Arup Consulting Engineers

Report 12

AMEC Civils Drainage Philosophy and Calculations

	amec	Corrib natural gas
Corrib Project L3882	Shell E+P Contract No. 101.24.15	
CORRIB FIELD DEVELOPMENT: BELLANABOY BRIDGE GAS TERMINAL		

DOCUMENT TITLE: **CIVILS DRAINAGE PHILOSOPHY DOCUMENT**

DOCUMENT NUMBER: **L3882-030-110-0390**

SHEET NO.: **1 of 10**

P1	NOV '03	FOR PLANNING APPLICATION	DSR	MC	SC
REV	DATE	DESCRIPTION	BY	CHK	APP
REVISIONS			APPROVALS		

CONTENTS

1. INTRODUCTION

Shell E+P Ireland Limited (SEPIL) are submitting a new Planning Application for the Corrib Natural Gas Terminal at Bellanaboy Bridge.

This report describes the terminal site drainage system, the drainage system is critically important for the following reasons:

- To control run-off and prevent pollution and damage to land, water bodies and watercourses in the local area around the site.
- For foundation, earthwork integrity and global stability.
- For operational reasons during the life of the facilities.

2. PREAMBLE

AMEC (Oil and Gas) has assessed the drainage design within the terminal security fence area. The purpose of this document is to set out the drainage design philosophy.

Arup Consulting Engineers have carried out the engineering of the drainage for the overall area of the development, AMEC have prepared the drainage design for the terminal site, which interfaces with the Arup designed drainage system.

This report assesses the 'final' terminal site drainage condition. Arup has also assessed the existing drainage arrangement and the drainage during the construction phase.

3. TERMINAL DRAINAGE SYSTEMS – SUMMARY

The terminal drainage is controlled using four separate drainage systems, summarised below, which are covered in more detail within this report. Refer to drawing number COR-AM-TD-001 for the terminal drainage schematic.

- Open ditch system (surface water)
- Surface water system (roof drainage).
- Oily water system, including access road and car park.
- Foul Sewer.

The terminal open ditch system captures uncontaminated rainfall and discharges into the external drainage system, at six locations. Refer to Appendix A for a schematic indicating the interface locations. Refer to drawing Number COR-AR-SD-001 for the external drainage drawing.

The surface water system collects rainfall from building roofs and discharges into the external drainage system, at two locations. There is an additional discharge from the administration building surface water system, which is routed to an existing ditch, which is also shown on the external drainage drawing.

The oily water system is a piped, self-contained system, routed to the open drains sump for treatment and discharging offshore via an out-fall. This system captures any water run-off that might be contaminated with oil or other chemicals.

The foul water sewer is routed to a "Puraflo" system for treatment and discharge.

4. DESIGN PARAMETERS

The design calculations were based on the following parameters.

- The 100-year return event rainfall is assumed to be 31mm in one hour. However, the drainage systems were also reviewed for the extreme design rainfall event of 45mm in one hour.
- A run-off co-efficient of 0.6 was applied for unpaved (gravel areas)
- A run-off co-efficient of 1.0 was applied for paved areas and roads.
- Catchment areas were assessed from the drainage drawing.
- Drainage run lengths were assessed from the drainage drawing.
- Localised flooding of ditch systems is not permissible.

The capacity analyses have been determined from the Micro-drainage program. Refer to appendix A for the drainage system calculations.

5. OPEN DITCH SYSTEM

5.1 INTRODUCTION

The ditch arrangement, and sizes are indicated on the terminal drainage plan drawing, drawing number COR-AM-TD-001. The on plot ditches will be constructed along the edges of the roads, and will be concrete lined. The ditch design is based on trapezoidal and rectangular cross section.

The purpose of the concrete lining is to avoid ground contamination from surface water run-off from the terminal site.

Although the 100-year return rainfall event is 31mm in one hour the drainage system was checked for the extreme design rainfall of 45mm in one hour.

The rate of rainfall was assessed using the relationships given in 'The Wallingford Procedure', based on the reference design rate rainfall of 45mm in one hour.

The design was carried out on the basis that localised flooding of the ditch system is not permissible. This analysis was performed using the Micro-Drainage 'simulation' program, this considers the backwater curve through the system and therefore provides a realistic and robust result.

5.2 OUTFLOWS FROM ON-PLOT DITCHES.

The on-plot ditch drainage system interfaces with the Arup external ditch system at six locations, as shown in appendix A.

The summary of ditch outflows is as below:

Ditch System	Tie in point number	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
NW Ditch outfall	1	31.800	13-21	120
NE Ditch outfall	2	32.216	8-14	190
E Ditch outfall	3	32.135	9-16	151
SE Ditch outfall	4	31.300	15-25	261
Firewater pond ditches	5	31.650	13-23	329
W Ditch outfall	6	32.400	9-15	205

6. SURFACE WATER SYSTEM.

6.1 INTRODUCTION

The surface water system collects the water run-off from the building roofs as well as water at ground level where required for de-watering. The surface water is split into three systems to reflect the location of the various buildings, and as such there are three discharge locations.

- Generator building, firewater pump house, wastewater treatment building and firewater building discharge into the external drainage system.
- The control building discharge into the external drainage system.
- The Maintenance building and administration building complex drains into the existing ditch in the tree firebreak.

Although the 100-year return rainfall event is 31mm in one hour the drainage system was checked for the extreme design rainfall of 45mm in one hour.

The rate of rainfall was assessed using the relationships given in 'The Wallingford Procedure', based on the reference design rate rainfall of 45mm in one hour.

The design of the system was carried out using the Micro-drainage 'storm' program without consideration of storage within the system. The system is capable of accommodating short term peaks in rainfall under even more extreme conditions than the 45mm in one hour, if the effect of storage is considered.

6.2 OUTFLOWS FROM ON-PLOT SURFACE WATER SYSTEM – INTERFACE WITH EXTERNAL DRAINAGE SYSTEM

Surface water System	Tie in point number	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
Control Building	7	31.425m (At N 32820m)	5.1	38
LER, Drains Sump, Generator Building, Firewater Pump House	8	29.900m (At N 32820m)	10.0	147

6.3 OUTFLOWS FROM ON-PLOT SURFACE WATER SYSTEM – DRAINING TO EXISTING DITCH IN FIRE BREAK BETWEEN TREES

Surface water System	Tie in point number	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
Admin Area Buildings (roofs only)	9	31.000m (At N 32816m)	5.6	74

7. OILY WATER SYSTEM

7.1 INTRODUCTION

In the paved areas the paving is laid to falls, draining to catch basins at the low point of the paving. The discharge from the oily water system is collected in the open drain sump (T-8301) for treatment.

The oily water system design was assessed for the following paved areas.

- Slug catcher area and Storage tanks bunds (Raw methanol, product methanol and condensate) system.
- Process area.
- Waste storage area.
- Flare Facilities Area (where paved).

The oily water system was checked for two design conditions, firewater event and heavy rain event.

7.2 FIREWATER FLOW RATES

The firewater flow rate for the tanks is based on the maximum deluge flow rate on the condensate tank. The firewater in the bund discharges through an overflow at the top of the bund into the oily water system, where it drains into the oily water sump.

The firewater rate for the process area is based on 4 monitors and 4 hydrants working simultaneously. The flow rate from the waste storage area is based on 2 hydrants working.

The fire water rate for the flare facilities area is based on 1 monitor working, the fire water flow enters the drainage system at the HP / LP knock out vessels paved area.

7.3 RAINWATER RUN-OFF

Although the 100-year return rainfall event is 31mm in one hour the drainage system was checked for the extreme design rainfall of 45mm in one hour.

The rate of rainfall was assessed using the relationships given in 'The Wallingford Procedure', based on the reference design rate rainfall of 45mm in one hour.

The design of the system was carried out using the Micro-drainage program without consideration of storage within the system. The system is capable of accommodating short term peaks in rainfall under even more extreme conditions than the 45mm in one hour, if the effect of storage is considered.

The paved catchment areas were calculated for each part of the oily water system, and are detailed in Appendix A.

The discharge from the paved areas, for the average hourly rainfall, is given in the table below. The total paved area represents all of the paving on the terminal site.

Event	Rainwater Run-off Rate	
	TOTAL PAVED AREA M^2	13,000
20 Year Return, Daily Maximum Rainfall	2.825 mm / hr	36.7 m^3/h
1 hour, 100 Year Return Rainfall	31mm / hr	402 m^3/h
1 hour, Extreme Rainfall	45mm / hr	584 m^3/h

7.4 OILY WATER SYSTEM DESIGN SUMMARY.

The table below provides details of the drainage flow rates for each of the drainage systems. The governing case for drainage design purposes is highlighted.

System Description	Rain Water 45mm / hr(l/s)	Firewater (l/s)	Design Case
Slug Catcher And Storage Tanks	73	320	Fire Water
Main Header To Open Drains Sump	362	320	Rain Water
Process Area	261	160	Rain Water
Waste Storage Area	130	218	Fire Water
Flare Area	17	50	Fire Water

Note the rain water flow rates in the table above are the instantaneous maximums and are not the average rain water rates.

8. ACCESS ROAD AND CAR PARK

The terminal access road includes a separate, piped drain system to contain possible tanker spillage and rainwater run-off. This system extends from the entrance gate to the waste storage area, and up to the tanker loading / unloading area.

The car park drainage is also connected to this piped drain system, to contain rainwater run-off.

The piped drain system is gravity drained into a sump, located alongside the entrance road inside the main entrance gate, from where it is pumped back to the terminal oily-water system (ref section 7.0 above).

The rate of rainfall was assessed using the relationships given in 'The Wallingford Procedure', based on the reference design rate rainfall of 45mm in one hour.

The system design was checked for a 45mm per hour extreme rainfall event, on the basis that no localised flooding of the ditch system would be permitted. This analysis was performed using the Micro-Drainage 'simulation' program, this considers the backwater curve through the system and therefore provides a realistic and robust result.

9. FOUL WATER SYSTEM

The foul water system from the administration building and control building drains to a septic tank, where it is pumped via a pumping chamber through a "Puraflo" system for treatment and discharge. The "Puraflo" system size is based on an occupany of 30 personnel at the terminal. The discharge is through a percolation area of 300m^2, which is provided outside the security fence south of the car park.

The discharge units were calculated in accordance with BS 8301

Number Of Units	Discharge Tie In Point Number (Ref. Appendix 8)	Flow Rate (l/s)
259	10	5

APPENDIX A CONTENTS

APPENDIX A - CALCULATIONS

SECTION A1 INTRODUCTION

Shell E & P require the drainage systems on the Terminal Site to be designed for rainfall of 31mm in one hour (100 year return period). Shell have also indicated that the effect of an alternative, more extreme, rainfall of 45mm in one hour (100 year return period) should be considered. The calculations which follow have been based on the 45mm in one hour rainfall case for simplicity. The designed system will, therefore, be robust for the 31mm rainfall condition.

For the purpose of these calculations, the extreme design rainfall of 45mm in one hour is used and is described as the reference design condition.

The rainfall profiles in storms of different durations and return period to the base design condition have been assessed using the relationships given in the Wallingford Procedure. An example of these calculations is included in Section A2 - Design Storm Intensity and Return Period. In practice, these calculations have been carried out using the Micro Drainage Win Des software.

It is common practice to design drainage systems for a storm of 5 or 10 year return period using the 'Modified Rational Method', as described in the Wallingford Procedure. This designs drainage on a simple basis, which does not take account of the beneficial effects of storage within the system and surcharge. Where required, the drainage system can be re-checked for its resistance to flooding in a longer return period storm, allowing for the effects of storage and surcharge.

BS EN 752-2 - 'Drain and Sewer Systems Outside Buildings - Performance Rquirements' suggests that sewer systems in industrial areas should be designed for a 1 in 5 year return period storm. Where it is required to check the resistance to flooding in a longer period storm, the Standard recommends that a 1 in 30 year return period storm is considered.

The piped drainage systems have been designed for a 1 in 10 year storm, without any consideration of the effects of storage within the system or surcharge. This is a more severe design condition than the 1 in 5 year storm suggested in BS EN 752-2. As the reference design condition of 45mm rainfall in one hour is also conservative, it can be seen that a highly robust system results.

Sizing of the open rainwater ditches has been carried out initially based on the 1 in 10 year storm, as for the piped drain systems. In view of the fact that surcharge of these drains would immediately result in flooding, these ditches have been individually checked for a 1 in 100 year storm, taking account of storage within the system. The rainfall profile during this design storm event varies according to the time taken for water to travel down each system. For each system, the actual rainfall profile has been derived from the reference design condition, as described above. As the reference design condition of 45mm rainfall in one hour is conservative, it can be seen that a highly robust system results.

To summarise:

- Piped drain systems are designed for a 1 in 10 year storm, taking no account of the beneficial effects of storage and surcharge.
- Open drain systems are designed for a 1 in 100 year storm, with the beneficial effects of storage within the system taken into account.
- The rainfall profile for each system is derived from the reference design condition, according to the design storm return period and the time taken for water to travel down the system.

The calculations have been carried out initially using the Micro Drainage Win Des 'Storm' program, which ignores the effects of storage and surcharge. Design of open ditches is checked using the more complex Win Des 'Simulation' programme, which allows for the beneficial effects of storage within the ditches.

The interface between the on-plot Terminal drainage system and the external drainage system designed by Arup is shown on Drawing COR-AP-SD-001. The Terminal drainage layout is shown on Drawing COR-AM-TD-001/002 - Terminal Drainage Plan.

The results of initial calculations were made available to Arup for design of the external drainage system. The final calculations included here show some variation to these figures, but the latest figures are generally less severe. For simplicity, the figures given in the summary report have been left unchanged. Full consistency checks will be made during the detailed design of the drainage systems.

The on-plot drainage generally takes runoff within the boundary road. A small amount of runoff from the area outside the boundary road is also allowed for. Other runoff, including runoff from the flare area and the ground drainage from the admin buildings and car park areas is taken by the external drainage system, designed by Arup.

Calculations have been carried out on the basis of a common plant level of 100m (equal to 33.400m OD).

amec	Client: Shell E & P Ireland Ltd.			Job Ref.	
	Plant: Gas Reception Terminal			L3882	
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.	
	Calc. by: IM	Date: Nov '03	Chck'd by:	Date:	App'd by:	Date:

SECTION A2 Design Storm Intensity and Return Period

The rate of rainfall has been assessed using the relationships given in 'The Wallingford Procedure', based on the reference design condition of 45mm in one hour (100-year return period). The Appendix in 'Volume 4 – The Modified Rational Method' is used.

Calculations are carried out using the WinDes software and manual estimations are included here as a cross-check on the values computed by the software. These manual calculations also enable us to find a value of M5-60 which correlates with the design case of "M100-60 = 45mm".

The calculations below start with the value of M5-60 = 20mm. Rainfall intensities are assessed and the resulting value of M100-60 is found. The value of M5-60 is then adjusted pro-rata to a value appropriate for M100-60 = 45mm. The detailed figures below are provided to show the derivation only and are not representative of the 45mm rainfall case. They are, however close and provide confidence in the output from the Win Des software. It is not considered necessary to re-run the figures for the correct M5-60 value.

(Seed value); "M5-60min = 20 mm"

From Fig A.2, the figure of R in the previous calculations appears to cover all circumstances. Therefore accept the earlier figure; r = 0.4

From Fig A.3b, obtain values of Z1 and insert in the spreadsheet below:

Storm Duration (Mins)	Storm Duration (Hours)	Z1	M5-60	5-Year Depth for Duration D (M5-D) (mm)
5	0.083	0.4	20	8.00
10	0.166	0.56	20	11.20
15	0.25	0.65	20	13.00
30	0.5	0.78	20	15.60
	1	1	20	20.00
	2	1.3	20	26.00
	4	1.59	20	31.80
	6	1.79	20	35.80
	10	2.21	20	44.20
	24	2.8	20	56.00
	48	3.5	20	70.00

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

Use values in Table A-1 (of the Wallingford Procedure Vol 4) to give values of MT-D and intensity, for comparison with Micro Drainage output.

Storm Duration (Hours)	5-Year Depth for Duration D (M5-D) (mm)	M50-D (mm)	50-Year Intensity (mm/hr)	M100-D (mm)	100-Year Intensity (mm/hr)
0.083	8.00	12.96	156.14	14.96	180.24
0.166	11.20	18.59	112.00	21.62	130.22
0.25	13.00	21.84	87.36	25.48	101.92
0.5	15.60	26.52	53.04	31.20	62.40
1	20.00	34.60	34.60	40.60	40.60
2	26.00	44.46	22.23	52.00	26.00
4	31.80	50.56	12.64	62.01	15.50
6	35.80	59.79	9.96	69.09	11.52
10	44.20	71.16	7.12	81.77	8.18
24	56.00	87.36	3.64	99.68	4.15
48	70.00	104.30	2.17	116.90	2.44

From the above, it can be seen that the 100-year 1-hour rainfall corresponding with the M5-60 value of 20mm used in the original calculations is 40.6mm. This is fairly close to the required value of 45mm.

