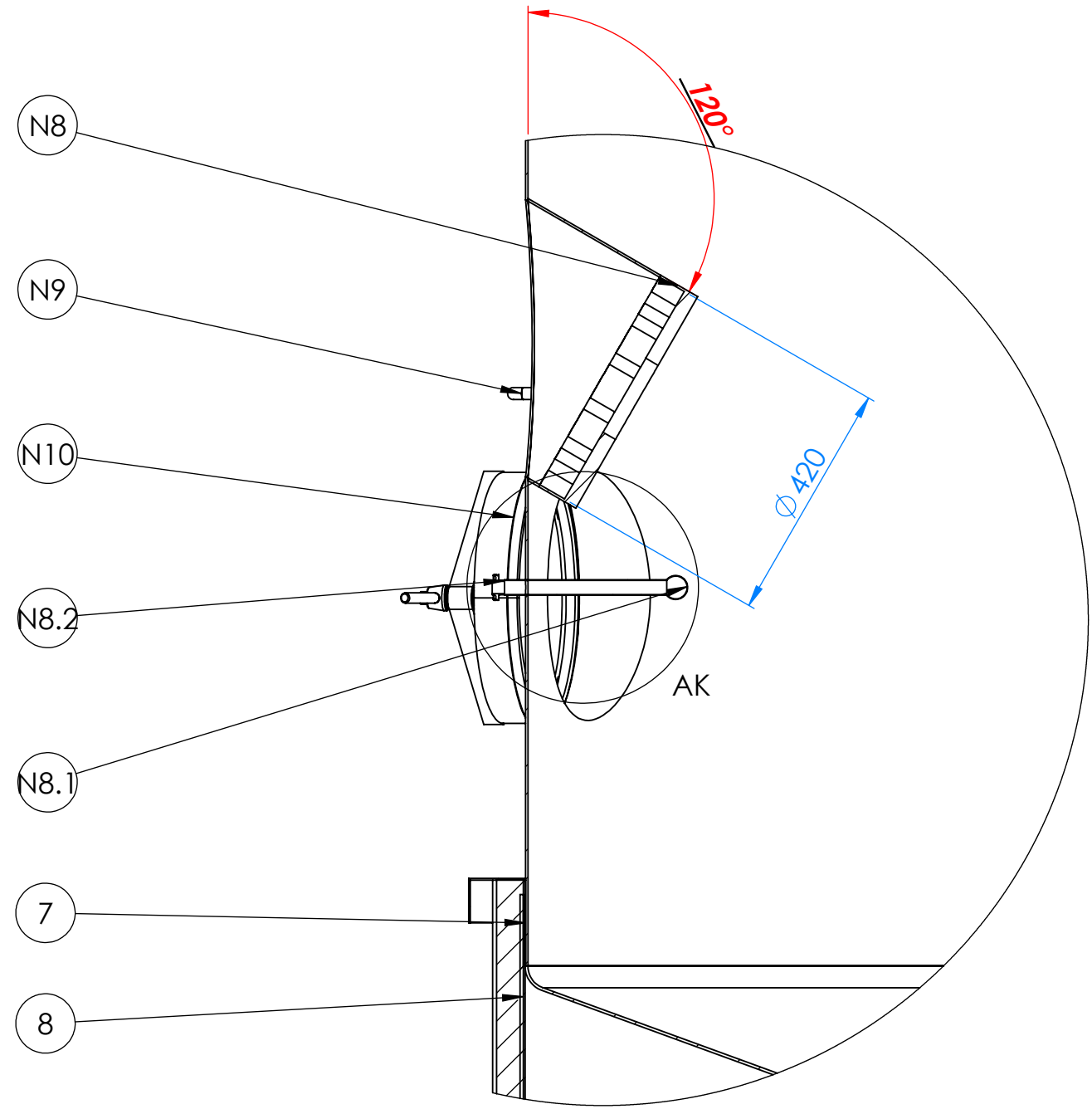
OUTLET DETAIL SILO 2&3



OUTLET DETAIL SILO 1&4



AGITATION DETAIL



