



Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU

TAN15: Flood Consequence Assessment

For Straightforward Properties Ltd

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www.krsenvironmental.com

CONTACT DETAILS

Registered Office:
 KRS Environmental Ltd
 3 Princes Square
 Princes Street
 Montgomery
 Powys
 SY15 6PZ

Tel: 01686 668957
 Mob: 07857 264 376

Email: keelan@krsenvironmental.com
 Web: www.krsenvironmental.com
 LinkedIn: uk.linkedin.com/in/keelanserjeant/

Office also at:
 KRS Environmental Ltd
 The Media Centre
 7 Northumberland Street
 Huddersfield
 West Yorkshire
 HD1 1RL

Tel: 01484 437420
 Mob: 07857 264 376

Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU

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| Prepared by | Keelan Serjeant BSc (Hons), MSc, MCIWEM |
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EXECUTIVE SUMMARY

The proposed development would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FCA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable, and the development would be in accordance with the requirements of TAN15.

This FCA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of TAN15. The development should not therefore be precluded on the grounds of flood risk.

1.0 INTRODUCTION

1.1 Background

This Flood Consequence Assessment (FCA) has been prepared by KRS Environmental Limited to support a planning application for the proposed development at Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU.

This FCA has been carried out in accordance with guidance contained in Technical Advice Note 15 Development and Flood Risk (TAN15) and associated Development Advice Maps. This FCA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 Technical Advice Note 15 (TAN15)

One of the key aims of TAN15 is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall. A risk-based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FCA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all sources;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate; and
- satisfy the justification test, including the acceptability of consequences.

1.3 Justification Test

The Justification Test sets out the details required to justify siting a new development in an area believed to be at risk of flooding and is defined in Section 6 of TAN15. The required criteria a site / development must fulfil are;

- i) its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or
- ii) its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and

- iii) it concurs with the aims of PPW and meets the definition of previously developed land; and,
- iv) the potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

1.4 Report Structure

This FCA has the following report structure:

- Section 2 describes the location area and the existing and proposed development;
- Section 3 outlines the flood risk to the existing and proposed development;
- Section 4 outlines mitigation measures used to reduce the overall level of flood risk;
- Section 5 provides justification of the proposed location of the development; and
- Section 6 presents a summary and conclusions.

2.0 LOCATION & DEVELOPMENT DESCRIPTION

2.1 Site Location

The site is located at Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU (see Figure 1). The National Grid Reference (NGR) of the site is 295852, 290626.

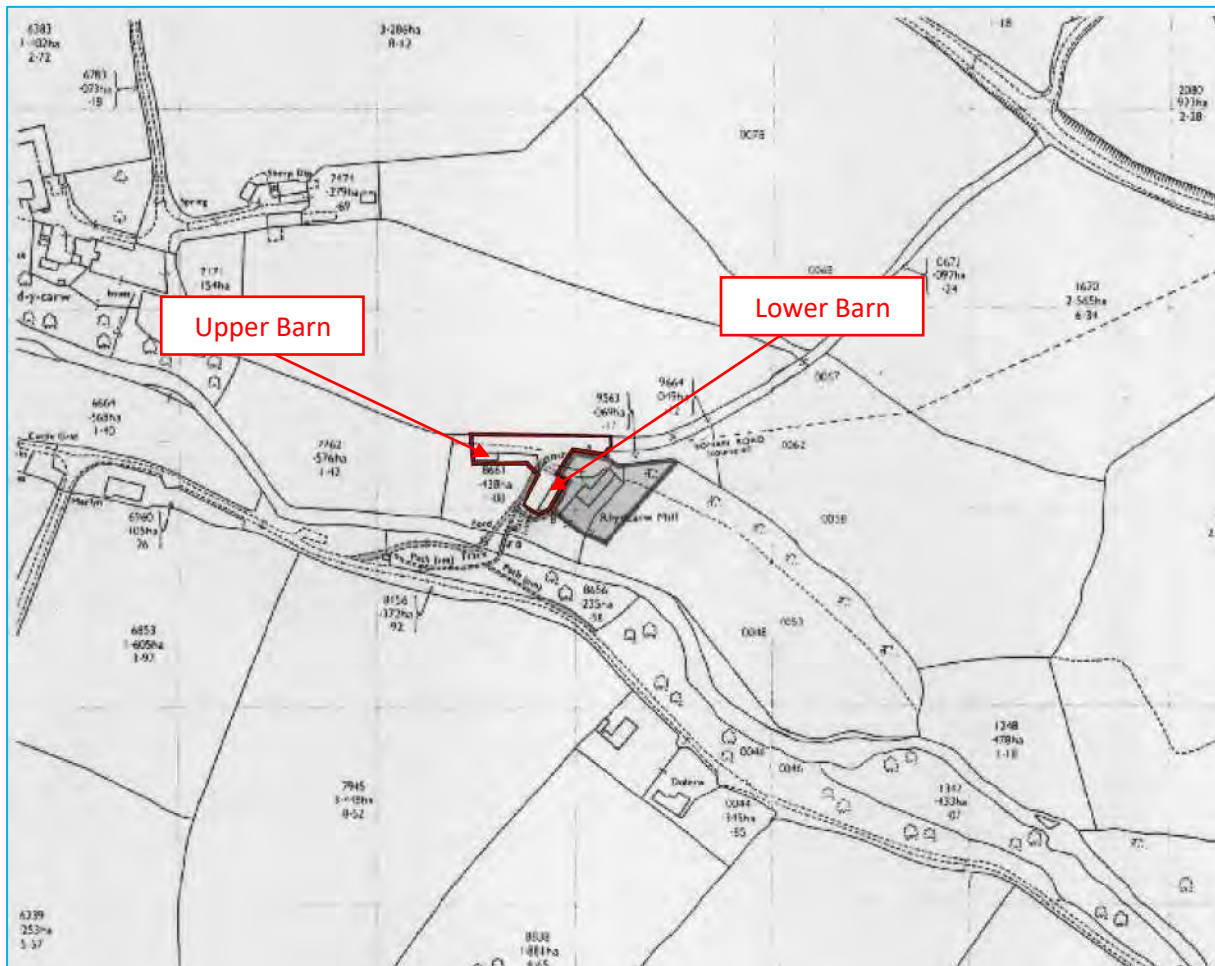


Figure 1 - Site Location

2.2 Existing Development

Located on the site are two barns, an upper barn and a lower barn (see Appendix 1). The upper barn is disused and the lower barn is used as kennels and for storage.