It can be seen from the above table that the M5-60 figure used in the Micro Drainage computer runs should be increased by a factor of 45/40.6 to suit the 100-year 1-hour rainfall design value of 45mm. Therefore, the Micro Drainage analyses have been carried out using the M5-60 value of 22.2mm.

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882	
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.	
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

SECTION A3 RUNOFF COEFFICIENTS

A run off coefficient of 1.0 is used for paved areas and a runoff coefficient of 0.6 for unpaved areas.

The Modified Rational Method would be used in the United Kingdom for the design of urban drainage systems. This is described in 'Design and Analysis of Urban Drainage, Volume 4, The Modified Rational Method'. From Section 4 it can be seen that the Volumetric Runoff Coefficient, Cv, would normally be taken as 0.75. A Routing Coefficient, Cr, would be taken as 1.3. The overall runoff coefficient for impervious areas would, therefore, be 0.75 x 1.3 = 0.975.

The documentation provided with the Micro Drainage Win Des program shows that a Routing Coefficient of 1.3 is included in the program design. The default value of Cv is 0.75. However, if it is required to adopt an overall runoff coefficient of 1.0, as is the case here, a Cv of 0.77 can be entered. The overall runoff coefficient is then 0.77 x 1.3 = 1.001.

When using the Modified Rational Method for design of urban drainage, it is common to ignore runoff from pervious areas. The Cv of 0.75, combined with Cr of 1.3, applied to impervious areas, is considered sufficient to allow for the runoff from both pervious and impervious areas.

At the Corrib Terminal site, conditions cannot be described as urban. For non-standard conditions, 'The Wallingford Procedure, Volume 1, offers Equation 7.3. As a check, the overall catchment permeability has been calculated in accordance with this equation, as shown below:

"PIMP is the percentage of catchment area covered by impervious surfaces intended to drain to the storm sewer: From the assessments of road areas within the original calculations it can be seen, by eye, that the impervious areas represent less than 25% of the total areas (total area = pervious + impervious area). For this comparison calculation, the impervious areas are, conservatively, taken to be 30% of the total areas".

Percentage of catchment area covered by impervious surfaces; PIMP = 30

SOIL is, conservatively, taken as the upper limit value of 0.5, from Section 7.4 of 'The Wallingford Procedure' (equivalent to a rock or peat surface); SOIL = 0.5

From Section 9.4 and Fig 9.7 (Annual rainfall taken as 1450mm from Section 2.2.5 of document L3847-010-110-0001 Rev A2); UCWI = 145

From Eqn 7.3;

PR = (0.829×PIMP) + (25.0×SOIL) + (0.078×UCWI) – 20.7; PR =**27.980**

This shows that an overall runoff coefficient of 0.3 would be adequate when applied to the overall catchment, including the impervious areas. Allowing for an overall runoff coefficient of 1.0 applied to the impervious areas, a conservative value of runoff coefficient for the pervious areas alone would be;

Cperv = ((0.3×1)-(0.25×1))/1; Cperv = **0.050**

amec	Client: Shell E & P Ireland Ltd. Plant: Gas Reception Terminal			Job Ref. L3882	
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.	
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

As indicated above an overall runoff coefficient of 0.6 has been applied to the pervious areas. It is considered that a highly conservative design results, in line with the design requirement to avoid pollution caused by flooding.

As noted above for the impervious areas, a Cv value 0.77 has been used in the program input In combination with the Cr value of 1.3, a total runoff coefficient of 1.0 is applied to 0.6 x Pervious Area. This is equivalent to applying a total runoff coefficient of 0.6 to all of the pervious area.

It can be seen that the calculations are conservative. Ditches on the Terminal Site should be well able to cope with storm flows and minor local variations in rainfall, ditch profile, etc.

SECTION A4 DESIGN OF ON-PLOT OPEN DITCHES (RAINWATER)

Open ditches are laid flat where possible. This does not generate enough flow velocity to be self cleansing. It is a requirement that the on-plot ditches will be regularly maintained and that this should not present undue difficulty. It should be noted that it may be necessary to provide handrail or grating to some ditches.

Open ditches are to be provided with a concrete lining, to minimise the possibility of ground pollution in the event of a spill. In order to contain any spillage, the open ditches are designed to work without overtopping.

Open ditches have been sized initially using the 'Storm' program. In order to confirm that the on-plot ditch system will operate without flooding, calculations were transferred to the Micro-Drainage 'Simulation' program. This considers the backwater curve through the system and is expected to provide a more realistic result.
The on-plot open ditches have a sprayed concrete lining. The purpose of the lining is to avoid ground contamination by oil spillage.

The areas draining to each ditch have been marked on the Catchment Areas drawing included at Appendix A10.

There are six ditch systems making up the total on-plot rainwater ditch system. These are:

- North-West outfall ditches.
- North-East outfall ditches.
- East outfall ditches.
- South-East outfall ditches.
- Firewater pond area ditches.
- West outfall ditches.

Drawings showing the run numbers used in computer calculations for each ditch length are included at Appendix A11.

Following the summary of calculated outflows, below, are:

- Detailed summation of areas draining to each ditch.
- Win Des calculations output.

A4.1 Summary of Outflows from On-Plot Ditches:

Given below are the summaries of the outflows from the Terminal Site ditches. These outflows are given for a 1 in 100-year storm, based the reference design condition, using the 'Simulation' design software. As indicated in the Introduction, above, these are values resulting from initial runs and it is not considered necessary to revise the figures to reflect changes of small effect in the final calculation runs which follow.

Ditch System	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
NW Ditch outfall	98.400	13-21	120
NE Ditch outfall	98.816	8-14	190
E Ditch outfall	98.735	9-16	151
SE Ditch outfall	97.900	15-25	261
Firewater pond ditches	98.250	13-23	329
W Ditch outfall	99.000	9-15	205

The range of times of concentration is given as it was noted that the times of concentration calculated in 'Simulation' were much longer than output from the original 'Storm' calculations. It has been recommended to Arup that the effect on the perimeter drain system of the range of times of concentration should be considered.

A4.2 'Simulation' Runs for On-Plot Ditches

As noted in the Introduction, above, it was decided to analyse the ditch systems using the Micro Drainage 'Simulation' package. The package analyses the backwater curve in individual pipe lengths and links the water levels of adjacent pipe lengths to calculate the overall flow in the system.

The network data have been brought in to the 'Simulation' package, on the following basis:

- Trapezoidal ditch invert levels include a nominal fall of up to 10mm, to allow the program to function, the program expects channels laid falls. (Rectangular channels will be constructed to falls).
- A standard head loss coefficient of 1.0 has been applied at all the manholes called up in the network data. This is intended to make some allowance for the losses at bends which are not included in the current network model.

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A4.3 DRAINED AREA SUMMATIONS FOR INDIVIDUAL DRAIN RUNS (TIE IN POINT 1)

A4.3.1 NORTH WEST OUTFALL DITCH SYSTEM – AREAS DRAINING TO DITCHES

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
NW Outfall Ditches								
Road	1.000	140	75	3	1	225		
Road			55	3	1	165		
Road			20	3	1	60		
Road			8	3	1	24		
Pervious Area			50	15	0.6	450		
Pervious Area			25	15	0.6	225		
Pervious Area			45	13	0.6	351		
Road			3	70	1	210	**1710** m2	
	1.001	10	0	0	0	0		Carrier
Road	1.002	30	35	3	1	105		
Road			3	25	1	75		
Road			30	11	0.6	198	**378** m2	
Road	2.000	15	20	3	1	60		
Road			3	15	1	45		
Road			15	15	0.6	135	**240** m2	
	1.003	10	0	0	0	0		Carrier
Road	3.000	57	3	20	1	60		
Road			60	3	1	180		
Road			3	18	1	54		
Pervious Area			55	11	0.6	363	**657** m2	
	3.001	10	0	0	0	0		Carrier
Road	3.002	30	28	3	1	84		
Road			3	18	1	54		
Pervious Area			25	12	0.6	180	**318** m2	
Road	4.000	18	25	3	1	75		
Road			3	15	1	45		
Pervious Area			7	12	0.6	50	**170** m2	
	3.003	10	0	0	0	0		Carrier
	5.000	95	95	3	1	285		
			95	3	0.6	171	**456** m2	
	3.004	45	45	3	1	135		
			45	3	0.6	81	**216** m2	
	6.000	120	110	3	1	330		
			115	3	0.6	207	**537** m2	
Total							4682 m2	

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A4.3.2 NORTH EAST OUTFALL DITCH SYSTEM – AREAS DRAINING TO DITCHES (TIE IN POINT 2)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
NE Outfall Ditches								
Pervious Area	1.000	40	34	10	0.6	204		
Pervious Area			30	5	0.6	90		
Road			35	3	1	105		
Road			15	3	1	45		
Road			15	3	1	45		
Road		13	15	3	1	45	**534** m2	
	1.001	6	0	0	0	0		Carrier
Road	2.000	35	50	3	1	150		
Road			15	3	1	45		
Road			11	8	1	88		
Pervious Area			35	5	0.6	105	**388** m2	
Road	1.002	29	25	3	1	75		
Pervious Area			22	6	0.6	79	**154** m2	
Road	3.000	13	18	3	1	54	**54** m2	
	1.003	10	0	0	0	0		Carrier
Road	4.000	13	18	3	1	54	**54** m2	
Road	1.004	75	75	3	1	225		
Pervious Area			15	20	0.6	180		
Pervious Area			58	40	0.6	1392	**1797** m2	
Road	5.000	78	32	3	1	96		
Road			60	3	1	180		
Pervious/Paving			35	52	0.9	1638	**1914**	75% future paving allowed
Road	6.000	150	142	3	1	426		
Pervious Area			142	3	0.6	256	**682** m2	
Road	7.000	140	40	3	1	120		
Road			90	3	1	270		
Pervious Area			40	3	0.6	72		
Pervious Area			95	3	0.6	171	**633** m2	
	1.005	10	0	0	0	0		Carrier
	1.006	14	0	0	0	0		Carrier
Total							**6210** m2	

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882	
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.	
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A4.3.3 EAST OUTFALL DITCH SYSTEM – AREAS DRAINING TO DITCHES (TIE IN POINT 3)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
E Outfall Ditches								
Road	1.000	120	140	6	1	840		
Road			3	28	1	84		
Pervious Area			40	10	0.6	240		
Pervious Area			85	6	0.6	306	**1470** m2	
	1.001	9	0	0	0	0		Carrier
Road	1.002	24	30	3	1	90		
Pervious Area			25	15	0.6	225	**315** m2	
Road	2.000	32	30	3	1	90		
Pervious Area			32	20	0.6	384	**474** m2	
Road	3.000	22	3	28	1	84		
Road			23	3	1	69		
Pervious Area			8	20	0.6	96	**249** m2	
	2.001	10	0	0	0	0		Carrier
Road	1.003	53	25	3	1	75		
Pervious Area			18	53	0.6	572		
Pervious Area			12	40	0.6	288		
Pervious Area			12	30	0.6	216	**1151** m2	
	1.004	10	0	0	0	0		Carrier
	1.005	14	0	0	0	0		Carrier
Total							3659	m2

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882
	Plant: Gas Reception Terminal			
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A4.3.4 SOUTH - EAST OUTFALL DITCH SYSTEM – AREAS DRAINING TO DITCHES (TIE IN POINT 4)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
SE Outfall Ditches								
Road	1.000	24	3	26	1	78		
Pervious Area			28	24	0.6	403	**481**	m2
Road	2.000	24	3	24	1	72		
Pervious Area			4	24	0.6	58	**130**	m2
	2.001	10	0	0	0		Carrier	
Road	1.001	31	3	33	1	99		
Pervious Area			28	33	0.6	554	**653**	m2
Road	3.000	13	3	13	1	39		
Pervious Area			4	13	0.6	31	**70**	m2
	3.001	10	0	0	0		Carrier	
Road	1.002	11	3	10	1	30		
Pervious Area			20	10	0.6	120	**150**	m2
	1.003	10	0	0	0		Carrier	
Road	1.004	100	3	100	1	300		
Pervious Area			20	45	0.6	540		
Pervious Area			10	17	0.6	102	**942**	m2
	1.005	10	0	0	0		Carrier	
Road	4.000	44	50	3	1	150		
Pervious Area			12	10	0.6	72	**222**	m2
Road	1.006	69	3	70	1	210		
Pervious Area			12	55	0.6	396		
Pervious Area			20	12	0.6	144	**750**	m2
Road	5.000	37	3	30	1	90		
Pervious Area			16	25	0.6	240	**330**	m2
	5.001	12	0	0	0		Carrier	
Road	5.002	86	3	48	1	144		
Road			3	20	1	60		
Road			3	10	1	30		
Pervious Area			15	10	0.6	90		
Pervious Area			23	12	0.6	166		
Pervious Area			52	8	0.6	250	**739**	m2
	1.007	10	0	0	0		Carrier	
Road	6.000	38	3	50	1	150		
Pervious Area			14	46	0.6	386	**536**	m2
	6.001	10	0	0	0		Carrier	
Road	6.002	115	3	115	1	345		
Pervious Area			55	115	0.6	3795	**4140**	m2
Road	1.008	70	3	10	1	30		
Pervious Area			55	12	0.6	396		
Pervious Area			21	10	0.6	126	**552**	m2
	1.009	18	0	0	0		Carrier	
	1.010	80	0	0	0		Carrier	
Total							**9696**	m2

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A4.3.5 FIRE WATER POND SYSTEM DITCHES – AREAS DRAINING TO DITCHES (TE IN POINT 5)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
FW Ditches								
Pervious Area	1.000	59	65	10	0.6	390	**390**	m2
	1.001	8	0	0	1	0		Carrier
Pervious Area	2.000	59	65	27.5	0.6	1073	**1073**	m2
Pervious Area	1.002	105	85	20	0.6	1020	**1020**	m2
Pervious Area	3.000	65	43	20	0.6	516		
Road			45	3	1	135	**651**	m2
	1.003	10	0	0	1	0		Carrier
Pervious Area	4.000	112	100	15	0.6	900	**900**	m2
	1.004	10	0	0	0	0		(Negligible)
Pervious Area	5.000	165	145	14	0.6	1218		
Pervious Area			20	14	0.6	168		
Road			145	3	1	435		
Road			20	3	1	60	**1881**	m2
Pervious Area	6.000	52	25	17	0.6	255	**255**	m2
	5.001	10	0	0	0	0		Carrier
Pervious Area	1.005	82	90	15	0.6	810		
Road			85	3	1	255	**1065**	m2
Pervious Area	7.000	162	70	13	0.6	546		
Pervious Area			60	22	0.6	792		
Pervious Area			10	22	0.6	132		
Pervious Area			10	22	0.6	132		
Road			145	3	1	435		
Road			20	3	1	60	**2097**	m2
Pervious Area	8.000	133	75	8	0.6	360		
Pervious Area			33	22	0.6	436		
Pervious Area			22	12	0.6	158		
Pervious Area			22	10	0.6	132		
Road			135	3	1	405	**1491**	m2
	7.001	10	0	0	0	0		Carrier
Total carried to next sheet							**10822.5**	m2

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882
	Plant: Gas Reception Terminal			
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A4.3.5 FIRE WATER POND SYSTEM DITCHES – AREAS DRAINING TO DITCHES (Cont'd)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
Carried forward from previous sheet							**10823**	**(Input manually)**
Pervious Area	1.006	100	65	15	0.6	585		
Pervious Area			35	30	0.6	630		
Road			100	3	1	300	**1515**	m2
Pervious Area	9.000	55	27	35	0.6	567		
Road			55	3	1	165	**732**	m2
	1.007	14	0	0	0	0		Carrier
Pervious Area	10.000	35	90	3	0.6	162		
Road			90	3	1	270	**432**	m2
Pervious Area	11.000	35	15	15	0.6	135		
Road			20	3	1	60		
Road			15	3	1	45	**240**	m2
	10.001	8	0	0	0	0		Carrier
	1.008	85	35	8	0.6	168	**168**	m2
Total area							**13910**	m2

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882
	Plant: Gas Reception Terminal			
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A4.3.6 WEST OUTFALL DITCH SYSTEM – AREAS DRAINING TO DITCHES (TIE IN POINT 6)

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
W Outfall Ditches								
Road	1.000	125	3	15	1	45		
Road			22	2	1	44		
Road			3	90	1	270		
Road			15	3	1	45		
Pervious Area			38	87	0.6	1984		
Road			35	30	1	630		
Pervious Area			20	30	0.6	360		
Pervious Area			23	3	0.6	41	**3419** m2	
	1.001	10	0	0	0			Carrier
Road	1.002	17	18	3	1	54		
Road			3	6	1	18		
Pervious Area			15	6	0.6	54		
Pervious Area			25	9	0.6	135	**261** m2	
Road	2.000	143	95	3	1	285		
Road			80	3	1	240		
Road			3	7	1	21		
Pervious Area			17	92	0.6	938		
Road			20	30	1	360		
Pervious Area			30	5	0.6	90	**1934** m2	
	1.003	10	0	0	0			Carrier
	3.000	95	82	3	1	246		
			3	6	1	18		
			80	3	0.6	144		
			3	10	0.6	18	**426** m2	
	4.000	140	3	140	1	420		
			15	3	1	45		
			3	140	0.6	252		
			12	3	0.6	22	**739** m2	
	4.001	13	0	0	0			Carrier
	4.002	18	15	3	1	45		
			20	3	1	60		
			15	3	0.6	27		
			3	15	0.6	27	**159** m2	
	1.004	13	0	0	0			Carrier
Total							**6938** m2	

