

TECHNICAL NOTE

Job Name: Green Park Interchange
Job No: 36382/2011
Note No: 36382/2011/TN001 **Rev C**
Date: 22nd December 2017 – **Rev C 21st February 2020**
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Approved By: S Earl
Subject: **Flood Risk and Proposed Surface Water Drainage – Station Building, Eastern Platform and Interchange**

1. Introduction

Stantec have been commissioned by Reading Borough Council (RBC) to complete a detailed design of the surface water drainage for Green Park Transport Interchange, including an allowance for surface water discharge from the proposed station building and eastern platform (station surface water to be designed by others). To gain planning permission, a Flood Risk Assessment (FRA) (reference 28791/4001; date Oct 2014) was submitted to RBC outlining the requirements for flood risk and the proposed surface water drainage strategy. There are three RBC planning conditions relating to surface water drainage and flood risk; these are:

- RBC Planning condition 30 – Design of the Surface Water Drainage
- RBC Planning Condition 29 – Compliance with Flood Risk Assessment
- RBC Planning condition 27 – Avoidance of construction of soakaways in contaminated land
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These planning conditions can be found in **Appendix A**

This Technical Note outlines the proposed surface water drainage design to be constructed, and addresses the planning conditions listed above, as well as the following conditions associated with the station building.

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- WBC planning condition 7 – SuDS
- WBC planning condition 8 – Soakaways

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- RBC planning condition 8 – Design of Drainage

2. Proposed Surface Water Drainage Strategy

Discharge Destination

In accordance with the discharge destination hierarchies of the National Planning Practice Guidance, an assessment of the suitability of the site to utilise infiltration drainage techniques has been undertaken.

TECHNICAL NOTE

See the Planning Practice Guidance

This states:

"Generally the aim should be discharge surface runoff 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, highway drain or another drainage system;*
- 4. To a combined sewer."*

Geo-environmental Report on Ground Conditions (Document reference 11321 / 4004 Rev 01; dated Oct 2010) and Geoenvironmental Data (technical note No. TN02/GEO; dated 24th October 2014 – submitted as part of the Interchange planning application – See Appendix E) outlines that the site was formerly used as a waste transfer site and that the composition of the made ground under the site has the potential to impact water quality.

The mitigation measures outlined in these geoenvironmental reports include a lined drainage system and measures to ensure no uncontrolled discharges, including run-off.

As such the proposed surface water strategy will discharge into the existing surface water body via a lined surface water drainage system. The proposed surface water network will discharge via a proposed headwall into the surface water lake along the eastern edge of the site.

The proposed outfall invert level will be set at 38.866m which is the modelled flood level for 1 in 100 year flood event. This outfall level has been set to allow cover of around 800mm to the surface water drainage pipe work under the proposed interchange carriageway in the north western edge of the site. The proposed pipe will be concrete encased for additional protection.

To mimic the effect of climate change, the surface water network was modelled to have a surcharged outfall to the 1 in 100 year flood event plus 20% climate change flood level (39.10m) to meet the Interchange planning condition.

This has also been checked against the 1 in 100 flood event plus 40% climate change flood level for the station building planning application.

Peak Flow Control – Defra Technical Standard S2

S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

In accordance with best practice the proposed surface water drainage strategy seeks to reduce the peak discharge rate from the site to '*should never exceed greenfield runoff rate*'.

In addition, RBC planning condition 30 states that 'run off rates will be limited to greenfield rates and the discharge volumes will be limited either by using infiltration drainage or where this is not practical the run-off rate will be limited to Q_{bar} of 2l/s/ha and additional attenuation provided to ensure no increase of flood risk downstream.'

As infiltration techniques will not be used, the proposed drainage scheme will provide attenuation to reduce the total peak discharge rate from the 0.9ha site to 5 l/s, which is the practical minimum to avoid blockage.

TECHNICAL NOTE

Table 1 below shows the Calculated Greenfield Runoff Rates as outlined in the Flood Risk Assessment for the site.

Rainfall Event	Greenfield Runoff Rate (l/s/ha)	Greenfield Runoff Rate (l/s) (Site Area 0.9ha)	Designed Rate from Microdrainage model (l/s)
1 in 1 year	3.16	2.84	5.0
1 in 30 year	8.32	7.49	5.0
1 in 100 year	11.85	10.67	5.0
1 in 100 year + 20% CC	-	-	5.0
1 in 100 year + 40% CC	-	-	5.0

Table 1: Calculated Greenfield Runoff Rates

This represents a reduction of greater than 50% on the existing greenfield run-off rate in the 1 in 100 year rainfall event.

The EA's *Flood Risk Assessments: Climate Change Allowances* guidance, which supports the NPPF, provides contingency allowances for potential increases in sea level, peak river flow and rainfall intensity.

In accordance with this guidance, the potential for increased pluvial (rainfall) flood probability as the result of possible climate change has been taken into account, over the lifetime of the development, through a +20% allowance for increases in peak rainfall intensity within the surface water drainage design. This represents the central limit for the climate change period up to 2115. This has also been checked against the upper end limit for the climate change period up to 2115 (40% allowance).

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115	Comment
Upper End	10%	20%	40%	20% allowance applied for 'more vulnerable' development in Flood Zone 1, not within a known flood risk area with a 100 year life expectancy (checked against 40%)
Central	5%	10%	20%	

Table 2: Flood Risk Assessments: Climate Change Allowances Table 2 Peak Rainfall Intensity Allowance in Small and Urban Catchments (use 1961 to 1991 baseline)

In order to demonstrate that the proposed peak discharge rates are deliverable within the development layout the surface water drainage network has been modelled. A copy of the Proposed Surface Water Drainage drawing (36382/2002/SK114) and accompanying MicroDrainage calculations are contained within **Appendices B and C** respectively.

TECHNICAL NOTE

Volume Control - Defra Technical Standard S4

S4 Where reasonably practicable, for greenfield development, 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 should never exceed the greenfield runoff volume for the same event.

The development proposals will increase the existing level of impermeability across the site and as such the volumetric run-off will be increased. However, the proposed drainage scheme will introduce attenuation and reduce the peak rate of run-off to the practical minimum. Therefore, the volumetric run-off will be reduced in any given storm duration compared to the existing unrestricted greenfield run-off rate.

Flood Risk within the Development – Defra Technical Standards S7 to S9

S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

The proposed outline surface water drainage network has been designed to demonstrate that the peak discharge rate can be achieved with no flooding in a 1 in 30 year or a 1 in 100 year rainfall event.

SuDS Selection

The Ministerial Statement HCWS161, dated 18th December 2014 states that:

*'.....the Government's expectation is that sustainable drainage systems will be provided in new developments **wherever this is appropriate.**'*

The NPPG paragraph 051 describes SuDS as follows:

*'Sustainable drainage systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. **They provide opportunities to:***

- *reduce the causes and impacts of flooding;*
- *remove pollutants from urban run-off at source;*
- *combine water management with green space with benefits for amenity, recreation and wildlife.'*

The current planning policy and guidance advises that SuDS in the form of open or near surface systems employing natural processes should be used where possible, not that they must be used. They can also provide opportunities to combine water management with amenity and wildlife, but only where appropriate.