2.3 Proposed Development

The proposed development is for the conversion of the barns to a multifunctional corporate retreat/events development (see Appendix 2). The upper barn will be used for accommodation and the lower barn will be used as an events studio with storage and an office. Further details with regard to the proposed development can be found in the accompanying information submitted with the planning application.

2.4 Ground Levels

A topographical survey of the site and the River Trannon has recently been undertaken (see Appendix 3). The site ground level rises from the south to the north, the minimum ground level is 148.31 metres Above Ordnance Datum (mAOD) and the maximum ground level is 153.03mAOD.

The external ground level at the location of the upper barn is 149.76mAOD and the existing internal ground level of the upper barn is 149.74mAOD to 151.15mAOD. The external ground level at the location of the lower barn is 147.90mAOD and the existing finished floor level of the lower barn is 148.45mAOD.

2.5 Catchment Hydrology

The River Trannon (Afon Trannon) is located adjacent to the southern boundary of the site. The River Trannon is a tributary of the River Severn and flows into the River Severn approximately 6.50km downstream of the site just upstream of Caersws.

At this location, the River Trannon is approximately 5m wide and 0.50m to 1.00m deep (see Figure 2). Just downstream of the site is a footbridge across the River Trannon (see Figure 3), no other structures on the River Trannon are located within the vicinity of the site.



Figure 2 - River Trannon adjacent to the site looking Downstream



Figure 3 - Footbridge Adjacent to the Site Looking Downstream

2.6 Ground Conditions

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site consists of the Caerau Mudstones Formation - mudstone and the Rhayader Mudstones Formation - mudstone. The superficial deposits consist of Glaciofluvial Deposits, Devensian - sand and gravel and Alluvium - gravel, sand, silt and clay.

3.0 FLOOD RISK

3.1 Sources of Flooding

All sources of flooding have been considered, these are: fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

3.2 Natural Resources Wales

Information regarding the current flood risk at the application site, local flood defences and flood water levels has been obtained from Natural Resources Wales. Natural Resources Wales has confirmed that they do not hold any modelled data for the site (see Appendix 4).

3.3 Powys County Council

Powys County Council is the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA) and has responsibilities for 'local flood risk', which includes surface runoff, groundwater and ordinary watercourses. Planning guidance written by Powys County Council regarding flood risk was consulted to assess the mitigation policies in place. In particular, the Powys County Council Strategic Flood Consequence Assessment (SFCA) has been reviewed.

3.4 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within TAN15 recommends that the effects of climate change are incorporated into FCA. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the CL-03-16 - Climate change allowances for Planning purposes.

Table 1 show the peak river flow allowances by river basin district. There is reasonable level of certainty that the future impacts of climate change will lie somewhere between the central and upper allowances.

The 9th January 2014 Welsh Government letter to all Chief Planning Officers (CPO) in Wales and CL-03-16 - Climate change allowances for Planning purposes clarifies and refers to the Natural Resources Wales recommendations that the lifetime of development for residential development is 100 years, and for other development it is considered to be 75 years i.e. 2095.

Table 1 - Peak River Flow Allowances by River Basin District (use 1961 to 1990 baseline)

| River Basin District | Allowance Category | Total Potential Change Anticipated by the 2020s | Total Potential Change Anticipated by the 2050s | Total Potential Change Anticipated by the 2080s |
|----------------------|--------------------|---|---|---|
| Severn | Upper end | +25% | +45% | +70% |
| | Central | +10% | +20% | +25% |
| | Lower end | +0% | +5% | +5% |

3.5 Historic Flooding

The Natural Resource Wales historic flood outline map shows that the site has not historically flooded. The British Hydrological Society (BHS) "Chronology of British Hydrological Events"¹ has no information on flooding within the vicinity of the site. No other historical records of flooding for the site have been recorded.

The River Trannon does overtop its banks within the vicinity of the site but this does not result in flooding of the site, as shown in Figures 4 and 5.



Figure 3 - Flooding on the 29/10/2020 from the Footbridge Looking at the Upper Barn

¹ <http://www.dundee.ac.uk/geography/cbhe/>



Figure 4 - Flooding on the 29/10/2020

3.6 Existing and Planned Flood Defence Measures

The site is not protected against flooding by existing flood defence measures. The flood risk will be further mitigated by using a number of risk management measures to manage and reduce the overall flood risk at the site, these are discussed in Section 4.0.

3.7 Development Advice Map

The Development Advice Map (DAM) which accompanies TAN15 shows that the site is located within C2 - Areas of the floodplain without significant flood defence infrastructure (see Figure 5).

Table 2 describes the composition and use of the TAN15 zones to control and manage development. Applying the Flood Risk Vulnerability Classification in Figure 2 of TAN15, the proposed development is classified as 'highly vulnerable'.

However, the lower barn will be used as an events studio with storage and an office and can be classified as 'less vulnerable'. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building.