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	0.001
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	140.00	0.010	14000.0	0.171	2.00	0	15.000	\/	-3
1.001	10.00	0.002	5000.0	0.000	0.00	0	6.000	\/	-3
1.002	30.00	0.002	15000.0	0.038	0.00	0	15.000	\/	-3
2.000	15.00	0.120	125.0	0.024	2.00	0	0.600	o	150
1.003	10.00	0.020	500.0	0.000	0.00	0	6.000	\/	-3
3.000	57.00	0.002	28500.0	0.066	2.00	0	15.000	\/	-2
3.001	10.00	0.002	5000.0	0.003	0.00	0	6.000	\/	-2
3.002	30.00	0.050	600.0	0.032	0.00	0	6.000	_|	-102
4.000	18.00	0.100	180.0	0.017	2.00	0	0.600	o	150
3.003	10.00	0.020	500.0	0.000	0.00	0	6.000	_|	-102
5.000	95.00	0.006	15833.3	0.046	2.00	0	15.000	\/	-2

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	16.5	99.474	0.171	0	0	0	0.16	54	0
1.001	0.0	17.0	99.464	0.171	0	0	0	0.32	107	0
1.002	0.0	20.2	99.462	0.209	0	0	0	0.16	53	0
2.000	0.0	2.3	99.400	0.024	0	0	0	0.90	16	0
1.003	0.0	20.4	98.980	0.233	0	0	0	1.00	338	0
3.000	0.0	12.5	99.624	0.066	0	0	0	0.09	16	0
3.001	0.0	13.2	99.622	0.069	0	0	0	0.26	46	0
3.002	0.0	13.8	99.620	0.101	0	0	0	0.81	219	0
4.000	0.0	2.4	99.400	0.017	0	0	0	0.75	13	0
3.003	0.0	14.0	99.300	0.118	0	0	0	0.89	240	0
5.000	0.0	15.0	99.624	0.046	0	0	0	0.12	22	0

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
3.004	45.00	0.050	900.0	0.022	0.00	0	6.000	|_|	-102
6.000	120.00	0.010	12000.0	0.054	2.00	0	15.000	\/	-2
1.004	13.00	0.250	52.0	0.000	0.00	0	0.600	o	750

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
3.004	0.0	16.2	99.280	0.186	0	0	0	0.66	179	0
6.000	0.0	16.3	99.624	0.054	0	0	0	0.14	25	0
1.004	0.0	20.5	98.660	0.473	0	0	0	3.89	1717	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file DITCH.SEC

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-2	\/	300	300	45		0.627	0.180
-3	\/	300	450	45		0.860	0.338
-102	_/	900	300			0.720	0.270

Summary of Results

Return Period (years)	100	Analysis Time Step (seconds)	5
Storm Duration (mins)	15	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.925	0.001	0.000	0.49	0	94	FLD RISK
1.001	99.815	-0.099	0.000	0.15	0	27	O K
1.002	99.802	-0.110	0.000	0.18	0	29	O K
2.000	99.517	-0.033	0.000	0.96	0	13	O K
1.003	99.112	-0.318	0.000	0.17	0	31	O K
3.000	99.924	0.000	0.000	0.46	0	36	O K
3.001	99.844	-0.078	0.000	0.29	0	25	O K
3.002	99.709	-0.211	0.000	0.20	0	34	O K
4.000	99.502	-0.048	0.000	0.80	0	9	O K
3.003	99.451	-0.149	0.000	0.29	0	40	O K
5.000	99.924	0.000	0.000	0.31	0	25	O K
3.004	99.444	-0.136	0.000	0.49	0	72	O K
6.000	99.924	0.000	0.000	0.36	0	30	O K
1.004	99.019	-0.391	0.000	0.16	0	122	O K

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	11

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.004	13	100.000	98.410	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	140.00	0.010	14000	0.171	2.00	1	15.000	\/	-3
1.001	10.00	0.002	5000	0.000	0.00	1	6.000	\/	-3
1.002	30.00	0.002	15000	0.038	0.00	1	15.000	\/	-3
2.000	15.00	0.120	125	0.024	2.00	1	0.600	o	150
1.003	10.00	0.020	500	0.000	0.00	1	6.000	\/	-3
3.000	57.00	0.002	28500	0.066	2.00	1	15.000	\/	-2
3.001	10.00	0.002	5000	0.003	0.00	1	6.000	\/	-2
3.002	30.00	0.050	600	0.032	0.00	1	6.000	_|	-102
4.000	18.00	0.100	180	0.017	2.00	1	0.600	o	150
3.003	10.00	0.020	500	0.000	0.00	1	6.000	_|	-102
5.000	95.00	0.006	15833	0.046	2.00	1	15.000	\/	-2
3.004	45.00	0.050	900	0.022	0.00	1	6.000	_|	-102
6.000	120.00	0.010	12000	0.054	2.00	1	15.000	\/	-2
1.004	13.00	0.250	52	0.000	0.00	1	0.600	o	750

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.474	0.001	101.000	99.464	1.086		1200
1.001	2	101.000	99.464	1.086	101.000	99.462	1.088	4	1200
1.002	3	101.000	99.462	1.088	99.925	99.460	0.015	4	1200
2.000	4	99.925	99.400	0.375	99.925	99.280	0.495		1200
1.003	5	99.925	98.980	0.495	99.925	98.960	0.515	4	1200
3.000	6	99.925	99.624	0.001	101.000	99.622	1.078		1200
3.001	7	101.000	99.622	1.078	101.000	99.620	1.080	4	1200
3.002	8	101.000	99.620	1.080	99.925	99.570	0.055	4	1200
4.000	9	99.925	99.400	0.375	99.925	99.300	0.475		1200
3.003	10	99.925	99.300	0.325	99.925	99.280	0.345	4	1200
5.000	11	99.925	99.624	0.001	99.925	99.618	0.007		1200
3.004	11	99.925	99.280	0.345	99.925	99.230	0.395	4	1200
6.000	12	99.925	99.624	0.001	99.925	99.614	0.011		1200
1.004	12	99.925	98.660	0.515	100.000	98.410	0.840	4	1200

Return Period 100 years
Average Rainfall Intensity 110.98 mm/hr

Time (Min)	US Level (m)	DS Level (m)	Surcharged Depth (m)	E. O'flow (m3/s)	Pipeflow (m3/s)
1	98.668	99.160	-0.742	0.000	0.000
2	98.717	99.160	-0.693	0.000	0.000
3	98.843	99.160	-0.567	0.000	0.000
4	99.007	99.160	-0.403	0.000	0.000
5	99.010	99.160	-0.400	0.000	0.007
6	99.010	99.160	-0.400	0.000	0.012
7	99.010	99.160	-0.400	0.000	0.019
8	99.011	99.160	-0.399	0.000	0.031
9	99.012	99.160	-0.398	0.000	0.051
10	99.015	99.160	-0.395	0.000	0.076
11	99.018	99.160	-0.392	0.000	0.104
12	99.019	99.160	-0.391	0.000	0.121
13	99.018	99.160	-0.392	0.000	0.122
14	99.016	99.160	-0.394	0.000	0.112
15	99.015	99.160	-0.395	0.000	0.099
16	99.014	99.160	-0.396	0.000	0.086
17	99.013	99.160	-0.397	0.000	0.074
18	99.012	99.160	-0.398	0.000	0.065
19	99.012	99.160	-0.398	0.000	0.057
20	99.012	99.160	-0.398	0.000	0.049
21	99.011	99.160	-0.399	0.000	0.043
22	99.011	99.160	-0.399	0.000	0.038
23	99.011	99.160	-0.399	0.000	0.034
24	99.011	99.160	-0.399	0.000	0.031
25	99.011	99.160	-0.399	0.000	0.027
26	99.010	99.160	-0.400	0.000	0.025
27	99.010	99.160	-0.400	0.000	0.022
28	99.010	99.160	-0.400	0.000	0.021
29	99.010	99.160	-0.400	0.000	0.019
30	99.010	99.160	-0.400	0.000	0.017
31	99.010	99.160	-0.400	0.000	0.016
32	99.010	99.160	-0.400	0.000	0.015
33	99.010	99.160	-0.400	0.000	0.014
34	99.010	99.160	-0.400	0.000	0.013
35	99.010	99.160	-0.400	0.000	0.012
36	99.010	99.160	-0.400	0.000	0.012
37	99.010	99.160	-0.400	0.000	0.011
38	99.010	99.160	-0.400	0.000	0.011
39	99.010	99.160	-0.400	0.000	0.010
40	99.010	99.160	-0.400	0.000	0.009
41	99.010	99.160	-0.400	0.000	0.009
42	99.010	99.160	-0.400	0.000	0.008
43	99.010	99.160	-0.400	0.000	0.008
44	99.010	99.160	-0.400	0.000	0.007
45	99.010	99.160	-0.400	0.000	0.007
46	99.010	99.160	-0.400	0.000	0.007
47	99.010	99.160	-0.400	0.000	0.006
48	99.010	99.160	-0.400	0.000	0.006

Total Volume over Overflow (Spill Flow) 0.000m3

cf. TC = 20.5 MINS IN 'STORM' RUN,
USE MORE CRITICAL 13 MINS FROM ABOVE.

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	40.00	0.005	8000.0	0.053	2.00	0	15.000	\/	-2
1.001	6.00	0.002	3000.0	0.000	0.00	0	6.000	\/	-2
2.000	13.00	0.002	6500.0	0.039	2.00	0	15.000	\/	-2
1.002	29.00	0.004	7250.0	0.016	0.00	0	15.000	\/	-3
3.000	13.00	0.001	13000.0	0.005	2.00	0	15.000	\/	-1
1.003	10.00	0.075	133.3	0.000	0.00	0	6.000	\/	-3
4.000	13.00	0.001	13000.0	0.005	2.00	0	15.000	\/	-1
1.004	75.00	0.170	441.2	0.180	0.00	0	15.000	_|	-103
5.000	78.00	0.010	7800.0	0.191	2.00	0	15.000	\/	-3
1.005	10.00	0.100	100.0	0.000	0.00	0	6.000	\/	-3

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	5.9	99.624	0.053	0	0	0	0.17	31	0
1.001	0.0	6.2	99.619	0.053	0	0	0	0.33	59	0
2.000	0.0	3.1	99.624	0.039	0	0	0	0.19	34	0
1.002	0.0	8.4	99.467	0.108	0	0	0	0.22	76	0
3.000	0.0	4.0	99.724	0.005	0	0	0	0.11	11	0
1.003	0.0	8.4	99.463	0.113	0	0	0	1.94	655	0
4.000	0.0	4.0	99.724	0.005	0	0	0	0.11	11	0
1.004	0.0	9.7	99.388	0.298	0	0	0	1.03	555	0
5.000	0.0	8.0	99.474	0.191	0	0	0	0.22	73	0
1.005	0.0	9.7	99.218	0.489	0	0	0	2.24	756	0

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
6.000	150.00	0.010	15000.0	0.068	2.00	0	15.000	V	-3
7.000	140.00	0.010	14000.0	0.063	2.00	0	15.000	V	-3
1.006	14.00	0.150	93.3	0.000	0.00	0	15.000	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
6.000	0.0	18.1	99.474	0.068	0	0	0	0.16	53	0
7.000	0.0	16.5	99.474	0.063	0	0	0	0.16	54	0
1.006	0.0	18.3	99.118	0.620	0	0	0	1.26	200	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file Ditch.sec

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-1	\/	300	200	45		0.462	0.100
-2	\/	300	300	45		0.627	0.180
-3	\/	300	450	45		0.860	0.338
-103	[_]	1200	450			1.029	0.540

Summary of Results

Return Period (years)	100	Analysis Time Step (seconds)	5
Storm Duration (mins)	15	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.915	-0.009	0.000	0.38	0	29	O K
1.001	99.840	-0.079	0.000	0.27	0	26	O K
2.000	99.860	-0.064	0.000	0.27	0	21	O K
1.002	99.819	-0.098	0.000	0.28	0	45	O K
3.000	99.819	-0.105	0.000	0.07	0	3	O K
1.003	99.619	-0.294	0.000	0.14	0	45	O K
4.000	99.819	-0.105	0.000	0.07	0	3	O K
1.004	99.612	-0.226	0.000	0.26	0	125	O K
5.000	99.924	0.000	0.000	0.57	0	105	O K
1.005	99.586	-0.082	0.000	0.39	0	146	O K
6.000	99.895	-0.029	0.000	0.19	0	37	O K
7.000	99.867	-0.057	0.000	0.18	0	35	O K
1.006	99.577	0.009	0.000	1.09	0	177	SURCH'ED

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	9

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.006	14	99.925	98.968	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	40.00	0.005	8000	0.053	2.00	1	15.000	\/	-2
1.001	6.00	0.002	3000	0.000	0.00	1	6.000	\/	-2
2.000	13.00	0.002	6500	0.039	2.00	1	15.000	\/	-2
1.002	29.00	0.004	7250	0.016	0.00	1	15.000	\/	-3
3.000	13.00	0.001	13000	0.005	2.00	1	15.000	\/	-1
1.003	10.00	0.075	133	0.000	0.00	1	6.000	\/	-3
4.000	13.00	0.001	13000	0.005	2.00	1	15.000	\/	-1
1.004	75.00	0.170	441	0.180	0.00	1	15.000	_|	-103
5.000	78.00	0.010	7800	0.191	2.00	1	15.000	\/	-3
1.005	10.00	0.100	100	0.000	0.00	1	6.000	\/	-3
6.000	150.00	0.010	15000	0.068	2.00	1	15.000	\/	-3
7.000	140.00	0.010	14000	0.063	2.00	1	15.000	\/	-3
1.006	14.00	0.150	93	0.000	0.00	1	15.000	o	450

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.624	0.001	99.925	99.619	0.006		1200
1.001	3	99.925	99.619	0.006	99.925	99.617	0.008	4	1200
2.000	4	99.925	99.624	0.001	99.925	99.622	0.003		1200
1.002	4	99.925	99.467	0.008	100.000	99.463	0.087	4	1200
3.000	5	99.925	99.724	0.001	100.000	99.723	0.077		1200
1.003	6	100.000	99.463	0.087	99.925	99.388	0.087	4	1200
4.000	7	99.925	99.724	0.001	99.925	99.723	0.002		1200
1.004	8	99.925	99.388	0.087	99.925	99.218	0.257	4	1200
5.000	9	99.925	99.474	0.001	99.925	99.464	0.011		1200
1.005	10	99.925	99.218	0.257	99.925	99.118	0.357	4	1200
6.000	11	99.925	99.474	0.001	99.925	99.464	0.011		1200
7.000	12	99.925	99.474	0.001	99.925	99.464	0.011		1200
1.006	13	99.925	99.118	0.357	99.925	98.968	0.507	4	1200

Return Period 100 years
Average Rainfall Intensity 110.98 mm/hr

Time (min)	US Level (m)	DS Level (m)	Surcharged Depth (m)	E'Flow (m3/s)	Pipeflow (m3/s)
1	99.118	99.418	-0.450	0.000	0.000
2	99.135	99.418	-0.433	0.000	0.000
3	99.176	99.418	-0.392	0.000	0.000
4	99.241	99.418	-0.327	0.000	0.000
5	99.280	99.418	-0.288	0.000	0.000
6	99.328	99.418	-0.240	0.000	0.001
7	99.340	99.418	-0.228	0.000	0.023
8	99.356	99.418	-0.212	0.000	0.048
9	99.387	99.418	-0.181	0.000	0.078
10	99.440	99.418	-0.128	0.000	0.117
11	99.510	99.418	-0.058	0.000	0.152
12	99.543	99.418	-0.025	0.000	0.161
13	99.570	99.418	0.002	0.000	0.162
14	99.577	99.418	0.009	0.000	0.175
15	99.566	99.418	-0.002	0.000	0.177
16	99.547	99.418	-0.021	0.000	0.162
17	99.527	99.418	-0.041	0.000	0.161
18	99.479	99.418	-0.089	0.000	0.161
19	99.450	99.418	-0.118	0.000	0.156
20	99.410	99.418	-0.158	0.000	0.137
21	99.368	99.418	-0.200	0.000	0.107
22	99.344	99.418	-0.224	0.000	0.067
23	99.334	99.418	-0.234	0.000	0.038
24	99.329	99.418	-0.239	0.000	0.020
25	99.328	99.418	-0.240	0.000	0.009
26	99.328	99.418	-0.240	0.000	0.005
27	99.328	99.418	-0.240	0.000	0.003
28	99.328	99.418	-0.240	0.000	0.003
29	99.328	99.418	-0.240	0.000	0.002
30	99.328	99.418	-0.240	0.000	0.002
31	99.328	99.418	-0.240	0.000	0.001
32	99.328	99.418	-0.240	0.000	0.001
33	99.328	99.418	-0.240	0.000	0.001
34	99.328	99.418	-0.240	0.000	0.001
35	99.328	99.418	-0.240	0.000	0.001
36	99.328	99.418	-0.240	0.000	0.001
37	99.328	99.418	-0.240	0.000	0.001
38	99.328	99.418	-0.240	0.000	0.001
39	99.328	99.418	-0.240	0.000	0.001
40	99.328	99.418	-0.240	0.000	0.000
41	99.328	99.418	-0.240	0.000	0.000
42	99.328	99.418	-0.240	0.000	0.000
43	99.327	99.418	-0.241	0.000	0.001
44	99.328	99.418	-0.240	0.000	0.001
45	99.327	99.418	-0.241	0.000	0.000
46	99.328	99.418	-0.240	0.000	0.000
47	99.327	99.418	-0.241	0.000	0.000
48	99.328	99.418	-0.240	0.000	0.000

Total Volume over Overflow (Spill Flow) 0.000m3

Cf. TC 18.3 mins in 'STORM' RUN
USE MORE CRITICAL VALUE ABOVE.