TECHNICAL NOTE

For the Green Park Interchange development it is considered that open surface SuDS are not appropriate due to the density of the development. Therefore, a system which utilises cellular attenuation tanks is proposed.

Cellular crate storage will provide the primary attenuation required for management of the 100 year + 40% storm event.

The proposed system follows the principles of the NPPG SuDS requirements by reducing flood risk and removal of pollutants / contaminants through the use of trapped gullies, catchpits / silt traps and an oil interceptor.

Structural Integrity – Defra Technical Standards S10 & S11

S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

The components that make up any drainage network have different life expectancies which can be greatly affected by the effectiveness of their maintenance regime and upstream sediment capture/management.

Green Park Interchange drainage network comprises a piped network, inspection chambers / catchpits, cellular crate storage and hydraulic flow controls. As with any drainage system, this network requires regular inspection and maintenance to ensure that the individual components continue to operate as designed, both in terms of hydraulic capacity and potential pollutant removal.

All the drainage manholes, catchpits and gullies will therefore be inspected and cleaned regularly by a Reading Borough Council within the Interchange. The drainage located in Network Rail land will be maintained and inspected by Network Rail. Refer to Appendix F for the proposed drainage for the Station itself.

3. Maintenance Strategy

This section sets out the inspection and maintenance requirements for long term management of the development's surface water drainage system. These works within the Interchange is to be undertaken by Reading Borough Council.

Health, Safety and Welfare

All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities, including lone working if relevant, and risk assessments should always be undertaken. The site's infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.

The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on to maintenance operatives through task specific risk assessments.

TECHNICAL NOTE

Operation and Maintenance

There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – ‘*basic tasks undertaken on a frequent and predictable schedule including vegetation management, litter and debris removal, and inspections.*’
- Occasional Maintenance – ‘*tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example.*’
- Remedial Maintenance – ‘*intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.*’

Specific maintenance needs should be monitored and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

Operation and Maintenance Activity	SuDS Component		
	Piped Network / Inspection Chambers	Cellular / Modular Storage	Oil Interceptor
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	□	□
Grass cutting			
Weed and invasive plant control			
Occasional Maintenance			
Sediment management ¹	■	■	■
Vacuum sweeping and brushing			
Remedial Maintenance			
Structure rehabilitation / repair	□	□	□
■ Will be required □ May be required ¹ Sediment should be collected and managed in pre-treatment systems, upstream of the main device.			

Table 3: Extract from The SuDS Manual

Piped Network / Inspection Chambers

Piped network components requires regular inspection and maintenance to ensure that the individual components continue to operate as designed, both in terms of hydraulic capacity and potential pollutant removal. All the gullies, inspection chambers catchpits and oil interceptors will therefore be inspected and cleaned regularly.

TECHNICAL NOTE

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Table 4: Piped Network / Inspection Chambers operation and maintenance

Cellular / Modular Storage

Cellular storage systems are plastic high void ratio modular systems which can be used to control and manage runoff.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required take remedial action	Monthly for three months, then annually
	Remove debris from catchment surface (where may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures and / or catchpits	Annually, or as required
Remedial Maintenance	Repair / rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually, and after large rainfall events
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of storage units is required.	As required

Table 5: The SuDS Manual Table 21.3: Operation and maintenance requirements for attenuation storage tanks

4. Fill Material

Within the FRA (reference 28791/4001; date Oct 2014), there is a requirement that the fill material is to have an infiltration rate of 1×10^{-5} m/s to allow for soakaways. Due to the potential for contaminated land and potential to contaminate the ground water it is not appropriate to use infiltration drainage. In addition there are higher costs associated to fill material with a material with an infiltration rate of 1×10^{-5} m/s, therefore a cohesive Class 2 material will be used with a lower infiltration rate.

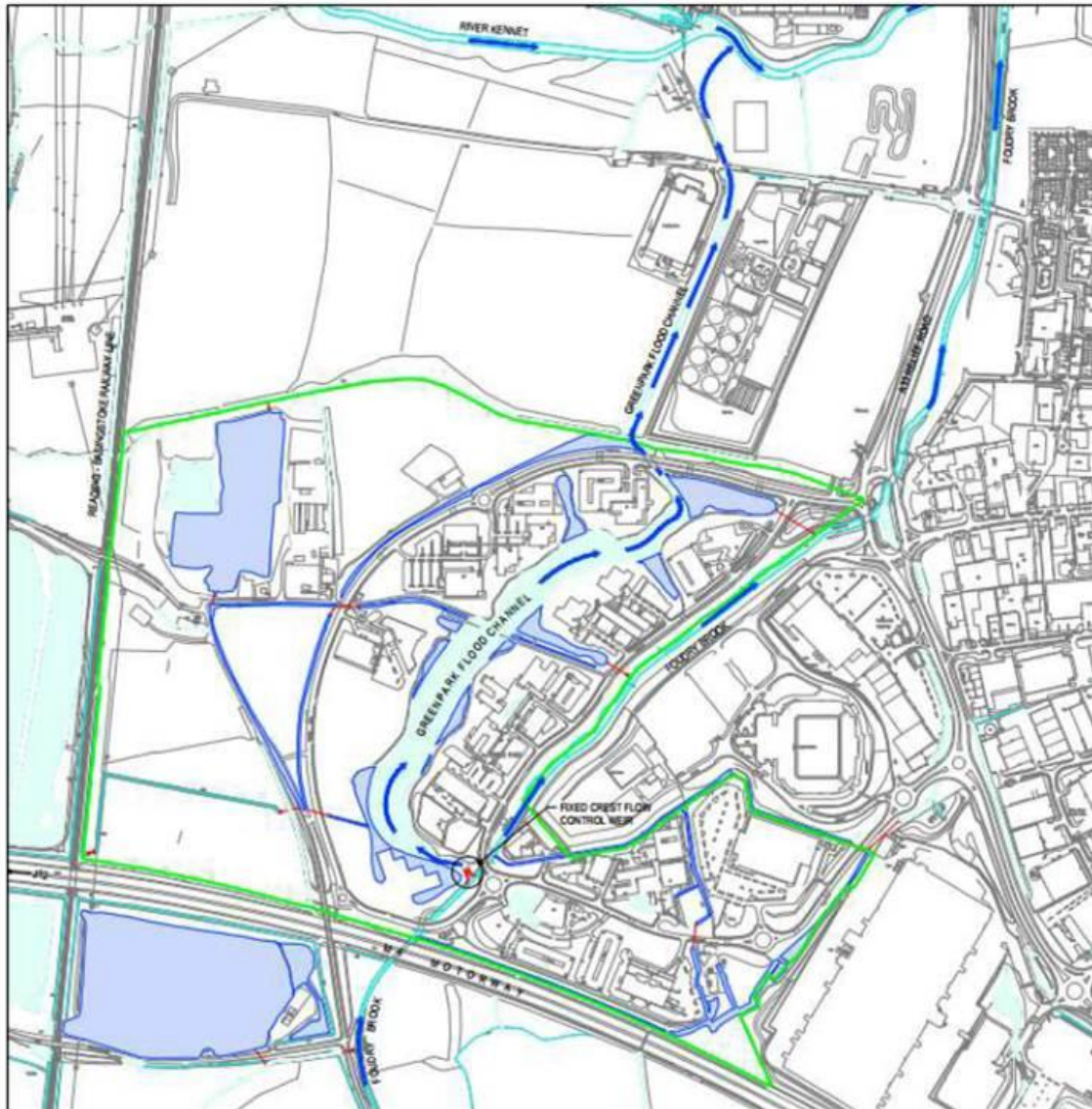
5. Flood Compensation

The site lies within the area of land designated as part of the 'Green Park Flood Management Scheme' (GPFMS), a floodplain management scheme devised in the 1980s in order to facilitate the development of all the Green Park phases and alleviate an existing flooding problem in South

