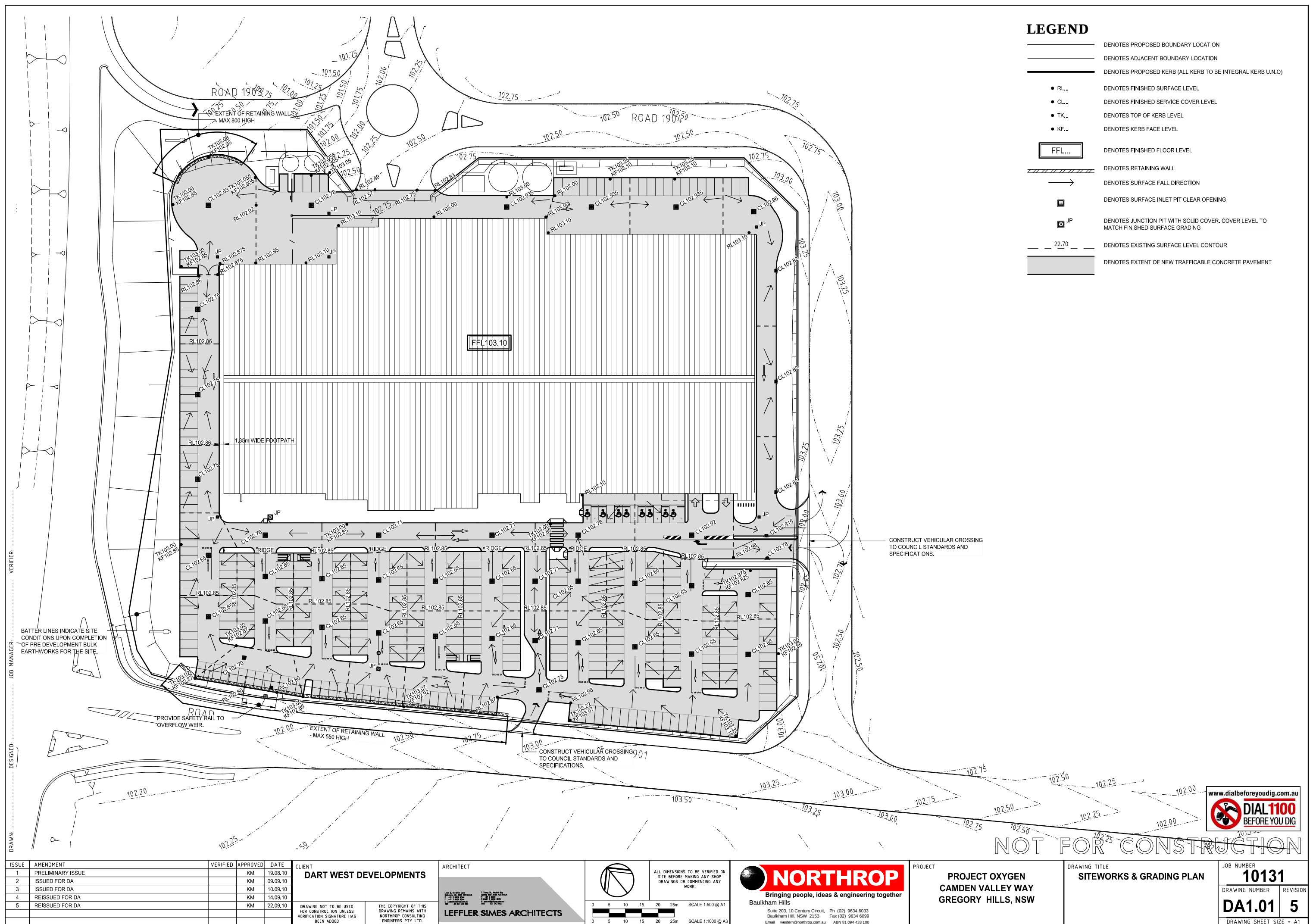
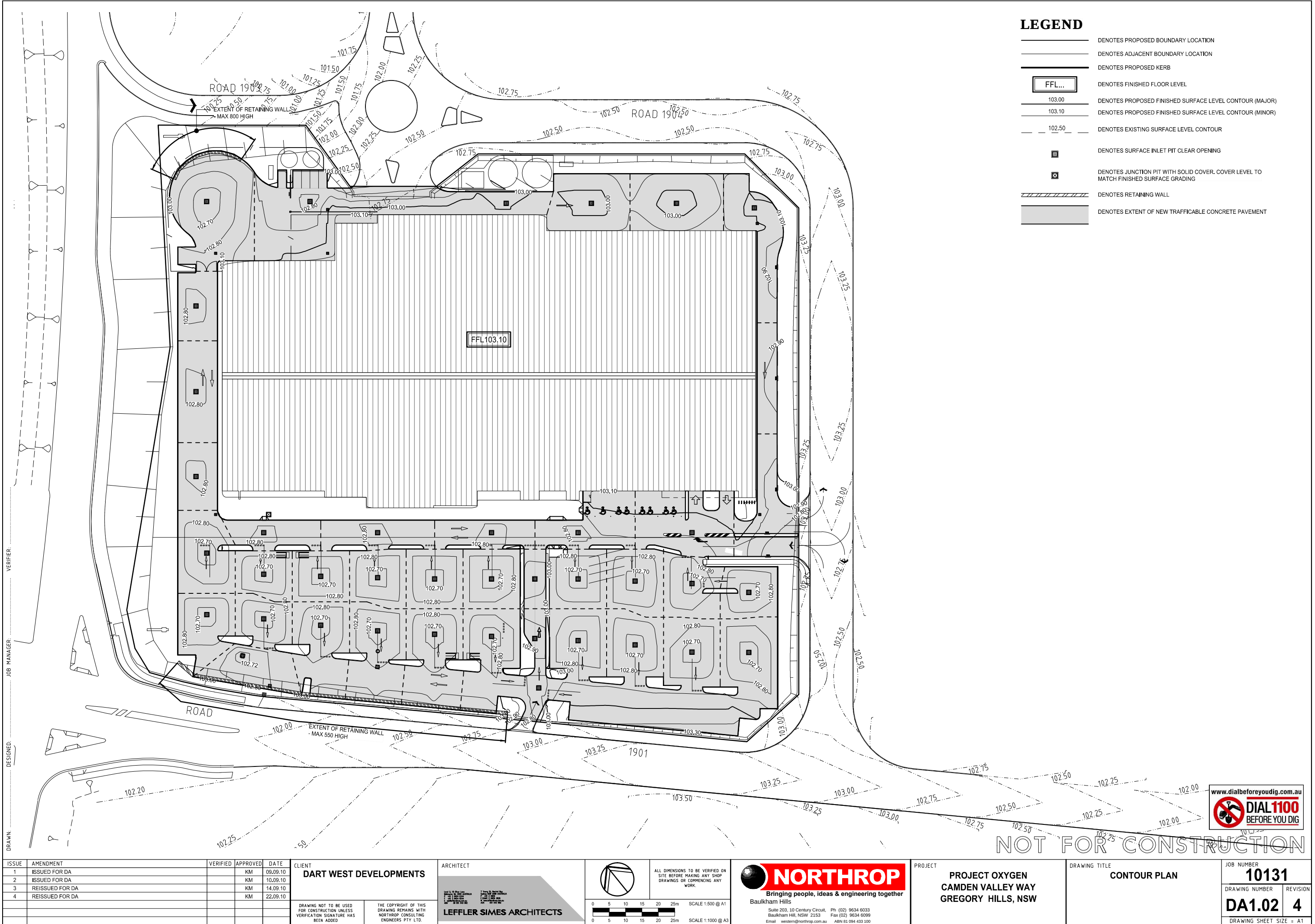






