

**Flood Risk Assessment
For
Cold Store Extension Phase 1
Tomlinson's Dairies
Minera
Wrexham**

Issue No 1

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Flood Risk Assessment

Cold Store Extension Phase 1, Tomlinson's Dairies, Wrexham

1.0 Brief

- 1.1 ABA Consulting were instructed by Haston Reynolds on behalf of Tomlinson's Dairies to prepare a Flood Risk Assessment to support a Planning Application for an extension to their existing Cold Store at Minera, Wrexham. This extension is the first phase of a planned expansion of Tomlinson's Dairies facilities on the site. An overview of the proposed expansion and information on the phasing is attached at Appendix F. This report describes the risks associated with flooding to the Phase 1 development and describes measures required to reduce such risks.
- 1.2 The Phase 1 extension will occupy some 892m² and is located on existing hard standing to the east of the existing cold store. New hardstanding is proposed to accommodate vehicle movements to the dock levellers on the northern section of the east elevation.
- 1.3 The proposed development will make use of existing surface water attenuation ponds and outfall, though the development will require some modifications to the system. A description of the existing and proposed surface water systems are described in section 6, along with an assessment of any risks associated with the proposal.

2.0 Site Location

- 2.1 The site is located adjacent to Tomlinson's Dairies existing Cold Store on the Five Crosses Industrial Estate in Minera Wrexham. The extension abuts the east side of the existing building close to the south east corner.

- 2.2 Tomlinson's Dairies Minera site is bounded by other industrial units forming the Industrial Park to the west and south. To the east runs Gwernygaseg Road beyond which there is agricultural land. To the north is the route of a disused railway and agricultural land.

There are two residential properties to the south east of the Cold Store Extension located adjacent to Gwernygaseg Road.

- 2.3 A copy of an Illustrative Site Layout Plan H0031-03-A3-PL-02 is provided at Appendix A. This drawing shows the site boundary and the location of the new extensions and the modifications to the yard area. The drawing also indicates the route of the access road feeding the site which is unchanged by the proposed extension. The residential properties adjacent to Gwernygaseg Road are indicated.

3.0 Site Surveys and Investigations

- 3.1 A site investigation was undertaken on the site by Ground Investigations Specialist Limited 2004, report reference 457. Borehole indicated an average topsoil thickness of 0.4 metres, overlying Boulder Clay. The Boulder Clay consisted of stiff fissured mottled brown and grey very silty sandy gravelly clay. The strata is described as having low permeability and the clays were of low to medium plasticity. A copy of the site investigation report is attached at Appendix E.

- 3.2 A Topographic Survey has been undertaken and this is attached at Appendix B, Haston Reynolds drawing reference H0070-16-A1-SU-01.

4.0 Flood Plain and Flood Levels

- 4.1 Reference to the Environment Agency website indicates that the site lies within flood zone 1 which is land assessed as having a less than 1 in 1000 annual

probability of river flooding. Surface water is generally routed via ditches to the River Gwenfro to the east of the site.

- 4.2 The site has a significant slope to the East, where the existing attenuation pond and surface water outlet are located. The attenuation pond has a base level some 6m below the proposed ground floor level of the proposed extension.
- 4.3 The surrounding buildings form part of the Five Crosses Industrial Estate and due to the general slope of the land those to the west are at a significantly higher level than the proposed extension and associated hardstanding and the development poses no risk of flooding.

5.0 Floor Levels of Proposed Buildings

- 5.1 The ground floor level of the Cold Store Extension will be the same as the existing store at 239.60m AOD. There will be a basement of some 460m² with a floor level of 236.245m AOD below central section of the building. The basement stops short of the existing cold store external wall, such that the construction will not compromise the foundations of the existing structure. The basement will be fully tanked.
- 5.2 The yard level around the extension is around 238.20m AOD. During the construction of previous buildings surplus material was retained on site with an area of land to the east of the stockyard being raised to around 241.5m. The new circulation areas will require a reduction in ground level to achieve a circulation area in line with the existing yard level, circa 238.20m AOD. The crest level of the balancing pond is some 237m and hence all yard areas are in excess of 2m above the maximum water level in the pond.

- 5.3 The reduction in surface levels adjacent to the existing attenuation allows for increase in the surface area of the pond whilst maintaining a similar top of embankment position.

