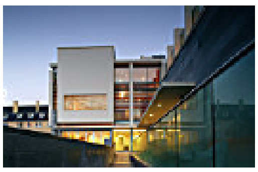
Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Flooding at Letterkenny General Hospital

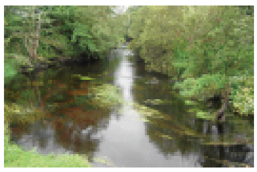
Review of Screen Design

November 2013

TOBIN CONSULTING ENGINEERS





TOBIN
Patrick J. Tobin & Co. Ltd.

REPORT

PROJECT: **Review of Screen Design**

CLIENT: **HSE Estates**

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DOCUMENT AMENDMENT RECORD

Client: **HSE Estates**

Project: **Flooding at Letterkenny General Hospital**

Title: **Review of Screen Design**

PROJECT NUMBER: 7284				DOCUMENT REF: 7284-TR02			
C	Third Issue	BG	Nov 13	PR	Nov 13	BD	Nov 13
B	Second Issue	BG	Nov 13	PR	Nov 13	BD	Nov 13
A	First Issue	BG	Oct 13	PR	Oct 13	BD	Oct 13
Revision	**Description & Rationale**	**Originated**	**Date**	**Checked**	**Date**	**Authorised**	**Date**
TOBIN Consulting Engineers							

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1 BACKGROUND

1.1 HISTORY OF THE FLOODING EVENT

On Friday 26th July 2013, commencing at approximately 5.30pm, flooding of Letterkenny General Hospital occurred following intense rainfall in the area. The source of the flood water was a local stream, known as the Sprackburn Tributary (of the River Swilly), which runs in a south-east direction towards the hospital and enters a 1350mm diameter circular culvert which runs through the hospital grounds. TOBIN Consulting Engineers were appointed by the HSE to examine causative factors associated with the flooding, and to make recommendations for improvement works where necessary.

1.2 TERMS OF REFERENCE

Our appointment project includes the following items:

- Recommendations on screening system maintenance – as currently installed
- Recommendations on screening system improvement works if required, and associated maintenance

In our Stage 2 Engineering Assessment Report we focused on culvert capacity and design. This report now presented addresses the issue of screen design.

1.3 REFERENCE DOCUMENTS

This review has been undertaken using the following reference documents:

- *Security and Trash Screen Guide,* UK Environment Agency, 2009
- *Culvert Design and Operation Guide (C689)*, CIRIA, 2010

It should be noted that the second of these documents primarily focuses on overall culvert design, and references the first document in relation to the particular design of screens. For this reason the first listed document is the primary reference document.

1.4 TERMINOLOGY

In the reference documents, two types of culvert screens are discussed:

- **Security screen**, to prevent the entry of people into the culvert
- **Trash screen**, to prevent debris from entering the culvert

Oftentimes, screens can perform both of these functions. However, in screen design it is important for the designer to decide what the primary purpose of the screen is, as the selection of design parameters depends on the screen type.

2 SCREEN DESIGN

2.1 SCREEN DESIGN PARAMETERS

Screen design in the reference documents consists of the selection of the following elements:

- Designation as either a trash screen, a security screen, or both
- Screen area (*in accordance with Chapter 7 of the Culvert Design and Operation Guide*)
- Bar spacing (*in accordance with Chapter 8 of the Culvert Design and Operation Guide*)
- Angle of bars to the horizontal (*ref. Section 11.5 Security and Trash Screen Guide, preferred angle of 45° and a maximum of 60° to the horizontal,*)
- Angle of the screen to the direction of flow (normally facing the flow, i.e. 90°)
- Bar shape (i.e. flat or round)

2.2 PROBABILITY OF SIGNIFICANT DEBRIS LOAD PRIOR TO THE FLOODING EVENT OF 26TH JULY 2013

An approach to estimating the probability of significant debris load arriving at the screens is outlined in the document titled *Predicting and Managing Flood Risk Associated with Trash Screens at Culverts, FRMRC, March 2012.* The delivery of debris to a screen depends solely upon upstream catchment factors and not upon the characteristics of the screen itself. In that document the probability of delivery of significant load of debris to a screen is stated to be a function of:

- NL, the channel length. Longer channel length generally increases the probability of delivery of a significant debris load. In this case NL = 1.72km.
- SL, the channel slope, S1085. Steeper catchments generally increase the probability of delivery of a significant debris load. SL = 1 in 15 for the Sprackburn Tributary, which indicates quite a steep catchment.
- Q_n, the flow in the channel. Higher flows generally increase the probability of delivery of a significant debris load. In this case the design (1000 year) flood event has been calculated as $6.58m^3/s$.
- R (rural) / AG (agricultural) / SU (suburban) / SO (suburban-open) / U (urban). These designations represent the types of landuse in the catchment. Woodland and urban landuses were found to be

most likely to generate significant debris volumes, and both of these landuses are present in the Sprackburn catchment.

- ID, the degree of social deprivation in the catchment (technically the 'Income Domain'). Poorer areas have been found to greatly increase the possibility of fly-tipping. The Pobal HP Deprivation Index 2011 for Ireland shows housing in the catchment falling into the '*Disadvantaged*' category, which is the 3rd most disadvantaged category out of 8. This increased the likelihood of fly-tipping in the catchment.