LEGEND

- DENOTES PROPOSED BOUNDARY LOCATION
- DENOTES ADJACENT BOUNDARY LOCATION
- DENOTES PROPOSED KERB
- DENOTES FINISHED FLOOR LEVEL
- DENOTES PROPOSED FINISHED SURFACE LEVEL CONTOUR (MAJOR)
- DENOTES PROPOSED FINISHED SURFACE LEVEL CONTOUR (MINOR)
- DENOTES EXISTING SURFACE LEVEL CONTOUR
- DENOTES SURFACE INLET PIT CLEAR OPENING
- DENOTES JUNCTION PIT WITH SOLID COVER. COVER LEVEL TO MATCH FINISHED SURFACE GRADING
- DENOTES RETAINING WALL
- DENOTES EXTENT OF NEW TRAFFICABLE CONCRETE PAVEMENT

DRAWN: DESIGNED: JOB MANAGER: VERIFIER:

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	ISSUED FOR DA		KM	09.09.10
2	ISSUED FOR DA		KM	10.09.10
3	REISSUED FOR DA		KM	14.09.10
4	REISSUED FOR DA		KM	22.09.10

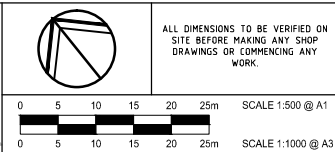
CLIENT
DART WEST DEVELOPMENTS

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ARCHITECT

LEFFLER SIMES ARCHITECTS



NORTHROP
Bringing people, ideas & engineering together

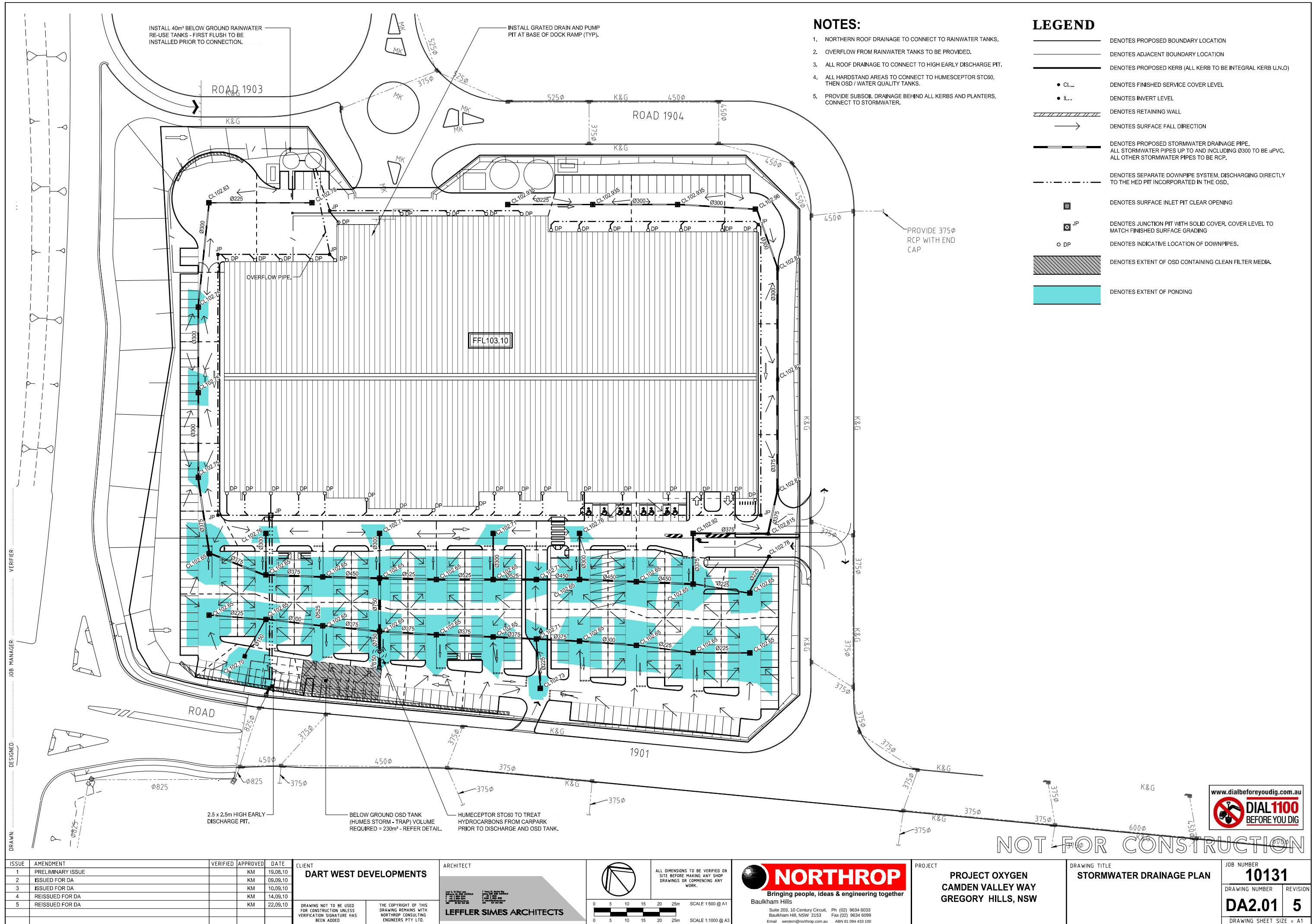
Suite 203, 10 Century Circuit, Baulkham Hill, NSW 2153
Ph (02) 9634 6033 Fax (02) 9634 6099
Email western@northrop.com.au ABN 81 094 433 100