Amec Capital Projects Ltd	
11 The Boulevard Crawley West Sussex RH10 1UX	Shell E & P Ireland Ltd. Corrib Project East Ditch Outfall
Date 14-November-2003 File East Ditch Outfall.SWS	Designed By IM Checked By
Micro Drainage	Storm W.7.6 (c)1982-2001 Micro Drainage

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	120.00	0.008	15000.0	0.150	2.00	0	15.000	V	-3
1.001	9.00	0.003	3000.0	0.000	0.00	0	6.000	V	-3
1.002	24.00	0.050	480.0	0.032	0.00	0	15.000	_|	-103
2.000	32.00	0.002	16000.0	0.048	2.00	0	15.000	V	-2
3.000	22.00	0.002	11000.0	0.025	2.00	0	15.000	V	-2
2.001	10.00	0.002	5000.0	0.000	0.00	0	6.000	V	-2
1.003	53.00	0.100	530.0	0.115	0.00	0	15.000	_|	-104

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	14.9	99.474	0.150	0	0	0	0.16	53	0
1.001	0.0	15.2	99.466	0.150	0	0	0	0.41	138	0
1.002	0.0	15.6	99.463	0.182	0	0	0	0.99	532	0
2.000	0.0	6.4	99.624	0.048	0	0	0	0.12	22	0
3.000	0.0	4.5	99.624	0.025	0	0	0	0.15	26	0
2.001	0.0	7.1	99.622	0.073	0	0	0	0.26	46	0
1.003	0.0	16.4	99.263	0.370	0	0	0	1.12	1006	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file Ditch.sec

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-2	\/	300	300	45		0.627	0.180
-3	\/	300	450	45		0.860	0.338
-103	_|	1200	450			1.029	0.540
-104	_|	1500	600			1.333	0.900

Summary of Results

Return Period (years)	100	Analysis Time Step (seconds)	5
Storm Duration (mins)	15	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.924	0.000	0.000	0.43	0	82	O K
1.001	99.763	-0.153	0.000	0.33	0	60	O K
1.002	99.693	-0.220	0.000	0.17	0	63	O K
2.000	99.924	0.000	0.000	0.35	0	26	O K
3.000	99.892	-0.032	0.000	0.18	0	12	O K
2.001	99.873	-0.049	0.000	0.36	0	32	O K
1.003	99.685	-0.178	0.000	0.14	0	107	O K

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	5

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.003	8	99.925	99.163	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	120.00	0.008	15000	0.150	2.00	1	15.000	V	-3
1.001	9.00	0.003	3000	0.000	0.00	1	6.000	V	-3
1.002	24.00	0.050	480	0.032	0.00	1	15.000	|_|	-103
2.000	32.00	0.002	16000	0.048	2.00	1	15.000	V	-2
3.000	22.00	0.002	11000	0.025	2.00	1	15.000	V	-2
2.001	10.00	0.002	5000	0.000	0.00	1	6.000	V	-2
1.003	53.00	0.100	530	0.115	0.00	1	15.000	|_|	-104

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.474	0.001	100.000	99.466	0.084		1200
1.001	2	100.000	99.466	0.084	99.925	99.463	0.012	4	1200
1.002	3	99.925	99.463	0.012	99.925	99.413	0.062	4	1200
2.000	4	99.925	99.624	0.001	100.000	99.622	0.078		1200
3.000	5	99.925	99.624	0.001	100.000	99.622	0.078		1200
2.001	6	100.000	99.622	0.078	99.925	99.620	0.005	4	1200
1.003	7	99.925	99.263	0.062	99.925	99.163	0.162	4	1200

Return Period 100 years
Average Rainfall Intensity 110.98 mm/hr

Time (Min)	US Level (m)	DS Level (m)	Surcharged Depth (m)	E.O Flow (m3/s)	Pipeflow (m3/s)
1	99.307	99.763	-0.556	0.000	0.000
2	99.382	99.763	-0.481	0.000	0.000
3	99.455	99.763	-0.408	0.000	0.000
4	99.492	99.763	-0.371	0.000	0.000
5	99.524	99.763	-0.339	0.000	0.000
6	99.568	99.763	-0.295	0.000	0.000
7	99.628	99.763	-0.235	0.000	0.000
8	99.660	99.763	-0.203	0.000	0.000
9	99.675	99.763	-0.188	0.000	0.036
10	99.682	99.763	-0.181	0.000	0.060
11	99.685	99.763	-0.178	0.000	0.079
12	99.682	99.763	-0.181	0.000	0.096
13	99.680	99.763	-0.183	0.000	0.107
14	99.680	99.763	-0.183	0.000	0.105
15	99.679	99.763	-0.184	0.000	0.100
16	99.679	99.763	-0.184	0.000	0.093
17	99.673	99.763	-0.190	0.000	0.080
18	99.662	99.763	-0.201	0.000	0.069
19	99.655	99.763	-0.208	0.000	0.058
20	99.651	99.763	-0.212	0.000	0.047
21	99.648	99.763	-0.215	0.000	0.037
22	99.646	99.763	-0.217	0.000	0.030
23	99.644	99.763	-0.219	0.000	0.023
24	99.643	99.763	-0.220	0.000	0.016
25	99.643	99.763	-0.220	0.000	0.009
26	99.643	99.763	-0.220	0.000	0.005
27	99.643	99.763	-0.220	0.000	0.003
28	99.643	99.763	-0.220	0.000	0.002
29	99.643	99.763	-0.220	0.000	0.001
30	99.643	99.763	-0.220	0.000	0.001
31	99.643	99.763	-0.220	0.000	0.001
32	99.643	99.763	-0.220	0.000	0.000
33	99.643	99.763	-0.220	0.000	0.001
34	99.643	99.763	-0.220	0.000	0.000
35	99.643	99.763	-0.220	0.000	0.000
36	99.643	99.763	-0.220	0.000	0.000
37	99.642	99.763	-0.221	0.000	0.000
38	99.643	99.763	-0.220	0.000	0.000
39	99.643	99.763	-0.220	0.000	0.000
40	99.642	99.763	-0.221	0.000	0.000
41	99.642	99.763	-0.221	0.000	0.000
42	99.643	99.763	-0.220	0.000	0.000
43	99.642	99.763	-0.221	0.000	0.000
44	99.642	99.763	-0.221	0.000	0.000
45	99.643	99.763	-0.220	0.000	0.000
46	99.641	99.763	-0.222	0.000	0.000
47	99.642	99.763	-0.221	0.000	0.000
48	99.642	99.763	-0.221	0.000	0.000

Total Volume over Overflow (Spill Flow) 0.000m3

Cf TC 16.4 MINS FROM 1 STORM RUN, USE MORE CRITICAL VALUE SHOWN ABOVE

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'Flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	24.00	0.009	2666.7	0.048	2.00	0	15.000	\/	-2
2.000	24.00	0.006	4000.0	0.013	2.00	0	15.000	\/	-2
2.001	10.00	0.002	5000.0	0.000	0.00	0	6.000	\/	-2
1.001	31.00	0.003	10333.3	0.065	0.00	0	15.000	\/	-3
3.000	13.00	0.001	13000.0	0.007	2.00	0	15.000	\/	-2
3.001	10.00	0.001	10000.0	0.000	0.00	0	6.000	\/	-2
1.002	11.00	0.001	11000.0	0.015	0.00	0	15.000	\/	-3
1.003	10.00	0.001	10000.0	0.000	0.00	0	6.000	\/	-3
1.004	100.00	0.100	1000.0	0.095	0.00	0	15.000	_|	-103
1.005	10.00	0.030	333.3	0.000	0.00	0	6.000	_|	-103
4.000	44.00	0.001	44000.0	0.023	2.00	0	15.000	\/	-2
1.006	69.00	0.075	920.0	0.075	0.00	0	15.000	_|	-104

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	3.3	99.624	0.048	0	0	0	0.30	53	0
2.000	0.0	3.7	99.624	0.013	0	0	0	0.24	44	0
2.001	0.0	4.3	99.618	0.013	0	0	0	0.26	46	0
1.001	0.0	7.1	99.465	0.126	0	0	0	0.19	63	0
3.000	0.0	3.6	99.624	0.007	0	0	0	0.13	24	0
3.001	0.0	4.5	99.623	0.007	0	0	0	0.18	32	0
1.002	0.0	8.1	99.462	0.148	0	0	0	0.18	61	0
1.003	0.0	8.8	99.461	0.148	0	0	0	0.22	75	0
1.004	0.0	11.3	99.460	0.243	0	0	0	0.68	369	0
1.005	0.0	11.4	99.360	0.243	0	0	0	1.38	744	0
4.000	0.0	12.1	99.624	0.023	0	0	0	0.07	13	0
1.006	0.0	13.4	99.180	0.341	0	0	0	0.85	763	0

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
5.000	37.00	0.001	37000.0	0.033	2.00	0	15.000	V	-2
5.001	12.00	0.001	12000.0	0.000	0.00	0	6.000	V	-2
5.002	86.00	0.001	86000.0	0.075	0.00	0	15.000	V	-3
1.007	10.00	0.030	333.3	0.000	0.00	0	6.000	|_|	-104
6.000	38.00	0.001	38000.0	0.054	2.00	0	15.000	V	-2
6.001	10.00	0.030	333.3	0.000	0.00	0	6.000	|_|	-102
6.002	115.00	0.120	958.3	0.414	0.00	0	15.000	|_|	-103
1.008	70.00	0.050	1400.0	0.055	0.00	0	15.000	|_|	-105
1.009	18.00	0.030	600.0	0.000	0.00	0	0.600	|_|	-105
1.010	80.00	0.030	2666.7	0.000	0.00	0	0.600	|_|	-13

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
5.000	0.0	9.8	99.624	0.033	0	0	0	0.08	14	0
5.001	0.0	11.0	99.623	0.033	0	0	0	0.16	30	0
5.002	0.0	33.2	99.472	0.108	0	0	0	0.06	22	0
1.007	0.0	33.3	99.105	0.449	0	0	0	1.63	1468	0
6.000	0.0	10.1	99.624	0.054	0	0	0	0.08	14	0
6.001	0.0	10.2	99.623	0.054	0	0	0	1.09	294	0
6.002	0.0	13.0	99.443	0.468	0	0	0	0.70	377	0
1.008	0.0	34.9	99.075	0.972	0	0	0	0.73	837	0
1.009	0.0	35.0	99.025	0.972	0	0	0	1.72	1964	0
1.010	0.0	36.8	98.595	0.972	0	0	0	0.76	763	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file Ditch.sec

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-2	\/	300	300	45		0.627	0.180
-3	\/	300	450	45		0.860	0.338
-13	_|	1000	1000	90		1.333	1.000
-102	_|	900	300			0.720	0.270
-103	_|	1200	450			1.029	0.540
-104	_|	1500	600			1.333	0.900
-105	_|	1900	600			1.471	1.140

Summary of Results

Return Period (years) 100 Analysis Time Step (seconds) 5
Storm Duration (mins) 30 DVD Status OFF
Margin for Flood Risk warning (mm) 300 Inertia Status OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.924	0.000	0.000	0.28	0	20	O K
2.000	99.919	-0.005	0.000	0.07	0	5	O K
2.001	99.915	-0.003	0.000	0.05	0	5	O K
1.001	99.913	-0.002	0.000	0.31	0	49	O K
3.000	99.871	-0.053	0.000	0.03	0	2	O K
3.001	99.870	-0.053	0.000	0.02	0	2	O K
1.002	99.869	-0.043	0.000	0.26	0	44	O K
1.003	99.804	-0.107	0.000	0.24	0	43	O K
1.004	99.630	-0.280	0.000	0.21	0	70	O K
1.005	99.527	-0.283	0.000	0.15	0	55	O K
4.000	99.844	-0.080	0.000	0.13	0	10	O K
1.006	99.541	-0.239	0.000	0.13	0	79	O K
5.000	99.917	-0.007	0.000	0.19	0	14	O K
5.001	99.877	-0.046	0.000	0.16	0	14	O K
5.002	99.867	-0.055	0.000	0.18	0	34	O K
1.007	99.506	-0.199	0.000	0.13	0	79	O K
6.000	99.924	0.000	0.000	0.32	0	25	O K
6.001	99.743	-0.180	0.000	0.17	0	28	O K
6.002	99.741	-0.152	0.000	0.60	0	206	O K
1.008	99.489	-0.186	0.000	0.27	0	216	O K
1.009	99.442	-0.183	0.000	0.25	0	201	O K
1.010	99.384	-0.211	0.000	0.22	0	199	O K

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	30
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	18

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.010	23	99.925	98.565	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	24.00	0.009	2667	0.048	2.00	1	15.000	\/	-2
2.000	24.00	0.006	4000	0.013	2.00	1	15.000	\/	-2
2.001	10.00	0.002	5000	0.000	0.00	1	6.000	\/	-2
1.001	31.00	0.003	10333	0.065	0.00	1	15.000	\/	-3
3.000	13.00	0.001	13000	0.007	2.00	1	15.000	\/	-2
3.001	10.00	0.001	10000	0.000	0.00	1	6.000	\/	-2
1.002	11.00	0.001	11000	0.015	0.00	1	15.000	\/	-3
1.003	10.00	0.001	10000	0.000	0.00	1	6.000	\/	-3
1.004	100.00	0.100	1000	0.095	0.00	1	15.000	_|	-103
1.005	10.00	0.030	333	0.000	0.00	1	6.000	_|	-103
4.000	44.00	0.001	32000	0.023	2.00	1	15.000	\/	-2
1.006	69.00	0.075	920	0.075	0.00	1	15.000	_|	-104
5.000	37.00	0.001	32000	0.033	2.00	1	15.000	\/	-2
5.001	12.00	0.001	12000	0.000	0.00	1	6.000	\/	-2
5.002	86.00	0.003	32000	0.075	0.00	1	15.000	\/	-3
1.007	10.00	0.030	333	0.000	0.00	1	6.000	_|	-104
6.000	38.00	0.001	32000	0.054	2.00	1	15.000	\/	-2
6.001	10.00	0.030	333	0.000	0.00	1	6.000	_|	-102
6.002	115.00	0.120	958	0.414	0.00	1	15.000	_|	-103

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.624	0.001	99.925	99.615	0.010		1200
2.000	2	99.925	99.624	0.001	100.000	99.618	0.082		1200
2.001	3	100.000	99.618	0.082	99.925	99.616	0.009		1200
1.001	4	99.925	99.465	0.010	99.925	99.462	0.013	4	1200
3.000	5	99.925	99.624	0.001	100.000	99.623	0.077		1200
3.001	6	100.000	99.623	0.077	99.925	99.622	0.003		1200
1.002	7	99.925	99.462	0.013	100.000	99.461	0.089	4	1200
1.003	8	100.000	99.461	0.089	99.925	99.460	0.015	4	1200
1.004	9	99.925	99.460	0.015	100.000	99.360	0.190	4	1200
1.005	10	100.000	99.360	0.190	99.925	99.330	0.145	4	1200
4.000	11	99.925	99.624	0.001	99.925	99.623	0.002		1200
1.006	12	99.925	99.180	0.145	100.000	99.105	0.295	4	1200
5.000	13	99.925	99.624	0.001	100.000	99.623	0.077		1200
5.001	14	100.000	99.623	0.077	99.925	99.622	0.003	4	1200
5.002	15	99.925	99.472	0.003	100.000	99.471	0.079	4	1200
1.007	16	100.000	99.105	0.295	99.925	99.075	0.250	4	1200
6.000	17	99.925	99.624	0.001	100.000	99.623	0.077		1200
6.001	18	100.000	99.623	0.077	99.925	99.593	0.032	4	1200
6.002	19	99.925	99.443	0.032	99.925	99.323	0.152	4	1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.008	70.00	0.050	1400	0.055	0.00	1	15.000	|_|	-105
1.009	18.00	0.030	600	0.000	0.00	1	0.600	|_|	-105
1.010	80.00	0.030	2667	0.000	0.00	1	0.600	|_|	-13

