

PREMIER INN, WREXHAM

**PROPOSED SW DRAINAGE
REPORT**

NOVEMBER 2012



FAIRHURST

CONTROL SHEET**CLIENT:** Marcus Worthingtons & Co Ltd**PROJECT TITLE:** Premier Inn, Wrexham**REPORT TITLE:** Proposed SW Drainage Report**PROJECT REFERENCE:** 91568/08**Issue and Approval Schedule:**

ISSUE 1	Name	Signature	Date
Prepared by	A Branston / C Meredith	C Meredith	23/11/12
Reviewed by	Frazer Thompson	F Thompson	23/11/12
Approved by	P Ward	P Ward	23/11/12

Revision Record:

Issue	Date	Status	Description	By	Chk	App
2						
3						
4						
5						
6						
7						
8						

This report has been prepared in accordance with procedure OP/P02 of Fairhurst's Quality Management System

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	APPENDIX B - Attenuation Calculations	

DESIGN ASSESSMENT FORM

Project: Premier Inn, Wrexham	Job No. 91568
	By/Date: A Branston 22/11/12
	Approved/Date: 22/11/12
Fairhurst Scope of Works:	Civil design of proposed Premier Inn car park and access road with associated drainage.
Description:-	Works consist of design and construction of car park and access road along with surface water drainage systems.
Scope of Services	Civil design of the proposed car park, access road and drainage within • Levels/ Civils Design • Drainage Design
Design Philosophy:	The purpose of this calculation is to determine a schematic surface drainage network for the development and to calculate the amount of SW attenuation required.
Site Location	The site is in situated off Regent Street, Wrexham.
Site Restrictions	The site is bound by railway line to the East and West, public highway to the North and another development site to the South.
Drainage Issues	The SW drainage is required to discharge to a watercourse some 120m south of the site, and the SW sewer will be required to run through the adjacent development site.
Site Investigation	Site Investigation report issued by Fairhurst, February 2012