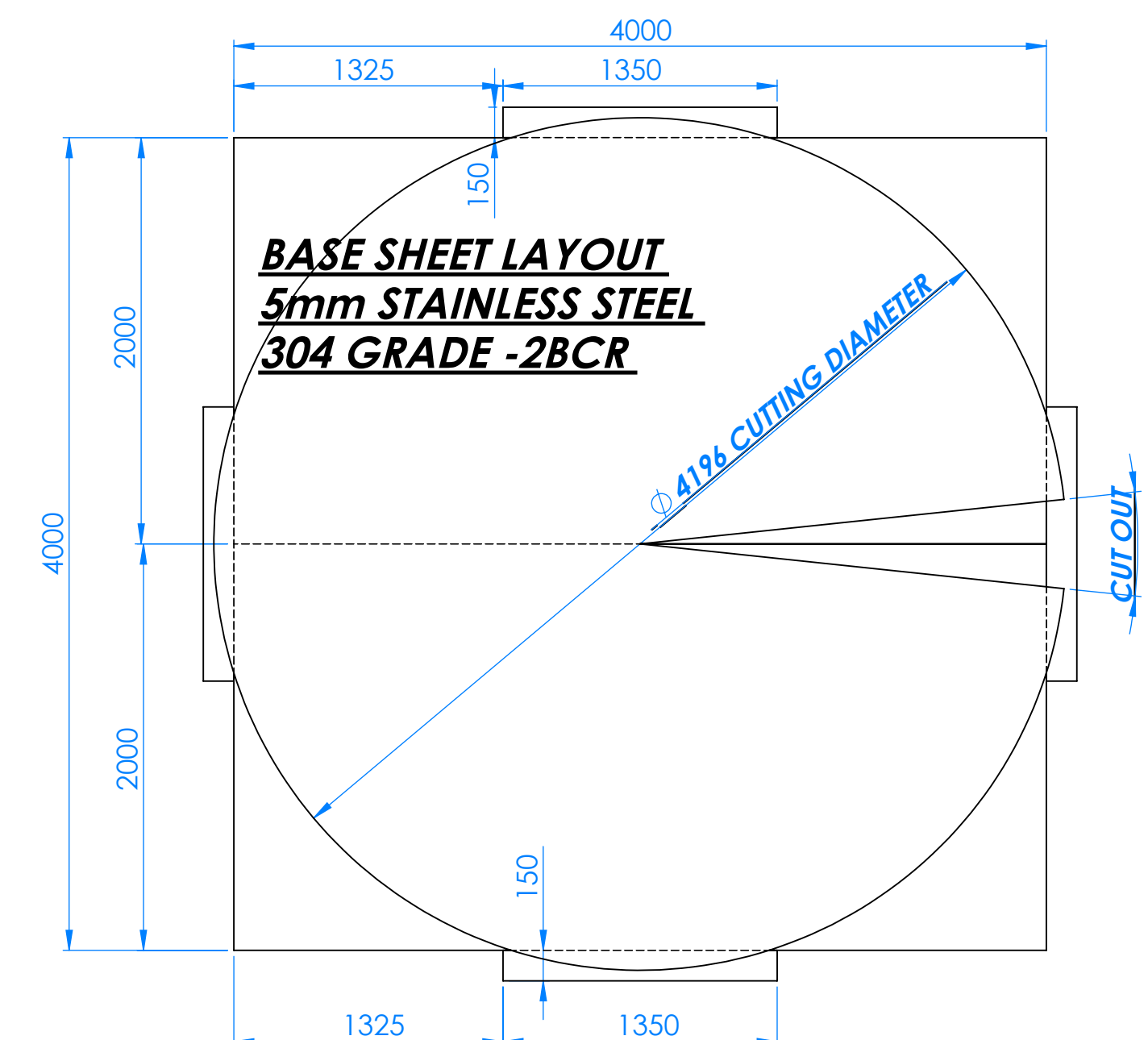
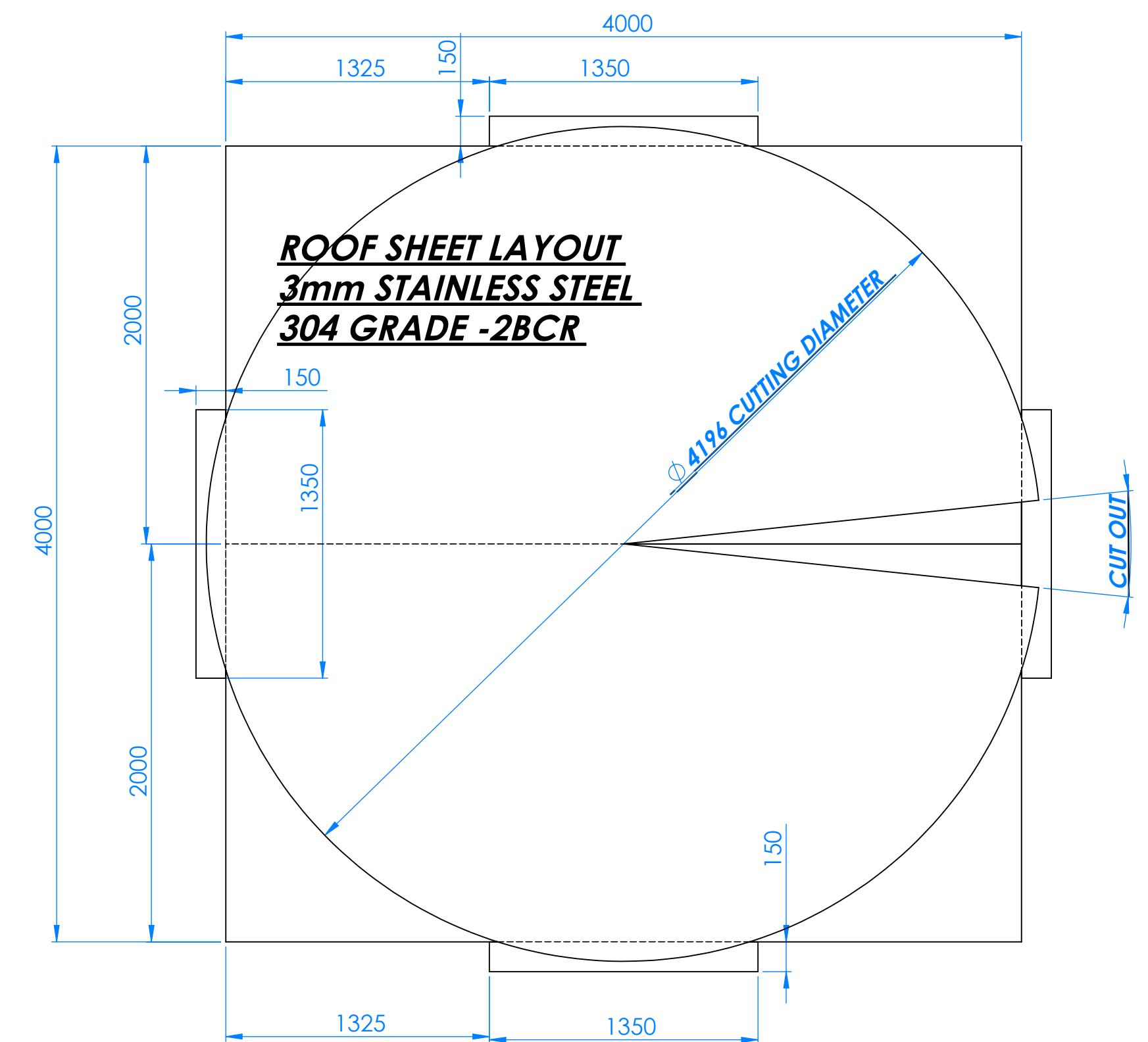
DETAIL AK
SCALE 2 : 11