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.008	20	99.925	99.075	0.250	100.000	99.025	0.375	4	1200
1.009	21	100.000	99.025	0.375	99.925	98.995	0.330	4	1200
1.010	22	99.925	98.595	0.330	99.925	98.565	0.360	4	1200

Return Period 100 years
Average Rainfall Intensity 70.13 mm/hr

Time (Min)	US Level (m)	DS Level (m)	Surcharged Depth (m)	F. D.Flow (m3/s)	Pipeflow (m3/s)
1	98.595	99.565	-1.000	0.000	0.000
2	98.601	99.565	-0.994	0.000	0.000
3	98.637	99.565	-0.958	0.000	0.000
4	98.711	99.565	-0.884	0.000	0.000
5	98.862	99.565	-0.733	0.000	0.000
6	99.012	99.565	-0.583	0.000	0.000
7	99.044	99.565	-0.551	0.000	0.000
8	99.054	99.565	-0.541	0.000	0.000
9	99.064	99.565	-0.531	0.000	0.000
10	99.095	99.565	-0.500	0.000	0.000
11	99.131	99.565	-0.464	0.000	0.000
12	99.172	99.565	-0.423	0.000	0.000
13	99.187	99.565	-0.408	0.000	0.000
14	99.134	99.565	-0.461	0.000	0.000
15	99.282	99.565	-0.313	0.000	0.000
16	99.216	99.565	-0.379	0.000	0.000
17	99.249	99.565	-0.346	0.000	0.000
18	99.377	99.565	-0.218	0.000	0.000
19	99.298	99.565	-0.297	0.000	0.000
20	99.344	99.565	-0.251	0.000	0.030
21	99.364	99.565	-0.231	0.000	0.047
22	99.373	99.565	-0.222	0.000	0.062
23	99.378	99.565	-0.217	0.000	0.144
24	99.377	99.565	-0.218	0.000	0.178
25	99.382	99.565	-0.213	0.000	0.199
26	99.383	99.565	-0.212	0.000	0.189
27	99.383	99.565	-0.212	0.000	0.172
28	99.384	99.565	-0.211	0.000	0.154
29	99.382	99.565	-0.213	0.000	0.149
30	99.383	99.565	-0.212	0.000	0.142
31	99.381	99.565	-0.214	0.000	0.136
32	99.379	99.565	-0.216	0.000	0.133
33	99.378	99.565	-0.217	0.000	0.127
34	99.376	99.565	-0.219	0.000	0.123
35	99.377	99.565	-0.218	0.000	0.112
36	99.377	99.565	-0.218	0.000	0.102
37	99.377	99.565	-0.218	0.000	0.087
38	99.377	99.565	-0.218	0.000	0.076
39	99.377	99.565	-0.218	0.000	0.074
40	99.377	99.565	-0.218	0.000	0.072
41	99.377	99.565	-0.218	0.000	0.069
42	99.377	99.565	-0.218	0.000	0.065
43	99.377	99.565	-0.218	0.000	0.061
44	99.377	99.565	-0.218	0.000	0.056
45	99.377	99.565	-0.218	0.000	0.052
46	99.377	99.565	-0.218	0.000	0.047
47	99.376	99.565	-0.219	0.000	0.042
48	99.376	99.565	-0.219	0.000	0.037

Total Volume over Overflow (Spill Flow) 0.000m3

Cf Tc 36.8 MINS IN 'STORM' FILE.
USE MORE CRITICAL VALUES GIVEN ABOVE.

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	59.00	0.004	14750.0	0.039	2.00	0	15.000	\/	-2
1.001	8.00	0.015	533.3	0.000	0.00	0	6.000	\/	-2
2.000	59.00	0.003	19666.7	0.108	2.00	0	15.000	\/	-3
1.002	105.00	0.030	3500.0	0.102	0.00	0	15.000	_|	-103
3.000	65.00	0.002	32500.0	0.066	2.00	0	15.000	\/	-2
1.003	10.00	0.015	666.7	0.000	0.00	0	6.000	_|	-103
4.000	112.00	0.005	22400.0	0.090	2.00	0	15.000	\/	-3
1.004	10.00	0.015	666.7	0.000	0.00	0	15.000	_|	-103
5.000	165.00	0.050	3300.0	0.188	2.00	0	15.000	_|	-102
6.000	52.00	0.001	52000.0	0.026	2.00	0	15.000	\/	-2

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	9.8	99.624	0.039	0	0	0	0.13	23	0
1.001	0.0	10.0	99.620	0.039	0	0	0	0.78	141	0
2.000	0.0	9.2	99.475	0.108	0	0	0	0.14	46	0
1.002	0.0	14.8	99.455	0.249	0	0	0	0.36	197	0
3.000	0.0	14.8	99.624	0.066	0	0	0	0.08	15	0
1.003	0.0	15.0	99.425	0.315	0	0	0	0.97	526	0
4.000	0.0	16.7	99.475	0.090	0	0	0	0.13	43	0
1.004	0.0	16.9	99.410	0.405	0	0	0	0.84	452	0
5.000	0.0	11.4	99.624	0.188	0	0	0	0.29	79	0
6.000	0.0	15.0	99.624	0.026	0	0	0	0.07	12	0

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
5.001	10.00	0.020	500.0	0.000	0.00	0	6.000	|_|	-102
1.005	82.00	0.020	4100.0	0.107	0.00	0	15.000	|_|	-104
7.000	162.00	0.150	1080.0	0.210	2.00	0	15.000	|_|	-102
8.000	133.00	0.195	682.1	0.149	2.00	0	15.000	|_|	-101
7.001	10.00	0.030	333.3	0.000	0.00	0	6.000	|_|	-102
1.006	100.00	0.075	1333.3	0.151	0.00	0	15.000	|_|	-105
9.000	55.00	0.005	11000.0	0.073	2.00	0	15.000	\/	-2
1.007	14.00	0.020	700.0	0.000	0.00	0	6.000	|_|	-105
10.000	90.00	0.008	11250.0	0.043	2.00	0	15.000	\/	-2
11.000	35.00	0.002	17500.0	0.024	2.00	0	15.000	\/	-2
1.008	85.00	0.200	425.0	0.013	0.00	0	15.000	|_|	-13

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
5.001	0.0	15.2	99.574	0.214	0	0	0	0.89	240	0
1.005	0.0	20.3	99.245	0.726	0	0	0	0.40	361	0
7.000	0.0	7.3	99.624	0.210	0	0	0	0.51	139	0
8.000	0.0	6.4	99.624	0.149	0	0	0	0.51	71	0
7.001	0.0	7.4	99.329	0.359	0	0	0	1.09	294	0
1.006	0.0	22.5	98.999	1.236	0	0	0	0.75	858	0
9.000	0.0	8.3	99.624	0.073	0	0	0	0.15	26	0
1.007	0.0	22.7	98.924	1.309	0	0	0	1.20	1368	0
10.000	0.0	12.4	99.624	0.043	0	0	0	0.14	26	0
11.000	0.0	7.0	99.624	0.024	0	0	0	0.12	21	0
1.008	0.0	23.8	98.504	1.393	0	0	0	1.25	1248	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file Ditch.sec

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-2	\/	300	300	45		0.627	0.180
-3	\/	300	450	45		0.860	0.338
-13	_/	1000	1000	90		1.333	1.000
-101	_/	700	200			0.509	0.140
-102	_/	900	300			0.720	0.270
-103	_/	1200	450			1.029	0.540
-104	_/	1500	600			1.333	0.900
-105	_/	1900	600			1.471	1.140

Summary of Results

Return Period (years)	100	Analysis Time Step (seconds)	5
Storm Duration (mins)	30	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.891	-0.033	0.000	0.22	0	18	O K
1.001	99.769	-0.151	0.000	0.17	0	16	O K
2.000	99.925	0.000	0.000	0.28	0	49	O K
1.002	99.764	-0.141	0.000	0.25	0	84	O K
3.000	99.924	0.000	0.000	0.37	0	30	O K
1.003	99.637	-0.238	0.000	0.27	0	81	O K
4.000	99.910	-0.015	0.000	0.21	0	41	O K
1.004	99.628	-0.232	0.000	0.35	0	100	O K
5.000	99.924	0.000	0.000	0.62	0	85	O K
6.000	99.858	-0.066	0.000	0.15	0	12	O K
5.001	99.707	-0.167	0.000	0.52	0	72	O K
1.005	99.611	-0.234	0.000	0.29	0	178	O K
7.000	99.903	-0.021	0.000	0.69	0	96	O K
8.000	99.824	0.000	0.000	1.00	0	69	O K
7.001	99.525	-0.104	0.000	0.94	0	158	O K
1.006	99.364	-0.235	0.000	0.37	0	315	O K
9.000	99.924	0.000	0.000	0.42	0	33	O K
1.007	99.195	-0.329	0.000	0.50	0	315	O K
10.000	99.885	-0.039	0.000	0.24	0	19	O K
11.000	99.842	-0.082	0.000	0.14	0	11	O K
1.008	99.163	-0.341	0.000	0.30	0	322	O K

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	30
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	20

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.008	20	99.925	98.304	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	59.00	0.004	14750	0.039	2.00	1	15.000	\/	-2
1.001	8.00	0.015	533	0.000	0.00	1	6.000	\/	-2
2.000	59.00	0.003	19667	0.108	2.00	1	15.000	\/	-3
1.002	105.00	0.030	3500	0.102	0.00	1	15.000	_|	-103
3.000	65.00	0.002	32000	0.066	2.00	1	15.000	\/	-2
1.003	10.00	0.015	667	0.000	0.00	1	6.000	_|	-103
4.000	112.00	0.005	22400	0.090	2.00	1	15.000	\/	-3
1.004	10.00	0.015	667	0.000	0.00	1	15.000	_|	-103
5.000	165.00	0.050	3300	0.188	2.00	1	15.000	_|	-102
6.000	52.00	0.002	32000	0.026	2.00	1	15.000	\/	-2
5.001	10.00	0.020	500	0.000	0.00	1	6.000	_|	-102
1.005	82.00	0.020	4100	0.107	0.00	1	15.000	_|	-104
7.000	162.00	0.150	1080	0.210	2.00	1	15.000	_|	-102
8.000	133.00	0.195	682	0.149	2.00	1	15.000	_|	-101
7.001	10.00	0.030	333	0.000	0.00	1	6.000	_|	-102

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.624	0.001	100.000	99.620	0.080		1200
1.001	2	100.000	99.620	0.080	99.925	99.605	0.020	4	1200
2.000	3	99.925	99.475	0.000	99.925	99.472	0.003		1200
1.002	4	99.925	99.455	0.020	100.000	99.425	0.125	4	1200
3.000	5	99.925	99.624	0.001	100.000	99.622	0.078		1200
1.003	6	100.000	99.425	0.125	99.925	99.410	0.065	4	1200
4.000	7	99.925	99.475	0.000	99.925	99.470	0.005		1200
1.004	8	99.925	99.410	0.065	99.925	99.395	0.080	4	1200
5.000	9	99.925	99.624	0.001	100.000	99.574	0.126		1200
6.000	10	99.925	99.624	0.001	100.000	99.623	0.077		1200
5.001	11	100.000	99.574	0.126	99.925	99.554	0.071	4	1200
1.005	12	99.925	99.245	0.080	99.925	99.225	0.100	4	1200
7.000	13	99.925	99.624	0.001	100.000	99.474	0.226		1200
8.000	14	99.925	99.624	0.101	100.000	99.429	0.371		1200
7.001	15	100.000	99.329	0.371	99.925	99.299	0.326	4	1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.006	100.00	0.075	1333	0.151	0.00	1	15.000	|_|	-105
9.000	55.00	0.005	11000	0.073	2.00	1	15.000	\/	-2
1.007	14.00	0.020	700	0.000	0.00	1	6.000	|_|	-105
10.000	90.00	0.008	11250	0.043	2.00	1	15.000	\/	-2
11.000	35.00	0.002	17500	0.024	2.00	1	15.000	\/	-2
1.008	85.00	0.200	425	0.017	0.00	1	15.000	|_|	-13

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.006	16	99.925	98.999	0.326	100.000	98.924	0.476	4	1200
9.000	17	99.925	99.624	0.001	100.000	99.619	0.081		1200
1.007	18	100.000	98.924	0.476	99.925	98.904	0.421	4	1200
10.000	19	99.925	99.624	0.001	99.925	99.616	0.009		1200
11.000	19	99.925	99.624	0.001	99.925	99.622	0.003		1200
1.008	19	99.925	98.504	0.421	99.925	98.304	0.621	4	1200

Return Period 100 years
Average Rainfall Intensity 70.13 mm/hr

Time (Min)	US Level (m)	DS Level (m)	Surcharged Depth (m)	F.O Flow (m3/s)	Pipeflow (m3/s)
1	98.518	99.304	-0.986	0.000	0.000
2	98.541	99.304	-0.963	0.000	0.000
3	98.619	99.304	-0.885	0.000	0.000
4	98.800	99.304	-0.704	0.000	0.000
5	98.927	99.304	-0.577	0.000	0.000
6	98.946	99.304	-0.558	0.000	0.000
7	98.956	99.304	-0.548	0.000	0.000
8	98.971	99.304	-0.533	0.000	0.000
9	98.994	99.304	-0.510	0.000	0.000
10	99.018	99.304	-0.486	0.000	0.000
11	99.040	99.304	-0.464	0.000	0.000
12	99.071	99.304	-0.433	0.000	0.000
13	99.103	99.304	-0.401	0.000	0.000
14	99.116	99.304	-0.388	0.000	0.000
15	99.111	99.304	-0.393	0.000	0.000
16	99.116	99.304	-0.388	0.000	0.026
17	99.122	99.304	-0.382	0.000	0.085
18	99.128	99.304	-0.376	0.000	0.143
19	99.136	99.304	-0.368	0.000	0.166
20	99.143	99.304	-0.361	0.000	0.197
21	99.147	99.304	-0.357	0.000	0.230
22	99.151	99.304	-0.353	0.000	0.254
23	99.155	99.304	-0.349	0.000	0.270
24	99.160	99.304	-0.344	0.000	0.283
25	99.163	99.304	-0.341	0.000	0.298
26	99.163	99.304	-0.341	0.000	0.313
27	99.161	99.304	-0.343	0.000	0.322
28	99.156	99.304	-0.348	0.000	0.320
29	99.151	99.304	-0.353	0.000	0.311
30	99.146	99.304	-0.358	0.000	0.297
31	99.141	99.304	-0.363	0.000	0.278
32	99.136	99.304	-0.368	0.000	0.260
33	99.130	99.304	-0.374	0.000	0.243
34	99.125	99.304	-0.379	0.000	0.224
35	99.121	99.304	-0.383	0.000	0.199
36	99.117	99.304	-0.387	0.000	0.177
37	99.114	99.304	-0.390	0.000	0.158
38	99.111	99.304	-0.393	0.000	0.139
39	99.111	99.304	-0.393	0.000	0.120
40	99.111	99.304	-0.393	0.000	0.095
41	99.111	99.304	-0.393	0.000	0.064
42	99.112	99.304	-0.392	0.000	0.052
43	99.111	99.304	-0.393	0.000	0.045
44	99.110	99.304	-0.394	0.000	0.036
45	99.108	99.304	-0.396	0.000	0.032
46	99.108	99.304	-0.396	0.000	0.029
47	99.109	99.304	-0.395	0.000	0.026
48	99.105	99.304	-0.399	0.000	0.021

Total Volume over Overflow (Spill Flow) 0.000m3

cf TC 23 MINS IN STORM RUN.
ADOPT 23 MIN FIGURE

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Depth from Soffit to G.L. (m)	0.010
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.25
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	125.00	0.020	6250.0	0.342	2.00	0	15.000	|_|	-103
1.001	10.00	0.020	500.0	0.000	0.00	0	6.000	|_|	-103
1.002	17.00	0.020	850.0	0.026	0.00	0	15.000	|_|	-103
2.000	143.00	0.005	28600.0	0.194	2.00	0	15.000	\/	-4
1.003	10.00	0.020	500.0	0.000	0.00	0	6.000	|_|	-104
3.000	95.00	0.003	31666.7	0.043	2.00	0	15.000	\/	-2
4.000	140.00	0.020	7000.0	0.074	2.00	0	15.000	|_|	-102
4.001	13.00	0.010	1300.0	0.000	0.00	0	15.000	|_|	-102
4.002	18.00	0.010	1800.0	0.016	0.00	0	15.000	|_|	-102
1.004	13.00	0.100	130.0	0.000	0.00	0	6.000	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	0.0	9.6	99.324	0.342	0	0	0	0.27	147	0
1.001	0.0	9.8	99.304	0.342	0	0	0	1.12	607	0
1.002	0.0	10.2	99.284	0.368	0	0	0	0.74	400	0
2.000	0.0	20.1	99.324	0.194	0	0	0	0.13	71	0
1.003	0.0	20.2	99.114	0.562	0	0	0	1.33	1199	0
3.000	0.0	20.5	99.624	0.043	0	0	0	0.09	15	0
4.000	0.0	13.6	99.624	0.074	0	0	0	0.20	54	0
4.001	0.0	14.0	99.604	0.074	0	0	0	0.47	126	0
4.002	0.0	14.8	99.594	0.090	0	0	0	0.40	107	0
1.004	0.0	20.6	99.094	0.695	0	0	0	1.41	306	0