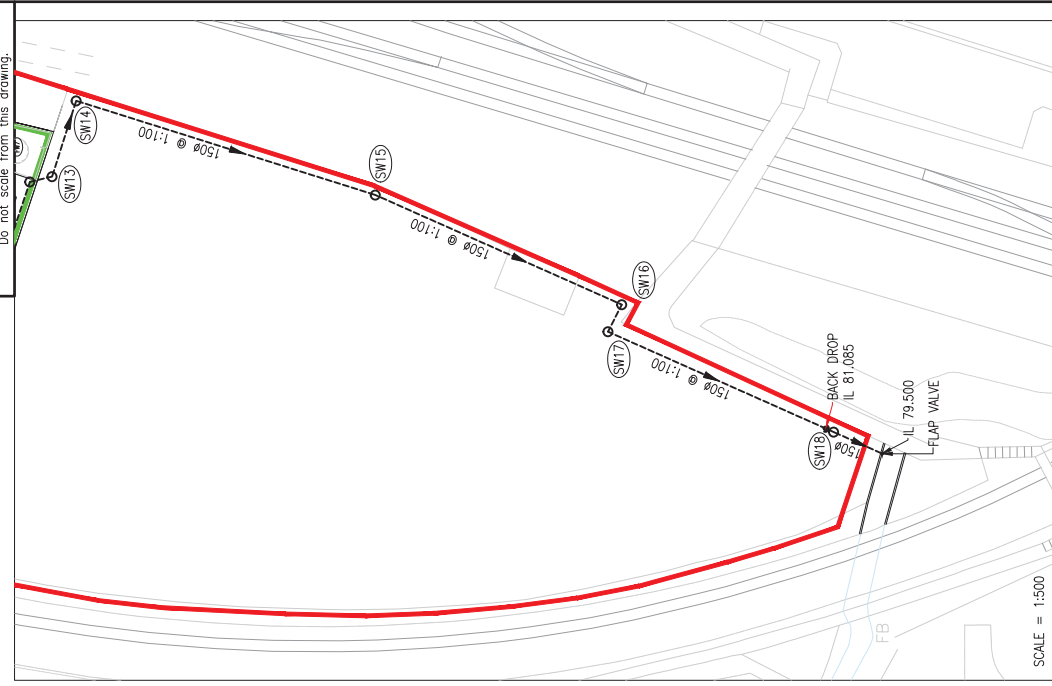
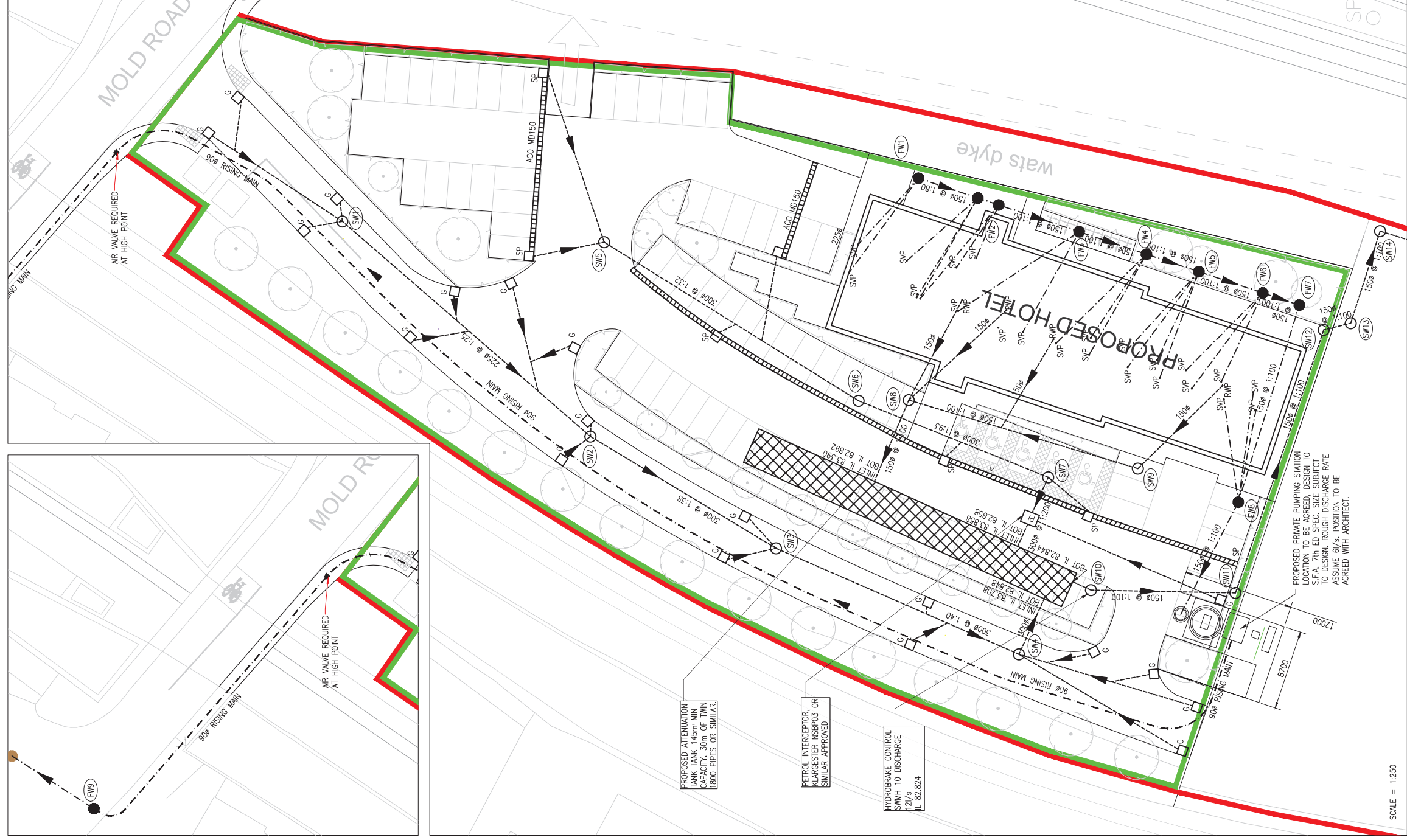
Project: Premier Inn, Wrexham	Job No. 91568
	By/Date A Branston 22/11/12
	Approved/Date 22/11/12
Fairhurst Scope of Works Below Ground Surface Water Drainage System Design	
<u>Introduction</u> The existing site is a former scrap metal yard, approximately 1.17Ha in area. It comprises of impermeable hardstanding with some rough permeable ground. The proposed site occupies part of the former scrapyard. It is to be a hotel with associated car park and delivery area. Access will be from Regent street via a new proposed junction and access road.	
<u>Design</u> The existing site hardstanding is approximately 2285m² or 0.229ha. Using the rational method this gives a 1 in 1 year run off from site of:- $0.229 \times (50 \times 2.75) = 31.8 \text{ l/s}$ SW runoff will discharge to the existing watercourse subject to approval by Wrexham County Council and the Environment Agency (EA). Following EA guidance the discharge from site is to be reduced by 30% post development from existing rates. $31.8 \times 0.7 = \underline{22 \text{ l/s}}$ Allowable discharge from the whole site following development The Proposed Premier Inn site has an impermeable area of approximately 4387m² or 0.439ha. The impermeable area for the adjacent development site is unknown. A layout of the site can be found in Appendix A. The allowable surface water discharge above is for the Premier Inn site and the adjacent development. The discharge rate of 22 l/s will be divided as follows: Premier Inn site = 12 l/s Adjacent development site = 10 l/s Each site will require attenuation to comply with discharge limit and discharge independently. SW attenuation for the Premier Inn site will be sized based on the discharge limited to 12 l/s for storm events upto the 1 in 100 year return period with 20% climate change allowance. Discharge will be limited via a flow control device downstream of the attenuation and will flow to the open watercourse to the south of the site via a piped connection with flap valve. Micro Drainage calculations can be found in Appendix B. These show that a maximum of 144.3 cubic metres of attenuation is required to satisfy requirements.	