PENDING CUSTOMER APPROVAL

GENERAL SPECIFICATION			DESIGN DATA / CAPACITY			PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION		SURFACE PREPERATION			
PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS	
PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT	
DESIGN CODE : SEP REF ASME 8 DIV1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP °	AMBIENT	0-+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED	
BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED	
RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0-+75 DEG	NOT REQUIRED	CATEGORY NUM:					
PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDIUM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					
BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										

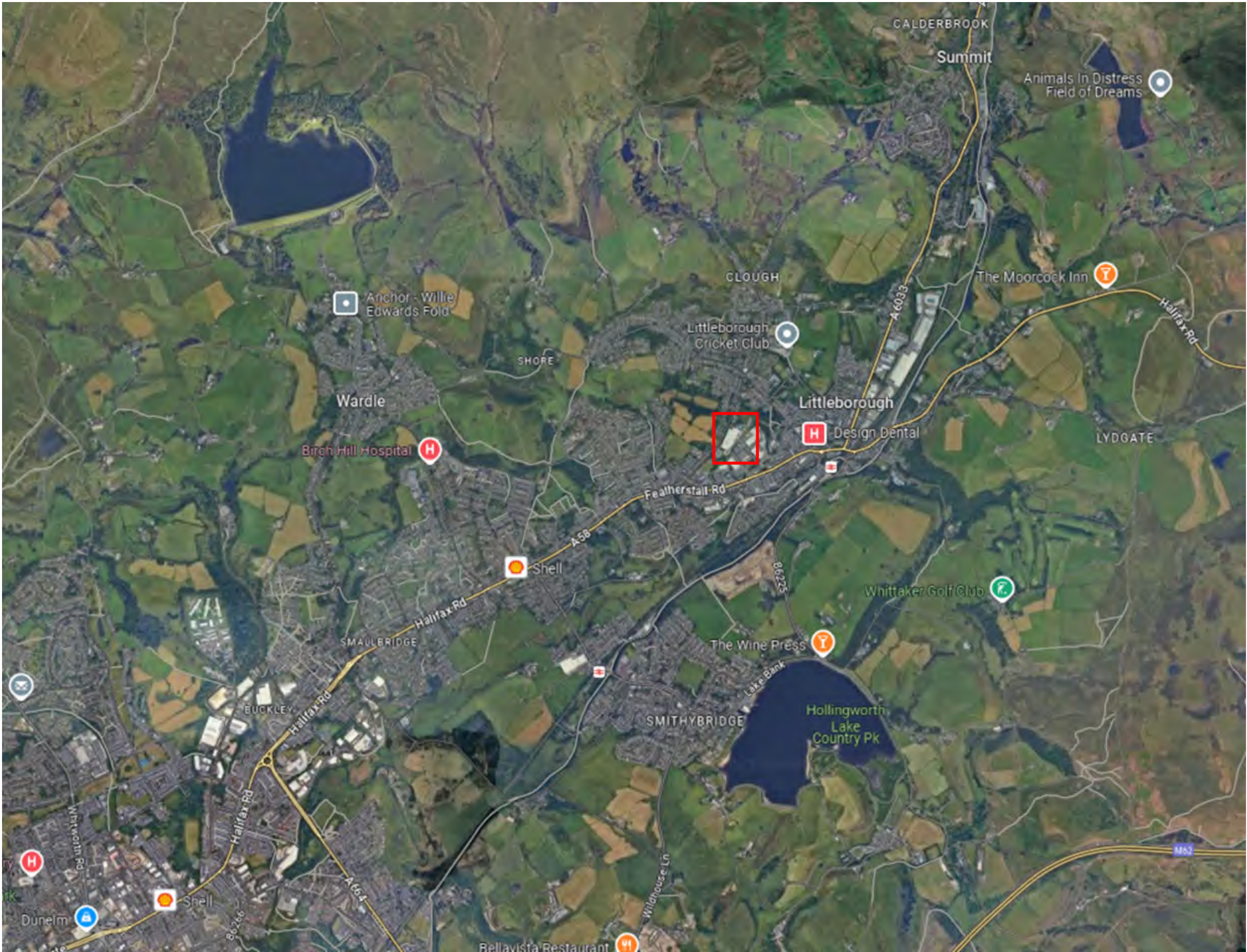
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ISSUE NO:	MODIFICATION	DRAWN	CHK,D	DATE
TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C				
DRAWN : DS	SCALE : NTS			
CHECKED :				
SHEET NO : 9	JOB NO : 11857			