6.0 Proposed Drainage

- 6.1 The proposed development is generally located on the existing hard paved lorry circulation area. To facilitate the future vehicle movements there will be a need for additional hard standing and in total there will be a net increase of 3,125m² of impermeable surface. It is proposed that the existing drainage system will be modified to route surface water to the existing surface water drainage system and that the volume of the attenuation pond will be increased to accommodate the increased volume.
- 6.2 The existing dairy facility is served by two attenuation ponds. The smaller of the two attenuation ponds is located adjacent to the main site access and deals with surface water run-off from the site access which would be unaffected by the proposed development. The larger of the two ponds located to the east of the proposed extension and deals with surface water from the roof areas and hard-standings around the existing buildings.
- 6.3 The existing attenuation ponds were designed to take rainwater volumes calculated from standard storm return periods and were designed to have spare capacity should any be required at a future date. The purpose of the ponds is to attenuate flows back to “Greenfield Discharge Rates” and these are set by the Environment Agency, i.e. 3 to 5 litres per second per hectare. This allows clean water to be conveyed safely back to surface drainage systems such as ditches and watercourses without overstressing capacity.

- 6.4 Given the slope of the site all surface water up to and including the 1 in 100 year plus climate change events would need to be contained on site. The existing attenuation ponds were sized using Environment Agency-approved micro-drainage analysis which provided for a 200 year return with a critical storm period of 6 hours duration at an intensity of 11.7mm/hour. On this basis taking into account previous developments the storage requirement needed for the existing dairy facilities is 804m³ with a controlled discharge rate via the hydrobrake device (located in the manhole on exit from the pond) at 5 litres / second.
- 6.5 For the Phase 1 Cold Store Extension a net additional 3,125m² of 100% run-off from the new roof and the new hard standing would require a further 197m³ of capacity based on the above criteria with no allowance included for time of concentration or pipe storage. The maximum discharge rate remains constant at 5 litres / second.
- 6.6 The total surface storage requirement in the main attenuation pond for the Phase 1 Cold Store Extension (excluding the access road which is catered for by the smaller attenuation pond) on the above basis equates to a volume of 1001m³ (804m³ existing + 197.0m³ proposed). With a previously indicated capacity of 1,068m³ the main attenuation pond would therefore appear adequate on the basis of the 6 hour 200 year event.
- 6.7 A further check on the attenuation volume for various storm events is attached at Appendix D. This includes a check for the 1in 100 year plus climate change event. The calculations include for the full impermeable area feeding to the main attenuation pond, and calculates the storage required whilst restricting the discharge to the previously agreed 5l/s. The calculations indicate that with the increased area the 24hour storm is critical, with storage requirements increasing to 1,325m³.

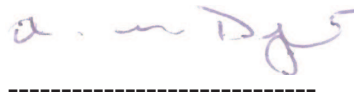
- 6.8 The modifications to the existing drainage system include a reduction in levels along the northern edge of the attenuation pond to increase capacity to 1350m³. The calculations in Appendix D, indicate the system will attenuate all storm events up to the 1 in 100 year plus climate change event.

7.0 Conclusions

- 7.1 The proposed development is within flood zone 1 and at an elevated level relative to the land to the south. Hence the risk of flooding from watercourses is not considered significant.
- 7.2 The surface water runoff from the site will be controlled and discharged at a restricted rate by the existing surface water attenuation system.
- 7.3 The established drainage system utilises SUDs principles with a balancing pond being used to attenuate the surface water runoff. The pond permits some natural infiltration and evaporation, although permeability of the site is low.
- 7.4 The ground floor of the extension is higher than the surrounding ground levels and is not at risk from surface flows. The basement area will be fully tanked reinforced concrete structure which protects the building from any flood risk.
- 7.5 Foul water will be routed by gravity sewers and connected to the existing connection to the public combined sewer running to the east of the extension. This sewer runs north south across the site partly beneath the attenuation pond. This sewer runs at considerable depth and surcharging of the drain does not put the development at risk.