Various equations are presented in that document for estimating the probability of significant debris volumes being conveyed downstream. Seasonality factors also apply and the relative significance of the various parameters varies throughout the year (eg. fly-tipped garden waste would obviously be higher in summer). Unfortunately all of the equations have poor R^2 values and for this reason it is not possible to use any of the equations to definitively calculate the probability of a significant debris load arriving at the screens. Nevertheless, the parameters used in the equations give an idea of what factors can increase the probability of a high debris load being generated.

Given that the Sprackburn catchment is characterised by a steep channel slope, with woodland/urban landuses, and a reasonably high degree of social deprivation, the probability of a significant debris load being generated by an intense rainfall event such as that which occurred on 26th July could be considered to be 'high'.

2.3 DESIGN REVIEW OF THE EXISTING SCREENS

2.3.1 Review of Screen Type

The existing screens at the entrance to the culvert, which were installed in 2011 when the culvert was extended to facilitate the construction of the new A&E Department, consist of a coarse screen, approximately 20m upstream of the culvert entrance, followed by a second screen at the culvert entrance itself, as shown in the photos below.

Figure 1: Upstream Trash Screen

Figure 2: Downstream Security Screen (replacement screen)

It should be noted that the downstream screen in place at the time of the flood on 26th July 2013 was broken as part of the response to the flooding incident, and a new downstream screen installed (Figure 2) with 100mm bar spacing. We have been informed that the new screen has the same physical characteristics as the previous screen in terms of angle, bar spacing etc.

Using the accepted terminology, the upstream screen operates as a coarse *trash screen*, while the downstream screen primarily operates as a *security screen* (but also collects trash under certain flood conditions).

If the downstream screen was primarily designed as a security screen, then in theory very little debris should have arrived at it, given the presence of a trash screen 20m upstream. However the downstream screen obviously did block on 26th July 2013, as the upstream screen was overwhelmed by the amount of debris arriving at it, part of which transferred to the downstream screen. The photograph below shows the substantial quantity of debris captured by the upstream screen. The screen was completely overwhelmed and in all likelihood a substantial quantity of debris bypassed this screen and made its way to the downstream screen.

Figure 3: Upstream Trash Screen after the Flood

We do not have sight of a detailed description of the design parameters associated with the screens, but in comparing the existing screens to the guidelines in respect of the above listed physical parameters, the following table summarises what is known about the existing screens:

Table 1: Description of Existing Screens

Parameter	***Upstream***	***Downstream***
Designation	Trash (assumed)	Security (assumed)
Angle of bars	60	60
Angle to the flow	90	90
Screen area (m^2)	3.2	10.5
Degree of blinding (design)	*Not known*	*Not known*
Bar spacing (centre to centre)	200mm	100mm
Bar shape	Round	Round

2.3.2 Review of Screen Area

We have assessed the adequacy of the existing screen area with reference to Section 7 of the *Security and Trash Screen Guide*. In terms of the characteristics of the catchment, which has a large bearing on the screen design, the following categorisation is made. Using this characterisation and employing the 'Magenis' method for estimating debris load quantities, a total annual debris load is calculated as shown below.

Table 2: Calculation of Debris Amount

Catchment	**Length**	**Debris Amount (Da)**
woodland/urban	720	55
suburban	0	0
open public areas (including golf courses)	0	0
open non-public areas (including farmland)	1000	20
Totals	*1720*	***75***

Using this catchment characterisation and debris loads, the following parameters are derived for the assessment (note figure or section number references relate to the *Security and Trash Screen Guide)*:

Table 3: Calculation of Design Debris Amount

Parameter	Details
Catchment type (Fig 7.4)	*Woodland/urban*
Length of upstream catchment	*1.72km*
Debris amount (Da) (Fig 7.4), as per Table 2	*75m^3/yr*
Average catchment gradient (S1085)	*65.76m/km (1 in 15)*
Design debris factor	*1 x Da*
Blinded depth factor **(Bdf)**	*0.45*
Design debris amount (Dda)	**75m^3/yr**

The required screen area is then calculated using the formula contained in Section 7.4.4:

$$\text{Area (m}^2\text{)} = \text{Dda} / (\text{Bdf x no. of events})$$

The number of events is taken as <u>three</u> as standard as per the guidelines. Using the above formula the required screen area is calculated as 56m^2. However this is a significant areal requirement and Section 7.3.1 of the *Security and Trash Screen Guide* states that there are lower and upper limits to screen size relative to the size of culvert protected, based on a review of satisfactorily performing screens. The guide permits the required size to be capped at <u>30 times the culvert cross sectional area</u> of 1.43m^2, which works out to be 43m^2. This is the required screen area that is taken forward to the discussion of screen modifications in Section 2.4 of this report.

This capping is permitted provided there are no unusual aspects to the upstream catchment that could generate exceptional amounts of debris. We would suggest that in light of the introduction of the proposed Flood Management Strategy at the hospital, which includes stream and catchment inspections amongst other preventative measures, the capping of the required screen area to 43m^2 is justified in this case.

The combined screen area of the two existing screens amounts to $13.7m^2$. A discussion is presented in Section 2.3.3 on whether provision of a total trash screen area of $56m^2$ in accordance with the *Security and Trash Screen Guide* is practical, or indeed desirable, in the context of risk mitigation at the site.