PROJECT
**PROJECT OXYGEN
CAMDEN VALLEY WAY
GREGORY HILLS, NSW**

DRAWING TITLE CONTOUR PLAN	JOB NUMBER 10131
DRAWING NUMBER DA1.02	REVISION 4
DRAWING SHEET SIZE = A1	



NOT FOR CONSTRUCTION

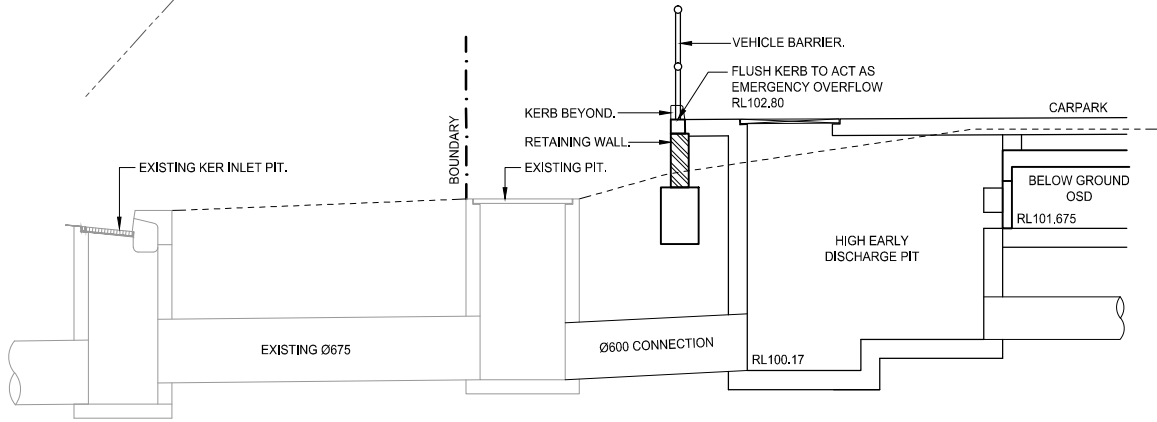
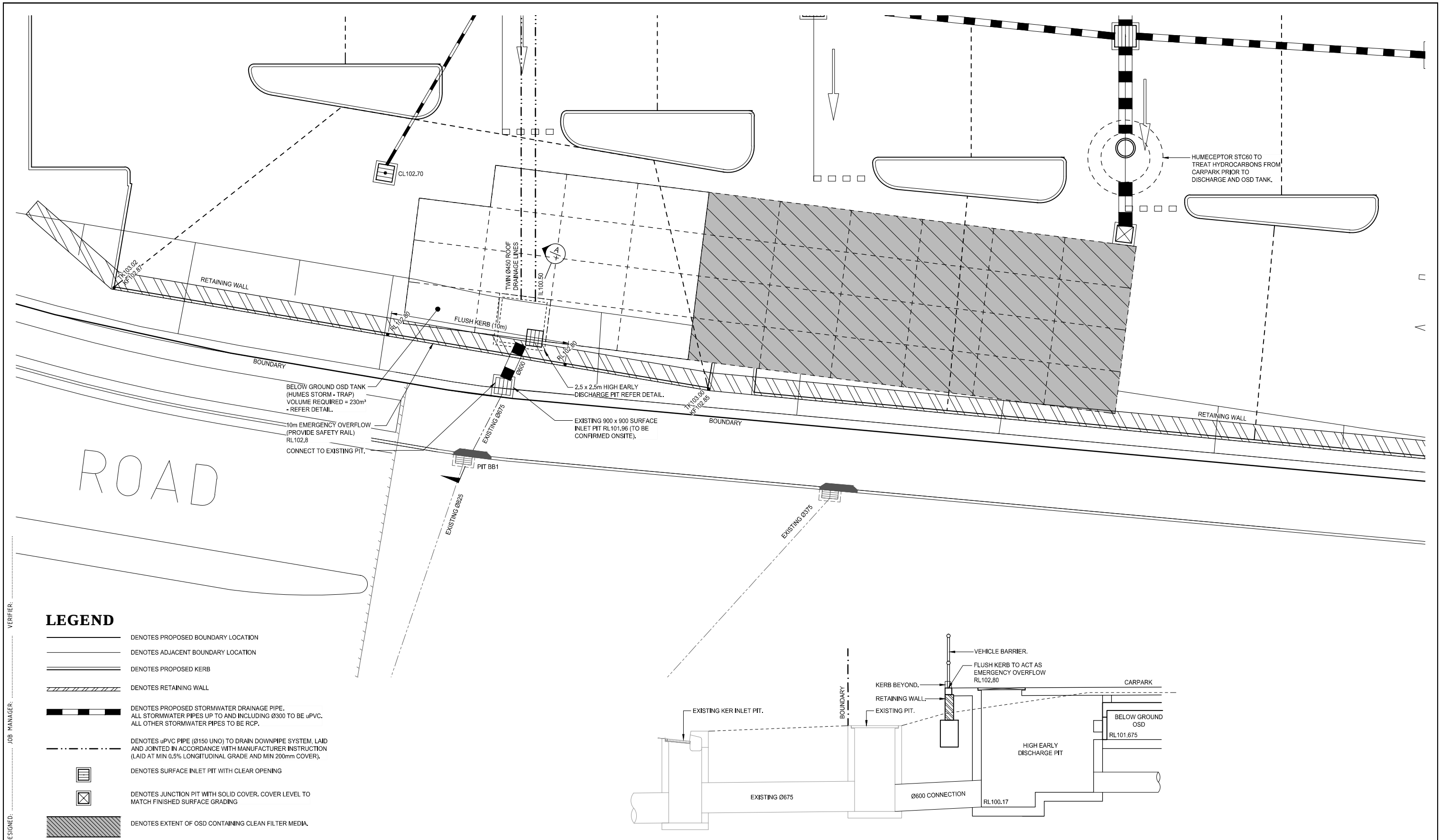


NOTES:

1. NORTHERN ROOF DRAINAGE TO CONNECT TO RAINWATER TANKS.
2. OVERFLOW FROM RAINWATER TANKS TO BE PROVIDED.
3. ALL ROOF DRAINAGE TO CONNECT TO HIGH EARLY DISCHARGE PIT.
4. ALL HARDSTAND AREAS TO CONNECT TO HUMESCEPTOR STC60, THEN OSD / WATER QUALITY TANKS.
5. PROVIDE SUBSOIL DRAINAGE BEHIND ALL KERBS AND PLANTERS, CONNECT TO STORMWATER.