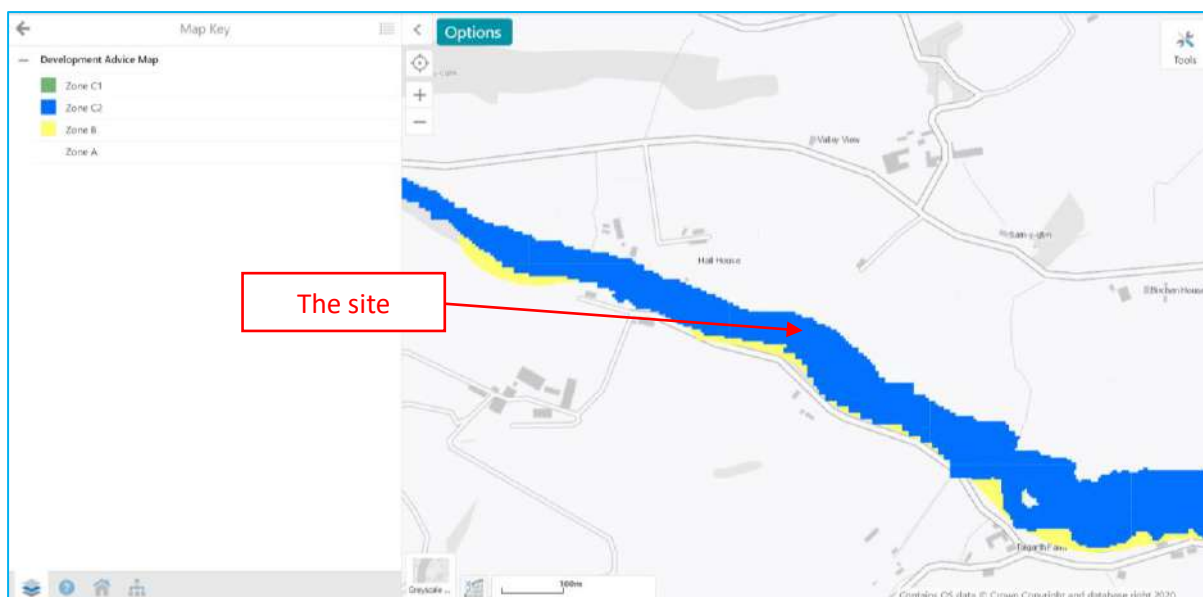


Figure 5 - Development Advice Map

Table 2 - Development Advice Map Flood Zones

| Description of Zone | Zone | Use within the precautionary Framework |
|---|------|--|
| Considered to be at little or no risk of fluvial or tidal/coastal flooding. | A | Used to indicate that justification test is not applicable and no need to consider flood risk further. |
| Areas known to have been flooded in the past evidenced by sedimentary deposits. | B | Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. |
| Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal) | C | Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences. |
| Areas of the floodplain which are developed and served by significant infrastructure, including flood defences. | C1 | Used to indicate that development can take place subject to application of justification test, including acceptability of consequences. |
| Areas of the floodplain without significant flood defence infrastructure. | C2 | Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered. |

3.8 Natural Resources Wales Flood Risk Map

A review of the Natural Resources Wales Flood Risk Map indicates that the site is located within the high fluvial flood risk zone with a chance of flooding of greater than 1 in 30 (3.3%) years (see Figure 6). The upper barn is shown to be located within the very low fluvial flood risk zone with a chance of flooding of less than 1 in 1000 (<0.1%) years. The lower barn is located within the high fluvial flood risk zone with a chance of flooding of greater than 1 in 30 (3.3%) years.

The Flood Risk Map is the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. The Natural Resources Wales flood zones show the worst-case scenario.



Figure 6 - Natural Resources Wales Flood Risk Map

3.9 Fluvial (river) Flooding

The River Trannon poses the primary flood risk to the site. In extreme events the River Trannon may overtop its banks and inundate a small proportion of the site with floodwater. The local topography is such that floodwater could only possibly enter the site at one place, to the west of the site. In order to do so, water depth within the River Trannon would need to be greater than 1.50m to overtop the left hand river bank.

Hydrological Modelling

The topography of the floodplains within the vicinity of the site is constricted and the mechanisms of flooding are not complex. Any flooding would be of a minor nature due to the low flows and topography of the area. The flooding will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site. The actual risk of flooding caused by overtopping of the riverbank during a fluvial flood event on the River Trannon will be reduced compared to the extent of flooding shown in the Natural Resources Wales flood outlines.

It is important to understand the hydrological nature of the River Trannon due to its implications on fluvial flood risk at the site. Such an investigation was undertaken using 'industry standard' techniques such as the Centre for Ecology and Hydrology (CEH) Flood Estimation Handbook (FEH) webservice, the FEH Statistical Method and the Revitalised Rainfall Runoff (ReFH)² Method. These methods are based on robust hydrological modelling techniques and are described in the Flood Estimation Handbook (FEH). The FEH Calculation Record is shown as Appendix 5.

Catchment descriptors from the FEH webservice can be used to infer the physical nature of the catchment and its possible response to a rainfall event. Table 3 sets out the relevant catchment descriptors for the study catchment upstream of the site at National Grid Reference (NGR) 354950, 217400 (see Figure 7). To ensure the runoff from the entire catchment is taken into account and flood flows are not underestimated, it is intended to calculate peak flows for the full catchment to the

downstream limit of the site. A definition of each can be found at <http://www.environment-agency.gov.uk/hiflows/97768.aspx>.

Table 3 - FEH Catchment Descriptors

| Catchment Descriptor | Value |
|----------------------|-----------------------|
| NGR | 295900, 290600 |
| Area | 29.58 km ² |
| Altbar | 358 m |
| Aspbar | 147 degrees |
| Aspvar | 0.16 |
| Bfihost | 0.410 |
| Bfihost19 | 0.364 |
| CentroidEasting | 291,961 m |
| CentroidNorthing | 292,449 m |
| Dplbar | 6.59 km |
| Dpsbar | 145.00 m/km |
| Farl | 1.0000 |
| Fpext | 0.0360 |
| Fpdbar | 0.398 cm |
| Fploc | 1.190 |
| Ldp | 12.94 km |
| Propwet | 0.660 |
| Rmed1H | 10.9 mm |
| Rmed1D | 50.4 mm |
| Rmed2D | 62.8 mm |
| Saar6190 | 1,559 mm |
| Saar4170 | 1,492 mm |
| Sprhost | 44.95 % |
| Urbconc1990 | |
| Urbext1990 | 0.0001 |
| Urbloc1990 | |
| Urbconc2000 | |
| Urbext2000 | 0.0000 |
| Urbloc2000 | |
| CatchmentRainC | -0.027 |
| CatchmentRainD1 | 0.483 |
| CatchmentRainD2 | 0.392 |
| CatchmentRainD3 | 0.378 |
| CatchmentRainE | 0.293 |
| CatchmentRainF | 2.466 |
| GridRainD1 | 0.479 |
| GridRainD2 | 0.377 |
| GridRainD3 | 0.383 |

The catchment boundary has been checked against the OS mapping and no changes are necessary. Qualitative checks on FARL using mapping and BFIHOST checked using soil maps was undertaken. The

soil catchment details were checked by using soil maps the catchment location. A visual assessment using Google Maps and the FEH Webservice Map was used to check the URBEXT2000 value and FARL. With a low URBEXT value, it was not necessary to consider any updating. These values were consistent with the maps. No catchment descriptors were altered from the initial FEH catchment descriptors.

The catchment area is small at 29.58km², the SPRHOST value (Standard Percentage Runoff) is 44.95% and indicates a low permeable catchment. Approximately 44.95% of the rainfall will contribute to direct runoff rather than be stored and reflects the low permeability of the underlying geology. The BFIHOST value (Baseflow Index) is low at 0.410.

The descriptors BFIHOST and SPRHOST are representative of the permeability of catchment soils and geology, a high BFIHOST and a low SPRHOST value indicate a very permeable catchment, whilst a low BFIHOST and high SPRHOST indicate a very impermeable catchment. Based on the relatively broad scale data sets that inform the catchment descriptors, the catchment descriptors values indicate a reasonably impermeable catchment.

The SAAR6190 (Standard Average Annual Rainfall) value is high at 1559. The URBEXT2000 value is 0.00 and therefore, the catchment is essentially rural. The catchment descriptors were used to calculate the design flow on River Trannon, using the FEH Statistical Method and the ReFH2 method.