SHELL SECTION LAYOUT



PENDING CUSTOMER APPROVAL

GENERAL SPECIFICATION		DESIGN DATA / CAPACITY				PRESSURE EQUIPMENT DIRECTIVE 91/23/EC INFORMATION		SURFACE PREPERATION				TITLE : X4-140,000 LTR Finished Milk Silos PROJECT NUMBER : 11857 -11860 CUSTOMER : COMPLETION DATE : T.B.C			
B	PROJECT NO : 11857	BWE NO : 11857		SHELL	JACKET	COIL	CONTENTS :		SURFACE	SHELL WELDS	NOZZLE WELDS				
	PURCHASE ORDER NUM :	DYE PENETRANT : YES	DESIGN PRESSURE BAR (G)	ATMOSPHERIC	6 BARG	NOT REQUIRED	PS XV:	INTERNAL :	2B COLD ROLLED	POLISHED 180 GRIT	POLISHED 180 GRIT				
	DESIGN CODE : SEP REF ASME 8 DIV1 & EN 14015	INSULATION : 50mm MINERAL WOOL	DESIGN TEMP *	AMBIENT	0+75 DEG	N/A	CONFORMITY MODULE :	EXTERNAL UNEXPOSED:	2B COLD ROLLED	BUFFED / POLISHED	BUFFED / POLISHED				
	BWE WELD PROCEDURE : SWE SS 001 /003&004	EXTERNAL PLATES AND PADS: 304L STAINLESS STEEL	OPERATING PRESSURE (BAR)	ATMOSPEHERIC	3BAR G	NOT REQUIRED	GROUP:	EXTERNAL EXPOSED:	CLADDING	POLISHED / BUFFED	BUFFED / POLISHED				
A	RADIOGRAPHY: NO	GASKET MATERIAL : PTFE	OPERATING TEMP	TO 95 DEG	0+75 DEG	NOT REQUIRED	CATEGORY NUM:					DRAWN : DS	SCALE : NTS		
	PASSIVATION : YES	WEIGHT FULL : T.B.C	TEST MEDIUM	NOT REQUIRED	GYLCOL	NOT REQUIRED	NOTIFIED BODY :					CHECKED :			
	BEW SEAM WELD PROCEDURE: BWE SS 005	BOTTOM JACKET AREA: NO										SHEET NO : 10	JOB NO : 11857		