LEGEND

- DENOTES PROPOSED BOUNDARY LOCATION
- DENOTES ADJACENT BOUNDARY LOCATION
- DENOTES PROPOSED KERB (ALL KERB TO BE INTEGRAL KERB U.N.O)
- DENOTES FINISHED SERVICE COVER LEVEL
- DENOTES INVERT LEVEL
- DENOTES RETAINING WALL
- DENOTES SURFACE FALL DIRECTION
- DENOTES PROPOSED STORMWATER DRAINAGE PIPE. ALL STORMWATER PIPES UP TO AND INCLUDING Ø300 TO BE uPVC. ALL OTHER STORMWATER PIPES TO BE RCP.
- DENOTES SEPARATE DOWNPIPE SYSTEM, DISCHARGING DIRECTLY TO THE HED PIT INCORPORATED IN THE OSD.
- DENOTES SURFACE INLET PIT CLEAR OPENING
- DENOTES JUNCTION PIT WITH SOLID COVER, COVER LEVEL TO MATCH FINISHED SURFACE GRADING
- DENOTES INDICATIVE LOCATION OF DOWNPIPES.
- DENOTES EXTENT OF OSD CONTAINING CLEAN FILTER MEDIA.
- DENOTES EXTENT OF PONDING



SECTION A
NOT TO SCALE

- LEGEND**
- DENOTES PROPOSED BOUNDARY LOCATION
 - DENOTES ADJACENT BOUNDARY LOCATION
 - DENOTES PROPOSED KERB
 - DENOTES RETAINING WALL
 - DENOTES PROPOSED STORMWATER DRAINAGE PIPE. ALL STORMWATER PIPES UP TO AND INCLUDING Ø300 TO BE uPVC. ALL OTHER STORMWATER PIPES TO BE RCP.
 - DENOTES uPVC PIPE (Ø150 UNO) TO DRAIN DOWNPIPE SYSTEM, LAID AND JOINTED IN ACCORDANCE WITH MANUFACTURER INSTRUCTION (LAID AT MIN 0.5% LONGITUDINAL GRADE AND MIN 200mm COVER).
 - DENOTES SURFACE INLET PIT WITH CLEAR OPENING
 - DENOTES JUNCTION PIT WITH SOLID COVER. COVER LEVEL TO MATCH FINISHED SURFACE GRADING
 - DENOTES EXTENT OF OSD CONTAINING CLEAN FILTER MEDIA.

DRAWN: DESIGNED: VERIFIED: JOB MANAGER:

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	ISSUED FOR DA		KM	09.09.10
2	ISSUED FOR DA		KM	10.09.10
3	REISSUED FOR DA		KM	14.09.10

CLIENT
DART WEST DEVELOPMENTS

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ARCHITECT

LEFFLER SIMES ARCHITECTS

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VERIFIER:
JOB MANAGER:
DESIGNED:
DRAWN:

STORMWATER CALCULATIONS

NOTE: SITE DRAIN TO SMALL CATCHMENT (EXTERNAL DRAINAGE WORKS) WHICH IN TURN FLOWS TO CULVERT UNDER CAMDEN VALLEY WAY. POST DEVELOPMENT FLOWS DO NOT EXCEED PRE DEVELOPMENTS FLOWS.

NOTE: DRAINS AND MUSIC MODELS AVAILABLE FOR ANALYSIS.

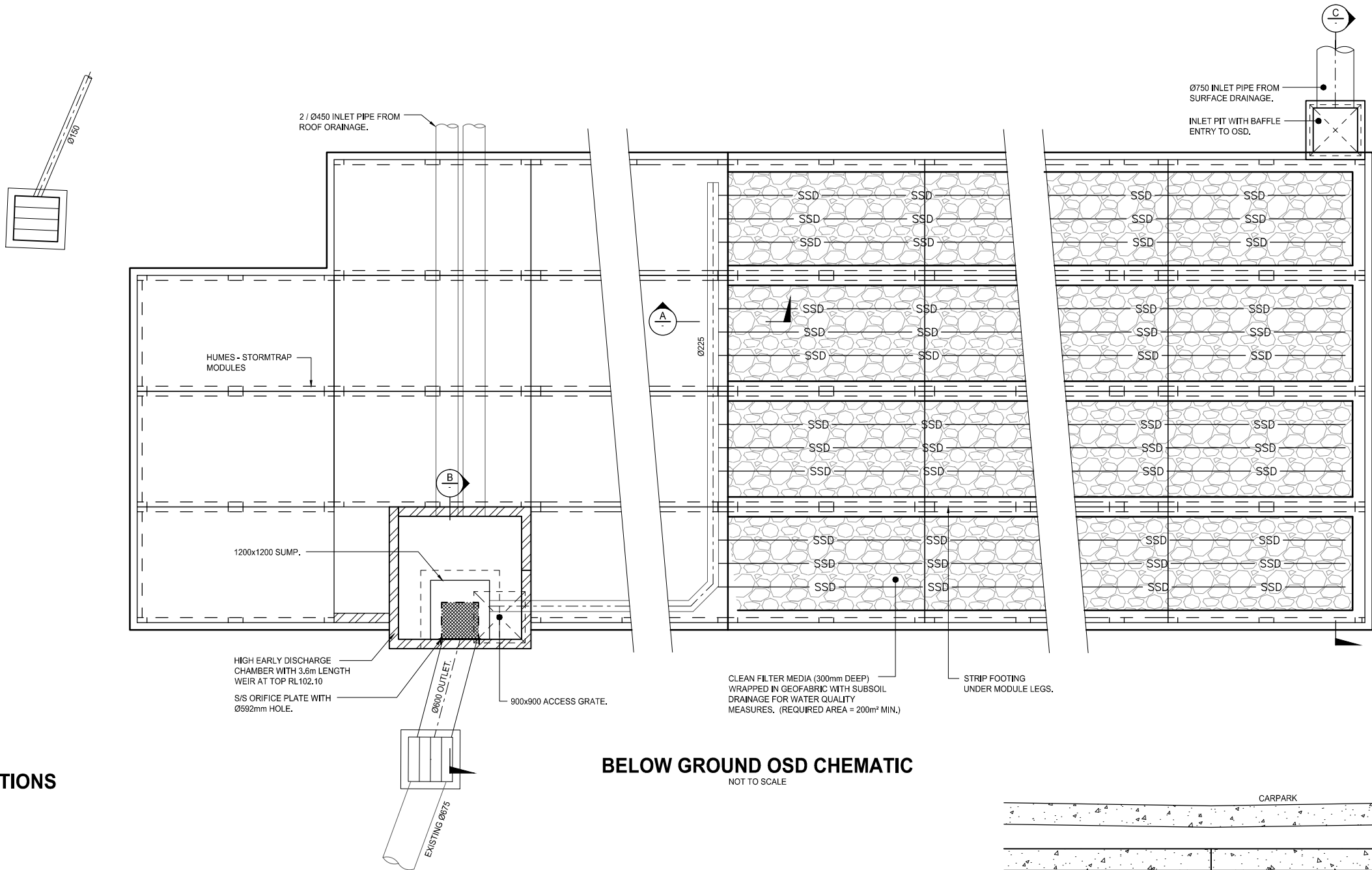
OSD STORAGE VOLUME
BELOW GROUND = 230m³ REQUIRED (238m³ PROVIDED)
ABOVE GROUND = 223m³
TOTAL STORAGE VOLUME = 453 REQUIRED (461m³ PROVIDED)