TECHNICAL NOTE

Reading. The RBC SFRA provides details of this scheme in Section 7.2 and states that “the scheme is designed to reduce the flood risk associated with the Foudry Brook whilst at the same time allowing further land raising to facilitate the entire Green Park development. The majority of the scheme has now been implemented. The original scheme requires that any losses in flood storage within boundary ditches will need to be compensated for on an area for area basis at the 37.8m contour”. See SFRA Figure 7.2 below (extent of GPFMS shown by green outline with designated flood storage areas in blue)

Figure 7.2: Overview of Green Park Floodplain Management Strategy



This Strategy was developed in order to facilitate the development of all the phases of Green Park and alleviate the flooding problems in the South Reading area. The GPFMS determined that 16ha of flood storage area has been dedicated to serve the Green Park development and enable development of the site. The proposed railway station building lies on land above the designated contour level of 37.8m AOD, and therefore floodplain compensation is not required for this element.

As a consequence of this, there would not be any requirement to provide floodplain compensation for the ground raising associated with the development – effectively, this compensatory flood storage was already provided as part of the original Strategy and the site lies within the extent of permissible

TECHNICAL NOTE

development based on the Strategy (for reference, the site is on a consented development platform of between 41.0 and 41.5m AOD, well above the modelled 1 in 100 annual probability +70% allowance for climate change flood level in any case (39.4m AOD)).

This approach was reconfirmed and accepted by the EA during the consultation period of the original Green Park Station scheme.

The FRA (reference 28791/4001; date Oct 2014), recommends flood compensation is provided however it was subsequently agreed in April 2015 with the Environment Agency (reference WA/2015/119569/02-L01) that flood compensation is not required as the area was included in the wider Floodplain Management Strategy. See **Appendix D** for details.

6. Construction Programme

Construction of the adjacent Transport Interchange (covered by RBC planning application 141944, approved on 8th May 2015) commenced in March 2019. Piling works for the station platforms are currently due to commence in Summer 2020.

Construction of the station building is currently programmed for completion in Spring 2021, and the currently project completion date is Spring 2021.

The key dates on the latest construction programme (January 2020) are shown below.

Access Date: Spring 2019

Start on Site (Interchange and enabling works): April 2019

Platform works commence: Summer 2020

Station Building works commence: Summer 2020

Completion Date: Spring 2021

7. Conclusion

Technical Note No TN02/GEO (See Appendix E) submitted as part of the Interchange planning application outlines that for the protection of the controlled waters the proposed surface water drainage system is to be lined and therefore, the site will not use infiltrating drainage techniques. As such the proposed surface water strategy will discharge into the existing surface water lake at the eastern edge of the site.

The proposed drainage scheme will provide attenuation to reduce the total peak discharge rate to 5 l/s in both the 1 in 100 year + 20% Climate Change (CC) and 1 in 100 year + 40% Climate Change events, which represents a reduction greater than 50% on the existing greenfield run-off rate.

In accordance with Table 2 of the EA's Flood Risk Assessments: Climate Change Allowances guidance, an allowance of 20% has been added to the peak rainfall intensities in the 1 in 100 year design storm event to account for the potential effects of climate change (and checked for an allowance of 40%).

The proposed surface water system utilises cellular crate storage to provide attenuation and water quality improvements in the management of run-off. The proposed system follows the principles of the NPPG SuDS requirements by reducing flood risk and removal of pollutants / contaminants through the use of trapped gullies, catchpits / silt traps and an oil interceptor.

As the landowner of the Interchange, Reading Borough Council will be responsible for the long term maintenance of the proposed system and will undertake inspection and maintenance in accordance with this Strategy.

TECHNICAL NOTE

As a result, the principles advocated by relevant national, regional and local planning policy guidance have been satisfactorily addressed.

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Manager)
36382-2011-TN001	-	22.12.17	GR/AM/RT	CB	CB	SE
36382-2011-TN001	B	13.12.19	GR	RT	GR	GR
36382-2011-TN001	C	21.02.20	RT	GR	GR	GR

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TECHNICAL NOTE

Appendix A

Planning Conditions relating to surface water drainage and flood risk.

RBC Planning condition 27 states the following:

The development hereby permitted shall not be commenced until such time as a scheme to dispose of surface water that ensures that no soakaways are constructed in contaminated ground, has been submitted to, and approved in writing by the Local Planning Authority. The scheme shall be implemented as approved.

Core Strategy Policy CS34: Pollution and Water Resources

RBC Planning Condition 29 states the following:

The development hereby permitted shall only be carried out in accordance with approved Flood Risk Assessment (FRA) ref: 28791/4001 undertaken by Peter Brett Associates, dated October 2014.

Reason: To reduce the risk of flooding. This condition is imposed in accordance with the National Planning Policy Framework (March 2012), and Policy CS16 of the West Berkshire Core Strategy (2006-2026).

RBC Planning condition 30 states the following:

No development shall commence on the railway station hereby approved until a surface water drainage scheme has been submitted to and approved in writing by the Local Planning Authority. Before these details are submitted an assessment shall be carried out of the potential for disposing of surface water by means of a sustainable drainage systems March 2015, and the results of the assessment provided to the local planning authority. Where a sustainable drainage scheme is to be provided, the submitted details shall:

- i. provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;
- ii. Include a timetable for its implementation; and
- iii. provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. Run off rates will be limited to greenfield rates and the discharge volumes will be limited either by using infiltration drainage or where this is not practical the run-off rate will be limited to Q_{bar} of 2l/s/ha and additional attenuation provided to ensure no increase of flood risk downstream.
- iv. Thereafter, the railway station shall not be brought into use until the surface water drainage scheme has been implemented in accordance with the requirements of part ii) of this condition. Thereafter the approved surface water drainage scheme shall be maintained and operated in accordance with the approved details.

Reason: To prevent the increased risk of flooding, to improve and protect water quality, improve habitat and amenity, and ensure future maintenance of the surface water drainage system. This condition is imposed in accordance with the National Planning Policy Framework (March 2012), Policy CS16 of the West Berkshire Core Strategy (2006-2026), and Supplementary Planning Document Quality Design (June 2006).