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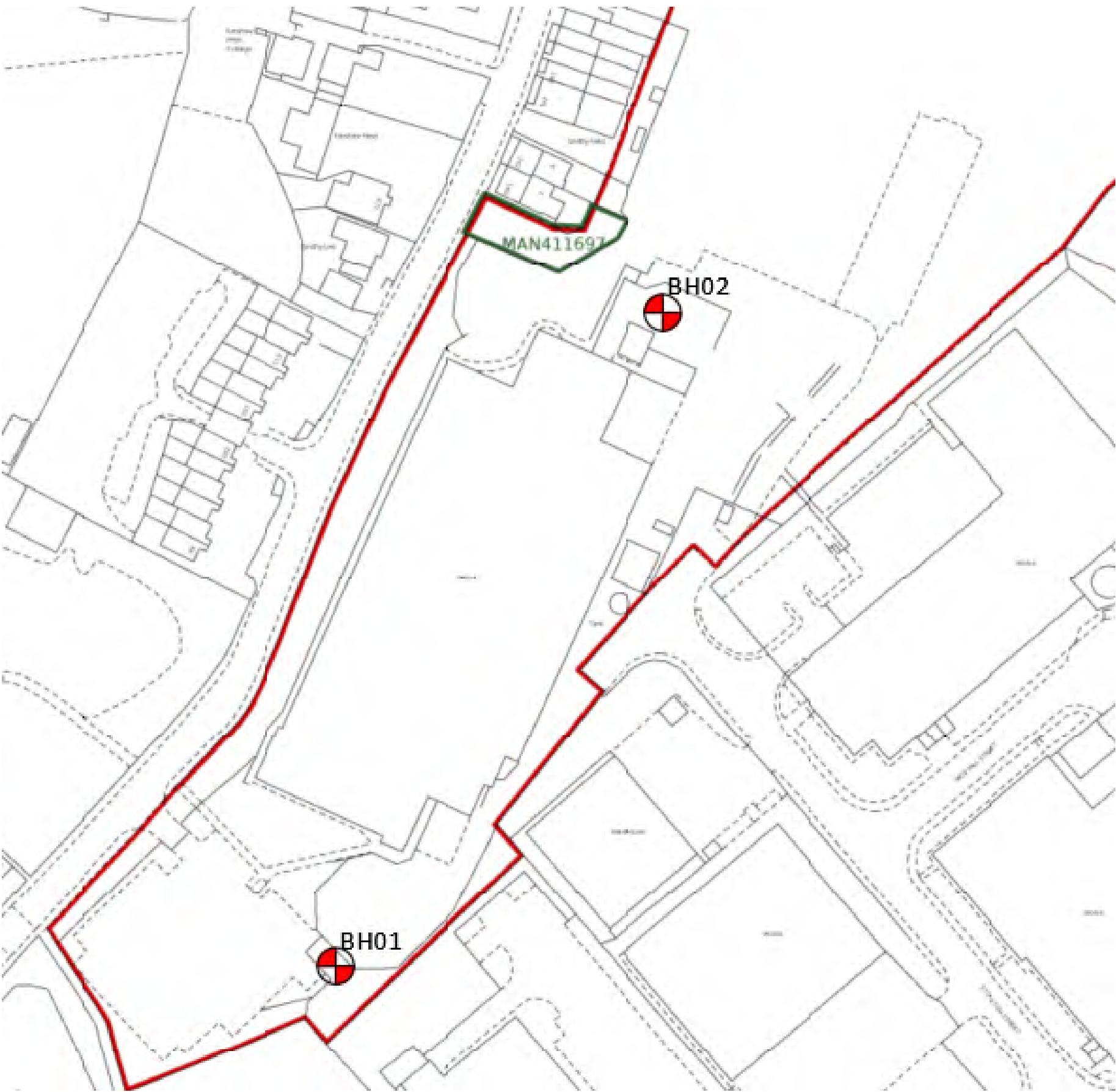
General Notes

Legend

Approximate location of site



CLIENT: Phantom Construction			
PROJECT: Lancashire Daries			
TITLE: Site Location Plan			
DRAWING STATUS: DRAFT		PROJECT No: GR000192	
DATE:		DRAWING No: GR000192-LR-01	
DRAWN: CJ	APPROVED: OH	SIZE: A3	REVISION: 01
SCALE BAR: NTS			



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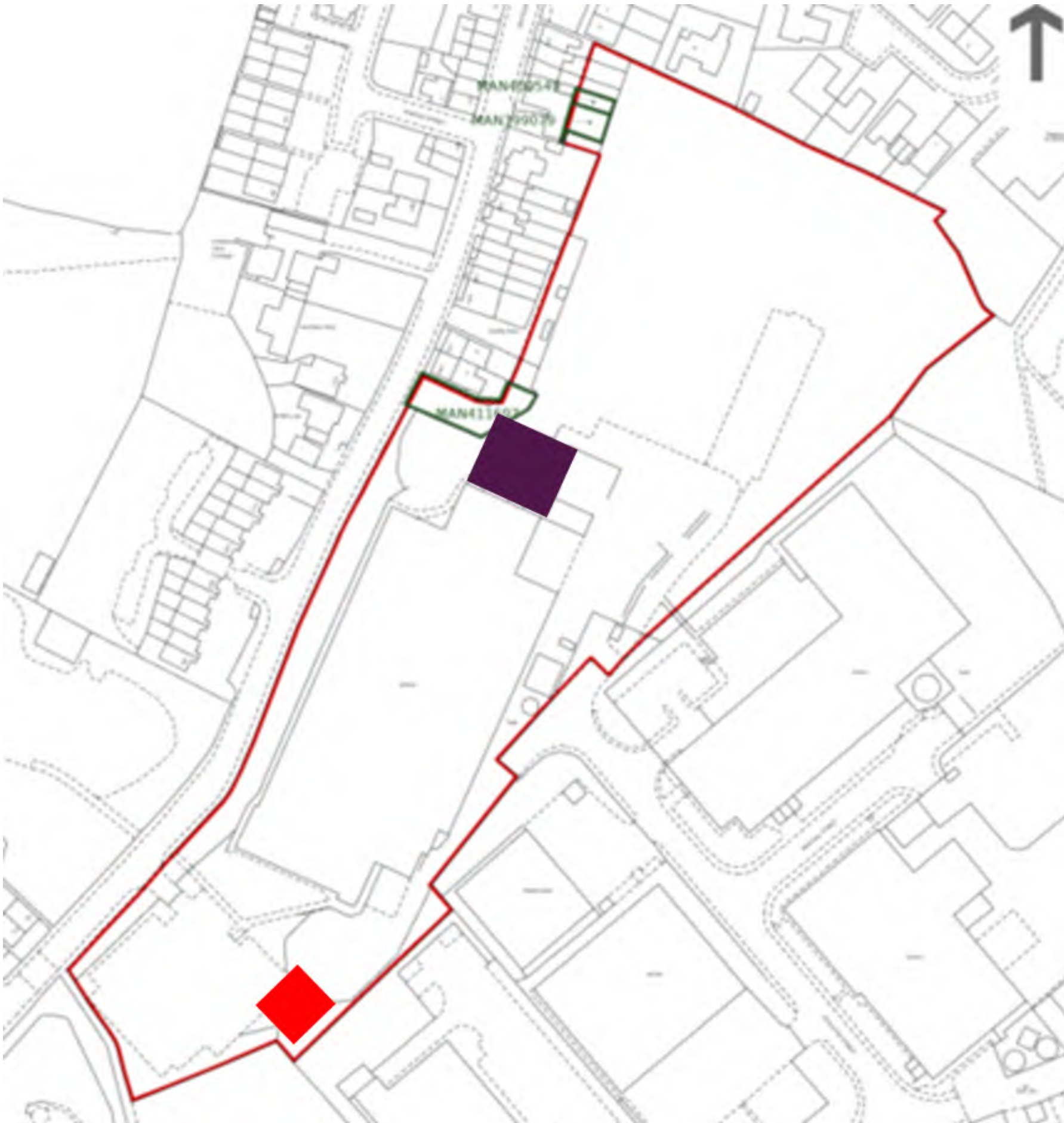
General Notes