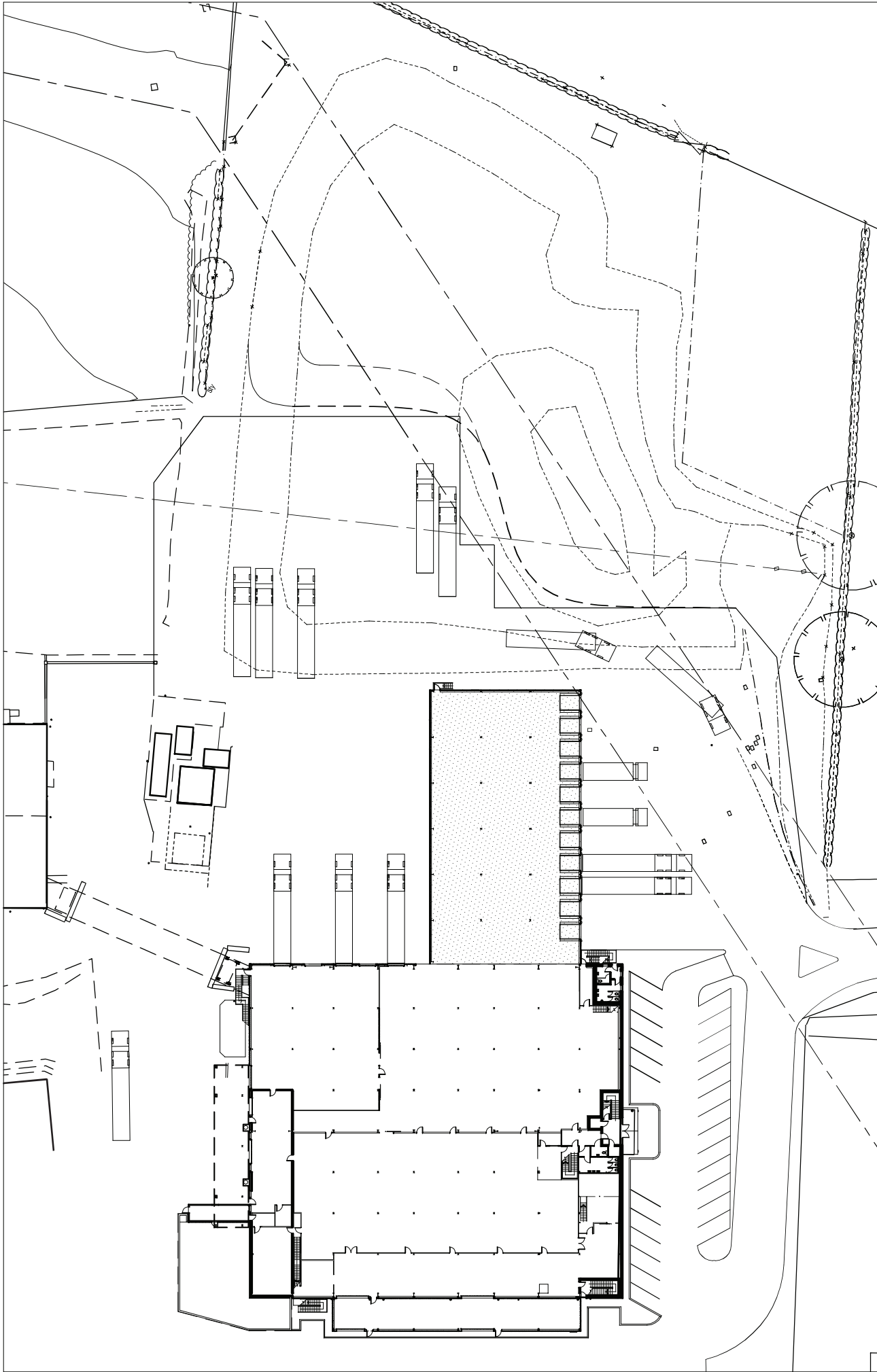
- 7.6 The surface water system intercepts and controls surface water run offs to achieve a controlled discharge below green field run off rates. The addition of the new extension to the existing system will be compensated by the increased storage volume. The areas developed under the Phase 1 works will no longer be contributing green field run off. As no increase in the restricted run off rate is being sought the scheme will assist in reducing the risk of surface water related flooding.

Report Prepared By
A.M. Dyer B.Eng C.Eng MICE
For ABA Consulting



Appendix A

Plans



HASTON REYNOLDS CHARTERED SURVEYORS +44 (0) 1902 840546 hrr@hastonreynolds.co.uk		DATE June 2016	SCALE 1/500@A3	JOB TITLE Cold Store Extension Tomlinson's Dairies Minera Wrexham		DRAWING TITLE Site Plan Phase 1
RICS		ORIGIN ISR	VERIFIED ISR	DWG No H0070-16-A3-PL-02		
		FILE NAME	ISSUE Planning			

Ref: 14150
June 2016

Appendix B

Topographic Survey

Rev	Date	By	Chkd
A	26/02/16	Detail from original survey added.	SH SH

[illegible]

Copyright of this plan is held by A.R.M. Surveys Limited.
No responsibility is taken for amendments or omissions.
Do not scale from copies or reproductions.
The origin, orientation and level datum of the survey is as stated on the title block.
This survey was carried out to a agreed specification. Detail and features not included in the original specification will not be shown.
The drawing scale indicates the accuracy of the original data.
Details with a brick drawing are shown in the changed position.
The survey has a total distance of 0.2m and larger included in the survey and shown with the average canopy spread. Areas that have not changed since the original survey, are labelled 'unchanged from original survey' may have detail omitted from this survey.
Heads within are indicative, text notes show widths.
Social boundary fences may not be shown where they are not shown.
Areas of the site obscured by overgrowth or spoil may have detail omitted from the survey.