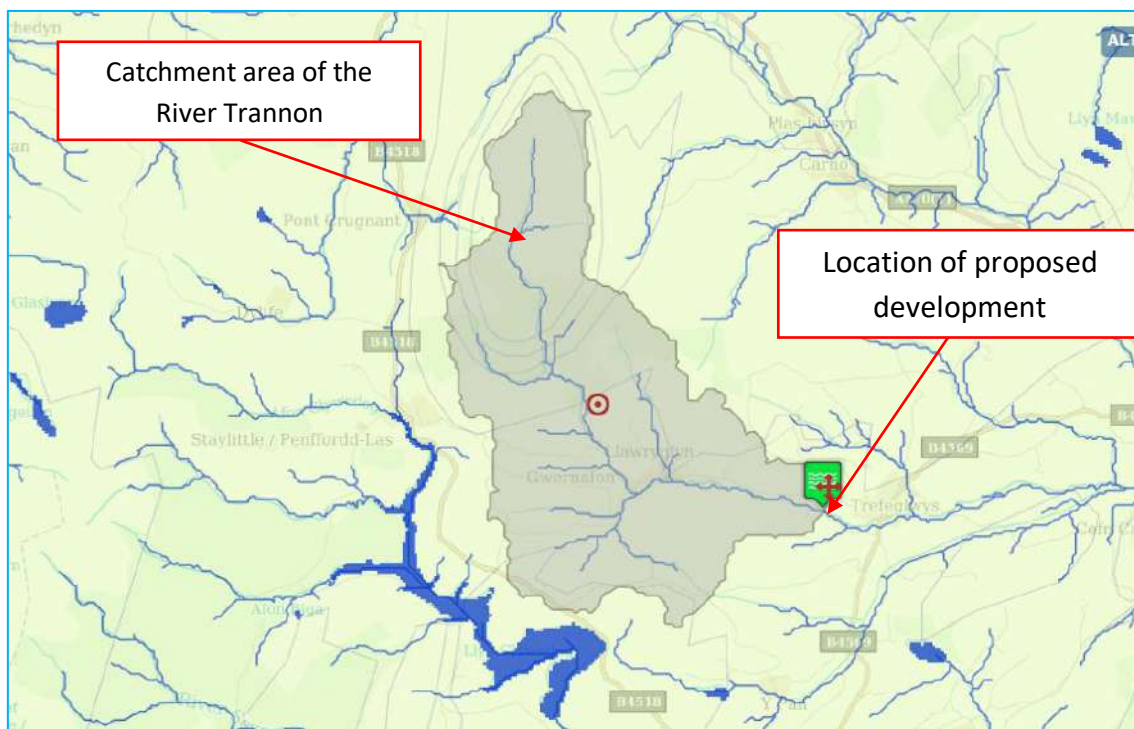


Figure 7 - River Trannon Upstream Catchment as shown on the FEH webservice

FEH Statistical Method

The statistical method is based on an Index Flood, which is the mean annual flood (QMED – with a return period of 2 years) from catchment descriptors and then improving this using data from an appropriate gauging station. The standard output from the method is presented in Appendix 6. Changes have been made to the QMED adjustment process in WINFAP-FEH3.0.003 updated with Version 7 of the NRFA Peak Flow Dataset, which improves upon the previous method. The value of QMED calculated from the catchment descriptors using the FEH Statistical Method is 0.95m³/s.

It is common practice to adjust QMED using gauged data from so-called donor catchments. The search area was restricted to 20km because the effect that the new data transfer method has on QMED adjustment becomes negligible when the distance between catchment centroids is greater than 10km.

Recent research has shown that the use of distant donor catchments is not the most accurate way to calibrate the QMED equation. As an alternative, sites should be chosen to minimise the geographical distance between the centroids of the target and donor catchments. This is based on a Guidance Note issued by the Environment Agency in July 2008 (from SC050050/SR Report and incorporated in WINFAP-FEH v3).

No suitable donors could be located for the site. They were either too distant (with centroids greater than 10km away) or too large and therefore of potentially contrasting hydrological regime (see Table 5).

Table 5 - Candidate Donor Sites for QMED

| Station | QMED Donor | Centroid Distance (km) | Area | SAAR | BFIHOST |
|----------------------------------|------------|------------------------|--------|------|---------|
| gb 295900, 290600 (subject site) | -- | -- | 29.58 | 1559 | 0.410 |
| 54014 (Severn @ Abermule) | 26.039 | 8.64 | 574.66 | 1256 | 0.449 |
| 54091 (Severn @ Hafren Flume) | 23.095 | 9.47 | 3.44 | 2514 | 0.303 |
| 54022 (Severn @ Plynlimon Flume) | 24.906 | 9.75 | 8.69 | 2483 | 0.323 |

Growth factors can be estimated from site records, if available, but should only be used for return periods of up to half the length of record, so determination of the 1 in 100 year event would require 200 years of recorded data. For longer return periods, the so-called pooled analysis is recommended. This method derives a growth curve from weighted parameters of catchments with similar hydrological characteristics. Data from the HiFlows-UK database has been used in deriving the Pooling Group. In addition, following guidance issued by the Environment Agency in 2009, pooling groups should use at least 500 station years of data, irrespective of the return period of interest.

WINFAP-FEH initially found 19 sites with catchment descriptors similar to those at the site that could be used for the pooling group. The WINFAP-FEH software indicated that the pooling group is acceptably homogeneous and a review of the pooling group is not required.

However, a review of the pooling was undertaken. The Standard Test of H2 is 094. FARL values were all above 0.94 and were considered appropriate and no stations were shown to have a high level of discordance. The years of data from all the stations totalled above 500 years. Table 6 shows the pooling group used, with the number of years totalling 524.

The pooling group sites which are ranked are satisfactory in terms of hydrological similarity with the subject site and the pooling group distribution provides an acceptable statistical fit. The FEH states that a significant proportion of pooling groups remain heterogeneous, even after a review of discordancy, heterogeneity and adapting a heterogeneous pooling group to make it homogeneous is not advised. Consequently, the pooling group is considered acceptable.

After the pooling group was reviewed, the goodness of fit (absolute Z value) was accessed. The Generalised Logistic (GL) provides a Z value of 0.0077 and the Generalised Extreme Value (GE) provides a Z value of 1.5488. The GL distribution was used to calculate growth factors and is the preferred distribution in view of its dominant role in FEH and since it gives a more conservative (higher) estimate,

this distribution typically provides the best fit for use in deriving growth curve factors and flood frequency estimates. WINFAP-FEH was then used to obtain a pooled growth curve to be used in estimating the flood flows. WINFAP-FEH was then used to define the QMED value as detailed above and create a flood frequency curve for the specified return periods by fitting the pooled growth curve created to the GL distribution.