Project: Premier Inn, Wrexham		Job No. 91568
		By/Date A Branston 22/11/12
		Approved/Date 22/11/12
Checklist of potential operations and hazards		
Potential Hazards	Present	Key Significant Hazards to be Addressed
Client operations		
Adjacent activities	X	
Restricted site		
Traffic		
Interface with public		
Near to highways	X	
Near to railways	X	
Near to waterways	X	
Tidal working		
Ground instability		
Contamination	X	Refer to Risk Register
Soil gas		
Ground water	X	
Inundation		
Sewage		
Fuel tanks		
Services	X	Refer to Risk Register
Overhead cables		
Demolition		
Unstable structures		
Explosives		
Asbestos		
Bird droppings		
Dust		
Hazardous materials		

Radiation		
Hot working		
Confined spaces	X	
Working at height	X	Refer to Risk Register
Manual handling	X	
Lifting operations	X	
Vibration	X	
Noise	X	
Other (state)		
Underground Structures		

Project: Premier Inn, Wrexham		Job No. 91568
		By/Date: A Branston 22/11/12
		Approved/Date: 22/11/12
Stage		Sheet
Hazard	Action by Designer	Residual Hazard
Deep Excavations/ Working at Height	1. To eliminate hazard	
	2. To reduce hazard All manholes designed to be minimum depth and gradients kept to a minimum where possible.	Deep Excavations
Live Services	1. To eliminate hazard	
	2. To reduce hazard Utility company service records checked prior to design commencement to ensure no clashes. Trial pits have been dug to discover size, location and depth of existing BT, electric and water services	Live Services Crossing Site
Contamination	1. To eliminate hazard	
	2. To reduce hazard SI has been undertaken to establish type and location of contamination.	Low level contamination in made ground.