Tel 01743 248265

Job	457-0216-T	Scale	1:500
Topographical Survey		Floor Plans	Dimensions
Title plans		Level Plans	Domestic Survey
Date	Dwg no	Rev	Surveyor
15/02/16	01/01	A	SH
Grid	Contours	Level Datum	SH
25m	0.25m		Previous survey

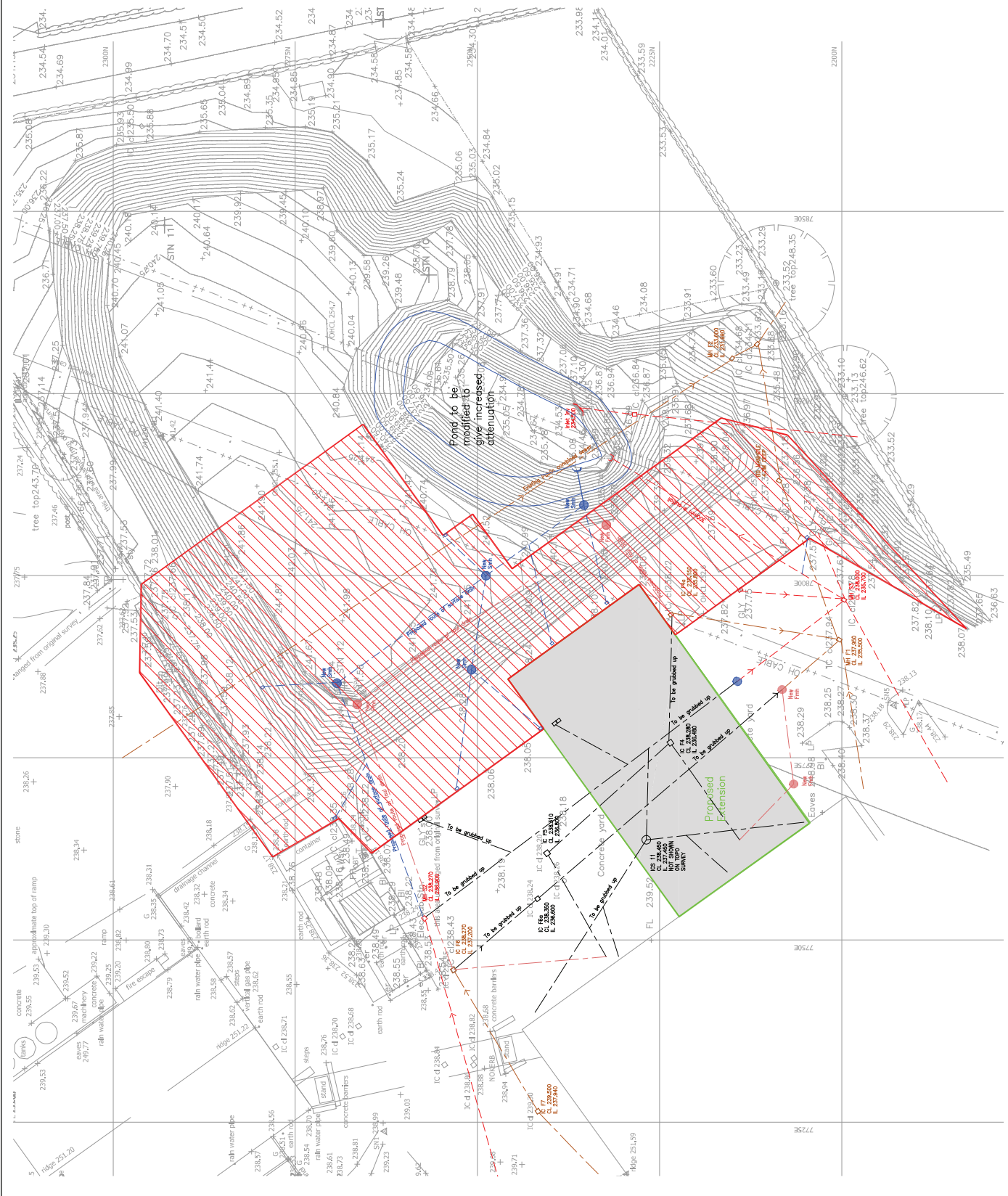


Appendix C

Proposed Drainage Arrangement.