Table 6 - Final Pooling Group

| No. | Station | Distance | Years of data | QMED AM | L-CV | L-SKEW | Discordancy |
|-----|---|----------|---------------|---------|-------|--------|-------------|
| 1 | 55017 (Chwefru @ Carreg-y-wen) | 0.144 | 7 | 21.421 | 0.428 | 0.535 | 2.314 |
| 2 | 61003 (Gwaun @ Cilrhedyn Bridge) | 0.167 | 39 | 20.679 | 0.157 | 0.030 | 0.915 |
| 3 | 21029 (Tweed @ Glenbreck) | 0.269 | 9 | 37.765 | 0.069 | 0.138 | 2.384 |
| 4 | 48004 (Warleggan @ Trengoffe) | 0.299 | 39 | 9.565 | 0.244 | 0.207 | 0.234 |
| 5 | 25012 (Harwood Beck @ Harwood) | 0.308 | 39 | 31.368 | 0.176 | 0.264 | 0.572 |
| 6 | 60004 (Dewi Fawr @ Glasfryn Ford) | 0.325 | 34 | 17.911 | 0.053 | -0.097 | 1.809 |
| 7 | 67013 (Hirnant @ Plas Rhiwedog) | 0.329 | 12 | 24.081 | 0.200 | -0.026 | 2.375 |
| 8 | 72007 (Brock @ U/s a6) | 0.337 | 30 | 29.438 | 0.194 | 0.273 | 2.025 |
| 9 | 48009 (st Neot @ Craigshill Wood) | 0.409 | 12 | 8.469 | 0.246 | 0.372 | 0.426 |
| 10 | 48801 (Cober @ Trenear Intake) | 0.454 | 21 | 2.591 | 0.265 | 0.252 | 0.309 |
| 11 | 27032 (Hebden Beck @ Hebden) | 0.465 | 42 | 3.910 | 0.222 | 0.267 | 0.173 |
| 12 | 76811 (Dacre Beck @ Dacre Bridge) | 0.481 | 9 | 34.576 | 0.250 | 0.345 | 2.185 |
| 13 | 21017 (Ettrick Water @ Brockhoperig) | 0.504 | 41 | 60.364 | 0.203 | 0.276 | 0.167 |
| 14 | 48001 (Fowey @ Trekeivesteps) | 0.512 | 39 | 16.858 | 0.220 | 0.300 | 0.169 |
| 15 | 48010 (Seaton @ Trebrownbridge) | 0.517 | 36 | 6.470 | 0.236 | 0.254 | 0.262 |
| 16 | 55015 (Honddu @ Tafolog) | 0.521 | 29 | 16.682 | 0.337 | 0.355 | 0.920 |
| 17 | 47009 (Tiddy @ Tideford) | 0.522 | 39 | 5.916 | 0.175 | 0.133 | 0.617 |
| 18 | 72013 (Borrowbeck @ Borrow Bridge Weir) | 0.528 | 5 | 73.779 | 0.255 | 0.426 | 0.950 |
| 19 | 49003 (de Lank @ de Lank) | 0.543 | 42 | 12.994 | 0.223 | 0.250 | 0.194 |
| | | | | | | | |
| | Total | | 524 | | | | |

The pooling group growth curves are shown in Figure 8. They show minor wide scatter, as would be expected for such a pooling group. A brief review was undertaken no reason could be found to justify

their exclusion of the stations. In any case, their retention leads to higher flood estimates which is considered to be a precautionary and thus conservative.

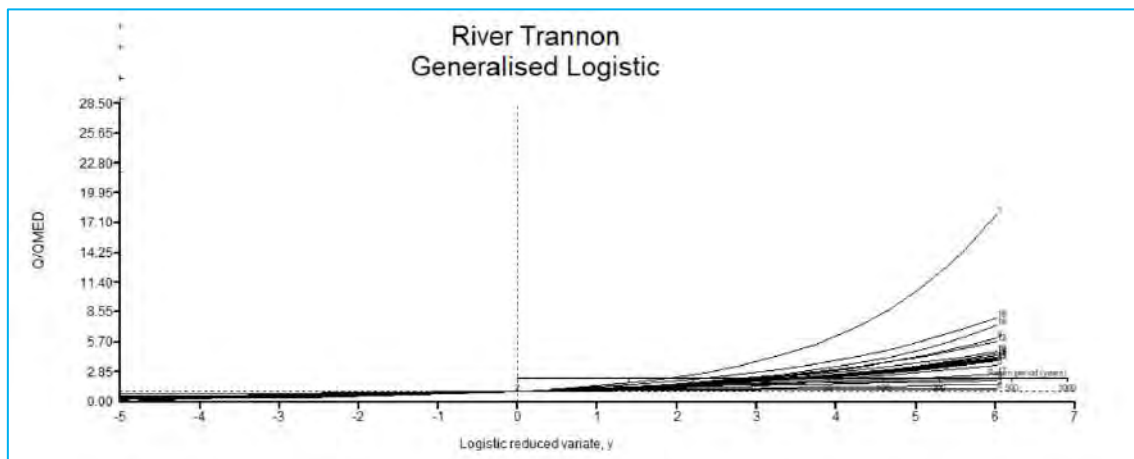


Figure 8 - Pooling Group Generalised Logistic Flood Frequency Curve

Revitalised Rainfall Runoff Method 2

The rainfall runoff modelling approach of ReFH2 has been used to ascertain the flood flows for the site, version 3.1 has been used. This method was released in 2015 and uses catchment descriptors to produce peak rates of runoff for both rural and urban catchments. The standard output from the method is presented in Appendix 7. The application of the ReFH2 method calculates a critical duration for the storm based on the catchment descriptors.

For the River Trannon the time to peak has been calculated as 1.87 hours. The seasonality of the annual maximum flood has been re-visited as part of recent research². This concluded that the default Seasonality should be based on urban extent and BFIHOST within ReFH 2. Based on this analysis the following default rules are applied within the ReFH model:

- Summer storms are selected by default if:
 - $URBEXT2000 \geq 0.30$, or
 - $0.15 \leq URBEXT2000 < 0.30$ and $BFIHOST19 \geq 0.65$.
- Winter storms are selected by default in all other cases.

Therefore, in this case a winter storm has been selected.

Peak Flows

The peak flows calculated using the FEH Statistical Method and the ReFH2 method have been compared (see Table 7). It is expected that results using the different methods will vary.