TECHNICAL NOTE

Appendix B

Drawing Numbers:

- 36382/2002/SK114
- 36382/2011/SD03
- 36382/2011/SD04

GULLY SCHEDULE (CENTRE POINTS)		
ITEM	EASTING	NORTHING
G1	469550.990	170181.814
G2	469552.682	170196.000
G3	469554.560	170212.211
G4	469555.714	170218.904
G5	469561.990	170222.301
G6	469567.423	170216.867
G7	469567.463	170216.339
G8	469565.698	170200.619
G9	469563.004	170177.871
G10	469554.476	170162.497
G11	469549.987	170166.099

GULLY SCHEDULE (CENTRE POINTS)		
ITEM	EASTING	NORTHING
G12	469598.315	170196.557
G13	469597.735	170190.781
G14	469597.813	170187.946
G15	469598.983	170186.944
G16	469593.456	170177.975
G17	469596.711	170173.558
G18	469594.713	170156.580
G19	469587.200	170140.449
G20	469577.157	170148.009
G21	469560.940	170154.867
G22	469560.493	170154.711

GULLY SCHEDULE (CENTRE POINTS)		
ITEM	EASTING	NORTHING
G23	469552.693	170147.673
G24	469561.157	170142.353
G25	469569.585	170137.080
G26	469573.667	170134.534
G27	469539.039	170118.729
G28	469549.626	170112.083
G29	469557.283	170107.325
G30	469561.926	170104.394
G31	469562.330	170104.109
G32	469581.914	170132.628

Manhole Schedule												
US/MH Name	Easting (m)	Northing (m)	Cover Level (m)	Manhole depth (m)	Manhole Diam. L*W (mm)	Manhole Type	Incoming pipe No.	Incoming invert (m)	Incoming diameter (mm)	Outgoing pipe No.	Outgoing invert (m)	Outgoing diameter (mm)
S1	469595.252	170188.686	40.567	1.027	1350	MH TYPE 2				S4.000	39.540	225
S2												
S3	469544.642	170227.790	41.269	1.544	1350	MH TYPE 2	S1.000	39.875 39.875	150 100	S1.001	39.725	300
S4	469557.369	170216.381	40.983	1.333	1350	CP TYPE 1	S1.001 S6.002	39.650 39.650	300 300	S1.002A	39.650	300
S5	469555.275	170197.194	41.090	1.521	1500	CP TYPE 1 with vent from cellular storage	S1.002A S5.000	39.569 39.931	300 150	S1.002B	39.569	225 (3No)
S6	469551.947	170167.785	41.300	1.855	1500	CP TYPE 1	S1.002B	39.445	225 (3no)	S1.003	39.445	300
S7												
S7A	469554.370	170235.843	41.266	1.333	1350	CP TYPE 1	S6.001	39.993	300	S6.002	39.933	300
S8	469545.520	170123.549	41.404	1.618	1350	MH TYPE 2	S2.000	39.861	150	S2.001	39.786	225
S9	469562.961	170138.517	41.260	1.671	1350	MH TYPE 2	S2.001 S7.001	39.589 39.664	225 150 (2No.)	S2.002	39.589	225
S9A	469571.734	170137.392	41.236	1.483	1350	CP TYPE 1	S7.000	40.295	150	S7.001	39.753	150 (2No.)
S9B	469565.055	170113.983	41.236	1.239	1350	CP TYPE 1				S7.000	39.997	150
S10	469584.656	170146.394	41.166	1.473	1350	MH TYPE 2				S3.000	39.693	150
S11	469574.453	170155.110	41.344	1.771	1350	MH TYPE 2	S3.000	39.573	150	S3.001	39.573	150
S12	469574.882	170163.689	41.275	1.932	1800	CP TYPE 1	S1.003 S2.002 S3.001	39.343 39.418 39.493	300 225 150	S1.004	39.343	225 (4no)
S13	469596.758	170161.054	40.835	1.75	1500	MH TYPE 2	S1.006	39.085	450	S1.007	39.085	450
S14	469608.531	170159.391	40.839	1.784	1200	MH TYPE 2	S1.007	39.055	450	S1.008	39.055	450
S15	469633.603	170156.429	40.812	1.823	1200	MH TYPE 2	S1.008	38.989	450	S1.009	38.989	450
S16	469637.731	170155.902	40.812	1.834	1500	MH TYPE 3 with Hydrobrake	S1.009	38.978	450	S1.010	38.978	150
S17	469587.775	170162.247	40.927	1.767	1800	CP TYPE 1 with vent from cellular storage	S1.004 S4.000	39.160 39.160	225 (4 no) 225	S1.005	39.160	450
F1	469546.536	170227.985	41.248	1.133	1200	MH TYPE 2				F1.001	40.115	150
F2	469559.877	170216.539	40.966	1.546	1200	MH TYPE 2	F1.001	39.420	150	F1.002	39.420	150
F3	469578.135	170202.890	41.025	2.08	1200	MH TYPE 2	F1.002	38.945	150	F1.003	38.945	150
F4	469599.580	170188.681	40.743	2.223	1200	MH TYPE 2	F1.003	38.52	150	F1.004	38.52	150
P6*	469605.601	170200.644	40.709	2.351	1350	MH TYPE 2	F1.002	38.358	150	BH SEWER	38.358	225
* MANHOLE TO BE CONSTRUCTED BY BERKELEY HOMES												

* MANHOLE TO BE CONSTRUCTED BY BERKELEY HOMES

KEY

- SITE EXTENTS
- PROPOSED SURFACE WATER HIGHWAY DRAIN (GRADIENT AND PIPE SIZE). SEE STANDARD DETAIL 36382/2011/SD06 FOR BEDDING DETAIL
- PROPOSED SURFACE WATER MANHOLE REFER TO MANHOLE SCHEDULE
- PROPOSED SURFACE WATER FLOW CONTROL MANHOLE.
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER MANHOLE
- PROPOSED LINED CELLULAR STORAGE TANK SEE STANDARD DETAIL 36382/2011/SD04
- PROPOSED TRAPPED GULLY AND CONNECTION. REFER TO STANDARD DETAIL 36382/2011/SD06
- PROPOSED CHANNEL DRAIN (ACO M150D CONSTANT OVERALL DEPTH 210mm OR EQUIVALENT APPROVED). SEE STANDARD DETAIL 36382/2011/SD03
- PROPOSED FUEL INTERCEPTOR REFER TO DRAWING NO. 36382/2011/SD13 FOR DETAILS.
- PROPOSED HEADWALL