WATER QUALITY MEASURES

A HUMCEPTOR IS TO BE INSTALLED TO TREAT HYDROCARBONS. - BASED ON OUR MUSIC MODEL:

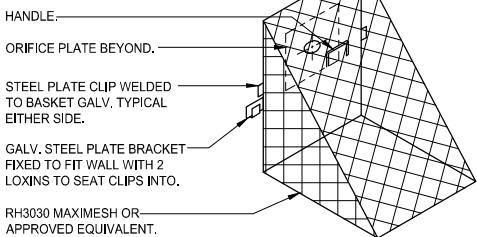
POST-DEVELOPMENT POLLUTANT LOAD REDUCTIONS			
	BEFORE TREATMENT TRAIN	AFTER TREATMENT TRAIN	% OF REDUCTION
TSS (KG/YR)	12.0 x 10³	1.06 x 10³	91.20%
TP (KG/YR)	14.700	4.950	66.30%
TN (KG/YR)	184	69.200	62.40%
GROSS POLLUTANT (KG/YR)	984	14.100	98.60%

TREATMENT TRAIN INCLUDES: HUMCEPTOR, RAINWATER TANKS AND FILTER MEDIA WITH SUBSOIL UNDER OSD (HUMES STORM - TRAP).



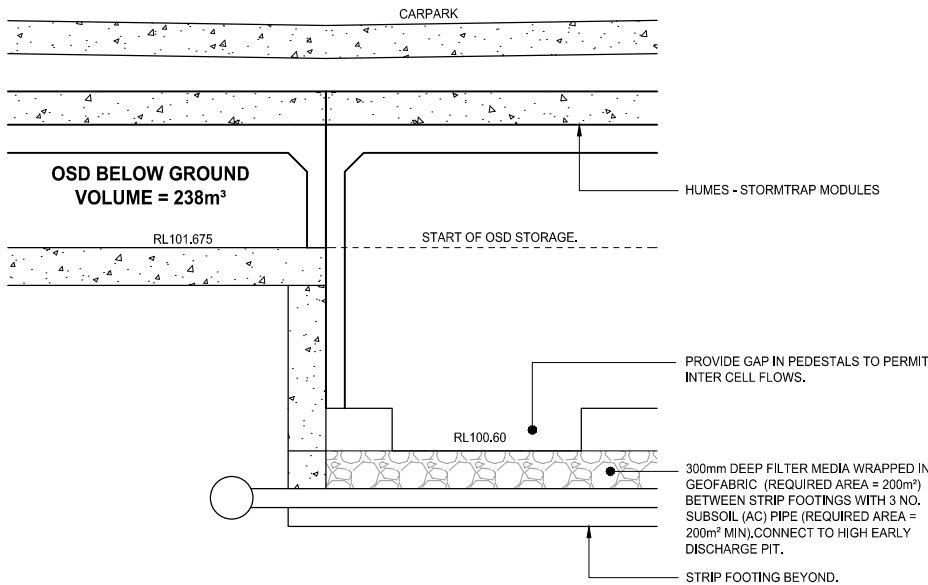
BELOW GROUND OSD CHEMATIC

NOT TO SCALE



TRASH SCREEN DETAIL

NOT TO SCALE



SECTION A

NOT FOR CONSTRUCTION

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	PRELIMINARY ISSUE		KM	19.08.10
2	ISSUED FOR DA		KM	09.09.10
3	ISSUED FOR DA		KM	10.09.10
4	REISSUED FOR DA		KM	14.09.10

CLIENT	
DART WEST DEVELOPMENTS	
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	
THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.	

ARCHITECT	
LEFFLER SIMES ARCHITECTS	

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE MAKING ANY SHOP DRAWINGS OR COMMENCING ANY WORK.