APPENDIX A



- PROPOSED FOUL SEWER
 --- PROPOSED SURFACE WATER SEWER
 --- EXISTING FOUL SEWER
 --- EXISTING SURFACE WATER SEWER
 ~~~ EX. S.W. SEWER TO BE ABANDONED  
 --- PROPOSED FOUL WATER SEWER  
 --- PROPOSED SURFACE WATER SEWER  
 --- DIVERSION  
 --- DIVERSION  
 --- PROPOSED CHANNEL DRAIN  
 --- PROPOSED KERB DRAIN  
 □ SP  
 □ G  
 □ RWP  
 ○ SAIL WATER PIPE  
 ○ SVP  
 ○ SOIL & VENT PIPE

|                                                            |                                                   |
|------------------------------------------------------------|---------------------------------------------------|
| THIS DRAINAGE LAYOUT IS BASED ON THE FOLLOWING INFORMATION |                                                   |
| ARCHITECT'S LAYOUT                                         | FLETCHER SMITH 3240/001 REV E                     |
| TOPO SURVEY                                                | FLETCHER SMITH TOPO WITH SITE BOUNDARY 15-06-2012 |

ONGOING DESIGN

| THIS REGISTER IS A NON-EXHAUSTIVE LIST OF RESIDUAL HAZARDS RELATING TO THE WORKS SHOWN ON THIS DRAWING THAT HAVE BEEN IDENTIFIED DURING THE DESIGN STAGE | DETAILS                                            | LOW LEVEL CONTAMINATION OF MADE GROUND, REFER TO S.I.         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------|
| SIGNIFICANT RESIDUAL HAZARDS                                                                                                                             | CONTAMINATION                                      | REFER TO EXISTING RECORDS                                     |
|                                                                                                                                                          | EXISTING UNDERGROUND SERVICES (LIVE CROSSING SITE) | LOCALISED OBSTRUCTIONS ASSOCIATED WITH HISTORICAL DEVELOPMENT |
|                                                                                                                                                          | UNDERGROUND STRUCTURES                             | ALL MANHOLES TO BE DESIGNED TO MIN DEPTH                      |
|                                                                                                                                                          | DEEP EXCAVATIONS                                   | REFER TO PLANS                                                |
|                                                                                                                                                          | WORKING NEAR WATER                                 | REFER TO PLANS                                                |
|                                                                                                                                                          | WORKING NEAR HIGHWAY                               | REFER TO PLANS                                                |
|                                                                                                                                                          | WORKING NEAR RAILWAY                               | REFER TO PLANS                                                |

NOTES:-

1. UNLESS NOTED OTHERWISE ALL EXISTING GULLIES ARE DRAINING EXISTING AREAS TO BE RETAINED SUBJECT TO CONDITION.
2. ALL MANHOLE COVERS TO BE GRADE D400 HEAVY DUTY.
3. EXISTING DRAINAGE INFORMATION IS REQUIRED SURVEYING PRIOR TO CONSTRUCTION OF PROPOSED DRAINAGE PRIOR TO ANY CONSTRUCTION OF PROPOSED DRAINAGE SCHEME.
4. ALL PIPES UP 300mm DIA. TO BE EITHER VITRIFIED CLAY OR UPVC/SOLID WALL OR CONCENTRIC RIB TO BRITISH STANDARD). ALL PIPES OVER 300mm DIA. TO BE CONCRETE.
5. ALL MANHOLES TO BE CONSTRUCTED FROM CONCRETE UNLESS OTHERWISE ON DRAINAGE DETAILS.
6. ALL NEW GULLIES TO BE CONCRETE/CLAY TO HIGHWAYS SPECIFICATION.
7. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS.
8. ALL NEW GULLIES TO BE CONCRETE/CLAY TO HIGHWAYS SPECIFICATION.
9. INVERT LEVELS RELATE TO THE LARGEST PIPE IN EACH MANHOLE ALL OTHER SMALLER PIPES ARE TO BE LAID WITH SOFFITS LEVEL TO LARGEST PIPE.
10. ALL EXISTING SEWERS/MANHOLES TO BE CHECKED & CLARIFIED TO CONFIRM INVERT LEVELS/POSITIONS.
11. IF ADVERSE GROUND CONDITIONS ARE ENCOUNTERED POSSIBLE TRENCH
12. STABILISATION WITH TERRAM LAYER/DE-WATERING COULD BE REQUIRED. CONTRACTOR TO NOTIFY FAIRHURST ENGINEER IMMEDIATELY.
13. ALL PIPES WITH LESS THAN 1200mm of COVER TO CROWN TO HAVE A CONCRETE SURROUND WITH EXPANSION JOINTS.
14. ATTENUATION/DISCHARGE FIGURE SUBJECT TO ENVIRONMENT AGENCY ACCEPTANCE.
15. DRAINAGE CONNECTIONS FW/SW SUBJECT TO S106 AGREEMENT.
16. ALL GULLIES & DRAINAGE CHANNELS WITHIN CAR PARK AND PEDESTRIAN AREAS TO BE FITTED WITH HELIUMGARD TYPE COVERS.
17. DOWNPIPES/SWP'S/RWP'S POSITIONS ARE INDICATIVE ONLY AWAITING DETAILS FROM ARCHITECT.
18. ALL NEW DRAINAGE TO BE CCTV'D, CLEANED OF ALL CONSTRUCTION DEBRIS AND COPY SENT TO FAIRHURST FOR AS BUILT PURPOSES.
19. ALL GULLIES & DRAINAGE CHANNELS WITHIN CAR PARK AND PEDESTRIAN AREAS TO BE FITTED WITH HELIUMGARD TYPE COVERS.
20. COVER LEVELS OF MANHOLES LABELED \* ARE DEPENDANT ON GROUND LEVELS OF FUTURE DEVELOPMENT. COVER LEVELS LABELED ARE DEPENDANT ON LEVELS AGREED WITHING S278 AGREEMENT.

THIS DRAWING HAS BEEN CREATED IN ABEYANCE OF THE FOLLOWING INFORMATION;  
WHEN RECEIVED, ADJUSTMENTS CANNOT BE MADE ON THIS LAYOUT MAY ALTER

|                                                  |                                                                                                                                                             |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO-ORINATED POP UP AND RWP POSITIONS             | POSITIONS OF CONNECTIONS NOT AVAILABLE AT TIME OF DESIGN. POP UP/RWP POSITIONS WILL AFFECT POSITION OF THE DRAINAGE NETWORK. EXTRA MANHOLES MAY BE REQUIRED |
| FINISHED FLOOR LEVEL TO BE AGREED WITH ARCHITECT | FEL WILL AFFECT COVER LEVELS AROUND THE BUILDING. THIS MAY AFFECT POSITION OF SURFACE WATER DRAINAGE CHANNELS                                               |
| FINALISED FOUNDATION PLAN                        | WILL AFFECT POSITION OF DRAINS RUNNING UNDER BUILDINGS. AWAITING DETAILS FROM ARCHITECT                                                                     |
| PUMPING STATION DESIGN                           | DEPTH, DESIGN AND POSITION OF PUMPING STATION TO BE AGREED WITH CLIENT AND ARCHITECT. SEE PUMPING STATION DETAIL 2012                                       |
| S278/ROAD DESIGN                                 | LEVELS AGREED WITHIN THE S278 AGREEMENT WILL AFFECT THE ROAD DESIGN WHICH IN TURN WILL AFFECT MANHOLE COVER LEVELS/ DEPTHS. ROAD DESIGN ON GOING            |

[illegible]

|         |                                                                                                                                                          |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name:   |                                                                                                                                                          |
| Client: |  <b>MARCUS WORTHINGTON<br/>&amp; CO. LTD.</b><br>BUILDING CONTRACTORS |

|                                                                     |                        |                 |                                                                                                                  |
|---------------------------------------------------------------------|------------------------|-----------------|------------------------------------------------------------------------------------------------------------------|
| SOLUS PREMIER INN HOTEL<br>JACQUES YARD<br>REGENT STREET<br>WREXHAM | <b>Project Title:</b>  |                 | <b>FAIRHURST</b><br>51a St. Pauls Street,<br>Wrexham, Cheshire, CH1 1LH<br>Tel: 0113 243 4671 Fax: 0844 381 4412 |
|                                                                     | <b>Scale at A1:</b>    |                 |                                                                                                                  |