NOTES

	New Building Extension
	New area of Handstanding
	Existing Surface
	Existing Foul Combined
	Existing drainage to be grubbed up
	New Foul Drainage
	New Surface Drainage



REV.	DATE	DESCRIPTION	BY
1			

Haston Reynolds

PROJECT
Cold Store Extension
Fire Crosses Industrial
Estate Minera, Wrexham

DRAWING TITLE
Proposed Drainage Layout

APPENDIX C

aba consulting
Consulting Civil & Structural Engineers

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St. Andrew's Road
St. Andrew's, St. Helier, Jersey
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DRAWN BY	N.V.EDGE	DATE	27.06.15
CHECKED BY	MD	SCALE	1:250
PROJECT No	14150	DRAWING No	500
		REVISIONS	~

Appendix D

Attenuation Calculations

Project Number	14150	
Project Title	Tomlinsons Dairies ; Cold Store Extension Phase 1	
Discharge Area	1.7555	ha
Date	27.06.16	
Addtl Info		
r	40	
M5-60	17	

Existing Buildings	14430	m2
Phase 1 Extension	3125	m2
Total Impermeable	1.7555	ha

Total Impermeable Area	1.7555	ha
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Wallingford Modified Rational Method

Sheet number: 01
 Design (MT): 1 in 1 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissible Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	0.38	40	17	6.46	0.62	4.01	48.26	1.00	0.75	1.7555	229.36	5.00	67,038	67.04
0.30	0.63	40	17	10.71	0.61	6.53	21.78	1.00	0.75	1.7555	103.51	5.00	106,387	106.39
0.50	0.80	40	17	13.60	0.62	8.43	16.86	1.00	0.75	1.7555	80.15	5.00	135,279	135.28
1.00	1.00	40	17	17.00	0.64	10.88	10.88	1.00	0.75	1.7555	51.71	5.00	168,166	168.17
2.00	1.20	40	17	20.40	0.65	13.26	6.63	1.00	0.75	1.7555	31.51	5.00	190,890	190.89
4.00	1.40	40	17	23.80	0.66	15.71	3.93	1.00	0.75	1.7555	18.67	5.00	196,777	196.78
6.00	1.55	40	17	26.35	0.68	17.92	2.99	1.00	0.75	1.7555	14.19	5.00	198,592	198.59
10.00	1.70	40	17	28.90	0.68	19.65	1.97	1.00	0.75	1.7555	9.34	5.00	156,263	156.26
24.00	2.20	40	17	37.40	0.70	26.18	1.09	1.00	0.75	1.7555	5.18	5.00	15,962	15.96
48.00	2.60	40	17	44.20	0.72	31.82	0.66	1.00	0.75	1.7555	3.15	5.00	-319,464	-319.46



Wallingford Modified Rational Method

Sheet number: 01
 Design (MT): 1 in 1 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Permissible			Rqd storage (100%) (m3)
											Discharge Rate (l/s)	Qp Discharge (l/s)	Rqd storage (100%) (l)	
0.083	0.38	40	17	6.46	0.62	4.01	48.26	1.00	0.75	1.7142	223.96	5.00	65,426	65.43
0.30	0.63	40	17	10.71	0.61	6.53	21.78	1.00	0.75	1.7142	101.07	5.00	103,757	103.76
0.50	0.80	40	17	13.60	0.62	8.43	16.86	1.00	0.75	1.7142	78.27	5.00	131,884	131.88
1.00	1.00	40	17	17.00	0.64	10.88	10.88	1.00	0.75	1.7142	50.50	5.00	163,786	163.79
2.00	1.20	40	17	20.40	0.65	13.26	6.63	1.00	0.75	1.7142	30.77	5.00	185,552	185.55
4.00	1.40	40	17	23.80	0.66	15.71	3.93	1.00	0.75	1.7142	18.23	5.00	190,454	190.45
6.00	1.55	40	17	26.35	0.68	17.92	2.99	1.00	0.75	1.7142	13.86	5.00	191,379	191.38
10.00	1.70	40	17	28.90	0.68	19.65	1.97	1.00	0.75	1.7142	9.12	5.00	148,352	148.35
24.00	2.20	40	17	37.40	0.70	26.18	1.09	1.00	0.75	1.7142	5.06	5.00	5,423	5.42
48.00	2.60	40	17	44.20	0.72	31.82	0.66	1.00	0.75	1.7142	3.08	5.00	-332,275	-332.27