The following hydraulic sections have been used in this network

NOTE: 'Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from the file Ditch.sec

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m2)
-2	\/	300	300	45		0.627	0.180
-4	\/	300	600	45		1.082	0.540
-102	_/	900	300			0.720	0.270
-103	_/	1200	450			1.029	0.540
-104	_/	1500	600			1.333	0.900

Summary of Results

Return Period (years) 100 Analysis Time Step (seconds) 5
Storm Duration (mins) 15 DVD Status OFF
Margin for Flood Risk warning (mm) 300 Inertia Status OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	99.774	0.000	0.000	0.55	0	188	O K
1.001	99.561	-0.193	0.000	0.40	0	119	O K
1.002	99.558	-0.176	0.000	0.45	0	116	O K
2.000	99.924	0.000	0.000	0.30	0	106	O K
1.003	99.530	-0.184	0.000	0.35	0	179	O K
3.000	99.924	0.000	0.000	0.29	0	24	O K
4.000	99.924	0.000	0.000	0.30	0	41	O K
4.001	99.709	-0.195	0.000	0.16	0	19	O K
4.002	99.696	-0.198	0.000	0.18	0	21	O K
1.004	99.510	-0.109	0.000	0.96	0	206	O K

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	22.200
Ratio R	0.400
Volumetric Runoff Coef	0.770
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	1.000
MADD Factor * 10m3/ha Storage	1.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of Tank Sewers	9

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.004	11	99.925	98.994	1200	0

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	125.00	0.020	6250	0.342	2.00	1	15.000	|_|	-103
1.001	10.00	0.020	500	0.000	0.00	1	6.000	|_|	-103
1.002	17.00	0.020	850	0.026	0.00	1	15.000	|_|	-103
2.000	143.00	0.005	28600	0.194	2.00	1	15.000	\/	-4
1.003	10.00	0.020	500	0.000	0.00	1	6.000	|_|	-104
3.000	95.00	0.003	31667	0.043	2.00	1	15.000	\/	-2
4.000	140.00	0.020	7000	0.074	2.00	1	15.000	|_|	-102
4.001	13.00	0.010	1300	0.000	0.00	1	15.000	|_|	-102
4.002	18.00	0.010	1800	0.016	0.00	1	15.000	|_|	-102
1.004	13.00	0.100	130	0.000	0.00	1	6.000	o	525

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	99.925	99.324	0.151	100.000	99.304	0.246		1200
1.001	2	100.000	99.304	0.246	99.925	99.284	0.191	4	1200
1.002	3	99.925	99.284	0.191	100.000	99.264	0.286	4	1200
2.000	4	99.925	99.324	0.001	100.000	99.319	0.081		1200
1.003	5	100.000	99.114	0.286	99.925	99.094	0.231	4	1200
3.000	6	99.925	99.624	0.001	99.925	99.621	0.004		1200
4.000	7	99.925	99.624	0.001	99.925	99.604	0.021		1200
4.001	8	99.925	99.604	0.021	99.925	99.594	0.031	4	1200
4.002	9	99.925	99.594	0.031	99.925	99.584	0.041	4	1200
1.004	10	99.925	99.094	0.306	99.925	98.994	0.406	4	1200

Return Period 100 years
Average Rainfall Intensity 110.98 mm/hr

Time [Min]	US Level [m]	DS Level [m]	Surcharged Depth [m]	F. D'flow [m^3/s]	Pipeflow [m^3/s]
1	99.103	99.519	-0.516	0.000	0.000
2	99.113	99.519	-0.506	0.000	0.000
3	99.128	99.519	-0.491	0.000	0.000
4	99.149	99.519	-0.470	0.000	0.000
5	99.192	99.519	-0.427	0.000	0.000
6	99.236	99.519	-0.383	0.000	0.000
7	99.307	99.519	-0.312	0.000	0.000
8	99.361	99.519	-0.258	0.000	0.000
9	99.414	99.519	-0.205	0.000	0.000
10	99.423	99.519	-0.196	0.000	0.028
11	99.450	99.519	-0.169	0.000	0.075
12	99.479	99.519	-0.140	0.000	0.133
13	99.510	99.519	-0.109	0.000	0.182
14	99.485	99.519	-0.134	0.000	0.206
15	99.507	99.519	-0.112	0.000	0.202
16	99.476	99.519	-0.143	0.000	0.201
17	99.474	99.519	-0.145	0.000	0.177
18	99.464	99.519	-0.155	0.000	0.158
19	99.455	99.519	-0.164	0.000	0.141
20	99.445	99.519	-0.174	0.000	0.123
21	99.437	99.519	-0.182	0.000	0.104
22	99.428	99.519	-0.191	0.000	0.085
23	99.424	99.519	-0.195	0.000	0.068
24	99.421	99.519	-0.198	0.000	0.055
25	99.417	99.519	-0.202	0.000	0.043
26	99.416	99.519	-0.203	0.000	0.032
27	99.415	99.519	-0.204	0.000	0.023
28	99.414	99.519	-0.205	0.000	0.016
29	99.414	99.519	-0.205	0.000	0.012
30	99.414	99.519	-0.205	0.000	0.008
31	99.414	99.519	-0.205	0.000	0.006
32	99.414	99.519	-0.205	0.000	0.005
33	99.414	99.519	-0.205	0.000	0.004
34	99.414	99.519	-0.205	0.000	0.004
35	99.414	99.519	-0.205	0.000	0.003
36	99.414	99.519	-0.205	0.000	0.003
37	99.414	99.519	-0.205	0.000	0.003
38	99.414	99.519	-0.205	0.000	0.003
39	99.414	99.519	-0.205	0.000	0.002
40	99.414	99.519	-0.205	0.000	0.002
41	99.414	99.519	-0.205	0.000	0.002
42	99.414	99.519	-0.205	0.000	0.002
43	99.414	99.519	-0.205	0.000	0.002
44	99.414	99.519	-0.205	0.000	0.002
45	99.414	99.519	-0.205	0.000	0.002
46	99.414	99.519	-0.205	0.000	0.002
47	99.414	99.519	-0.205	0.000	0.002
48	99.414	99.519	-0.205	0.000	0.001

Total Volume over Overflow (Spill Flow) 0.000m3

cf 13 MINS TC IN 'STORM' RUN
ADOPT MORE CRITICAL 13 MINS.

SECTION A5 OILY WATER DRAIN SYSTEM

A5.1 INTRODUCTION

The oily water drain system is a piped self-contained system, routed to the open drains sump for treatment and discharging offshore via an out-fall. This system captures any water run-off that might be contaminated with oil or other chemicals.

The oily water system was divided into four systems for the purpose of design, as follows:-

1) Slug catcher area; including the storage tank bunds (Methanol storage tank, Raw methanol storage tank and condensate storage tank). This system includes the main header draining into the open drains sump. Flows from the adjacent oily water systems are added to this system to check the capacity of the header.

2) Process area; this system includes the rainwater run-off from the compressor building roof and the process area paving.

3) Flare area; this system includes the condensate run-off from the flare as part of the closed drain system.

4) Waste storage area; this system includes the run-off from the bunded waste storage area, local paved areas and the pumped return from the access road drain system. The discharge from the oily surface water interceptor is a controlled discharge into the terminal oily drain system via a pump, and is not taken as coincident with peak fire water or rainwater run-off.

The system was checked for two design cases, the firewater discharge scenario and rainwater runoff.

A5.2 RAINWATER SCENARIO

The drainage system was designed using the Micro Drainage WinDes storm software for a 1 in 10 year return period storm. The storm intensity is derived from the reference design condition of design 45mm rainfall in one hour (100 year return period), as noted in section A1. It is considered that this will provide a robust system for the 1 in 100 year storm when storage and surcharging effects are considered.

A5.3 FIREWATER SCENARIO

The four oily water systems were checked for the maximum fire water discharge for each of the areas, based on the fire hydrant and fire monitor maximum flows. The bunded areas for the storage tanks are designed to over flow into the oily water drainage system during firewater deluge. The drainage system between the storage tanks and the open drain sump was checked for the maximum tank firewater deluge. Individual overflow branches were checked for the applicable tank firewater deluge.

A5.4 OILY WATER SYSTEM DESIGN SUMMARY

The governing design case for each system is as follows:

SYSTEM DESCRIPTION	RAIN WATER (l/s)	FIREWATER (l/s)	DESIGN CASE
SLUG CATCHER AND STORAGE TANKS	73	320	FIRE WATER
MAIN HEADER TO OPEN DRAINS SUMP	362	320	RAIN WATER
PROCESS AREA	261	160	RAIN WATER
WASTE STORAGE AREA	130	218	FIRE WATER
FLARE AREA	17	50	FIRE WATER

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A5.5 SLUG CATCHER AND STORAGE TANK DRAINAGE SYSTEM RAINWATER CASE

Slug catcher and storage tank drainage System – Rain water run-off areas Draining to system

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
SLUG CATCHER								
Paving	1.000	37	44.00	8.50	1	374		
no catchment	1.001	20				0		
Paving	1.002	56	44.00	8.50	1	374		
from pipe 2.000					1	135	760 m2	
Paving	1.003	39	6.50	11.00	1	72	72 m2	
Paving	1.004	35	6.50	34.00	1	221	221 m2	
from pipe 5.000	1.005	38				280		
from pipe 8.000						60	340 m2	
from pipe 3.000	1.006	16				96		
from pipe 4.000	1.007					236	332 m2	
from pipe 7.000	1.008					540	540 m2	
tanker loading	1.009		25.00	50.00	1	1250	1250 m2	
flow from process area 261 l/s - refer to process area storm run								
no catchment	1.010					0		
Paving	2.000	13	6.00	22.50	1	135	135 m2	
Paving	3.000	12	4.00	9.00	1	36		
Paving			12.00	5.00	1	60	96 m2	
Paving	4.000	50	5.50	9.00	1	50		
Paving			3.50	10.00	1	35		
Paving			6.70	22.60	1	151	236 m2	
Paving	5.000	33	20.00	14.00	1	280	280 m2	
road	7.000		6.00	90.00	1	540	540 m2	
Paving	8.000		3.00	10.00	1	60	60 m2	

amec	Client: Shell E & P Ireland Ltd.			Job Ref. L3882
	Plant: Gas Reception Terminal			
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A5.6 PROCESS AREA DRAINAGE SYSTEM RAINWATER CASE

Process area drainage System – Rain water run-off areas draining to system

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
PROCESS AREA								
from pipe 7.000	1.000	30			1	388		
Paving			17.25	21.50	1	371		
Paving			30.00	18.33	1	550	**1309** m2	
from pipe 2.000	1.001	19			1	760	**760** m2	
from pipe 4.000	1.002	17			1	760	m2	
Paving			15.00	18.33	1	275	**1035** m2	
Paving	1.003	50	14.00	9.40	1	132		
Paving			30.00	9.17	1	275		
Paving			30.00	18.33	1	550		
Paving			17.25	21.50	1	371	**1327** m2	
Paving	1.004	41	17.25	21.50	1	371		
Paving			22.00	10.00	1	220		
Paving			18.00	19.50	1	351	**942** m2	
Paving								
from pipe 5.000	1.005	59			1	280		
from pipe 8.000					1	521		
from pipe 3.000					1	288		
from pipe 6.000					1	1467		
from pipe 6.001					1	568	**3124** m2	
Paving	2.000	49	24.00	18.00	1	432		
Paving			41.00	8.00	1	328	**760** m2	
Paving	3.000	10	18.00	16.00	1	288	**288** m2	
Paving	4.000	53	24.00	18.00	1	432		
Paving			41.00	8.00	1	328	**760** m2	
Paving	5.000	12	20.00	14.00	1	280	**280** m2	
from pipe 8.000	6.000	33			1	521		
Paving			17.25	21.50	1	371		
Paving			10.00	22.00	1	220		
Paving			18.00	19.75	1	356	**1467** m2	
from pipe 5.000	6.001	32			1	280		
from pipe 3.000		32			1	288	**568** m2	
building roof	7.000	26	22.50	17.25	1	388		
building roof	8.000	46	7.00	16.00	1	112		
building roof			3.00	7.00	1	21		
building roof			22.50	17.25	1	388	**521** m2	

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A5.7 WASTE STORAGE AREA DRAINAGE SYSTEM RAINWATER CASE

Waste storage area drainage System – Rain water run-off Areas Draining to system

			1.000	33.0				
			1.001	54.0				
			1.002	58.0				

Note pipe lengths 1.000, 1.001 and 1.002 reserved for pipe from external oily surface water interceptor controlled discharge - no included with storm water calculation.

storage area	1.003	85	26.00	35.00	1	910	
storage area			15.00	15.00	1	225	
Paving			32.50	9.20	1	299	
road			6.00	90.00	1	540	**1974** m2
from pipe 2.000	1.004	37	9.00	9.00	1	581	
from pipe 3.000			19.50	7.70	1	150	
road			6.00	40.00	1	240	**971** m2
also allow for 27 l/s pumped from access road system							
Paving	1.005	48	27.00	15.00	1	405	
Road			6.00	40.00	1	240	**645** m2
no catchment	1.006		16.30	7.20	1	117	**117** m2
tanker loading	1.007	35	20.00	20.00	1	400	**400** m2
Include 17/s from flare area, refer to flare storm run							
Paving	2.000	36	9.00	9.00	1	81	
			27.00	18.50	1	500	**581** m2
Paving	3.000	13	19.50	7.70	1	150	**150** m2

amec	Client: Shell E & P Ireland Ltd. Plant: Gas Reception Terminal			Job Ref. L3882	
	Location: Corrib On-Plot Storm Drainage			Sheet no./rev.	
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by	Date

A5.8 FLARE AREA DRAINAGE SYSTEM RAINWATER CASE

Flare area drainage System – Rain water areas Draining to system

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
FLARE AREA								
	1.000		35					
Allow for 5 l/s flare condensation from flare								
no catchment	1.001		80					
	2.000		27					
Allow for 5 l/s from LER number 1 transformer sumps (Controlled discharge)								
Paving	2.001		15	20.00	12.00	1	240 m2	
no catchment	1.002		68					

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A5.9 SLUG CATCHER AND STORAGE TANK DRAINAGE SYSTEM FIREWATER CASE

Slug catcher and storage tank drainage System – Firewater deluge scenario

The firewater discharge will be 4 monitors and 4 hydrants discharging at once to the head of the oily water system.
Monitors =32 l/s * 4 = 127 l/s
Hydrants=7.5 l/s * 4= 30 l/s
Max fire water flow = 157 l/s.
Fire water will enter system through 4 number gullies at 40 l/s per gully
The three storage tank bunded areas will have a bund overflow pipe, allowing the excess firewater deluge to drain into the oily water system, this overflow will not incorporate a valve. Drainage sytem designed for the following deluge rates.
Raw methanol tank bund – 319 l/s (note this is applied as 160 l/s, in combination with the 160l/s applied at the head of the sytem)
Product methanol tank bund 120 l/s
Condensate tank bund 228 l/s
Note that each component of the system is designed for the maximum firewater flow for that component. These are not combined as this would result in the firewater flow in the whole system exceeding 320 l/s (Raw methanol storage tank deluge).