|                                                                     | <b>For information</b> |                 |                                                                                                                  |
|                                                                     | <b>1:500</b>           |                 |                                                                                                                  |
| <b>Drawing Title:</b><br>PROPOSED DRAINAGE LAYOUT                   | <b>Drawn:</b>          | <b>Checked:</b> | <b>Approved:</b>                                                                                                 |
|                                                                     | JS                     | JS              | FT                                                                                                               |
|                                                                     | <b>Date:</b>           | <b>Date:</b>    | <b>Date:</b>                                                                                                     |
|                                                                     | 19/06/12               | 28/06/12        | 28/06/12                                                                                                         |
| <b>Drawing No.:</b>                                                 |                        |                 | <b>Revision:</b>                                                                                                 |
| 91568/2003                                                          |                        |                 | A                                                                                                                |

## APPENDIX B

|                                                             |                     |                                 |                         |                                                                                     |        |
|-------------------------------------------------------------|---------------------|---------------------------------|-------------------------|-------------------------------------------------------------------------------------|--------|
| W A Fairhurst & Partners                                    |                     |                                 |                         | Page 1                                                                              |        |
| 51a St.Paul's Street<br>Leeds<br>LS1 2TE                    |                     | Proposed Premier Inn<br>Wrexham |                         |  |        |
| Date 23.11.12<br>File pipe storage.srcx                     |                     | Designed by cmm<br>Checked by   |                         |                                                                                     |        |
| Micro Drainage                                              |                     | Source Control W.12.6           |                         |                                                                                     |        |
| <u>Summary of Results for 100 year Return Period (+20%)</u> |                     |                                 |                         |                                                                                     |        |
| Storm<br>Event                                              | Max<br>Level<br>(m) | Max<br>Depth<br>(m)             | Max<br>Control<br>(l/s) | Max<br>Volume<br>(m³)                                                               | Status |
| 15 min Summer                                               | 83.750              | 0.876                           | 8.5                     | 72.3                                                                                | O K    |
| 30 min Summer                                               | 83.956              | 1.082                           | 9.4                     | 94.8                                                                                | O K    |
| 60 min Summer                                               | 84.139              | 1.265                           | 10.1                    | 114.2                                                                               | O K    |
| 120 min Summer                                              | 84.236              | 1.362                           | 10.5                    | 123.8                                                                               | O K    |
| 180 min Summer                                              | 84.242              | 1.368                           | 10.5                    | 124.4                                                                               | O K    |
| 240 min Summer                                              | 84.219              | 1.345                           | 10.4                    | 122.2                                                                               | O K    |
| 360 min Summer                                              | 84.157              | 1.283                           | 10.2                    | 116.0                                                                               | O K    |
| 480 min Summer                                              | 84.098              | 1.224                           | 9.9                     | 110.0                                                                               | O K    |
| 600 min Summer                                              | 84.040              | 1.166                           | 9.7                     | 103.9                                                                               | O K    |
| 720 min Summer                                              | 83.984              | 1.110                           | 9.5                     | 97.9                                                                                | O K    |
| 960 min Summer                                              | 83.881              | 1.007                           | 9.1                     | 86.6                                                                                | O K    |
| 1440 min Summer                                             | 83.703              | 0.829                           | 8.3                     | 67.1                                                                                | O K    |
| 2160 min Summer                                             | 83.494              | 0.620                           | 7.3                     | 44.8                                                                                | O K    |
| 2880 min Summer                                             | 83.323              | 0.449                           | 6.6                     | 27.9                                                                                | O K    |
| 4320 min Summer                                             | 83.049              | 0.175                           | 6.3                     | 6.2                                                                                 | O K    |
| 5760 min Summer                                             | 82.970              | 0.096                           | 5.4                     | 2.0                                                                                 | O K    |
| 7200 min Summer                                             | 82.942              | 0.068                           | 4.5                     | 1.0                                                                                 | O K    |
| 8640 min Summer                                             | 82.927              | 0.053                           | 3.9                     | 0.6                                                                                 | O K    |
| 10080 min Summer                                            | 82.917              | 0.043                           | 3.5                     | 0.4                                                                                 | O K    |