Wallingford Modified Rational Method

Sheet number: 02
 Design (MT): 1 in 5 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissible Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	0.38	40	17	6.46	1.02	6.59	79.39	1.00	0.75	1.7555	377.33	5.00	111,253	111.25
0.30	0.63	40	17	10.71	1.03	11.03	36.77	1.00	0.75	1.7555	174.77	5.00	183,355	183.36
0.50	0.80	40	17	13.60	1.03	14.01	28.02	1.00	0.75	1.7555	133.16	5.00	230,689	230.69
1.00	1.00	40	17	17.00	1.03	17.51	17.51	1.00	0.75	1.7555	83.23	5.00	281,611	281.61
2.00	1.20	40	17	20.40	1.03	21.01	10.51	1.00	0.75	1.7555	49.94	5.00	323,533	323.53
4.00	1.40	40	17	23.80	1.03	24.51	6.13	1.00	0.75	1.7555	29.13	5.00	347,456	347.46
6.00	1.55	40	17	26.35	1.03	27.14	4.52	1.00	0.75	1.7555	21.50	5.00	356,397	356.40
10.00	1.70	40	17	28.90	1.03	29.77	2.98	1.00	0.75	1.7555	14.15	5.00	329,339	329.34
24.00	2.20	40	17	37.40	1.02	38.15	1.59	1.00	0.75	1.7555	7.55	5.00	220,745	220.75
48.00	2.60	40	17	44.20	1.02	45.08	0.94	1.00	0.75	1.7555	4.46	5.00	-92,574	-92.57



Wallingford Modified Rational Method

Sheet number: 01
 Design (MT): 1 in 10 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissible Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	0.38	40	17	6.46	1.20	7.75	93.40	1.00	0.75	1.7555	443.92	5.00	131,149	131.15
0.30	0.63	40	17	10.71	1.23	13.17	43.91	1.00	0.75	1.7555	208.71	5.00	220,006	220.01
0.50	0.80	40	17	13.60	1.24	16.86	33.73	1.00	0.75	1.7555	160.31	5.00	279,558	279.56
1.00	1.00	40	17	17.00	1.24	21.08	21.08	1.00	0.75	1.7555	100.19	5.00	342,697	342.70
2.00	1.20	40	17	20.40	1.24	25.30	12.65	1.00	0.75	1.7555	60.12	5.00	396,836	396.84
4.00	1.40	40	17	23.80	1.24	29.51	7.38	1.00	0.75	1.7555	35.07	5.00	432,976	432.98
6.00	1.55	40	17	26.35	1.22	32.15	5.36	1.00	0.75	1.7555	25.47	5.00	442,063	442.06
10.00	1.70	40	17	28.90	1.20	34.68	3.47	1.00	0.75	1.7555	16.48	5.00	413,405	413.40
24.00	2.20	40	17	37.40	1.19	44.51	1.85	1.00	0.75	1.7555	8.81	5.00	329,536	329.54
48.00	2.60	40	17	44.20	1.17	51.71	1.08	1.00	0.75	1.7555	5.12	5.00	20,871	20.87



Wallingford Modified Rational Method

Sheet number: 03
 Design (MT): 1 in 30 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissible Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	0.38	40	17	6.46	1.46	9.43	113.63	1.00	0.75	1.7555	540.10	5.00	159,889	159.89
0.30	0.63	40	17	10.71	1.51	16.17	53.91	1.00	0.75	1.7555	256.22	5.00	271,319	271.32
0.50	0.80	40	17	13.60	1.53	20.81	41.62	1.00	0.75	1.7555	197.80	5.00	347,043	347.04
1.00	1.00	40	17	17.00	1.54	26.18	26.18	1.00	0.75	1.7555	124.43	5.00	429,962	429.96
2.00	1.20	40	17	20.40	1.53	31.21	15.61	1.00	0.75	1.7555	74.18	5.00	498,064	498.06
4.00	1.40	40	17	23.80	1.53	36.41	9.10	1.00	0.75	1.7555	43.27	5.00	551,075	551.07
6.00	1.55	40	17	26.35	1.51	39.79	6.63	1.00	0.75	1.7555	31.52	5.00	572,815	572.82
10.00	1.70	40	17	28.90	1.50	43.35	4.34	1.00	0.75	1.7555	20.60	5.00	561,756	561.76
24.00	2.20	40	17	37.40	1.47	54.98	2.29	1.00	0.75	1.7555	10.89	5.00	508,721	508.72
48.00	2.60	40	17	44.20	1.42	62.76	1.31	1.00	0.75	1.7555	6.21	5.00	209,946	209.95