Legend

BHxx
XX Borehole Location



CLIENT: Phantom Construction			
PROJECT: Lancashire Daries			
TITLE: Exploratory Hole Location Plan			
DRAWING STATUS: DRAFT		PROJECT No: GR000192	
DATE:		DRAWING No: GR000192-LR-02	
DRAWN: CJ	APPROVED: OH	SIZE: A3	REVISION: 01
SCALE BAR: NTS			



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General Notes

Legend

Approximate location of proposed new silos

Approximate location of proposed new warehouse extension

			
CLIENT: Phantom Construction			
PROJECT: Lancashire Daries			
TITLE: Site Redevelopment Layout			
DRAWING STATUS: DRAFT		PROJECT No: GR000192	
DATE:		DRAWING No: GR000192-LR-03	
DRAWN: CJ	APPROVED: OH	SIZE: A3	REVISION: 01
SCALE BAR: NTS			

APPENDIX B – EXPLORATORY HOLE LOGS

		Combined Log										BH01		
		Hole Type		Easting		Northing		Ground Level (m)		Scale		Sheet 1 of 6		
		IP+RO+RC								1:50				
Project Name		Lancashire Dairy		Project No.		GR000192		Start Date		End Date				
Client Phantom Construction				Contractor				Consultant CJ						
Inst/ Backfill	Water Levels	Samples and Tests			Coring				Frac (mm) min avg max	Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)	RQD (%)				Legend	Description	
											(0.10) 0.10		MADE GROUND: Grass over dark brown slightly gravelly slightly clayey fine to coarse organic SAND. Gravel is angular to subangular, fine to coarse of mixed natural lithologies, rare brick, concrete and plastic. Frequent fine rootlets throughout. [Made Ground, Topsoil]	0.5
		1.00	ES								(1.70)		MADE GROUND: Grey and dark grey slightly sandy to sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick, concrete, sandstone and siltstone. Sand is fine to coarse. [Made Ground, Granular Made Ground]	1.0
		1.20	SPT	N=10 (2,2/2,3,3,2)										1.5
		2.00	SPT	N=15 (3,3/5,3,4,3)							1.80		Firm rarely stiff brown locally mottled bluish grey slightly sandy to sandy slightly gravelly to gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of sandstone, siltstone, mudstone and coal occasional subangular cobbles of sandstone and siltstone throughout. [Glacial Till, Cohesive Till]	2.0
		3.00	SPT	N=26 (2,3/9,11,3,3)										2.5
		3.00	D											3.0
		3.50	U 4											3.5
		4.00	SPT	N=14 (3,3/4,3,4,3)										4.0
		4.40	D											4.5
		5.00	U 5.5											5.0
											(7.00)			5.5
		6.00	SPT	N=15 (3,4/3,4,4,4)										6.0
														6.5
		7.00	U 7.4											7.0
		7.50	SPT	N=13 (2,3/2,3,4,4)										7.5
		8.00	U 8.4											8.0
														8.5
8.90	D								8.80		Firm brown slightly sandy slightly gravelly silty CLAY. Locally laminated. Sand is predominantly fine to medium. Gravel is subangular to subrounded, fine to medium of siltstone, sandstone, mudstone and coal. [Glacial Till, Cohesive Till]	9.0		
9.00	SPT	N=12 (1,3/3,2,3,4)										9.5		
9.00	D								(4.20)			10.0		
											Continued on next page			
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.											Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC			Logger CJ



Remarks	Method, Plant, Stability, Dimensions	Logger
1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.	0.00 - 51.00m IP+RO+RC	CJ