| 15 min Winter                                               | 83.837              | 0.963                           | 8.9                     | 81.8                                                                                | O K    |
| 30 min Winter                                               | 84.077              | 1.203                           | 9.9                     | 107.8                                                                               | O K    |
| 60 min Winter                                               | 84.312              | 1.438                           | 10.7                    | 131.0                                                                               | O K    |
| 120 min Winter                                              | 84.464              | 1.590                           | 11.3                    | 143.7                                                                               | O K    |
| Storm<br>Event                                              | Rain<br>(mm/hr)     |                                 | Time-Peak<br>(mins)     |                                                                                     |        |
| 15 min Summer                                               | 97.985              |                                 | 21                      |                                                                                     |        |
| 30 min Summer                                               | 66.783              |                                 | 34                      |                                                                                     |        |
| 60 min Summer                                               | 43.553              |                                 | 62                      |                                                                                     |        |
| 120 min Summer                                              | 27.465              |                                 | 104                     |                                                                                     |        |
| 180 min Summer                                              | 20.664              |                                 | 136                     |                                                                                     |        |
| 240 min Summer                                              | 16.764              |                                 | 172                     |                                                                                     |        |
| 360 min Summer                                              | 12.403              |                                 | 240                     |                                                                                     |        |
| 480 min Summer                                              | 10.018              |                                 | 310                     |                                                                                     |        |
| 600 min Summer                                              | 8.481               |                                 | 378                     |                                                                                     |        |
| 720 min Summer                                              | 7.397               |                                 | 446                     |                                                                                     |        |
| 960 min Summer                                              | 5.956               |                                 | 578                     |                                                                                     |        |
| 1440 min Summer                                             | 4.379               |                                 | 836                     |                                                                                     |        |
| 2160 min Summer                                             | 3.212               |                                 | 1208                    |                                                                                     |        |
| 2880 min Summer                                             | 2.574               |                                 | 1564                    |                                                                                     |        |
| 4320 min Summer                                             | 1.880               |                                 | 2208                    |                                                                                     |        |
| 5760 min Summer                                             | 1.502               |                                 | 2936                    |                                                                                     |        |
| 7200 min Summer                                             | 1.262               |                                 | 3656                    |                                                                                     |        |
| 8640 min Summer                                             | 1.096               |                                 | 4336                    |                                                                                     |        |
| 10080 min Summer                                            | 0.972               |                                 | 5128                    |                                                                                     |        |
| 15 min Winter                                               | 97.985              |                                 | 21                      |                                                                                     |        |
| 30 min Winter                                               | 66.783              |                                 | 34                      |                                                                                     |        |
| 60 min Winter                                               | 43.553              |                                 | 62                      |                                                                                     |        |
| 120 min Winter                                              | 27.465              |                                 | 114                     |                                                                                     |        |
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|                                                                 |  |                                 |                     |                                                                                     |                       |        |
|-----------------------------------------------------------------|--|---------------------------------|---------------------|-------------------------------------------------------------------------------------|-----------------------|--------|
| W A Fairhurst & Partners                                        |  |                                 |                     | Page 2                                                                              |                       |        |
| 51a St.Paul's Street<br>Leeds<br>LS1 2TE                        |  | Proposed Premier Inn<br>Wrexham |                     |  |                       |        |
| Date 23.11.12<br>File pipe storage.srcx                         |  | Designed by cmm<br>Checked by   |                     |                                                                                     |                       |        |
| Micro Drainage                                                  |  | Source Control W.12.6           |                     |                                                                                     |                       |        |