Description		Contributing to Pipe Length	Drain Length (m)	number of hydrants (32 l/s)	number of monitors (7.5 l/s)	deluge system (l/s)	total	Comment
				40.00	7.50			
SLUG CATCHER								
2 gullies	1.000		37	2.00	0.00	0	80	
	1.001		20	0.00	0.00	0	0	
2 gullies	1.002		56	2.00	0.00	0	80	
from pipe 2.000								not coincident max already 160 l/s
no additional fw	1.003		39	0.00	0.00	0		
	1.004		35	0.00	0.00	160	160	Raw methanol tank deluge - max case
from pipe 5.000	1.005		38	0.00	0.00		0	max case 320 l/s from tank deluge
from pipe 8.000							0	max case 320 l/s from tank deluge
	1.006		16	0.00	0.00	0	0	max case 320 l/s from tank deluge
from pipe 4.000	1.007		50	0.00	0.00	0	0	max case 320 l/s from tank deluge
from pipe 7.000	1.008		30	0.00	0.00	0	0	max case 320 l/s from tank deluge
no additional fw	1.009		55	0.00	0.00	0	0	max case 320 l/s from tank deluge
	1.010		4	0.00	0.00	0	0	max case 320 l/s from tank deluge
From equipment	2.000		13	0.00	0.00	2	2	
1 gully	3.000		12	1.00	0.00	0	40	
residual run-off	4.000		50	0.00	0.00	35	35	
2 gullies	5.000		33	2.00	0.00	0	80	
methanol tank	6.000		20				120	
condensate tank c	7.000		25				228	
2 gullies	8.000		29	0.00	2.00	0	15	

amec	Client: Shell E & P Ireland Ltd.				Job Ref.
	Plant: Gas Reception Terminal				L3882
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by: IM	Date: Nov '03	Chck'd by:	Date:	App'd by: / Date:

A5.10 PROCESS AREA DRAINAGE SYSTEM FIRE WATER CASE

Process area drainage System – Firewater deluge scenario

The firewater discharge will be 4 monitors and 4 hydrants discharging at once to the head of the oily water system.
Monitors =32 l/s * 4 = 127 l/s
Hydrants=7.5 l/s * 4= 30 l/s
Max fire water flow = 157 l/s.
Fire water will enter system through 4 number gullies at 40 l/s per gully

Note that each component of the system is designed for the maximum firewater flow for that component. These are not combined as this would result in the firewater flow in the whole system exceeding 157 l/s

Description	Contributing to Pipe Length	Drain Length (m)	number of hydrants (32 l/s)	number of monitors (7.5 l/s)	deluge system(l/s)	total	Comment
			40.00	7.50			
PROCESS AREA							
2 gullies	1.000	30	2.00	0.00	0	80	
2 gullies	1.001	19	2.00	0.00	0	80	max case 160 l/s
	1.002	17	0.00	0.00	0	0	max case 160 l/s
	1.003	50	0.00	0.00	0	0	max case 160 l/s
	1.004	41	0.00	0.00	0	0	max case 160 l/s
	1.005	59	0.00	0.00	0	0	max case 160 l/s
	2.000	49	3.00	0.00	0	120	
2 gullies	3.000	10	2.00	0.00	0	80	
3 gullies	4.000	53	3.00	0.00	0	120	
1 gully	5.000	12	1.00	0.00	0	40	
2 gullies	6.000	33	2.00	0.00	0	80	
2 gullies	6.001	32	2.00	0.00	0	80	
no fw	7.000	26	0.00	0.00	0	0	
no fw	8.000	46	0.00	0.00	0	0	

amec	Client: Shell E & P Ireland Ltd.				Job Ref.
	Plant: Gas Reception Terminal				L3882
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by: IM	Date: Nov '03	Chck'd by:	Date:	App'd by: / Date:

A5.11 WASTE STORAGE AREA DRAINAGE SYSTEM FIRE WATER CASE

Waste storage area drainage System - Firewater Draining to system

The firewater discharge will be 2 hydrants discharging at once to the head of the oily water system.
Hydrants=7.5 l/s * 2= 15 l/s

Firewater will enter system from 2 hydrants adjacent to power generator building. Note this has been modelled as one 40 l/s.

Note that each component of the system is designed for the maximum firewater flow for that component. These are not combined as this would result in the firewater flow in the whole system exceeding 30 l/s

Description	Contributing to Pipe Length	Drain Length (m)	number of hydrants (32 l/s)	number of monitors (7.5 l/s)	deluge system (l/s)	total	Comment
			40.00	7.50			
WASTE STOARGE AREA							
	1.000	33.0	0.00	0.00		0	0
	1.001	54.0	0.00	0.00		0	0
	1.002	58.0	0.00	0.00		0	0
Note pipe lengths 1.000, 1.001 and 1.002 reserved for pipe from external oily surface water interceptor controlled discharge - no included with fire water calculation.							
2 hydrants	1.003	85	0.00	2.00		0	15
from pipe 2.000	1.004	37					40
from pipe 2.001							27
Paving	1.005	48	0.00	0.00		0	0
no catchment	1.006		0.00	0.00		0	0
tanker loading	1.007	35	0.00	0.00		0	0
1 monitor	2.000	36	1.00	0.00		0	40
	2.001	65					27
also allow for 27 l/s pumped from access road system							
from flare	3.000	13					50

amec	Client: Shell E & P Ireland Ltd. Plant: Gas Reception Terminal				Job Ref. L3882
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

A5.12 FLARE AREA DRAINAGE SYSTEM

Description	Contributing to Pipe Length	Drain Length (m)	number of hydrants (32 l/s)	number of monitors (7.5 l/s)	deluge system (l/s)	total	Comment
			40.00	7.50			
FLARE AREA							
	1.000	35					
Allow for 5 l/s flare condensation from flare							
no catchment	1.001	80					
	2.000	27					
Allow for 5 l/s from LER number 1 transformer sumps (Controlled discharge)							
1 Gully	2.001	15	1	0.00	0.00	40	
no catchment	1.002	68					

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	37.00	0.074	500.0	0.037	2.00	0	0.600	o	375
1.001	20.00	0.040	500.0	0.000	0.00	0	0.600	o	375
1.002	55.50	0.080	693.8	0.076	0.00	0	0.600	o	525
1.003	39.00	0.053	735.8	0.007	0.00	0	0.600	o	525
1.004	34.50	0.043	802.3	0.023	0.00	0	0.600	o	675
1.005	37.50	0.048	781.3	0.034	0.00	0	0.600	o	675
1.006	16.00	0.020	800.0	0.010	0.00	0	0.600	o	675
1.007	50.00	0.063	793.7	0.033	0.00	0	0.600	o	675
1.008	30.00	0.038	789.5	0.054	0.00	0	0.600	o	675
1.009	55.00	0.069	797.1	0.125	0.00	261	0.600	o	750
1.010	4.00	0.013	307.7	0.000	0.00	0	0.600	o	675
2.000	12.50	0.083	150.6	0.014	2.00	0	0.600	o	150
3.000	12.00	0.040	300.0	0.010	2.00	0	0.600	o	150
4.000	50.00	0.550	90.9	0.024	2.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	143.8	2.8	99.160	0.037	0	0	0	0.80	89	15
1.001	137.7	3.2	98.910	0.037	0	0	0	0.80	89	15
1.002	124.1	4.3	98.815	0.113	0	0	0	0.84	182	39
1.003	116.1	5.1	98.660	0.120	0	0	0	0.82	177	39
1.004	110.5	5.7	98.460	0.142	0	0	0	0.92	328	44
1.005	105.2	6.4	98.331	0.176	0	0	0	0.93	333	51
1.006	103.1	6.7	98.197	0.186	0	0	0	0.92	329	53
1.007	97.1	7.6	98.091	0.219	0	0	0	0.92	330	59
1.008	93.8	8.1	97.942	0.273	0	0	0	0.92	331	71
1.009	88.8	9.0	97.818	0.398	261	0	0	0.98	434	359
1.010	88.6	9.1	97.674	0.398	261	0	0	1.49	533	359
2.000	152.3	2.3	99.125	0.014	0	0	0	0.82	14	6
3.000	150.6	2.3	98.875	0.010	0	0	0	0.58	10	4
4.000	148.0	2.5	99.200	0.024	0	0	0	1.65	117	10

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
5.000	33.00	0.200	165.0	0.024	2.00	0	0.600	o	250
6.000	20.00	0.036	555.6	0.028	2.00	0	0.600	o	450
7.000	25.00	0.033	757.6	0.054	2.00	0	0.600	o	600
8.000	29.00	0.193	150.3	0.010	2.00	0	0.600	o	200
8.001	15.00	0.100	150.0	0.000	0.00	0	0.600	o	200

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
5.000	148.0	2.5	98.700	0.024	0	0	0	1.09	53	10
6.000	149.9	2.4	98.500	0.028	0	0	0	0.86	136	12
7.000	148.5	2.5	98.500	0.054	0	0	0	0.88	248	22
8.000	148.2	2.5	99.260	0.010	0	0	0	0.99	31	4
8.001	144.2	2.7	98.990	0.010	0	0	0	0.99	31	4

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	30.00	0.100	300.0	0.131	2.00	0	0.600	o	375
1.001	19.00	0.026	730.8	0.076	0.00	0	0.600	o	525
1.002	17.00	0.023	739.1	0.104	0.00	0	0.600	o	525
1.003	50.00	0.069	724.6	0.133	0.00	0	0.600	o	525
1.004	41.00	0.057	719.3	0.095	0.00	0	0.600	o	525
1.005	59.00	0.081	728.4	0.312	0.00	0	0.600	o	675
2.000	49.00	0.098	500.0	0.076	2.00	0	0.600	o	450
3.000	35.00	0.078	448.7	0.029	2.00	0	0.600	o	225
4.000	53.00	0.106	500.0	0.076	2.00	0	0.600	o	450
5.000	12.00	0.046	260.9	0.028	2.00	0	0.600	o	200
6.000	33.00	0.066	500.0	0.147	2.00	0	0.600	o	375
6.001	32.00	0.043	744.2	0.057	0.00	0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	148.4	2.5	98.775	0.131	0	0	0	1.04	115	54
1.001	142.3	2.9	98.525	0.207	0	0	0	0.82	178	82
1.002	137.3	3.2	98.499	0.311	0	0	0	0.82	177	119
1.003	124.7	4.2	98.476	0.444	0	0	0	0.82	178	154
1.004	116.3	5.1	98.407	0.539	0	0	0	0.83	179	174
1.005	107.5	6.1	98.200	0.851	0	0	0	0.96	345	254
2.000	141.7	2.9	98.948	0.076	0	0	0	0.90	144	30
3.000	141.0	3.0	98.912	0.029	0	0	0	0.61	24	11
4.000	140.6	3.0	98.991	0.076	0	0	0	0.90	144	30
5.000	152.1	2.3	99.105	0.028	0	0	0	0.75	23	12
6.000	145.1	2.7	98.900	0.147	0	0	0	0.80	89	59
6.001	135.5	3.3	98.684	0.204	0	0	0	0.81	176	77

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
7.000	26.00	0.217	119.8	0.039	2.00	0	0.600	o	300
8.000	46.00	0.053	867.9	0.052	2.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
7.000	151.5	2.3	99.525	0.039	0	0	0	1.44	101	16
8.000	134.0	3.5	99.442	0.052	0	0	0	0.53	37	19

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	250

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	35.00	0.200	175.0	0.000	2.00	5	0.600	o	150
1.001	80.00	0.457	175.1	0.000	0.00	0	0.600	o	150
2.000	27.00	0.154	175.3	0.000	2.00	5	0.600	o	150
2.001	15.00	0.146	102.7	0.024	0.00	0	0.600	o	300
1.002	68.00	0.168	404.8	0.000	0.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	143.7	2.8	99.200	0.000	5	0	0	0.76	13	5
1.001	121.4	4.5	99.000	0.000	5	0	0	0.76	13	5
2.000	146.5	2.6	99.150	0.000	5	0	0	0.76	13	5
2.001	144.0	2.8	98.846	0.024	5	0	0	1.55	110	15
1.002	108.1	6.0	0.000	0.024	10	0	0	0.78	55	17

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	250

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	33.00	0.078	423.1	0.000	2.00	0	0.600	o	150
1.001	54.00	0.127	425.2	0.000	0.00	0	0.600	o	150
1.002	58.00	0.136	426.5	0.000	0.00	0	0.600	o	150
1.003	46.00	0.108	425.9	0.197	0.00	0	0.600	o	300
1.004	37.00	0.051	725.5	0.097	0.00	27	0.600	o	525
1.005	48.00	0.060	800.0	0.065	0.00	0	0.600	o	525
1.006	32.00	0.040	800.0	0.000	0.00	0	0.600	o	525
1.007	35.00	0.101	346.5	0.018	0.00	17	0.600	o	525
2.000	36.00	0.103	349.5	0.058	2.00	0	0.600	o	225
3.000	13.00	0.168	77.4	0.015	2.00	50	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	138.3	3.1	98.975	0.000	0	0	0	0.48	9	0
1.001	116.7	5.0	98.897	0.000	0	0	0	0.48	9	0
1.002	100.7	7.0	98.770	0.000	0	0	0	0.48	8	0
1.003	94.3	8.0	98.484	0.197	0	0	0	0.76	53	52
1.004	90.1	8.8	98.151	0.294	27	0	0	0.82	178	101
1.005	85.1	9.8	98.100	0.359	27	0	0	0.78	170	112
1.006	82.1	10.5	98.040	0.359	27	0	0	0.78	170	112
1.007	80.1	11.0	98.000	0.377	44	0	0	1.20	259	128
2.000	142.3	2.9	98.875	0.058	0	0	0	0.69	28	23
3.000	154.9	2.1	98.368	0.015	50	0	0	1.79	126	56

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	37.00	0.074	500.0	0.000	2.00	80	0.600	o	375
1.001	20.00	0.040	500.0	0.000	0.00	0	0.600	o	375
1.002	55.50	0.080	693.8	0.000	0.00	80	0.600	o	525
1.003	39.00	0.053	735.8	0.000	0.00	0	0.600	o	525
1.004	34.50	0.043	802.3	0.000	0.00	160	0.600	o	675
1.005	37.50	0.048	781.3	0.000	0.00	0	0.600	o	675
1.006	16.00	0.020	800.0	0.000	0.00	0	0.600	o	675
1.007	50.00	0.063	793.7	0.000	0.00	0	0.600	o	675
1.008	30.00	0.038	789.5	0.000	0.00	0	0.600	o	675
1.009	55.00	0.069	797.1	0.000	0.00	0	0.600	o	675
1.010	4.00	0.013	307.7	0.000	0.00	0	0.600	o	675
2.000	12.50	0.083	150.6	0.000	2.00	2	0.600	o	150
3.000	12.00	0.040	300.0	0.000	2.00	40	0.600	o	300
4.000	50.00	0.550	90.9	0.000	2.00	35	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	200.0	2.8	99.160	0.000	80	0	0	0.80	89	80
1.001	200.0	3.2	98.910	0.000	80	0	0	0.80	89	80
1.002	200.0	4.3	98.815	0.000	160	0	0	0.84	182	160
1.003	189.6	5.1	98.660	0.000	160	0	0	0.82	177	160
1.004	181.3	5.7	98.460	0.000	320	0	0	0.92	328	320
1.005	173.4	6.4	98.331	0.000	320	0	0	0.93	333	320
1.006	170.2	6.7	98.197	0.000	320	0	0	0.92	329	320
1.007	160.7	7.6	98.091	0.000	320	0	0	0.92	330	320
1.008	155.3	8.1	97.942	0.000	320	0	0	0.92	331	320
1.009	146.3	9.1	97.818	0.000	320	0	0	0.92	329	320
1.010	145.9	9.1	97.674	0.000	320	0	0	1.49	533	320
2.000	200.0	2.3	99.125	0.000	2	0	0	0.82	14	2
3.000	200.0	2.2	98.875	0.000	40	0	0	0.90	64	40
4.000	200.0	2.5	99.200	0.000	35	0	0	1.65	117	35

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
5.000	33.00	0.200	165.0	0.000	2.00	80	0.600	o	300
6.000	20.00	0.036	555.6	0.000	2.00	120	0.600	o	450
7.000	25.00	0.033	757.6	0.000	2.00	228	0.600	o	600
8.000	29.00	0.193	150.3	0.000	2.00	15	0.600	o	200
8.001	15.00	0.100	150.0	0.000	0.00	0	0.600	o	200

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
5.000	200.0	2.5	98.700	0.000	80	0	0	1.22	86	80
6.000	200.0	2.4	98.500	0.000	120	0	0	0.86	136	120
7.000	200.0	2.5	98.500	0.000	228	0	0	0.88	248	228
8.000	200.0	2.5	99.260	0.000	15	0	0	0.99	31	15
8.001	200.0	2.7	98.990	0.000	15	0	0	0.99	31	15

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	23	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	30.00	0.100	300.0	0.000	2.00	80	0.600	o	375
1.001	19.00	0.026	730.8	0.000	0.00	80	0.600	o	525
1.002	17.00	0.023	739.1	0.000	0.00	0	0.600	o	525
1.003	50.00	0.069	724.6	0.000	0.00	0	0.600	o	525
1.004	41.00	0.057	719.3	0.000	0.00	0	0.600	o	525
1.005	59.00	0.081	728.4	0.000	0.00	0	0.600	o	525
2.000	49.00	0.098	500.0	0.000	2.00	118	0.600	o	450
3.000	35.00	0.078	448.7	0.000	2.00	80	0.600	o	375
4.000	53.00	0.106	500.0	0.000	2.00	118	0.600	o	450
5.000	12.00	0.046	260.9	0.000	2.00	40	0.600	o	250
6.000	33.00	0.066	500.0	0.000	2.00	80	0.600	o	375
6.001	32.00	0.043	744.2	0.000	0.00	80	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	200.0	2.5	98.775	0.000	80	0	0	1.04	115	80
1.001	200.0	2.9	98.623	0.000	160	0	0	0.82	178	160
1.002	200.0	3.2	98.511	0.000	160	0	0	0.82	177	160
1.003	200.0	4.2	98.402	0.000	160	0	0	0.82	178	160
1.004	193.7	5.1	98.247	0.000	160	0	0	0.83	179	160
1.005	178.3	6.2	98.104	0.000	160	0	0	0.82	178	160
2.000	200.0	2.9	98.948	0.000	118	0	0	0.90	144	118
3.000	200.0	2.7	98.912	0.000	80	0	0	0.85	94	80
4.000	200.0	3.0	98.991	0.000	118	0	0	0.90	144	118
5.000	200.0	2.2	99.105	0.000	40	0	0	0.86	42	40
6.000	200.0	2.7	98.900	0.000	80	0	0	0.80	89	80
6.001	200.0	3.3	98.784	0.000	160	0	0	0.81	176	160