- The ReFH2 Method yielded more conservative results than the FEH Statistical Method. Although in this case they are very similar and suggests that either method can be used on this occasion for a permeable catchment.

² Environment Agency. Estimating flood peaks and hydrographs for small catchments: Phase 2.

- Guidance confirms that flood estimates for the FEH Statistical 1 in 1000 year event should be obtained by applying a scaling factor to the 1 in 100 year event. The scaling factor is obtained by dividing the 1 in 1000 year event by the 1 in 100 year estimate from the ReFH2 method.
- Climate change allowances must be taken into account over the whole lifetime of the development (see Table 1). Therefore, the peak river flows for the 1 in 100 year event have been increased by 5%, 25% and 70% to account for the effects of climate change in accordance with TAN15.
- The GL was preferred in view of its dominant role in FEH and since it had the lowest Z value.
- Estimates obtained using FEH Statistical method and the ReFH2 method consistently match.
- It had already been established that there were no grounds for adjusting the QMED on the basis of nearby donors.
- There is no clear evidence of flooding of the land at the site in recent years. Whilst the absence of serious flooding on the land does not validate any flood assessment it is consistent with the observations of the owner.
- The FEH Statistical method is the preferred method as a larger dataset of gauged data was used in the calibration of the method and it has been more directly calibrated to reproduce flood frequency on UK catchments.

Table 7 - Peak Flows for the River Trannon

| Return Period (yrs) | Peak Discharge (m ³ /s) | |
|---------------------|------------------------------------|--------------|
| | FEH Statistical Method | ReFH2 Method |
| 2 | 26.58 | 25.32 |
| 20 | 49.78 | 50.21 |
| 50 | 60.91 | 62.29 |
| 100 | 70.80 | 72.91 |
| 100 +5% | 74.34 | 76.56 |
| 100 +25% | 88.50 | 91.14 |
| 100 +70% | 120.36 | 123.95 |
| 1000 | 116.46* | 119.93 |

Note: * Calculated using the ratio between the ReFH method 1000/100 return period peak flows.

Hydraulic Modelling

Hydraulic modelling is used to convert the hydrological modelling outputs in flow and water levels within a river. A steady state HEC-RAS (version 5.0.7) model of the River Trannon has been developed from the topographical survey in steady state mode. In steady state model HEC-RAS calculates water levels iteratively for a constant discharge through the reach and is therefore conservative, as they do not allow any attenuation of the design discharge. The model has been run using a mixed flow regime.

The ReFH Method peak flows shown in Table 7 have been used as the upstream inflows. Given the short length of the River Trannon that passes through the site only one inflow location in the model has been included, a short distance upstream of the site.

Model Cross Sections

Figure 9 and Appendix 3 shows the cross sections used within the HEC-RAS model. The cross sections are representative of the channel in the reach adjacent, upstream and downstream of the site. The HEC-RAS model comprises of a single reach of the River Trannon reach 001. The distance between the cross sections was kept to a minimum under the circumstances, the majority of the cross section are less than 50m apart with the maximum spacing being 100m. It was not possible to safely locate the cross sections closer together at some locations.

A schematic of the HEC-RAS model is shown in Figure 10 which shows the naming convention of the HEC-RAS model. This extends from 296149, 290428 (downstream extent) to 295379, 290746 (upstream extent). The total model length is 874m.

The numbering system must be consistent in that HEC-RAS assumes that higher river cross sections are upstream and lower river cross sections are downstream. Cross section 0000 is located at the downstream limit of the model of cross section 0874 is located at the upstream limited of the model and is based on the chainage along the River Trannon.