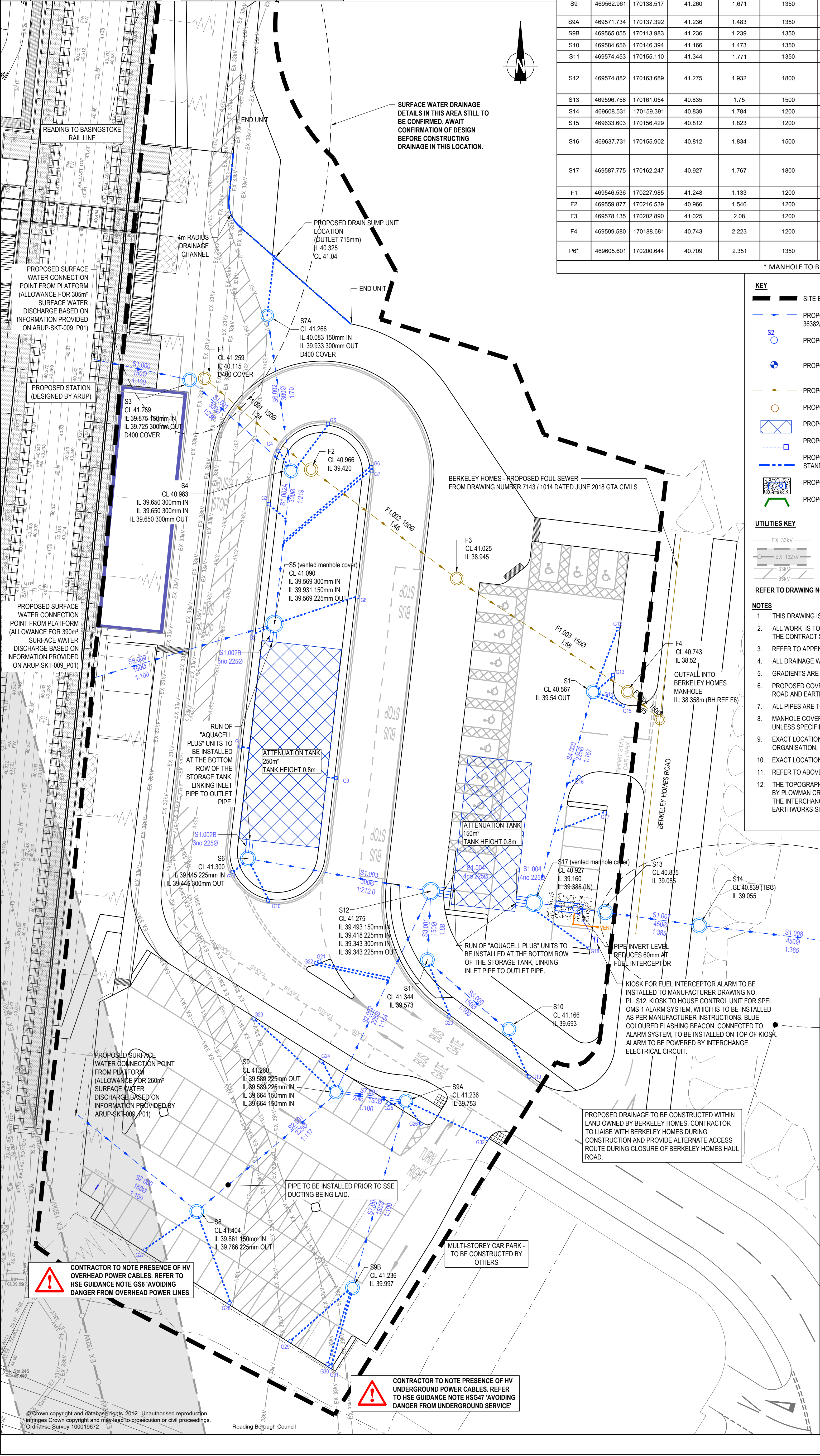
UTILITIES KEY

- EXISTING ELECTRICITY - 33KV UNDERGROUND TO BE DIVERTED
- EXISTING ELECTRICITY - 132 KV OVERHEAD AND SAFETY CLEARANCE ZONE
- PROPOSED 33kv ELECTRICITY UNDERGROUND CABLE CORRIDOR

REFER TO DRAWING NO. 36382/2001/SK060 & SK072 FOR DETAILS

NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DOCUMENTS AND DRAWINGS.
- ALL WORK IS TO BE IN ACCORDANCE WITH THE HIGHWAYS AGENCY SPECIFICATION FOR HIGHWAYS WORK VOLUME 1 AND THE CONTRACT SPECIFIC NUMBERED APPENDICES.
- REFER TO APPENDIX 5/1 OF THE SPECIFICATION FOR DETAILS.
- ALL DRAINAGE WORKS ARE TO COMMENCE AT THE OUTFALL AND WORK UPSTREAM.
- GRADIENTS ARE INDICATED FOR HYDRAULIC PURPOSES ONLY AND SHOULD NOT BE USED FOR SETTING OUT.
- PROPOSED COVER LEVELS SHOWN ARE INDICATIVE FOR DRAINAGE PURPOSES AND ARE TO BE CHECKED AGAINST FINISHED ROAD AND EARTHWORK LEVELS.
- ALL PIPES ARE TO BE CONNECTED WITH LEVEL SOFFITS UNLESS OTHERWISE STATED.
- MANHOLE COVERS IN CARRIAGEWAY AND PARKING AREAS TO BE D400. B125 IN FOOTWAYS, VERGES AND PEDESTRIAN AREAS UNLESS SPECIFIED OTHERWISE.
- EXACT LOCATION AND SETTING OUT OF PROPOSED GULLY LOCATIONS TO BE AGREED ON-SITE WITH THE OVERSEEING ORGANISATION.
- EXACT LOCATION AND SETTING OUT OF MANHOLE COVERS TO BE AGREED ON-SITE WITH THE OVERSEEING ORGANISATION.
- REFER TO ABOVE TABLES FOR SETTING OUT INFORMATION. DO NOT USE MICRO-DRAINAGE OUTPUT FOR CONSTRUCTION.
- THE TOPOGRAPHICAL SURVEY FOR THE RAILTRACK IS TAKEN FROM THE SURVEY ORIGINALLY COMPLETED IN JANUARY 2017 BY PLOWMAN CRAVEN AND VERIFIED IN AUGUST 2018 BY PLOWMAN CRAVEN. REFER TO DIRECTLY TO SURVEY FOR DETAILS. THE INTERCHANGE AREA HAS BEEN FILLED BY BERKELEY HOMES TO 40.2M AND HAS NOT BEEN SURVEYED, AS SUCH THE EARTHWORKS SHOWN UNDER THE INTERCHANGE ARE INDICATIVE



Mark	Revision	Date	Drawn	Chkd	Appd
SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay. UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.					
Drawing Issue Status					
FOR PLANNING					
GREEN PARK STATION PROPOSED INTERCHANGE DRAINAGE LAYOUT					
Client Reading Borough Council Working better with you					
Date of 1st Issue 20.02.20					
Designed RT					
Drawn SF					
A1 Scale 1:250					
Checked GR					
Approved -					
Drawing Number 36382/2002/SK123					
Revision -					
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3 NO. 100mm M12 STAINLESS
STEEL MEDIUM DUTY
MECHANICAL ANCHORS