2.3.3 Bar Spacing

In relation to choosing the optimum bar spacing for the screens, Section 8.4 of the *Security and Trash Screen Guide* states:

> *Trash screens placed upstream of culverts and inverted siphons should have a minimum clear spacing of 150 mm between bars. The spacing should prevent the passage of material of the type and size likely to pose a significant risk at the site. In urban locations where larger debris needs to be excluded but smaller debris should be allowed to pass, spacing of 300 mm between bars may be appropriate.*

The bar spacing of 200mm on the upstream trash screen complies with this requirement.

The recommended bar spacing for a security screen in the *Security and Trash Screen Guide 2009* is no greater than 140mm. While the bar spacing of 100mm on the screen at the culvert entrance complies with this requirement, we would propose to amend the bar spacing of the screen at the culvert entrance to 140mm bar spacing to improve hydraulic efficiency.

2.4 PROPOSED MODIFICATIONS TO THE EXISTING SCREEN ARRANGEMENT

2.4.1 Design Philosophy

The proposed approach to screen modifications is as follows:

- The total trash screen area required is 43m^2, as set out in Section 2.3
- The total area provided at the existing security screen (to be called '**Screen 3**') is 10.5m^2. This will perform the dual role of trash screen and security screen and hence its area can be taken into consideration in the calculation of new screen area required, which is 32.5m^2
- It is proposed to replace Screen 3 with a screen consisting of a bar spacing of 140mm as discussed above.
- A new 'coarse' trash screen is to be constructed approx 15m inside the property boundary, upstream of the confluence of the Sprackburn Tributary and the 'Northern Tributary'. This screen will be called '**Screen 1**' and will be designed to prevent large objects such as oil drums, toys, gas cylinders etc. (as previously experienced in the catchment) from passing and causing blockage to downstream screens. The total screen area provided at this location will be 2.5m^2. The screen angle will be set at 60º to the horizontal.
- The remaining areal requirement of 30m^2 will be split between two new structures.
- **Screen 1A** will be constructed approx. 30m downstream of Screen 1, and will consist of two stepped screens as shown on Drawing 7284-2014. This will have a bar spacing of 200mm in accordance with Section 8.4 of the *Security and Trash Screen Guide* and will screen debris on the Sprackburn Tributary. A total of 13.5m^2 screen area will be provided here. The screen angle will be set at 60º to the horizontal.
- The existing upstream screen will be demolished and replaced by **Screen 2A** which will be constructed approx. 15m upstream of the culvert entrance, and will also consist of two stepped screens as shown on Drawing 7284-2014. This screen will have a bar spacing of 200mm in accordance with Section 8.4 of the *Security and Trash Screen Guide* and will screen debris on the both the Sprackburn Tributary and Northern Tributary. The screen angle will be set at 60º to the horizontal.

The proposed new layout of screens is shown on Drawing 7284-2003.

A robust maintenance plan is to be put in place to maintain the screens largely free from debris. This plan incorporates both manual inspection and regular raking of screens, plus CCTV and water level monitoring, as described in Section 2.4.2 below.

2.4.2 Facilitating Maintenance

Screen cleaning is covered under Section 11.1 of the *Security and Trash Screen Guide* and has been used in the development of maintenance facilities at the screens.

Access platforms with a working depth of 2m and handrailing will be provided at all screens to allow manual raking. In addition it will be possible to access the immediate vicinity of all four screens with a hiab lorry and/or tracked excavator to remove larger items and to transport away debris. A concrete plinth and skip will be provided for the temporary storage of debris removed from the screens. The maximum reach for manual raking will be set as 2m, and this will allow temporary storage of material on the platform.

2.4.3 CCTV and Water Level Monitoring

As well as looking at the design of the physical characteristics of the screen, the *Security and Trash Screen Guide 2009* (Section 4) also discusses overall risk mitigation associated with culvert screens.

The need to put a maintenance programme in place, and the extent of that programme, is based on an analysis of the risk of a blockage of the screens (including an analysis of debris load, flood frequency etc.) , and the consequences of such a blockage. In Section 4.7 of the *Security and Trash Screen Guide*, the following considerations are discussed in terms of reducing the overall risk profile associated with a screen blockage:

- An assessment of the need for CCTV monitoring
- An assessment of the need for automatic water level monitoring

The decision to install CCTV and water level monitoring is based on a Design Risk Assessment, in accordance with Table 4.4 of the document which is reproduced below. This risk assessment combines probability (of a blockage occurring) and consequence (if it does occur).

Blockage of culvert	Score				
	5	4	3	2	1
Probability	**More frequently than one in two years**	**One in two to one in five years**	**One in five to one in 10 years**	**One in 10 to one in 25 years**	**Less frequently than one in 25 years**
	Regular recorded blockage (e.g. once or twice in the last two years).	Some record of blockage (e.g. once or twice in the last five years) or Culvert size under one m^2, catchment urban or woodland.	Culvert size under one m^2 and at least 50 per cent urban or woodland or Culvert size over one m^2 and under three m^2 with potential blockage points.	Culvert size over one m^2 and under three m^2 or Culvert size over three m^2 with no upstream public access.	Culvert size over three m^2
Consequence	**Over £1 million**	**£100,000 to £1 million**	**£10,000 to £100,000**	**£1,000 to £10,000**	**Under £1,000**
	Cost of flooding damages **plus** Cost of removing blockage and culvert repair (per event).	Cost of flooding damages **plus** Cost of removing blockage and culvert repair (per event).	Cost of flooding damages **plus** Cost of removing blockage and culvert repair (per event).	Cost of flooding damages **plus** Cost of removing blockage and culvert repair (per event).	Cost of flooding damages **plus** Cost of removing blockage and culvert repair (per event).
Damage caused by debris to infrastructure of culvert	**Score**				
	5	4	3	2	1
Probability	**More frequently than one in two years**	**One in two to one in five years**	**One in five to one in 10 years**	**One in 10 to one in 25 years**	**Less frequently than one in 25 years**
	Impact damage to structure from debris in flow (e.g. once or twice in the last two years).	Impact damage at frequency of once or twice in the last five years.	Some impact damage possible due to size of debris.	Low but some possibility of impact damage.	Rare likelihood of damage or no impact damage possible.
Consequence	**Over £1 million**	**£100,000 to £1 million**	**£10,000 to £100,000**	**£1,000 to £10,000**	**Under £1,000**
	Repairs involving diversion of watercourse and works to full length of culvert.	Repairs involving significant temporary works and works to more than half of culvert length.	Repairs involving some temporary works and repairs to less than half of culvert length.	Repairs requiring no temporary works.	Minor repairs required, not in urgent need of attention. May be encompassed in general maintenance.