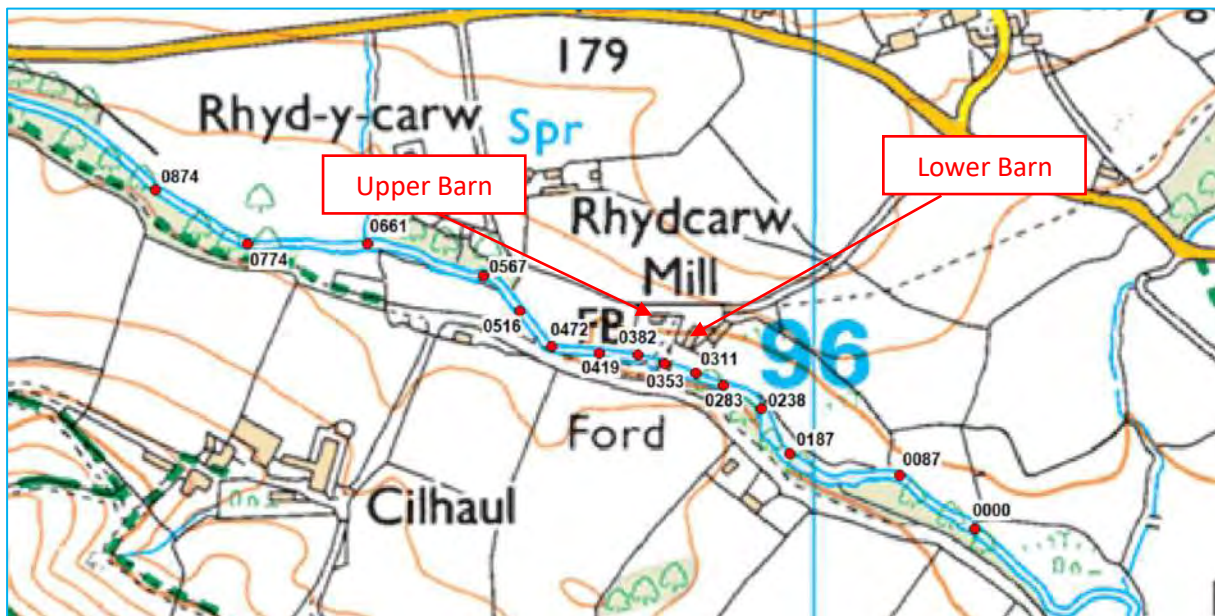


Figure 9 - Model Cross Section Locations

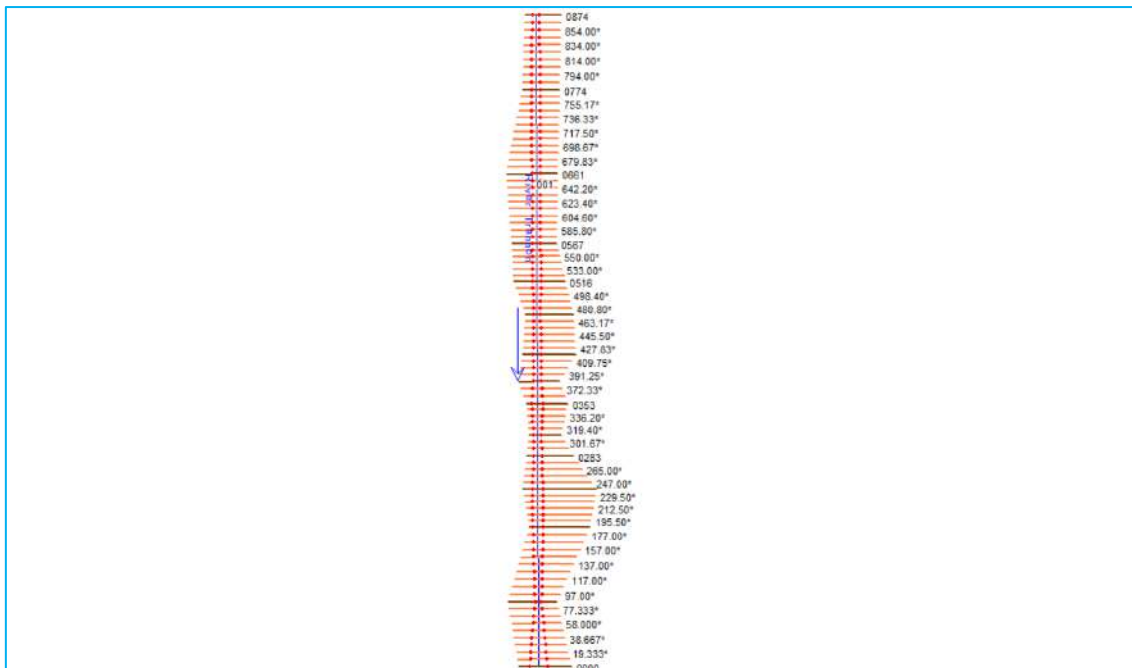


Figure 10 - HEC-RAS Model Schematic

The geometry of a natural channel is irregular and cannot be characterised by simple mathematical relationships. Therefore, representation in mathematical models requires that the stream geometry, in the form of discrete cross sections, be taken transversely at key locations in the watercourse. The in-bank survey described previously is sufficient to estimate water levels provided the flows remain within the confines of the main channel. In order to account for conveyance when flow overtops the main channel banks, the in-bank cross sections should be extended across the full width of the floodplain. Therefore, the cross sections have been extended across the site. The topographical survey and a 1m resolution LiDAR data Digital Terrain Model (DTM) and the site topographical survey have been used to extend the cross sections further into the floodplain.

In total 15 surveyed cross sections have been used to develop the model as shown in Table 8. The errors, warning and notes that HEC-RAS produces when the model is run were reviewed and where required interpolated sections were used to remove these errors. Interpolated cross sections have been used to improve the energy, conveyance and head loss calculations in the model. It was not possible to remove all the errors, warning and notes, however, the majority were removed, and no major errors remain and therefore, would have little impact on the flood risk posed to the site.

Structure Data

No hydraulically significant structure have been identified on the River Trannon within the study reach. The footbridge adjacent to the site is not considered to be hydraulically significant, as shown in Figure 3.

Table 8 - HEC-RAS Model Cross Sections

| Model Cross Section | Survey Cross Section | Eastings | Northings | Extended |
|---------------------|----------------------|----------|-----------|------------|
| 0000 | 1.016 | 296149 | 290428 | Left bank |
| 0087 | 1.015 | 296079 | 290478 | Right bank |
| 0187 | 1.014 | 295976 | 290498 | Left bank |
| 0238 | 1.013 | 295949 | 290541 | Left bank |
| 0283 | 1.012 | 295913 | 290563 | Left bank |
| 0311 | 1.011 | 295887 | 290574 | Left bank |
| 0353 | 1.009 | 295858 | 290583 | Left bank |
| 0382 | 1.008 | 295833 | 290591 | Left bank |
| 0419 | 1.007 | 295796 | 290592 | Left bank |
| 0472 | 1.006 | 295752 | 290599 | Left bank |
| 0516 | 1.005 | 295722 | 290632 | Both banks |
| 0567 | 1.004 | 295688 | 290666 | Right bank |
| 0661 | 1.003 | 295579 | 290696 | Right bank |
| 0774 | 1.002 | 295466 | 290696 | ---- |
| 0847 | 1.001 | 295379 | 290746 | ---- |

Boundary Conditions

The flow regime within the HEC-RAS model has been set both subcritical and supercritical flow conditions (i.e. mixed mode within the plan file). Due to the nature of the watercourse sub-critical flow conditions will be expected; therefore, a normal depth downstream boundary condition has been used with a slope of 0.006m/m for the upstream boundary and a slope of 0.0003m/m for the downstream boundary within HEC-RAS. With no data available at the site, this method of calculating the downstream boundary gives a reasonable estimation of the downstream water level.

Errors or assumptions in the estimation of the downstream boundary can impact on upstream calculated water levels and subsequent flood outlines. Therefore, the backwater length equation was calculated. The equation ensures that any errors in the downstream boundary estimation do not adversely affect modelled water levels at critical sections of the reach (i.e. those adjacent to the site).

The downstream boundary is located 382m downstream of the area of interest. Therefore, it has been calculated that the downstream boundary is far enough away from the area of interest so as to not affect the results.

Hydraulic Roughness

Hydraulic roughness represents the conveyance capacity of vegetation growth, bed and bank material, channel, sinuosity and structures on the floodplain. Within HEC-RAS, the hydraulic roughness is defined using the Manning's 'n' roughness coefficient values. Manning's 'n' roughness values were assigned by using site knowledge, photographs, modelling judgement and with industry standard literature including Chow³, Hicks & Mason⁴ and USGS⁵. Chow (1959) contains reference tables to match observed bed conditions with a value for Manning's 'n'. These reference tables are the most widely used method in 1D hydraulic modelling study.



³ Open Channel Hydraulics, Chow V.T., McGraw-Hill, Singapore 1959.

⁴ Hicks, D.M. and Mason, P.D. (1998) 'Roughness Characteristics of New Zealand Rivers' National Institute of Water and Atmospheric Research Ltd, New Zealand.

⁵ US Geological Society (2001) 'Verified Roughness Characteristics of Natural Channels', Water Resources of the Western United States.