| <div>Summary of Results for 100 year Return Period (+20%)</div> |  |                                 |                     |                                                                                     |                       |        |
| Storm<br>Event                                                  |  | Max<br>Level<br>(m)             | Max<br>Depth<br>(m) | Max<br>Control<br>(l/s)                                                             | Max<br>Volume<br>(m³) | Status |
| 180 min Winter                                                  |  | 84.472                          | 1.598               | 11.3                                                                                | 144.3                 | O K    |
| 240 min Winter                                                  |  | 84.434                          | 1.560               | 11.2                                                                                | 141.4                 | O K    |
| 360 min Winter                                                  |  | 84.320                          | 1.446               | 10.8                                                                                | 131.7                 | O K    |
| 480 min Winter                                                  |  | 84.217                          | 1.343               | 10.4                                                                                | 122.0                 | O K    |
| 600 min Winter                                                  |  | 84.123                          | 1.249               | 10.0                                                                                | 112.6                 | O K    |
| 720 min Winter                                                  |  | 84.037                          | 1.163               | 9.7                                                                                 | 103.5                 | O K    |
| 960 min Winter                                                  |  | 83.883                          | 1.009               | 9.1                                                                                 | 86.9                  | O K    |
| 1440 min Winter                                                 |  | 83.636                          | 0.762               | 8.0                                                                                 | 59.9                  | O K    |
| 2160 min Winter                                                 |  | 83.348                          | 0.474               | 6.7                                                                                 | 30.3                  | O K    |
| 2880 min Winter                                                 |  | 83.062                          | 0.188               | 6.4                                                                                 | 7.0                   | O K    |
| 4320 min Winter                                                 |  | 82.952                          | 0.078               | 4.9                                                                                 | 1.3                   | O K    |
| 5760 min Winter                                                 |  | 82.926                          | 0.052               | 3.9                                                                                 | 0.5                   | O K    |
| 7200 min Winter                                                 |  | 82.912                          | 0.038               | 3.3                                                                                 | 0.3                   | O K    |
| 8640 min Winter                                                 |  | 82.903                          | 0.029               | 2.9                                                                                 | 0.2                   | O K    |
| 10080 min Winter                                                |  | 82.896                          | 0.022               | 2.5                                                                                 | 0.1                   | O K    |
| Storm<br>Event                                                  |  | Rain<br>(mm/hr)                 |                     | Time-Peak<br>(mins)                                                                 |                       |        |
| 180 min Winter                                                  |  | 20.664                          |                     | 144                                                                                 |                       |        |
| 240 min Winter                                                  |  | 16.764                          |                     | 182                                                                                 |                       |        |
| 360 min Winter                                                  |  | 12.403                          |                     | 260                                                                                 |                       |        |
| 480 min Winter                                                  |  | 10.018                          |                     | 334                                                                                 |                       |        |
| 600 min Winter                                                  |  | 8.481                           |                     | 406                                                                                 |                       |        |
| 720 min Winter                                                  |  | 7.397                           |                     | 476                                                                                 |                       |        |
| 960 min Winter                                                  |  | 5.956                           |                     | 614                                                                                 |                       |        |
| 1440 min Winter                                                 |  | 4.379                           |                     | 878                                                                                 |                       |        |
| 2160 min Winter                                                 |  | 3.212                           |                     | 1256                                                                                |                       |        |
| 2880 min Winter                                                 |  | 2.574                           |                     | 1532                                                                                |                       |        |
| 4320 min Winter                                                 |  | 1.880                           |                     | 2204                                                                                |                       |        |
| 5760 min Winter                                                 |  | 1.502                           |                     | 2856                                                                                |                       |        |
| 7200 min Winter                                                 |  | 1.262                           |                     | 3560                                                                                |                       |        |
| 8640 min Winter                                                 |  | 1.096                           |                     | 4352                                                                                |                       |        |
| 10080 min Winter                                                |  | 0.972                           |                     | 4992                                                                                |                       |        |