CATCHES



35. AGGREGATES FOR CONCRETE - SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS 882.
36. HIGH STRENGTH CONCRETE TOPPING - SHALL BE PRODUCED, LAID AND FINISHED IN ACCORDANCE WITH THE RELEVANT PROVISIONS OF BS 8204: PART 2 AND THE FOLLOWING APPROXIMATE MIX PROPORTIONS BY WEIGHT SHALL BE USED: 1 PART CEMENT, 1 PART NATURAL SAND AND 2 PARTS SINGLE SIZE COARSE AGGREGATE.
37. AGGREGATE FOR HIGH STRENGTH CONCRETE TOPPING - SHALL COMPLY WITH BS 882* AND BE 10mm NOMINAL SIZE, GRADED IN ACCORDANCE WITH TABLE 6 OF THAT STANDARD.
*WHEN THIS STANDARD IS SUPERSEDED BY EN 12620, THE AGGREGATES SHALL FOLLOW THE RECOMMENDATIONS IN THE UK NATIONAL GUIDANCE TO EN 12620.
38. ALL ADAPTABLE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH SEWERS FOR ADOPTION 6th EDITION.
39. ALL THE ABOVE REQUIREMENTS SHALL APPLY UNLESS OTHERWISE STATED IN THE DRAINAGE LAYOUT DRAWING, MANHOLE SCHEDULE OR SPECIFICATION. IN THE EVENT OF A CONTRADICTION THE CONTRACT SPECIFIC DOCUMENTS SHALL BE DEEMED TO PREVAIL.
40. CONSTRUCTION SHALL COMPLY WITH THE REQUIREMENTS AND SPECIFICATION OF SEWERS FOR ADOPTION (SFA) 6th EDITION AND THOSE SPECIFIC REQUIREMENTS OF THE ADOPTING STATUTORY UNDERTAKER.
41. TYPE 2 MANHOLE MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE TO BE 3.0m.
42. ALL PIPES TO BE EITHER VITRIFIED CLAY OR CONCRETE AS PER THE SFA SPECIFICATION. ALL JOINTS AND MATERIALS SHALL BE RESISTANT TO CORROSION AND THE PARTICULAR NATURE OF THE CONTAMINANTS FOUND ON THE SITE AS DETAILED IN THE PROJECT DRAINAGE INVESTIGATION.
43. RISING SPINDLE AND GUIDE BRACKETS TO BE STAINLESS STEEL A131 316L TO BS EN 10088.
44. HYDROBRAKE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