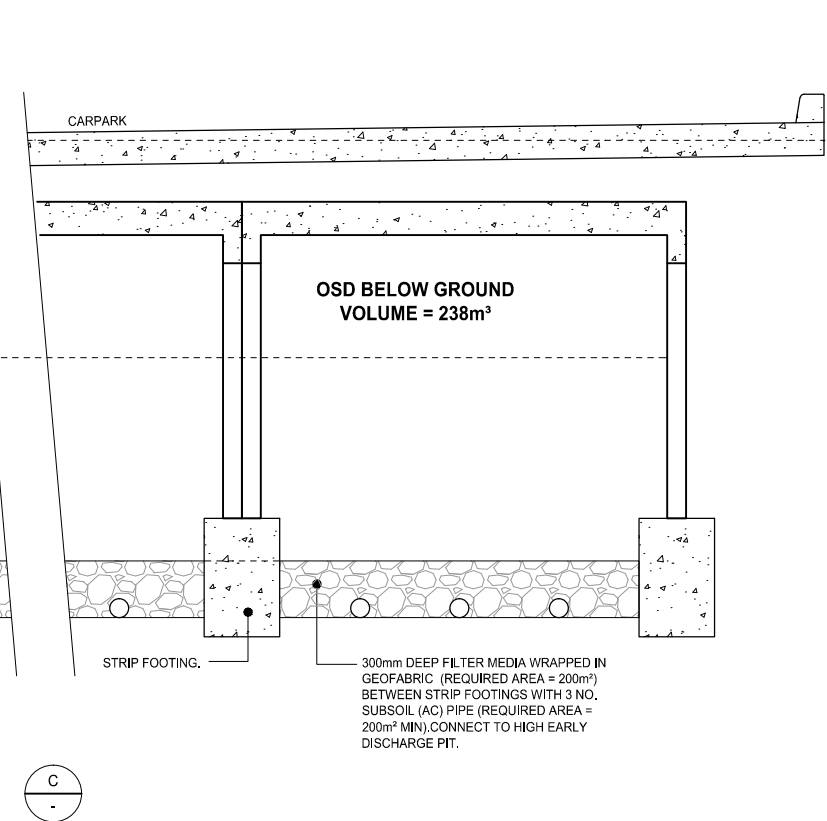
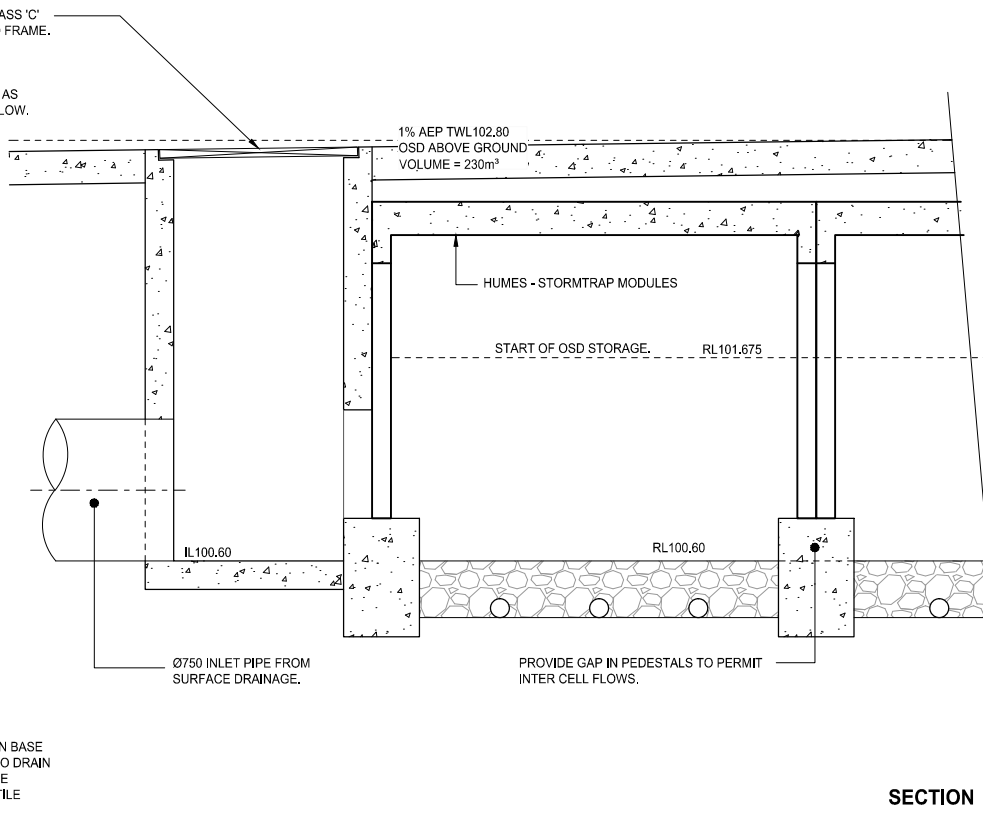
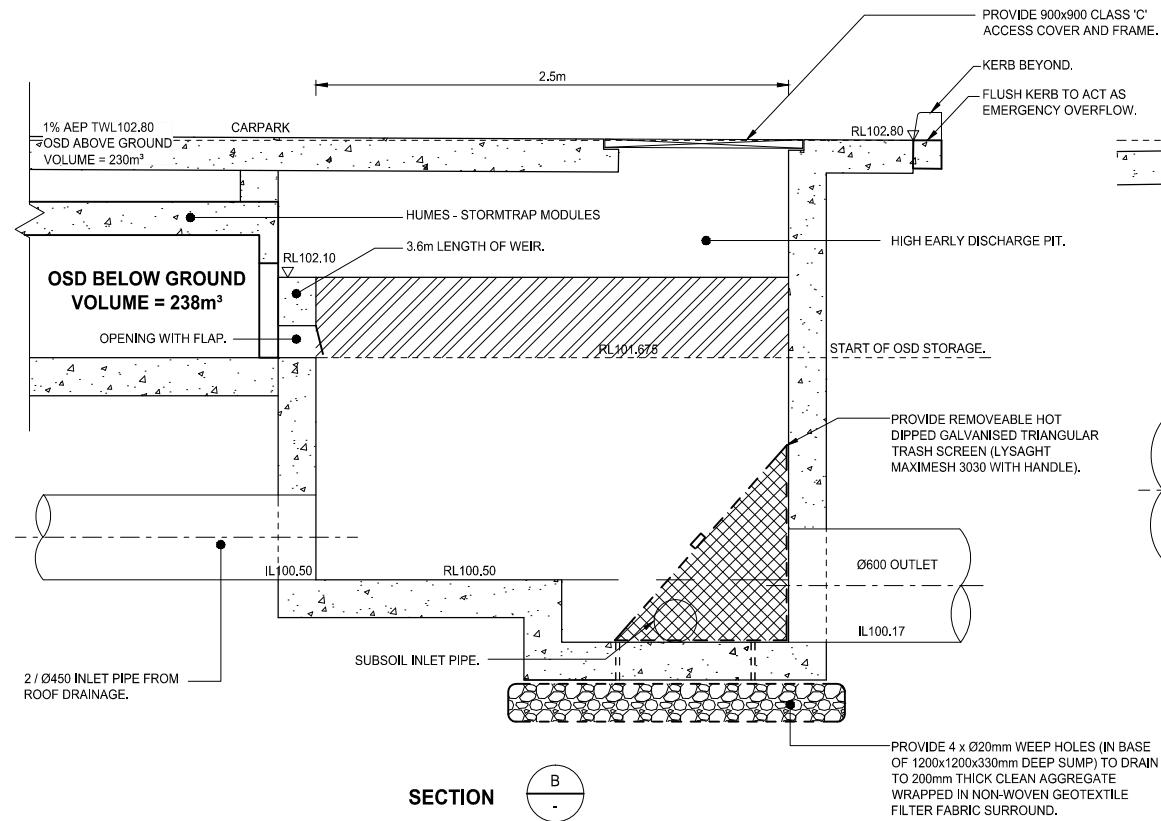
NORTHROP
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Ph (02) 9634 6033 Fax (02) 9634 6099
Email western@northrop.com.au ABN 81 094 433 100