The guidelines state that:

Any proposed screen site with a consequence score of five, for either blockage or damage (see Table 4.4), must have remote water-level monitoring installed, linked by telemetry to an operational centre and should have CCTV as an integral part of the scheme. Any proposed screen site with a consequence score of four, for either blockage or damage (see Table 4.4), must have remote water-level monitoring installed, linked by telemetry to an operational centre as an integral part of the scheme. In this scenario the installation of CCTV should be considered. At all other sites, remote water-level monitoring must be considered as part of the Design Risk Assessment. It can only be omitted where the risk can be acceptably mitigated or the consequence is negligible.

In relation to Letterkenny General Hospital, this would suggest that both water level monitoring and CCTV would be required at trash screens. It should be noted however that this Environment Agency document is not a statutory requirement in Ireland, and furthermore, the frequency of blockage is something that can only be assessed based on historical operational data.

Following the flood event in July 2013, both CCTV and ultrasonic water level monitoring have been installed at the two existing screens, thereby reducing the risk of a recurrence of blockage at the culvert. A water level monitor is located immediately downstream of the security screen, and a second at the upstream trash screen, allowing hospital maintenance staff to monitor the relative water levels at these points.

It is now proposed that all four screens will have both CCTV and ultrasonic water level monitoring installed, as shown on Drawing 7284-2003. In addition a high level 'breach alarm' is to be installed as part of Secondary Protection Measures to provide a warning that overtopping at the headworks is about to occur.

These monitoring arrangements form a central part of the Flood Management Strategy being put in place at the hospital.

3 PROPOSED BYPASS CULVERT SCREEN DESIGN

3.1 PROPOSED LONG-TERM ENGINEERING SOLUTION

The proposed long-term engineering solution involves the construction of a storm routing culvert around the western perimeter of the hospital site, as outlined in our Stage 2 Engineering Assessment Report.

We have also examined the option of constructing an open channel generally along the same route on the western perimeter of the site. An open channel could either be utilised as an overflow channel in lieu of the proposed culvert, or indeed as a full diversion of the stream around the perimeter of the site. There are advantages and disadvantages to such an approach, as follows:

Advantages

- The open channel would not carry the possibility of a blockage at its entrance as it would operate without a screen
- It would be less susceptible to collapse than a closed culvert

Disadvantages

- If constructed as an alternative overflow, the open channel would be 4m deep in places, and would be very difficult to construct safely in the limited space between the Acute Mental Health Unit and the hospital boundary (note that this does not apply to the full stream diversion approach)
- If constructed as a full stream diversion, this would require extensive liaison with the OPW and would not be capable of being constructed in the short-term, which is the goal for the proposed overflow culvert
- If the open channel were constructed as an overflow, it would be a deep dry channel most of the time, and there would be an associated safety risk so close to the Acute Mental Health Unit. It would also be a magnet for litter.
- If the open channel were constructed as a full stream diversion, there would also be an associated safety risk with a 'flashy' fast flow stream running through the hospital grounds, which is essentially a public facility.

Taking account of the above factors, and the need to put an engineering solution in place in the short-term, we have chosen the overflow culvert as the preferred option.

3.2 THE NEED FOR A SCREEN

The overflow culvert has been designed to operate in the event of a blockage to the existing culvert, and in accordance with Section 12 of the *Security and Trash Screen Guide 2009* can be considered a *screen bypass*. We have considered whether a screen is to be provided on this bypass, in light of the recommendations in the reference documents, mindful of the fact that the main hazard associated with the bypass is that it in itself could become blocked by trash.

The first decision to be made is whether a screen on the bypass is required at all. The CIRIA document titled *Culvert Design and Operation Guide (C689),* states that*:*

Security screens should be provided where there is a significant risk to the general public….Indicators of high risk of the hazard include:

- *Long culverts (say more than 50m)*
- *Culverts that may flow full*
- *Steep culverts with swift flow velocity*
- *Culverts with internal hazards such as steps in the bed or a hydraulic jump*

Indicators of high risk in terms of likelihood and anyone being exposed to the hazard are:

- *A history of previous incidents*
- *Location of the culvert entrance near to areas where children are known to congregate*

Taking into consideration the proximity of local housing and the accessibility of the culvert to local children, and given the fact that the culvert will be significantly in excess of 50m long, a *security screen* will be required on the entrance to the bypass culvert. We would consider that given the fact that the bypass culvert entrance is set as a high level at right angles to the direction of flow, and that the three in-line screens will trap the majority of the debris, there is no particular requirement for an additional *trash screen*.