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
7.000	26.00	0.217	119.8	0.000	2.00	0	0.600	o	150
8.000	46.00	0.383	120.1	0.000	2.00	0	0.600	o	100

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
7.000	200.0	2.5	99.525	0.000	0	0	0	0.92	16	0
8.000	200.0	3.1	99.442	0.000	0	0	0	0.70	6	0

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	23	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	250

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	33.00	0.078	423.1	0.000	2.00	8	0.600	o	300
1.001	54.00	0.127	425.2	0.000	0.00	8	0.600	o	300
1.002	58.00	0.136	426.5	0.000	0.00	0	0.600	o	300
1.003	46.00	0.108	425.9	0.000	0.00	16	0.600	o	300
1.004	37.00	0.051	725.5	0.000	0.00	67	0.600	o	525
1.005	48.00	0.060	800.0	0.000	0.00	0	0.600	o	525
1.006	32.00	0.040	800.0	0.000	0.00	0	0.600	o	525
1.007	35.00	0.101	346.5	0.000	0.00	0	0.600	o	525
2.000	36.00	0.103	349.5	0.000	2.00	42	0.600	o	300
3.000	13.00	0.168	77.4	0.000	2.00	50	0.600	o	300
2.001	65.00	0.372	174.7	0.000	0.00	27	0.600	o	375
1.008	1.00	0.010	100.0	0.000	0.00	0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	200.0	2.7	98.975	0.000	8	0	0	0.76	54	8
1.001	200.0	3.9	98.897	0.000	16	0	0	0.76	53	16
1.002	191.6	5.2	98.770	0.000	16	0	0	0.76	53	16
1.003	178.7	6.2	98.634	0.000	32	0	0	0.76	53	32
1.004	170.4	7.0	98.376	0.000	99	0	0	0.82	178	99
1.005	159.4	8.0	98.250	0.000	99	0	0	0.78	170	99
1.006	152.9	8.7	98.165	0.000	99	0	0	0.78	170	99
1.007	148.6	9.1	98.000	0.000	99	0	0	1.20	259	99
2.000	200.0	2.7	98.875	0.000	42	0	0	0.84	59	42
3.000	200.0	2.1	98.368	0.000	50	0	0	1.79	126	50
2.001	200.0	3.5	98.125	0.000	119	0	0	1.37	151	119
1.008	148.6	9.2	97.603	0.000	218	0	0	2.24	485	218

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	100	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.010
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.500
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	250

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	35.00	0.200	175.0	0.000	2.00	5	0.600	o	150
1.001	80.00	0.457	175.1	0.000	0.00	0	0.600	o	150
2.000	27.00	0.154	175.3	0.000	2.00	5	0.600	o	150
2.001	15.00	0.146	102.7	0.000	0.00	40	0.600	o	300
1.002	68.00	0.168	404.8	0.000	0.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	200.0	2.8	99.200	0.000	5	0	0	0.76	13	5
1.001	195.5	4.5	99.000	0.000	5	0	0	0.76	13	5
2.000	200.0	2.6	99.150	0.000	5	0	0	0.76	13	5
2.001	200.0	2.8	98.846	0.000	45	0	0	1.55	110	45
1.002	176.0	6.0	0.000	0.000	50	0	0	0.78	55	50

SECTION A6 SURFACE WATER SYSTEM

A6.1 Introduction

The surface water system collects the water run-offs from the building roofs as well as water at ground level where required for de-watering. The surface water is split into three systems to reflect the location of the various buildings, and as such there are three discharge locations.

- The roof and dewatering drainage to the:
  - Open and Closed Drains Sump
  - Generator Building
  - Firewater Pump House
  - Switchroom LER 1
- The control building discharge into the external drainage system.
- The Maintenance building and administration building complex drains into the existing ditch in the tree firebreak.

The design of the system was carried out using the Micro-drainage 'storm' program for a 1 in 10 year return period storm, derived using reference design condition of 45mm rainfall in one hour (100 year return period). This will provide a system suitable for a 100-year return period storm, when the effects of storage and surcharging are considered.

A6.1 LER / Drain Sumps / Generator Building / FW Pump House

Areas based on building roof areas and de-watering requirements local to the building. Design criteria as per Appendix A section 1, viz:
"Return period = 10 years"
"M5-60 = 22.2 mm"
"Volumetric runoff coefficient, Cv = 0.77"

The results are attached.

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

6.2 ON-PLOT ROOF DRAINS SYSTEM – TIE IN POINT 8

Outfall Ditch System - Areas Draining to Ditches

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
On - Plot Roof Drains System								
Roof & Road	1.000	81	32	17	1	544	**544** m2	
Roof & Road	2.000	28	32	16	1	512		
Pervious Area			32	10	0.6	192	**704** m2	
	1.001	38	0	0	0			Carrier
Roof & Road	3.000	18	19	19	1	361	**361** m2	
Roof & Road	1.002	54	15	37	1	555	**555** m2	
Roof & Road	1.003	22	15	12	1	180	**180** m2	
Roof & Road	4.000	50	19	19	1	361	**361** m2	
	1.004	15	0	0	0			Carrier
Roof & Road	1.005	48	27	12	1	324	**324** m2	
Roof & Road	5.000	37	27	12	1	324	**324** m2	
	1.006	22	0	0	0			Carrier
	1.007	35	35	22	1	770	**770** m2	
	1.008	41	60	13	1	780	**780** m2	
	6.000	31	20	15	1	300	**300** m2	
	1.009	100	0	0	0			Carrier
Total							**5203** m2	

A6.3 Control building

Area drained from Block C building :

"Roof:	40 x12 = 480 m^2
"Roads (3m road width to north and south of building. Outer half	
"of perimeter road is taken to drain out to perimeter ditches	
"without specific drain provision).	50 x 6 = 300 m^2
"General area drainage:	50 x 9 x 0.6 = 270 m^2
"Total:	= **1050** m^2 ."

A6.4 Admin Buildings

These calculations are based on the roof areas for the administration and maintenance buildings

Runoff areas to be allowed for:

"Run 1.000:	
"Block G (Warehouse)	39 x 20 = **780** m^2
"Run 2.000:	
"Block E (Admin)	54 x 10 = 540 m^2
"(Area between Blocks G and B, in contradiction of above statement)	19 x 20 x 0.6 = 228 m^2
"	Run 2.000 Total = **768** m^2
"Run 1.001:	
"Block A	14 x 9 = **126** m^2
"Run 1.002:	
"Block B	38 x 9 = **342** m^2
"Run 3.000:	
"Block F	11 x 9 = 99 m^2
"Block D	15 x 9 = 135 m^2
"Allow some of Block B drainage here	9 x 10 = 90 m^2
"	Run 3.000 Total = **324** m^2 ."

Results are shown in the attached Micro Drainage files.

A6.5 DESIGN SUMMARY

The summary of surface water system outfalls from the main process plot roofs is as below:

Drainage System	Tie in point number	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
LER, Drains Sump, Generator Building, Firewater Pump House	8	96.500 (At N 32820m)	10.0	147 *(SEE NOTE)
Control Building	7	98.025 (At N 32820m)	5.1	38
Admin Area Buildings (roofs only)	9	97.600 (At N 32816m)	5.6	74

These calculations have been run only using the Micro Drainage 'Storm' program, based on a 10-year return period storm, without consideration of storage within the system. The tie-in point numbers refer to the interface with the external drainage system on drawing COR-AP-SD-001. The results of initial calculations were made available to the designers of the external drainage system. The final calculations included here show some variation to these figures, but the latest figures are generally less critical. For simplicity, it has been decided that the figures given in the summary report should be left unchanged. Minor variations in the results of the detailed calculations are considered to be of no consequence.

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.300
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	81.00	0.310	261.3	0.056	3.00	0	0.060	o	225
2.000	28.00	0.200	140.0	0.070	3.00	0	0.600	o	225
1.001	37.50	0.350	107.1	0.000	0.00	0	0.600	o	225
3.000	18.00	0.067	268.7	0.037	3.00	0	0.600	o	225
1.002	54.00	0.500	108.0	0.112	0.00	0	0.600	o	300
1.003	22.00	0.375	58.7	0.037	0.00	0	0.600	o	300
4.000	50.00	0.200	250.0	0.052	3.00	0	0.600	o	225
1.004	15.00	0.130	115.4	0.000	0.00	0	0.600	o	375
1.005	48.00	0.150	320.0	0.033	0.00	0	0.600	o	450
5.000	37.00	0.250	148.0	0.033	3.00	0	0.600	o	150

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	123.2	4.4	99.175	0.056	0	0	0	0.99	39	19
2.000	134.4	3.4	99.175	0.070	0	0	0	1.10	44	26
1.001	118.1	4.9	98.800	0.126	0	0	0	1.26	50	41
3.000	135.0	3.4	98.800	0.037	0	0	0	0.79	32	14
1.002	112.6	5.5	98.375	0.275	0	0	0	1.51	107	86
1.003	111.1	5.6	97.875	0.312	0	0	0	2.06	145	96
4.000	127.1	4.0	98.500	0.052	0	0	0	0.82	33	18
1.004	109.9	5.8	97.425	0.364	0	0	0	1.69	186	111
1.005	104.4	6.5	97.220	0.397	0	0	0	1.13	180	115
5.000	130.3	3.7	99.175	0.033	0	0	0	0.82	15	12

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.006	22.00	0.090	244.4	0.000	0.00	0	0.600	o	450
1.007	35.00	0.060	583.3	0.058	0.00	0	0.600	o	450
1.008	41.00	0.070	585.7	0.078	0.00	0	0.600	o	525
6.000	31.00	0.100	310.0	0.030	3.00	0	0.600	o	225
1.009	100.00	0.180	555.6	0.000	0.00	0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.006	102.4	6.8	97.070	0.430	0	0	0	1.30	206	122
1.007	97.7	7.5	96.980	0.488	0	0	0	0.83	133	133
1.008	93.2	8.2	96.845	0.566	0	0	0	0.92	199	147
6.000	130.9	3.7	97.800	0.030	0	0	0	0.74	29	11
1.009	84.3	10.0	96.775	0.596	0	0	0	0.94	204	147

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.300
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	50.00	0.400	125.0	0.105	3.00	0	0.600	o	225
1.001	80.00	0.300	266.7	0.000	0.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	130.7	3.7	98.800	0.105	0	0	0	1.17	46	38
1.001	115.8	5.1	98.325	0.105	0	0	0	0.96	68	38

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	0.300
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.75
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	750

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	45.00	0.350	128.6	0.078	3.00	0	0.600	o	225
2.000	70.00	0.350	200.0	0.078	3.00	0	0.600	o	225
1.001	34.00	0.250	136.0	0.016	0.00	0	0.600	o	300
1.002	61.00	0.350	174.3	0.032	0.00	0	0.600	o	300
3.000	67.00	0.250	268.0	0.034	3.00	0	0.600	o	225
1.003	6.00	0.040	150.0	0.000	0.00	0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	131.5	3.7	98.700	0.078	0	0	0	1.15	46	29
2.000	124.3	4.3	98.900	0.078	0	0	0	0.92	37	27
1.001	119.8	4.7	98.275	0.172	0	0	0	1.35	95	57
1.002	111.9	5.5	98.025	0.204	0	0	0	1.19	84	63
3.000	122.7	4.4	98.800	0.034	0	0	0	0.79	32	12
1.003	111.2	5.6	97.675	0.238	0	0	0	1.28	91	74

SECTION A7 ACCESS ROAD AND CAR PARK DRAINAGE SYSTEM

A7.1 Introduction

The access road and main car park drain to a sump located near the site entrance. The access road is kerbed along its length to ensure that any accidental spillage from a tanker is contained. All runoff is pumped to the oily water system on the terminal site (refer to the waste storage area system).

For this part of the oily water system there are two design conditions:

- Storm rainfall or
- Oil arising from an accidental tanker spill.

Any accidental spillage will be contained with the kerbed area. These calculations check the system's ability to cope with rainfall.

The design of the system is run on the Micro Drainage 'Storm' program using a 1 in 10-year storm profile, derived form the reference design condition of 45mm rainfall in one hour (100 year return period). Pipes are laid to normal falls and the pipes are sized for the maximum flow only.

A7.2 Access Road Impermeable Areas

The ground around the Administration Area buildings and car park is drained by Arup. The roads in this area are provided with a kerb. The kerb is required to contain any accidental oil spillage. Runoff into the road drainage system is, therefore, limited to runoff from the net road areas.

Road areas are calculated below. Area numbers are marked on the sketch plan of the drainage system.

amec	Client: Shell E & P Ireland Ltd.				Job Ref. L3882
	Plant: Gas Reception Terminal				
	Location: Corrib On-Plot Storm Drainage				Sheet no./rev.
	Calc. by IM	Date Nov '03	Chck'd by	Date	App'd by / Date

Description	Contributing to Pipe Length	Drain Length (m)	Area Length (m)	Area Breadth (m)	Cv, Runoff Coefficient (If Partially Pervious)	Area (m2)	Sum of Areas (m2)	Comment
Area Nos								
1	1.000	32	25	15	1	**375**		
2	1.001	53	48	10	1	**480**		
5	1.002	20	50	6	1	**300**		
3	1.003	68	10	6	1	60		
4	1.003		10	6	1	60		
6A	1.003		50	8	1	400		
							520	
6B	1.004	40	40	8	1	**320**		
7	1.005	45	10	10	1	100		
8	1.005		35	12	1	420		
							520	
12	2.000	40	55	16	1	**880**		
	2.001	52						Carrier
9	1.006	82	10	10	1	100		
10	1.006		20	8	1	160		
11	1.006		67	6	1	402		
							662	
12	1.007	32	31	6	1	**186**		
13	1.008	72	72	6	1	**432**		
14	3.000	63	78	6	1	468		
radius			12	12	1	144		
							612	

A7.3 Outflows from Access Road and Car Park Drains:

The detailed Micro Drainage 'Storm' calculations follow.

The outflow from the Access Road and Car Park drain system is shown below. These figures are based on the results of the 1 in 10 year 'Storm' program output.

It should be noted that the flow from the Access Road and Car Park system does not drain directly to the perimeter ditch system. It drains to a local sump and is then pumped to the terminal oily water system.

The summary of the Access Road and Car Park drain system outflow is as below:

Ditch System	Outflow Invert Level (m)	Time of Concentration (min)	Max Flow (l/s)
Access Road and Car Park Drains	97.755	11.2	110

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Location - Scotland & Ireland

Return Period (years)	10	Volumetric Runoff Coeff.	0.77
M5-60 (mm)	22	Infiltration %	0
Ratio R	0.40	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	200	Depth from Soffit to G.L. (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel. (m/s - Auto Design Only)	0.70
O'flow Setting (*Foul only)	0	Min Slope (1:X - Optimisation)	1000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	32.00	0.120	266.7	0.038	2.00	0	0.600	o	225
1.001	53.00	0.140	378.6	0.048	0.00	0	0.600	o	300
1.002	20.00	0.050	400.0	0.030	0.00	0	0.600	o	300
1.003	68.00	0.180	377.8	0.050	0.00	0	0.600	o	300
1.004	40.00	0.080	500.0	0.000	0.00	0	0.600	o	375
1.005	45.00	0.100	450.0	0.050	0.00	0	0.600	o	375
2.000	40.00	0.100	400.0	0.090	2.00	0	0.600	o	300
2.001	52.00	0.150	346.7	0.000	0.00	0	0.600	o	300
1.006	82.00	0.140	585.7	0.067	0.00	0	0.600	o	450
1.007	32.00	0.050	640.0	0.019	0.00	0	0.600	o	450
1.008	72.00	0.130	553.8	0.043	0.00	0	0.600	o	450
3.000	63.00	0.230	273.9	0.061	2.00	0	0.600	o	225
1.009	10.00	0.030	333.3	0.000	0.00	0	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	145.3	2.7	99.000	0.038	0	0	0	0.80	32	15
1.001	130.0	3.8	98.805	0.086	0	0	0	0.80	57	31
1.002	125.0	4.2	98.665	0.116	0	0	0	0.78	55	40
1.003	111.3	5.6	98.615	0.166	0	0	0	0.80	57	51
1.004	104.7	6.4	98.360	0.166	0	0	0	0.80	89	51
1.005	98.7	7.3	98.280	0.216	0	0	0	0.85	94	59
2.000	142.5	2.9	98.800	0.090	0	0	0	0.78	55	36
2.001	128.6	3.9	98.700	0.090	0	0	0	0.84	59	36
1.006	89.2	9.0	98.105	0.373	0	0	0	0.83	132	92
1.007	85.9	9.6	97.965	0.392	0	0	0	0.80	127	94
1.008	79.8	11.0	97.915	0.435	0	0	0	0.86	136	97
3.000	135.6	3.3	98.700	0.061	0	0	0	0.79	31	23
1.009	79.2	11.2	97.785	0.496	0	0	0	1.11	176	109