Wallingford Modified Rational Method

Sheet number: 03
 Design (MT): 1 in 50 Year Storm Event
 Project Number: 14150
 Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
 Discharge Area: 1.7555 ha
 Calc Date: 27.06.16
 Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissible Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	0.38	40	17	6.46	1.61	10.40	125.31	1.00	0.75	1.7555	595.59	5.00	176,469	176.47
0.30	0.63	40	17	10.71	1.67	17.89	59.62	1.00	0.75	1.7555	283.37	5.00	300,640	300.64
0.50	0.80	40	17	13.60	1.70	23.12	46.24	1.00	0.75	1.7555	219.78	5.00	386,603	386.60
1.00	1.00	40	17	17.00	1.73	29.41	29.41	1.00	0.75	1.7555	139.79	5.00	485,230	485.23
2.00	1.20	40	17	20.40	1.72	35.09	17.54	1.00	0.75	1.7555	83.39	5.00	564,386	564.39
4.00	1.40	40	17	23.80	1.71	40.70	10.17	1.00	0.75	1.7555	48.36	5.00	624,378	624.38
6.00	1.55	40	17	26.35	1.70	44.80	7.47	1.00	0.75	1.7555	35.49	5.00	658,481	658.48
10.00	1.70	40	17	28.90	1.68	48.55	4.86	1.00	0.75	1.7555	23.08	5.00	650,766	650.77
24.00	2.20	40	17	37.40	1.64	61.34	2.56	1.00	0.75	1.7555	12.15	5.00	617,512	617.51
48.00	2.60	40	17	44.20	1.58	69.84	1.45	1.00	0.75	1.7555	6.92	5.00	330,954	330.95



Wallingford Modified Rational Method

Sheet number: 04
Design (MT): 1 in 100 Year Storm Event +20%
Project Number: 14150
Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
Discharge Area: 1.7555 ha
Calc Date: 27.06.16
Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Qp Discharge +20% (l/s)	Permissible Discharge Rate (l/s)	Rqd Storage (120%) (l)	Rqd Storage (120%) (m3)
0.083	0.38	40	17	6.46	1.84	11.89	143.21	1.00	0.75	1.7555	680.68	816.81	5.00	242.570	242.57
0.30	0.63	40	17	10.71	1.95	20.88	69.62	1.00	0.75	1.7555	330.88	397.06	5.00	423.422	423.42
0.50	0.80	40	17	13.60	1.99	27.06	54.13	1.00	0.75	1.7555	257.27	308.73	5.00	546.706	546.71
1.00	1.00	40	17	17.00	2.03	34.51	34.51	1.00	0.75	1.7555	164.03	196.83	5.00	690.595	690.59
2.00	1.20	40	17	20.40	2.02	41.21	20.60	1.00	0.75	1.7555	97.93	117.52	5.00	810.125	810.13
4.00	1.40	40	17	23.80	2.01	47.84	11.96	1.00	0.75	1.7555	56.84	68.21	5.00	910.259	910.26
6.00	1.55	40	17	26.35	1.97	51.91	8.65	1.00	0.75	1.7555	41.12	49.35	5.00	957.859	957.86
10.00	1.70	40	17	28.90	1.96	56.64	5.66	1.00	0.75	1.7555	26.92	32.31	5.00	983.073	983.07
24.00	2.20	40	17	37.40	1.89	70.69	2.95	1.00	0.75	1.7555	14.00	16.80	5.00	1,019.398	1019.40
48.00	2.60	40	17	44.20	1.81	80.00	1.67	1.00	0.75	1.7555	7.92	9.51	5.00	778.683	778.68



Wallingford Modified Rational Method

Sheet number: 04
Design (MT): 1 in 100 Year Storm Event +30%
Project Number: 14150
Project Title: Tomlinsons Dairies ; Cold Store Extension Phase 1
Discharge Area: 1.7555 ha
Calc Date: 27.06.16
Addtl Info: 0

Duration (hrs)	Z1 (mm)	r	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Qp Discharge +30% (l/s)	Permissible Discharge Rate (l/s)	Rqd Storage (130%) (l)	Rqd Storage (130%) (m3)
0.083	0.38	40	17	6.46	1.84	11.89	143.21	1.00	0.75	1.7555	680.68	884.88	5.00	262,908	262.91
0.30	0.63	40	17	10.71	1.95	20.88	69.62	1.00	0.75	1.7555	330.88	430.15	5.00	459,157	459.16
0.50	0.80	40	17	13.60	1.99	27.06	54.13	1.00	0.75	1.7555	257.27	334.45	5.00	593,015	593.01
1.00	1.00	40	17	17.00	2.03	34.51	34.51	1.00	0.75	1.7555	164.03	213.23	5.00	749,644	749.64
2.00	1.20	40	17	20.40	2.02	41.21	20.60	1.00	0.75	1.7555	97.93	127.31	5.00	880,636	880.64
4.00	1.40	40	17	23.80	2.01	47.84	11.96	1.00	0.75	1.7555	56.84	73.90	5.00	992,114	992.11
6.00	1.55	40	17	26.35	1.97	51.91	8.65	1.00	0.75	1.7555	41.12	53.46	5.00	1,046,681	1046.68
10.00	1.70	40	17	28.90	1.96	56.64	5.66	1.00	0.75	1.7555	26.92	35.00	5.00	1,079,996	1080.00
24.00	2.20	40	17	37.40	1.89	70.69	2.95	1.00	0.75	1.7555	14.00	18.20	5.00	1,140,348	1140.35
48.00	2.60	40	17	44.20	1.81	80.00	1.67	1.00	0.75	1.7555	7.92	10.30	5.00	915,574	915.57