For this reason, the bar spacing and other parameters will be designed in accordance with *security screen* requirements.

3.3 BYPASS SCREEN DESIGN

The design of the screen at the entrance to the proposed bypass culvert is based on its function as a *security screen*, as outlined above. For this reason, in accordance with *Security and Trash Screen Guide 2009*, a detailed calculation of screen area is not required.

The designation as a security screen assumes:

- The upstream trash screens, set at 90º to the flow, will be properly designed to capture the debris load
- The bypass security screen will be set at a high level, and as such will not accumulate debris on an ongoing basis
- Any debris that does build up on this screen will be periodically removed through regular maintenance

In accordance with Section 8.2 of the *Security and Trash Screen Guide 2009*, a bar spacing of 140mm is proposed for the bypass screen. This will match the proposed bar spacing on the security screen at the main culvert entrance. The screen angle will be set at 60º to the horizontal. A platform to facilitate screen maintenance will also be provided as per the guidelines.

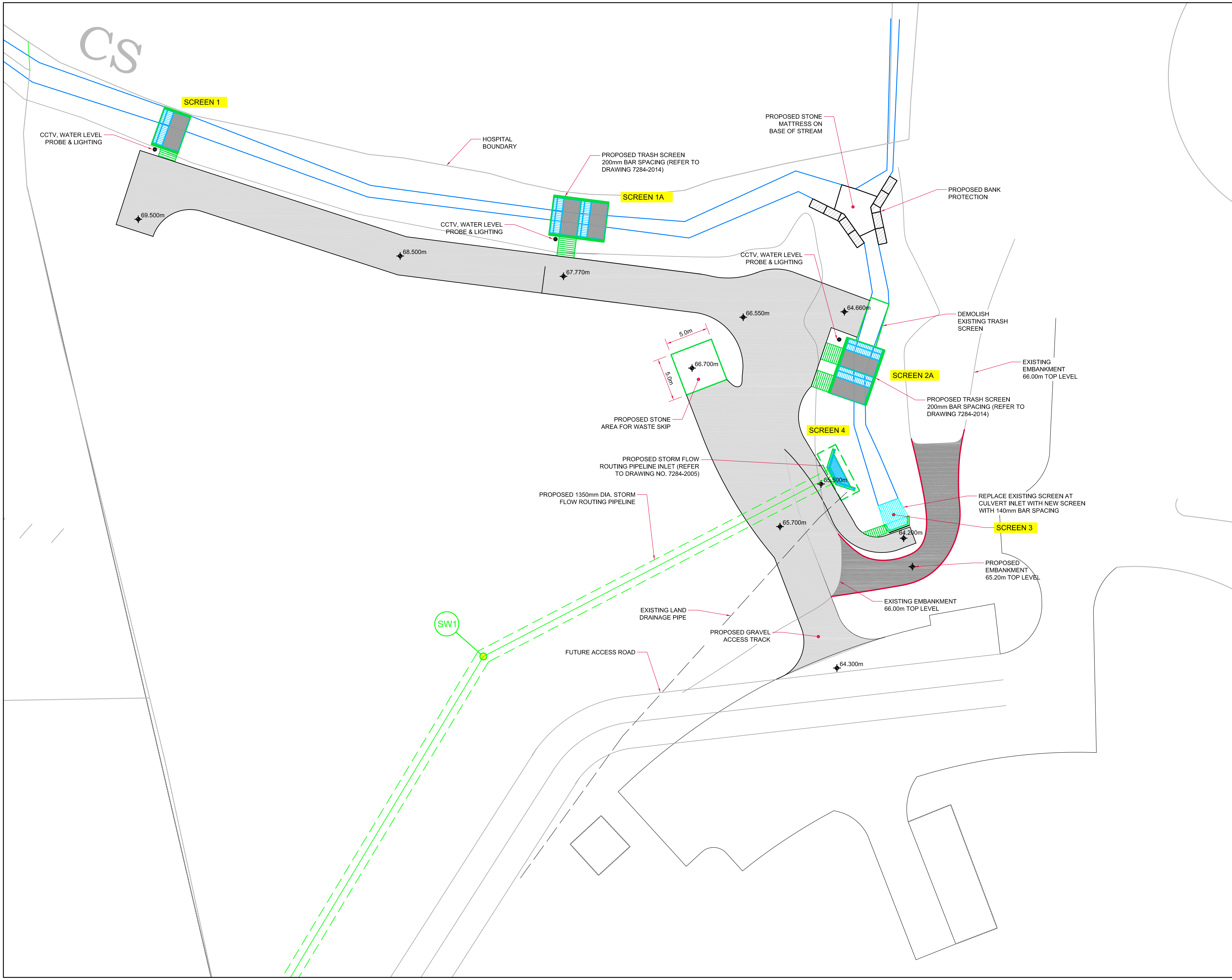
The proposed layout for the bypass screen design is shown on Drawing 7284-2005.

APPENDIX 1: DRAWINGS

Drawing 7284-2003 Proposed Headworks Details

Drawing 7284-2005 Details of Proposed Storm Routing Culvert Inlet Chamber

Drawing 7284-2015 Details of Proposed Screens 1A and 2A



NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD, THE GEOGRAPHIC COORDINATE SYSTEM IS TO IRISH TRANSVERSE MERCATOR (ITM)

Rev.	Date	Description	By	Chkd.
B	NOV '13	REVISED SCREEN LAYOUT	P.R.	B.G.
A	OCT '13	ARTICLE 35 INFORMATION	J.M.	P.R.