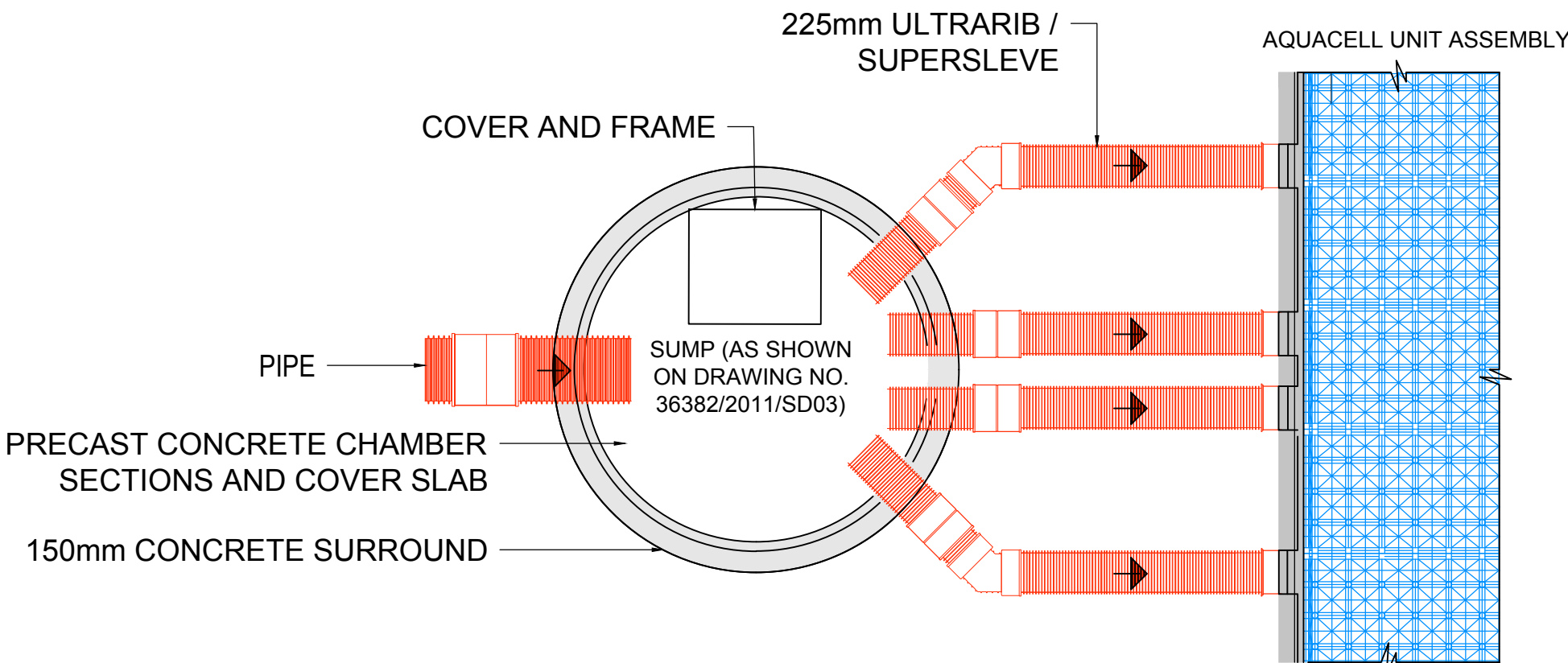
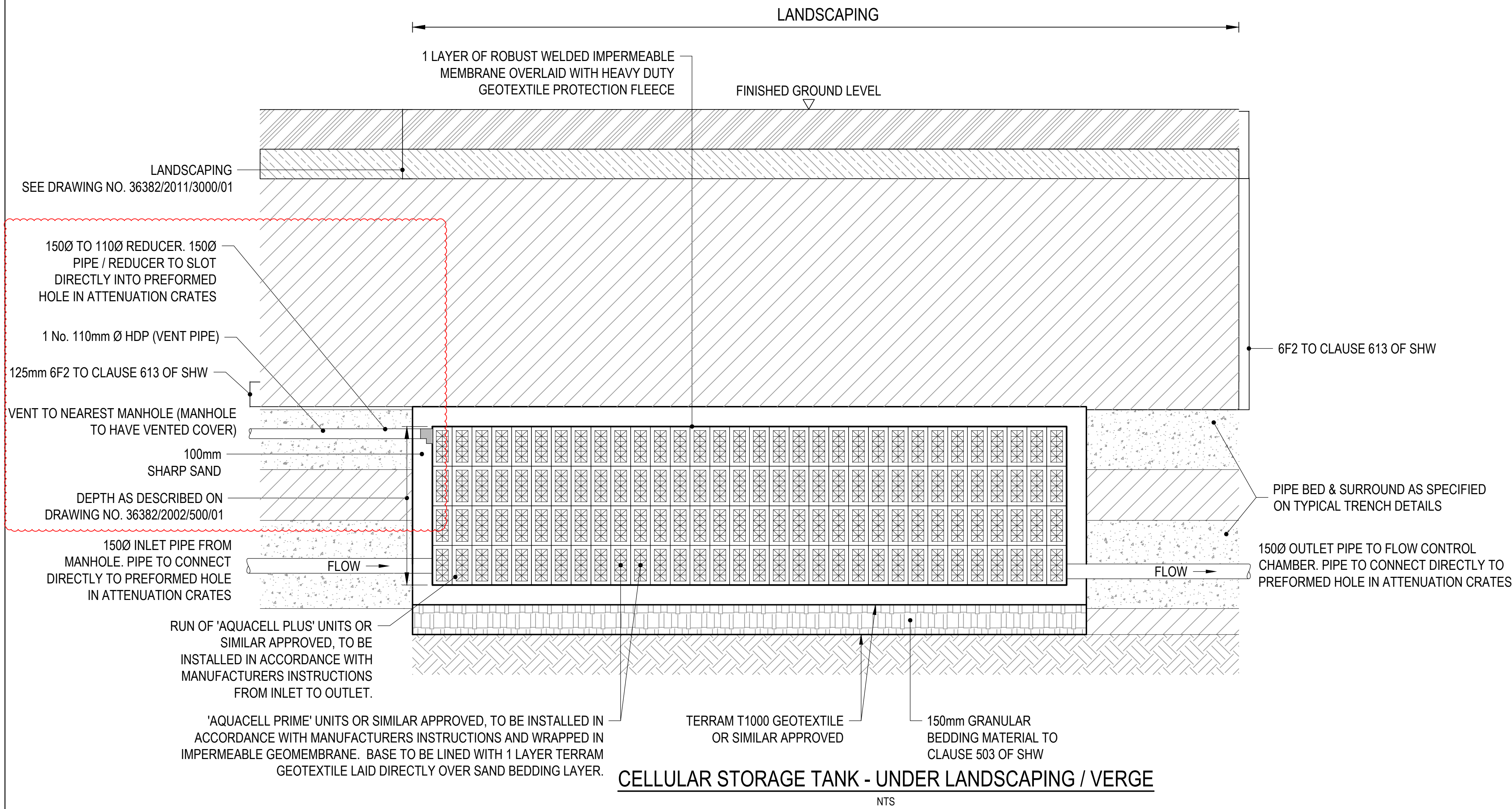
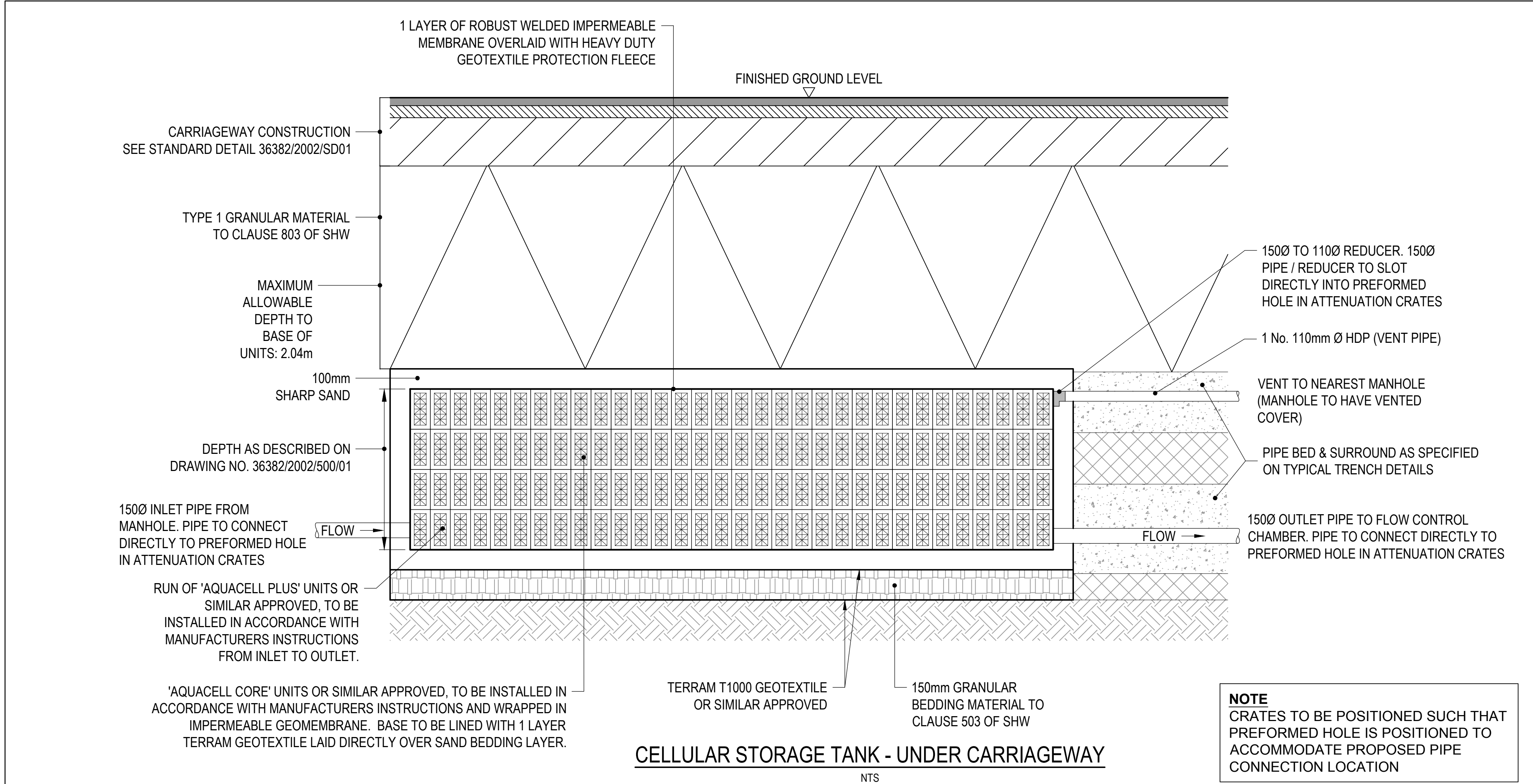
SCALING NOTE: Do not scale from this drawing. If in doubt, ask.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.