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|                                          |                                 |                                                                                     |
|------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|
| W A Fairhurst & Partners                 |                                 | Page 3                                                                              |
| 51a St.Paul's Street<br>Leeds<br>LS1 2TE | Proposed Premier Inn<br>Wrexham |  |
| Date 23.11.12                            | Designed by cmm                 |                                                                                     |
| File pipe storage.srcx                   | Checked by                      |                                                                                     |
| Micro Drainage                           |                                 | Source Control W.12.6                                                               |

#### Rainfall Details

|                       |                   |                       |       |
|-----------------------|-------------------|-----------------------|-------|
| Rainfall Model        | FSR               | Winter Storms         | Yes   |
| Return Period (years) | 100               | Cv (Summer)           | 0.750 |
| Region                | England and Wales | Cv (Winter)           | 0.840 |
| M5-60 (mm)            | 18.000            | Shortest Storm (mins) | 15    |
| Ratio R               | 0.324             | Longest Storm (mins)  | 10080 |
| Summer Storms         | Yes               | Climate Change %      | +20   |

#### Time / Area Diagram

Total Area (ha) 0.440

| Time<br>(mins) | Area<br>(ha) | Time<br>(mins) | Area<br>(ha) |
|----------------|--------------|----------------|--------------|
| 0-4            | 0.220        | 4-8            | 0.220        |

| W A Fairhurst & Partners                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                 | Page 4                                                                              |            |            |            |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|-----------|------------|-------|-----|-------|-----|-------|------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|-----|-------|------|-------|------|-------|------|-------|-----|-------|------|-------|------|--|--|-------|-----|-------|------|-------|------|--|--|
| 51a St.Paul's Street<br>Leeds<br>LS1 2TE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Proposed Premier Inn<br>Wrexham |  |            |            |            |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| Date 23.11.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Designed by cmm                 |                                                                                     |            |            |            |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| File pipe storage.srcx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Checked by                      |                                                                                     |            |            |            |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| Micro Drainage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                 | Source Control W.12.6                                                               |            |            |            |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| <p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 85.640</p> <p style="text-align: center;"><u>Double Pipe Structure</u></p> <p style="text-align: center;">Diameter (m)    1.800                      Length (m) 30.000<br/>Slope (1:X) 500.000    Invert Level (m) 82.874</p> <p style="text-align: center;"><u>Hydro-Brake® Outflow Control</u></p> <p style="text-align: center;">Design Head (m) 1.800    Hydro-Brake® Type Md5 SW Only    Invert Level (m) 82.824<br/>Design Flow (l/s) 12.0                      Diameter (mm)                      121</p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> </tr> </thead> <tbody> <tr><td>0.100</td><td>3.8</td><td>1.200</td><td>9.7</td><td>3.000</td><td>15.3</td><td>7.000</td><td>23.3</td></tr> <tr><td>0.200</td><td>6.2</td><td>1.400</td><td>10.4</td><td>3.500</td><td>16.5</td><td>7.500</td><td>24.1</td></tr> <tr><td>0.300</td><td>6.4</td><td>1.600</td><td>11.1</td><td>4.000</td><td>17.6</td><td>8.000</td><td>24.9</td></tr> <tr><td>0.400</td><td>6.3</td><td>1.800</td><td>11.8</td><td>4.500</td><td>18.7</td><td>8.500</td><td>25.7</td></tr> <tr><td>0.500</td><td>6.6</td><td>2.000</td><td>12.5</td><td>5.000</td><td>19.7</td><td>9.000</td><td>26.4</td></tr> <tr><td>0.600</td><td>7.0</td><td>2.200</td><td>13.1</td><td>5.500</td><td>20.7</td><td>9.500</td><td>27.2</td></tr> <tr><td>0.800</td><td>7.9</td><td>2.400</td><td>13.7</td><td>6.000</td><td>21.6</td><td></td><td></td></tr> <tr><td>1.000</td><td>8.8</td><td>2.600</td><td>14.2</td><td>6.500</td><td>22.5</td><td></td><td></td></tr> </tbody> </table> |                                 |                                                                                     | Depth (m)  | Flow (l/s) | Depth (m)  | Flow (l/s) | Depth (m)  | Flow (l/s) | Depth (m) | Flow (l/s) | 0.100 | 3.8 | 1.200 | 9.7 | 3.000 | 15.3 | 7.000 | 23.3 | 0.200 | 6.2 | 1.400 | 10.4 | 3.500 | 16.5 | 7.500 | 24.1 | 0.300 | 6.4 | 1.600 | 11.1 | 4.000 | 17.6 | 8.000 | 24.9 | 0.400 | 6.3 | 1.800 | 11.8 | 4.500 | 18.7 | 8.500 | 25.7 | 0.500 | 6.6 | 2.000 | 12.5 | 5.000 | 19.7 | 9.000 | 26.4 | 0.600 | 7.0 | 2.200 | 13.1 | 5.500 | 20.7 | 9.500 | 27.2 | 0.800 | 7.9 | 2.400 | 13.7 | 6.000 | 21.6 |  |  | 1.000 | 8.8 | 2.600 | 14.2 | 6.500 | 22.5 |  |  |
| Depth (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Flow (l/s)                      | Depth (m)                                                                           | Flow (l/s) | Depth (m)  | Flow (l/s) | Depth (m)  | Flow (l/s) |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3.8                             | 1.200                                                                               | 9.7        | 3.000      | 15.3       | 7.000      | 23.3       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6.2                             | 1.400                                                                               | 10.4       | 3.500      | 16.5       | 7.500      | 24.1       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6.4                             | 1.600                                                                               | 11.1       | 4.000      | 17.6       | 8.000      | 24.9       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6.3                             | 1.800                                                                               | 11.8       | 4.500      | 18.7       | 8.500      | 25.7       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6.6                             | 2.000                                                                               | 12.5       | 5.000      | 19.7       | 9.000      | 26.4       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7.0                             | 2.200                                                                               | 13.1       | 5.500      | 20.7       | 9.500      | 27.2       |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 0.800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7.9                             | 2.400                                                                               | 13.7       | 6.000      | 21.6       |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
| 1.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 8.8                             | 2.600                                                                               | 14.2       | 6.500      | 22.5       |            |            |            |           |            |       |     |       |     |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |       |      |       |     |       |      |       |      |  |  |       |     |       |      |       |      |  |  |
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