Client
HSE ESTATES

Project
PROPOSED STORM FLOW ROUTING PIPE AT LETTERKENNY GENERAL HOSPITAL

Title
PROPOSED HEAD WORKS DETAILS

Scale @ A1 1:200

Prepared by:	Checked	Date
J.M.	P.R.	OCT.2013

Project Director Brian Downes

Drawing Status PLANNING

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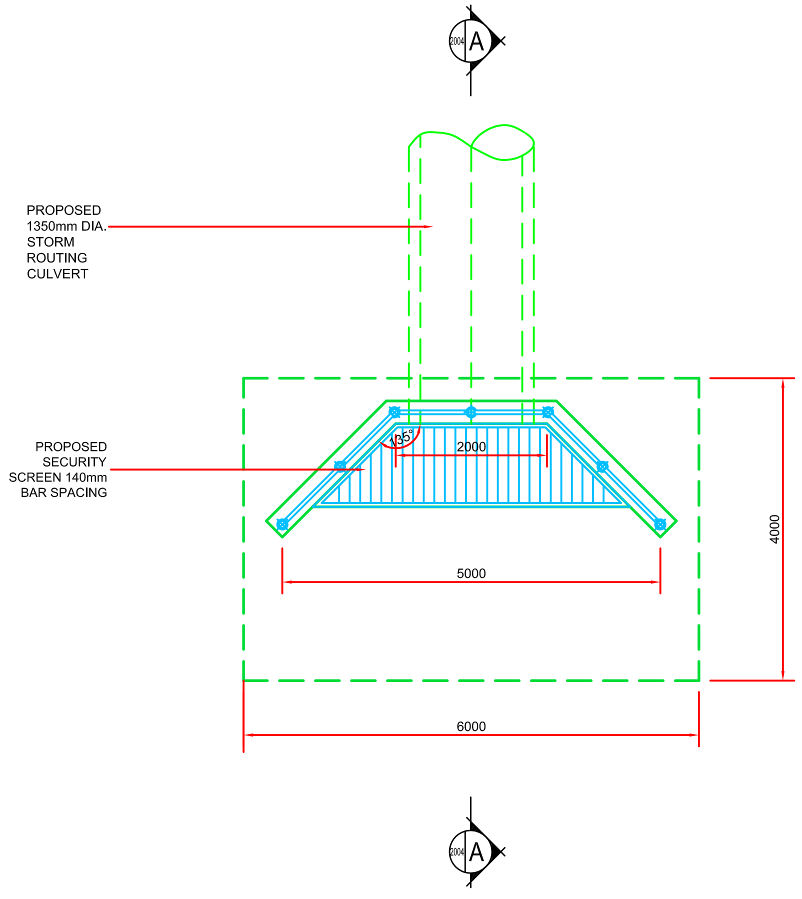
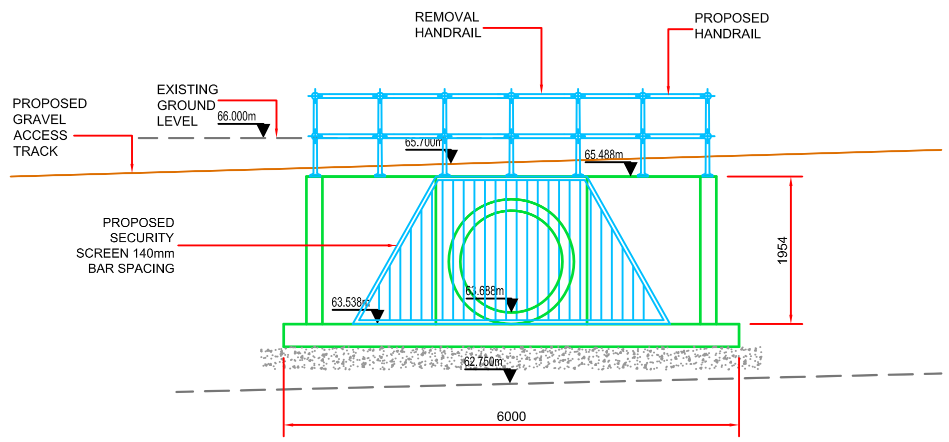
Drawing No. 7248-2003