 ABA Consulting Unit A Racecourse Business Park Dovefields, Uttoxeter Staffordshire ST14 8GB	Project				Job Ref.	
	Section				Sheet no./rev.	
	Calc. by M	Date 28/06/2016	Chk'd by	Date	App'd by	1 Date

From Previous Works - Critical Storm 200year; Duration= 6hr ; Intensity = 11.7mm/hr

Existing Impermeable Area

Site Area – Prior to Cold Store Extension; $A_o = 14000\text{m}^2$

Run off coefficient ; $C_v = 0.9$

Total storm Run off ;

Volume = $A_o \times \text{Intensity} \times C_v \times \text{Duration} = 884.520\text{m}^3$

Permitted site discharge; $q_d = 5\text{l/s}$

Outflow during storm event; $\text{Out} = q_d \times \text{Duration} = 108.000\text{m}^3$

Attenuation volume required existing; $\text{Vol}_{ae} = \text{Volume} - \text{Out} = 776.520\text{m}^3$

Additional Impermeable Area; $A_i = 3125\text{m}^2$

Additional run off volume

Volume = $A_i \times \text{Intensity} \times C_v \times \text{Duration} = 197.438\text{m}^3$

Intensity = **11.700**mm/hr

Total Required Attenuation

Appendix E

Site Investigation

Appendix F

Proposed Phased Development of Tomlinson's Dairies Overview

F1. INTRODUCTION

- F1.1 Tomlinson's Dairies Limited (TDL) principally operates from the Five Crosses Industrial Estate in Minera, Wrexham and is currently the largest processor of liquid milk in Wales, with a throughput of approximately 95 million litres of milk per annum.
- F1.2 Tomlinson's Dairies Limited has recently been selected by J Sainsbury to process 100 million litres of milk and cream for sale in their stores in Wales and parts of England from July 2017. This will generate a further 60 full time jobs at the Five Crosses site, together with many more jobs in the wider rural economy.
- F1.3 Whilst the existing Five Crosses Dairy has sufficient capacity to process the additional milk, delivery is constrained principally due to insufficient cold storage capacity, insufficient storage for the increased number of poly bottles that will be blow moulded on site and inadequate staff car parking.
- F1.4 In order to help facilitate the required increase in output and the associated increase in employment, Tomlinson's Dairies Limited needs to increase the size of its cold storage facilities through the extension of the existing main dairy building, provide additional poly bottle production and storage facilities through the extension of the existing blow moulding building and to re-organise and extend on-site car parking.
- F1.5 Given that the dairy has to continue operating throughout the development process, the development will be arranged into three Phases, with each Phase being the subject of a separate planning application. The development comprised within each Phase will broadly be as follows:

Phase 1

- Extension of the main dairy building to provide approximately 36% of the required additional cold storage capacity and additional first floor office accommodation; and
- Extension of the hardstanding to the east of the main dairy to facilitate the circulation and manoeuvring of goods vehicles and the interim provision of additional car parking.

Phase 2

- Extension of the main dairy building to provide the remaining 64% of the required additional capacity;
- Re-positioning of the main surface water attenuation pool;
- Removal of the majority of the earth mound to the east of the main

dairy building;

- Repositioning of the main parking area for goods vehicles;
- Formation of a new staff car park with car-only access off Gwern y gasseg Road; and
- Establishment of extensive structural landscaping for the dairy site as a whole.

Phase 3

- Extension of the existing blow moulding building to facilitate increased production and to provide storage for the additional poly bottles;
- Establishment of additional structural landscaping.

- F1.6 Whilst forming an integral part of a holistic proposal, this planning application and the associated submission deal specifically with the Phase 1 development.
- F1.7 Precise details for the developments proposed within Phases 2 and 3 will be submitted within subsequent planning applications.
- F1.8 The planning application for the Phase 1 cold store extension is being made by Tomlinson's Dairies Limited which is the freeholder owner of the site.