PROJECT	
PROJECT OXYGEN CAMDEN VALLEY WAY GREGORY HILLS, NSW	

DRAWING TITLE	
DETAIL SHEET 1	

JOB NUMBER	
10131	
DRAWING NUMBER	REVISION
DA3.01	4
DRAWING SHEET SIZE = A1	

DRAWN: DESIGNED: JOB MANAGER: VERIFIER:



NOT FOR CONSTRUCTION

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	ISSUED FOR DA		KM	09.09.10
2	ISSUED FOR DA		KM	10.09.10
3	REISSUED FOR DA		KM	14.09.10

CLIENT DART WEST DEVELOPMENTS	
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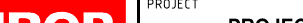
NORTHRUP Bringing people, ideas & engineering together Baulkham Hills Suite 203, 10 Century Circuit, Baulkham Hill, NSW 2153 Ph (02) 9634 6033 Fax (02) 9634 6099 Email: western@northrup.com.au ABN 81 094 433 100

PROJECT PROJECT OXYGEN CAMDEN VALLEY WAY GREGORY HILLS, NSW

DRAWING TITLE DETAIL SHEET 2
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JOB NUMBER 10131	REVISION
DRAWING NUMBER DA3.02	3
DRAWING SHEET SIZE = A1	

DRAWN: DESIGNED: JOB MANAGER: VERIFIER:

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE	CLIENT DART WEST DEVELOPMENTS	ARCHITECT  LEFFLER SIMES ARCHITECTS	ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE MAKING ANY SHOP DRAWINGS OR COMMENCING ANY WORK.	 NORTHROP Bringing people, ideas & engineering together Baulkham Hills Suite 203, 10 Century Circuit, Baulkham Hill, NSW 2153 Email: western@northrop.com.au Ph: (02) 9634 6033 Fax: (02) 9634 6099 ABN 81 094 433 100	PROJECT PROJECT OXYGEN CAMDEN VALLEY WAY GREGORY HILLS, NSW	DRAWING TITLE DRAINS DATA	JOB NUMBER 10131	DRAWING NUMBER DA4.01	REVISION 2	DRAWING SHEET SIZE = A1
1	ISSUED FOR DA		KM	09.09.10										
2	REISSUED FOR DA		KM	14.09.10										
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DRAINS RESULTS OUTPUT TABLE