Issue B



STORM ROUTING CULVERT INLET - PLAN
SCALE 1:50



FRONT ELEVATION
SCALE 1:50

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
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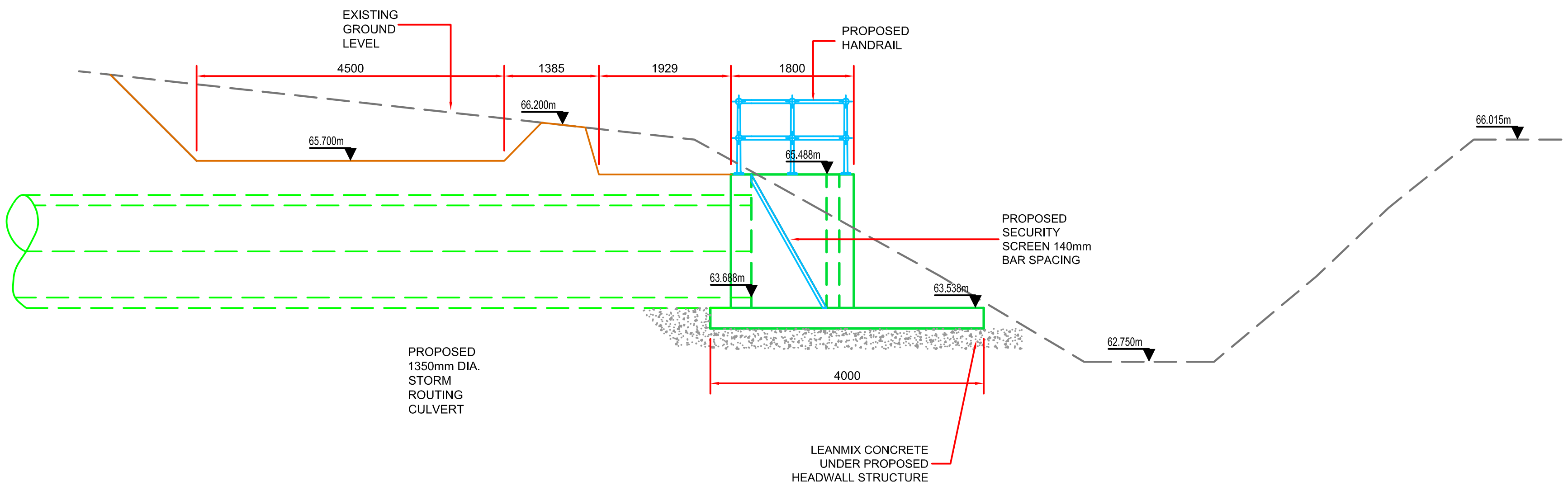

SECTION A-A
SCALE 1:50

Rev.	Date	Description	By	Chkd.
B	NOV '13	SCREEN BAR SPACING AMENDED	P.R.	B.G.
A	OCT '13	ARTICLE 35 INFORMATION	J.M.	P.R.

Client
HSE ESTATES

Project
PROPOSED STORM FLOW ROUTING PIPE AT LETTERKENNY GENERAL HOSPITAL

Title
DETAILS OF STORM ROUTING CULVERT INLET CHAMBER

Scale @ A1	1:50	
Prepared by: J.M.	Checked P.R.	Date OCT.2013
Project Director	Brian Downes	
Drawing Status	PLANNING	

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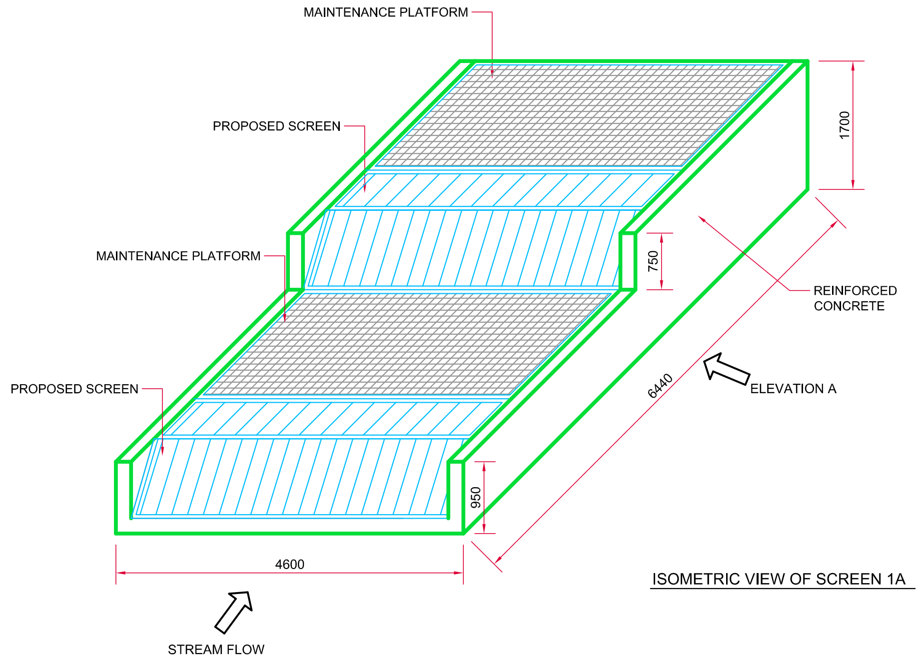
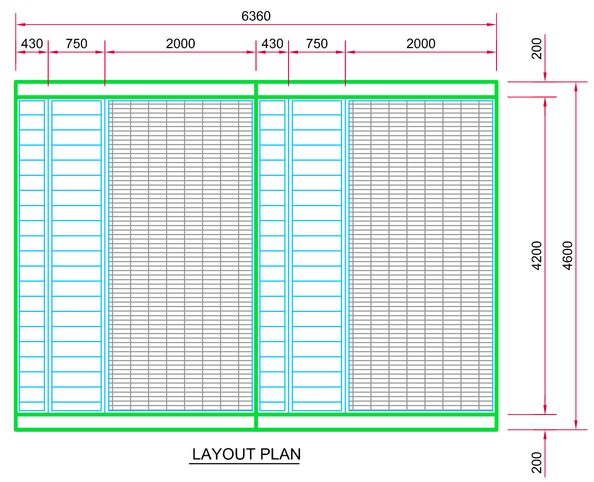
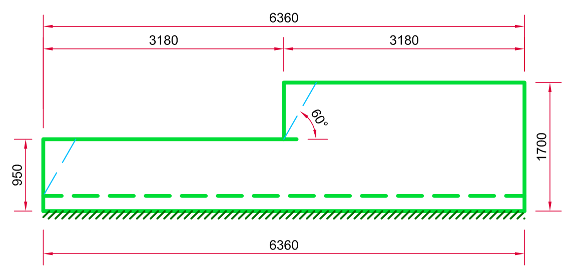
Drawing No. 7248-2005
Issue B