BH01

Sheet 3 of 6

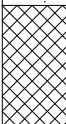
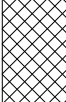
Client	Contractor	Consultant
Phantom Construction		CJ

Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.	Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC	Logge C3
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 GROUND RISK		Combined Log										BH01	
												Sheet 5 of 6	
		Hole Type IP+RO+RC		Easting		Northing		Ground Level (m)		Scale 1:50			
Project Name Lancashire Dairy				Project No. GR000192		Start Date		End Date					
Client Phantom Construction				Contractor				Consultant CJ					
Inst/ Backfill	Water Levels	Samples and Tests			Coring				Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)	RQD (%)			Frac (mm) min avg max	Legend	
												As previous page.	
													40.5
													41.0
													41.5
													42.0
													42.5
													43.0
													43.5
													44.0
													44.5
													45.0
													45.5
													46.0
													46.5
													47.0
													47.5
													48.0
													48.5
													49.0
													49.5
													50.0
Continued on next page													
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.										Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ	

		Combined Log										BH01		
												Sheet 6 of 6		
		Hole Type IP+RO+RC		Easting		Northing		Ground Level (m)		Scale 1:50				
Project Name Lancashire Dairy				Project No. GR000192				Start Date		End Date				
Client Phantom Construction				Contractor				Consultant CJ						
Inst/ Backfill	Water Levels	Samples and Tests			Coring				Frac (mm) min avg max	Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)	RQD (%)				Legend	Description	
													As previous page.	
														50.5
														51.0
														51.5
														52.0
														52.5
														53.0
														53.5
														54.0
														54.5
													55.0	
													55.5	
													56.0	
													56.5	
													57.0	
													57.5	
													58.0	
													58.5	
													59.0	
													59.5	
													60.0	
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.												Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ

 GROUND RISK	Combined Log				BH01	
					SUPPLEMENTARY INFO	
	Hole Type IP+RO+RC	Easting	Northing	Ground Level (m)	Scale 1:50	
Project Name Lancashire Dairy		Project No. GR000192		Start Date	End Date	
Client Phantom Construction		Contractor		Consultant CJ		
SPT - Details						
Top Depth (m)	Type	Results	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio
1.20		N=10 (2,2/2,3,3,2)				
2.00		N=15 (3,3/5,3,4,3)				
3.00		N=26 (2,3/9,11,3,3)				
4.00		N=14 (3,3/4,3,4,3)				
6.00		N=15 (3,4/3,4,4,4)				
7.50		N=13 (2,3/2,3,4,4)				
9.00		N=12 (1,3/3,2,3,4)				
10.50		N=10 (2,1/2,3,2,3)				
12.00		N=14 (2,3/3,3,4,4)				
13.50		N=28 (5,4/6,8,7,7)				
15.00		N=30 (4,6/6,7,8,9)				
16.50		N=43 (6,8/9,10,10,14)				
18.00		N=37 (6,7/6,10,10,11)				
19.50		N=50 (9,10/11,22,17,0 for...				
21.00		N=50 (25,0/50 for 50mm)				
25.50		N=50 (25,0/50 for 30mm)				
28.50		N=50 (25,0/50 for 20mm)				
DRAFT						
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.				Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ

		Combined Log										BH02		
		Hole Type IP+RO+RC		Easting		Northing		Ground Level (m)		Scale 1:50		Sheet 1 of 6		
		Project Name Lancashire Dairy				Project No. GR000192		Start Date		End Date				
Client Phantom Construction					Contractor					Consultant CJ				
Inst/ Backfill	Water Levels	Samples and Tests			Coring				Frac	Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)	RQD (%)				Legend	Description	
		0.40	ES								(0.20) 0.20		Strong grey CONCRETE with 10mm reinforcement bar. [Made Ground, Hardstanding]	
		1.20 1.20	SPT D	N=9 (1,1/2,2,2,3)							(0.80)		MADE GROUND: Brownish grey to grey slightly clayey sandy locally very sandy angular to subangular fine to coarse GRAVEL of predominantly siltstone and sandstone. [Made Ground, Subbase]	0.5
		2.00 2.00	SPT D	N=10 (2,1/2,2,3,3)							1.00 (0.80)		Soft to firm brown mottled grey and yellowish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of sandstone, siltstone, mudstone and coal. [Glacial Till, Cohesive Till]	1.0 1.5
		3.00 3.00	SPT D	N=13 (1,1/2,3,4,4)							1.80		Firm to stiff brown and reddish brown slightly sandy slightly gravelly CLAY. Locally slightly silty and laminated with thin sandy interlaminae. Sand is predominantly fine. Gravel is subangular to rounded, fine to coarse of sandstone, siltstone, mudstone and coal. Occasional subangular to subrounded cobbles of sandstone and siltstone. [Glacial Till, Cohesive Till]	2.0 2.5
		3.50	U											3.0 3.5
		4.00 4.00	SPT D	N=15 (3,2/3,3,4,5)										4.0
		5.00 5.00	SPT D	N=35 (5,7/7,8,10,10)									Occasional thin sandy interlaminae. (4.50 - 5.00m)	4.5
		5.50	U										Occasional thin bands of slightly silty predominantly fine to medium sand throughout. (5.00 - 10.00m)	5.0 5.5
		6.50	SPT	N=17 (4,4/4,5,4,4)							(8.65)			6.0 6.5
		8.00	SPT	N=17 (5,3/4,3,4,6)										7.0 7.5 8.0
	9.50	SPT	N=18 (4,3/4,4,5,5)										8.5 9.0 9.5	
Continued on next page														10.0
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.												Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ

		Combined Log										BH02	
												Sheet 2 of 6	
		Hole Type IP+RO+RC		Easting		Northing		Ground Level (m)		Scale 1:50			
Project Name Lancashire Dairy				Project No. GR000192		Start Date		End Date					
Client Phantom Construction				Contractor				Consultant CJ					
Inst/ Backfill	Water Levels	Samples and Tests			Coring			Frac	Level (m)	Depth (thickness) (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)				RQD (%)	Legend	
												As previous page.	
										10.45		Light brown silty CLAY with occasional sand and gravel bands. [Glacial Till]	10.5
													11.0
													11.5
													12.0
													12.5
													13.0
													13.5
													14.0
													14.5
													15.0
											(9.55)		15.5
													16.0
													16.5
													17.0
													17.5
													18.0
													18.5
													19.0
													19.5
												20.0	
Remarks										Method, Plant, Stability, Dimensions		Logger	
1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.										0.00 - 51.00m IP+RO+RC		CJ	

		Combined Log										BH02	
												Sheet 4 of 6	
		Hole Type IP+RO+RC		Easting		Northing		Ground Level (m)		Scale 1:50			
Project Name Lancashire Dairy				Project No. GR000192				Start Date		End Date			
Client Phantom Construction				Contractor				Consultant CJ					
Inst/ Backfill	Water Levels	Samples and Tests			Coring			Frac	Level (m)	Depth (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)				RQD (%)	Legend	
											x x x	As previous page.	
											x x x		30.5
											x x x		
											x x x		31.0
											x x x		
											x x x		31.5
											x x x		
											x x x		32.0
											x x x		
											x x x		32.5
											x x x		
											x x x		33.0
											x x x		
											x x x		33.5
											x x x		
											x x x		34.0
											x x x		
											x x x		34.5
											x x x		
											x x x		35.0
											x x x		
											x x x		35.5
											x x x		
											x x x		36.0
											x x x		
											x x x		36.5
											x x x		
											x x x		37.0
											x x x		
											x x x		37.5
											x x x		
											x x x		38.0
											x x x		
											x x x		38.5
											x x x		
											x x x		39.0
											x x x		
											x x x		39.5
											x x x		
											x x x		40.0
Continued on next page													
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.										Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ	

Hole Type IP+RO+RC	Easting	Northing	Ground Level (m)	Scale 1:50
Project Name Lancashire Dairy		Project No. GR000192	Start Date	End Date

Client	Contractor	Consultant
Phantom Construction		CJ

Inst/ Backfill	Water Levels	Samples and Tests			Coring				Frac	Level	Depth (m)	Strata		
		Depth (m)	Type/ Ref	Results	Core Run	TCR (%)	SCR (%)	RQD (%)				Legend	Description	
												x x x	As previous page.	
												x x x		40.5
												x x x		41.0
												x x x		41.5
												x x x		42.0
												x x x		42.5
												x x x		43.0
												x x x		43.5
												x x x		44.0
												x x x		44.5
												x x x		45.0
												x x x		45.5
												x x x		46.0
												x x x		46.5
												x x x		47.0
												x x x		47.5
												x x x		48.0
												x x x		48.5
												x x x		49.0
												x x x		49.5
												x x x		50.0
													Continued on next page	

Continued on next page

Remarks

1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.

Method, Plant, Stability, Dimensions

0.00 - 51.00m	IP+RO+RC
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Logger

CJ

 GROUND RISK	Combined Log				BH02	
	SUPPLEMENTARY INFO					
	Hole Type IP+RO+RC	Easting	Northing	Ground Level (m)	Scale 1:50	
Project Name Lancashire Dairy		Project No. GR000192		Start Date	End Date	
Client Phantom Construction		Contractor		Consultant CJ		
SPT - Details						
Top Depth (m)	Type	Results	Casing Depth (m)	Water Depth (m)	Hammer Serial No.	Energy Ratio
1.20		N=9 (1,1/2,2,2,3)				
2.00		N=10 (2,1/2,2,3,3)				
3.00		N=13 (1,1/2,3,4,4)				
4.00		N=15 (3,2/3,3,4,5)				
5.00		N=35 (5,7/7,8,10,10)				
6.50		N=17 (4,4/4,5,4,4)				
8.00		N=17 (5,3/4,3,4,6)				
9.50		N=18 (4,3/4,4,5,5)				
DRAFT						
Remarks 1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) Borehole terminated at target depth within Pennine Lower Coal Measures formation.				Method, Plant, Stability, Dimensions 0.00 - 51.00m IP+RO+RC		Logger CJ