FOR CONSTRUCTION

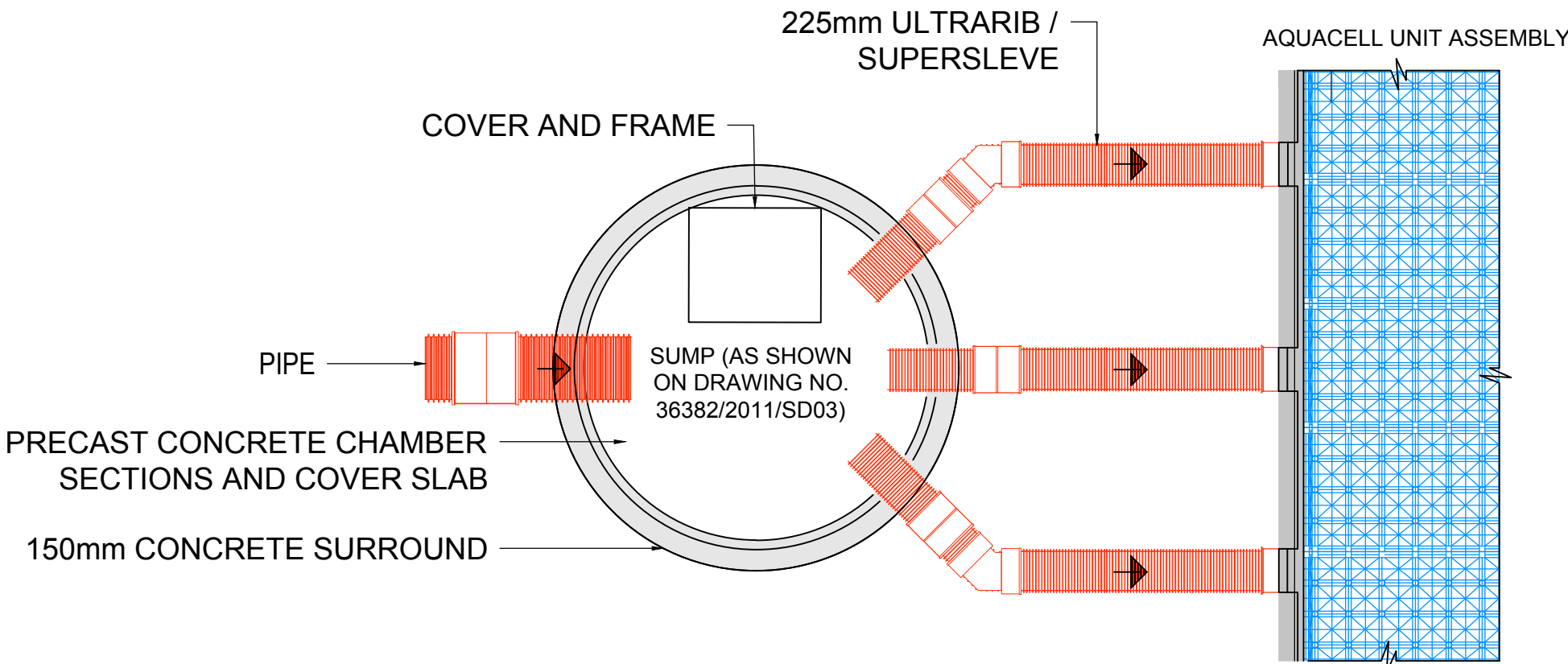
GREEN PARK STATION PROPOSED INTERCHANGE LAYOUT DRAINAGE CONSTRUCTION DETAILS

Client		 Reading Borough Council <i>Working better with you</i>		 Offices throughout the UK and Europe www.peterbrett.com © Peter Brett Associates LLP READING Tel: 0118 950 0761	
Date of 1st Issue	09.03.18	Designed	RT	Drawn	SF
A1 Scale	NTS	Checked	RT	Approved	MF
Drawing Number		36382/2011/SD03		Revision	
		C3			



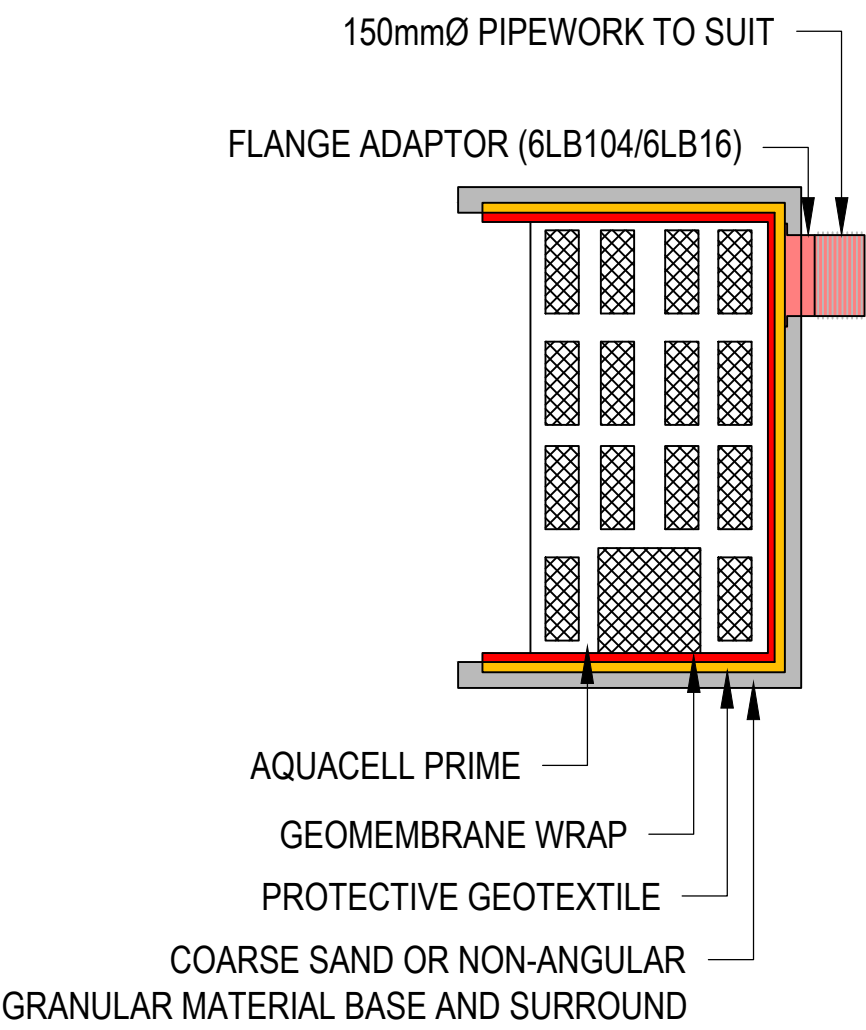
MANIFOLD CONNECTION UNDER CARRIAGEWAY

NTS



MANIFOLD CONNECTION UNDER LANDSCAPING / VERGE

NTS



GULLY CONNECTIONS
TO CELLULAR STORAGE

C8	VENT LOCATION AMENDED	12.11.19	CD	TY	GR
C7	AMENDMENTS TO IMPROVE BUILDABILITY	17.09.19	SF	GR	MF
C6	"AQUACELL PLUS" UNITS ADDED TO EACH AREA	21.05.19	RT	GR	MF
C5	INFLOW DETAILS UPDATED	12.03.19	SF	GR	MF
C4	PIPE DIMENSIONS UPDATED	30.08.18	RT	GR	MF
C3	CONNECTION CONFIGURATIONS ADDED	26.07.18	SF	GR	MF
C2	CELLULAR STORAGE SPEC UPDATED	31.05.18	RT	GR	SE
Mark	Revision	Date	Drawn	Chkd	Appd

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Drawing Issue Status

FOR CONSTRUCTION

**GREEN PARK STATION
PROPOSED INTERCHANGE
CELLULAR STORAGE TANK
CONSTRUCTION DETAILS**

Client



Reading Borough Council
Working better with you

Date of 1st Issue
09.03.18

Designed
RT

Drawn
SF

A1 Scale
NTS

Checked
RT

Approved
MF

Drawing Number
36382/2011/SD04

Revision
C8



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TECHNICAL NOTE

Appendix C

MicroDrainage calculations