DRAINS results prepared 14 September, 2010 from Version 2010.09

PIT / NODE DETAILS		Max HGL		Max Pond HGL		Max Surface Flow Arriving (cu.m/d)		Version 8 Max Pond Volume (cu.m)		Min Flowboard (m)		Overflow (cu.m/s)		Constraint	
Name															
Lot1003			101.03					0.072				0.7		0 None	
AA/2			99.72					0				2.57		0 None	
AA/1			99.43					0				1.9		0 None	
culvert - outlet			99.3					0						0 None	
Lot1008			102.84					0.085				2.41		0 None	
AA/8			102.09					0.018				0.88		0 None	
AA/7			101.87					0.022				0.83		0 None	
AA/6			101.88					0.025				0.49	0.001 Inlet Capacity		
AA/5			101.06					0.007				0.87		0 None	
AA/4			100.62					0				0.84		0 None	
AA/3			99.72					0				2.04		0 None	
CC/1			101.38					0.026				0.54	0.001 Inlet Capacity		
DD/1			101.89					0.033				0.87	0.003 Inlet Capacity		
Lot1006			101.45					0.072				0.75		0 None	
Lot1007			101.74					0.087				1.31		0 None	
Lot1004			101.88					0				1.12		0 None	
BB/1			101.11					0.014				0.37		0 None	
SUB-CATCHMENT DETAILS															
Name		Max Flow Q (cu.m/d)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/d)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm							
Cat101003		0.072		0	0.072	5	15	OAR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1							
Cat101008		0.085		0	0.085	5	15	OAR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1							
CatAA/8		0.018	0.012	0	0.002	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
CatAA/7		0.022	0.02	0.008	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
CatAA/6		0.025	0.023	0.003	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
CatAA/5		0.006	0.006	0.001	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
CatCC/1		0.023	0.02	0.003	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
CatDD/1		0.033	0.03	0.003	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
Cat101006		0.072		0	0.072	5	15	OAR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1							
Cat101007		0.087		0	0.087	5	15	OAR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1							
Cat101004		1.155	1.925	0.036	9	9	19	OAR&R 100 year, 20 minutes storm, average 121 mm/h, Zone 1							
CatBB/1		0.013	0.012	0.002	5	5	10	OAR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1							
Outflow Volumes for Total Catchment (3.41 Impervious + 1.18 pervious = 4.59 total ha)															
Storm		Total Rainfall (cu.m)	Total Runoff (cu.m (Runoff %))	Impervious Runoff (cu.m (Runoff %))	Pervious Runoff (cu.m (Runoff %))										
AR&R 100 year, 5 minutes storm, average 219 mm/h, Zone 1		837.95	635.58 (76.2%)	358.73 (84.5%)	66.86 (31.2%)										
AR&R 100 year, 10 minutes storm, average 187 mm/h, Zone 1		1277.87	1073.61 (84.0%)	915.80 (86.4%)	157.81 (48.1%)										
AR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1		1607.02	1383.06 (86.2%)	1180.39 (87.1%)	224.67 (54.3%)										
AR&R 100 year, 20 minutes storm, average 121 mm/h, Zone 1		1831.91	1613.06 (87.2%)	1342.45 (87.5%)	272.63 (57.4%)										
AR&R 100 year, 25 minutes storm, average 108 mm/h, Zone 1		2086.17	1810.33 (87.0%)	1505.86 (87.6%)	308.87 (58.2%)										
AR&R 100 year, 30 minutes storm, average 98 mm/h, Zone 1		2248.83	1979.33 (88.0%)	1638.20 (88.0%)	341.12 (59.1%)										
AR&R 100 year, 45 minutes storm, average 79 mm/h, Zone 1		2720.46	2413.73 (88.7%)	1998.02 (88.3%)	425.70 (61.0%)										
AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1		3076.3	2740.65 (89.2%)	2232.32 (88.5%)	488.13 (61.8%)										
AR&R 100 year, 1.5 hours storm, average 52 mm/h, Zone 1		3581.37	3198.19 (89.2%)	2627.94 (88.7%)	570.25 (62.0%)										
AR&R 100 year, 2 hours storm, average 42.8 mm/h, Zone 1		3899.51	3517.12 (89.8%)	2894.34 (88.6%)	622.88 (61.6%)										
AR&R 100 year, 3 hours storm, average 33 mm/h, Zone 1		4343.58	4036.06 (89.2%)	3344.75 (89.0%)	711.30 (61.0%)										
PIPE DETAILS															
Name		Max Q (cu.m/d)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm									
Lot1003-AA/2		0.072	1.7	100.7	100.83	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
AA2-AA1		1.139	4.8	99.861	99.484	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
existing culvert		1.139	1.8	99.331	99.3	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
Lot1008-AA/8		0.065	0.9	102.23	102.064	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
AA8-AA7		0.074	1.9	101.947	101.67	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
AA7-AA6		0.186	2.2	101.937	101.379	AR&R 100 year, 1.5 hours storm, average 52 mm/h, Zone 1									
AA6-AA5		0.302	1.9	101.164	101.085	AR&R 100 year, 1.5 hours storm, average 52 mm/h, Zone 1									
AA5-AA4		1.087	2	100.786	100.619	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
AA4-AA3		1.087	4	99.909	99.722	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
AA3-AA2		1.087	3	99.722	99.722	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
CC2-AA6		0.025	0.3	101.381	101.379	AR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1									
DD1-AA7		0.03	0.3	101.873	101.87	AR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1									
Lot1006-AA/6		0.072	0.7	101.353	101.379	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
Lot1007-AA/7		0.087	0.6	101.674	101.67	AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1									
OSD Culvert @75mm		0.872	1.1	101.947	101.878	AR&R 100 year, 20 minutes storm, average 121 mm/h, Zone 1									
ED-BB1		0.872	2.4	101.178	101.118	AR&R 100 year, 20 minutes storm, average 121 mm/h, Zone 1									
ED-AA5		0.872	1.6	101.113	101.085	AR&R 100 year, 20 minutes storm, average 121 mm/h, Zone 1									
CHANNEL DETAILS															
Name		Max Q (cu.m/d)	Max V (m/s)	Channelage (m)	Max HGL (m)	Due to Storm									
OVERFLOW ROUTE DETAILS															
Name		Max Q U/S	Max Q D/S	Safe Q	Max D	Max Div	Max Width	Max V	Due to Storm						
OF-Lot1003		0	0	7.663	0		0	0	0						
OF-AA2 DUMMY		0	0	7.663	0		0	0	0						
OF-AA1		0	0	7.663	0		0	0	0						
OF-Lot1008		0	0	7.663	0		0	0	0						
OF-AA8		0	0	7.663	0		0	0	0						
OF-AA7		0	0	7.663	0		0	0	0						
OF-AA6		0.001	0.001	7.663	0.003		0	1.63	0.14 AR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1						
OF-AA5 DUMMY		0	0	7.663	0		0	0	0						
OF-AA4 DUMMY		0	0	7.663	0		0	0	0						
OF-AA3 DUMMY		0	0	7.663	0		0	0	0						
OF-CC1		0.001	0.001	7.663	0.003		0	1.63	0.16 AR&R 100 year, 25 minutes storm, average 108 mm/h, Zone 1						
OF-DD1		0.003	0.003	7.663	0.009		0	3.14	0.2 AR&R 100 year, 15 minutes storm, average 140 mm/h, Zone 1						
OF-Lot1006		0	0	7.663	0		0	0	0						
OF-Lot1007		0	0	7.663	0		0	0	0						
OF-Lot1004		0	0	7.663	0		0	0	0						
OF-BB1 DUMMY		0	0	7.663	0		0	0	0						
DETENTION BASIN DETAILS															
Name		Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level									
OSD		102.8	376.8	0.872	0.872		0								
CONTINUITY CHECK for AR&R 100 year, 1 hour storm, average 67 mm/h, Zone 1															
Node		Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Change %	Difference %									
Lot1003		108.38	108.38	0	0	0									
AA4/2		2746.2	2746.2	0	0	0									
AA/1		2746.2	2733.06	0	-0.2	0									
culvert - outlet		2733.06	2733.06	0	0	0									
Lot1008		109.26	99.26	0	0	0									
AA/8		109.7	109.7	0	0	0									
AA/7		273.54	273.41	0	0	0									
AA/6		487.35	487.27	0	0	0									
AA/5		2683.09	2687.82	0	0	0									
AA/4		2637.82	2687.35	0	0	0									
AA/3		2637.85	2642.61	0	-0.2	0									
CC/1		26.89	26.88	0	0	0									
DD/1		41.5	41.49	0	0	0									
Lot1006		108.38	108.38	0	0	0									
Lot1007		95.29	95.29	0	0	0									
OSD		2175.13	2175.03	0.09	0	0									
Lot1004		2175.03	2174.91	0	0	0									
BB/1		2191.54	2192.82	0	-0.1	0									
Run Log for W184092_Chp8_ST02_HARWARE SITE ISSUED 135a10_Northrop.din run at 12:28:52 on 14/9/2010															
No water upwelling from any pit. Free board was adequate at all pits.															