ISOMETRIC VIEW OF SCREEN 1A

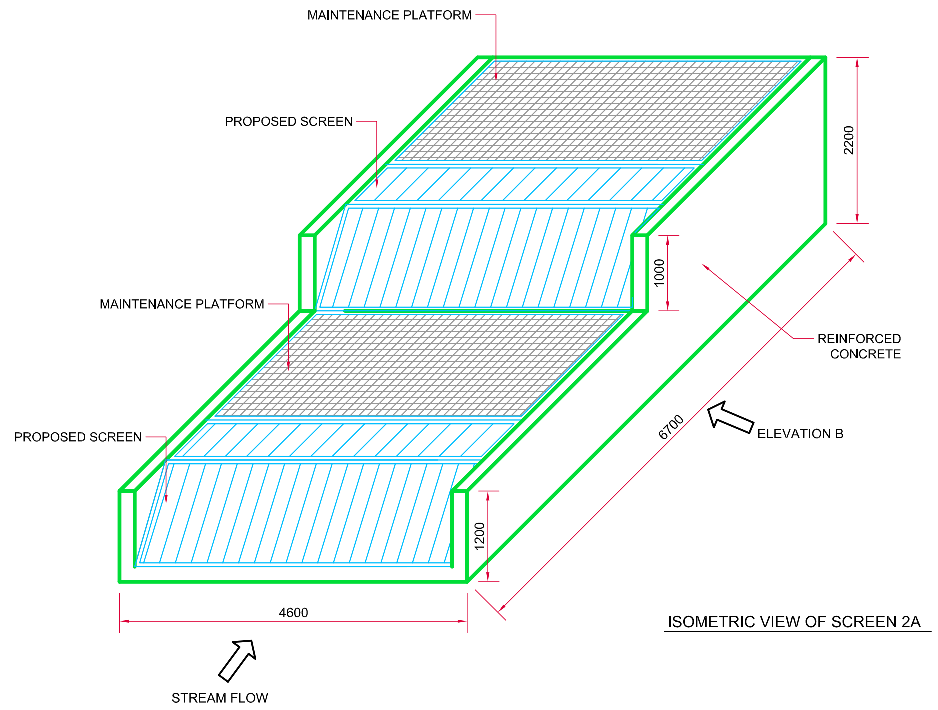


LAYOUT PLAN

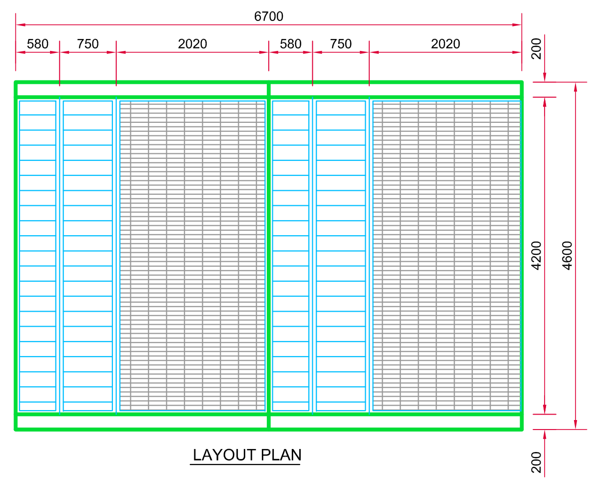


ELEVATION A

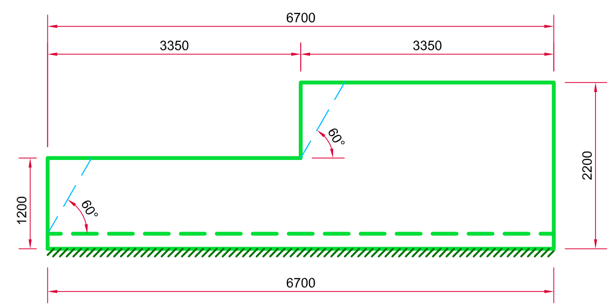
DETAILS OF SCREEN 1A



ISOMETRIC VIEW OF SCREEN 2A



LAYOUT PLAN



ELEVATION B

DETAILS OF SCREEN 2A

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD, THE GEOGRAPHIC COORDINATE SYSTEM IS TO IRISH TRANSVERSE MERCATOR (ITM)

Rev.	Date	Description	By	Chkd.
A	NOV '13	FIRST ISSUE	J.M.	P.R.

Client
HSE ESTATES

Project
PROPOSED STORM FLOW ROUTING PIPE AT LETTERKENNY GENERAL HOSPITAL

Title
DETAILS OF INLET SCREENS 1A AND 2A

Scale @ A1 1:50
Scale @ A3 1:100

Prepared by:	Checked	Date
J.M.	P.R.	NOV 2013

Project Director: Brian Downes
Drawing Status: PLANNING

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Issue A