Table 9 details the Manning's 'n' roughness coefficient values and description of the river reaches characterised by similar floodplain and channel bank roughness conditions. A Manning's 'n' roughness coefficient value of 0.035 has been used for the river channel and a value of 0.035 has been used for the floodplain. The sensitivity of the model results to the Manning's 'n' roughness coefficient values has been explored in detail.

Table 9 - Manning's 'n' roughness coefficient values

| Photograph | Cross Section Reference | Manning's 'n' | Description |
|---|-------------------------|---------------|---|
|  | Floodplain | 0.035 | Pasture, farmland, light brush |
|  | River Channel | 0.035 | Clean, straight, full, no rifts or deep pools, with some stones and weeds |

Model Coefficients

Flow contraction and expansion coefficients were determined using the HEC-RAS User's Manual. Contraction and expansion coefficients are used by the hydraulic model computations to determine the transition losses due to the expansion and constriction of flow, between two adjacent cross sections. The manual suggests that values of 0.10 (contraction) and 0.30 (expansion) are typical for a gradual transition along an open channel. In this instance, coefficients of 0.10 and 0.30 have been applied to the contraction and expansion for the open channel sections.

Assumptions & Limitations of the Model

The representation of any complex system by simple model requires a number of assumptions to be made. In the case of a simple 1D hydraulic model of a river system, it must be assumed that:

- The cross sections accurately represent the river;
- The hydrological analysis based on the gauged data (where available) can be extrapolated to other parts of the system; and

- The design flows are an accurate representation of flows for a given return period.

Owing to the lack of gauged data for local watercourse during flood events in this part of the catchment, the model has not been calibrated against observed flood levels. Instead, careful consideration has been given to the selection of roughness, structure discharge coefficients and ineffective flow boundaries. The theory of these is well understood and the model may be considered appropriate for flows up to bank full capacity and simple flow on the floodplain.

Results

Table 10 shows that the maximum modelled water levels for the River Trannon, model cross sections 0382 to 0311 are most applicable to the site (see Appendix 8).

Table 11 - Modelled Water Levels for the River Trannon (mAOD)

| Model Cross Section | Survey Cross Section | 100 | 100 +5% | 100 +25% | 100 +70% | 1000 |
|---------------------|----------------------|--------|---------|----------|----------|--------|
| 0000 | 1.016 | 146.64 | 146.71 | 146.94 | 147.38 | 147.33 |
| 0087 | 1.015 | 146.64 | 146.71 | 146.94 | 147.38 | 147.33 |
| 0187 | 1.014 | 147.23 | 147.34 | 147.63 | 147.97 | 147.93 |
| 0238 | 1.013 | 147.68 | 147.76 | 147.92 | 148.26 | 148.22 |
| 0283 | 1.012 | 147.80 | 147.87 | 147.80 | 148.07 | 148.05 |
| 0311 | 1.011 | 148.17 | 148.21 | 148.37 | 148.67 | 148.64 |
| 0353 | 1.009 | 148.58 | 148.62 | 148.80 | 149.14 | 149.11 |
| 0382 | 1.008 | 148.85 | 148.89 | 149.03 | 149.30 | 149.27 |
| 0419 | 1.007 | 148.97 | 149.01 | 149.16 | 149.45 | 149.42 |
| 0472 | 1.006 | 149.11 | 149.14 | 149.25 | 149.47 | 149.45 |
| 0516 | 1.005 | 149.65 | 149.68 | 149.84 | 150.07 | 150.05 |
| 0567 | 1.004 | 149.77 | 149.80 | 149.93 | 150.16 | 150.14 |
| 0661 | 1.003 | 150.30 | 150.32 | 150.53 | 150.73 | 150.71 |
| 0774 | 1.002 | 151.07 | 151.10 | 151.23 | 151.50 | 151.46 |
| 0847 | 1.001 | 151.63 | 151.67 | 151.81 | 152.09 | 152.06 |

Sensitivity Analysis

The results of the sensitivity analyses give an indication of the level of confidence that can be placed in the water level estimates obtained from computational hydraulic modelling. This is most important in circumstances where it has not been possible to calibrate the model for observed events, as in this case. The sensitivity analyses also give an indication of how the results may vary due to seasonal changes in vegetative growth, variations in the estimate of peak flows and variations in the coefficients of hydraulic structures. The following parameters were varied one at a time to assess their sensitivity on the water levels.

- Design flows +5%, +25% and +70% are assessed in the climate change scenario.
- Manning's 'n' roughness coefficient values +/- 20%.

Sensitivity to Flow

Water levels along the River Trannon are sensitive to flow rate as would be expected. When the 100 year flows are increased by 25%, there is a maximum increase in water levels of 0.40m at cross section 0187 and an average increase of 0.21m. These results show that the model is behaving normally and therefore shows confidence in the model results.

Sensitivity to Hydraulic Roughness

The sensitivity of the model water levels to channel and floodplain roughness was checked by varying the adopted Manning's 'n' roughness values. Manning's 'n' roughness values were uniformly increased by 20% for the first run and uniformly decreased by 20% for the second run (see Table 12).

A 20% increase in Manning's 'n' roughness values resulted in an increase in water levels on average throughout the study reach of 0.13m during the 1 in 100 year (+25%) event (see Appendix 9). Conversely, a 20% decrease in Manning's 'n' roughness values resulted in a decrease in water levels on average throughout the study reach of 0.21m during the 1 in 100 year (+25%) event (see Appendix 10).

These results show that the model is behaving normally and therefore shows confidence in the model results. The largest changes in water level due to changes in Manning's 'n' are located downstream or upstream from the site and will have limited impact on flood risk at the site.

Table 12 - Manning's n Sensitivity Analysis Modelled Water Levels for the River Trannon (mAOD)

| Model Cross Section | Survey Cross Section | 100 | | | 100 +25% | | |
|---------------------|----------------------|----------|--------|--------|----------|--------|--------|
| | | Baseline | +20% | -20% | Baseline | +20% | -20% |
| 0000 | 1.016 | 146.64 | 146.88 | 146.36 | 146.94 | 147.19 | 146.64 |
| 0087 | 1.015 | 146.64 | 146.90 | 145.57 | 146.94 | 147.21 | 145.73 |
| 0187 | 1.014 | 147.23 | 147.43 | 147.15 | 147.63 | 147.72 | 147.58 |
| 0238 | 1.013 | 147.68 | 147.81 | 147.55 | 147.92 | 148.03 | 147.88 |
| 0283 | 1.012 | 147.80 | 147.99 | 147.14 | 147.80 | 148.19 | 147.60 |
| 0311 | 1.011 | 148.17 | 148.17 | 148.17 | 148.37 | 148.37 | 148.37 |
| 0353 | 1.009 | 148.58 | 148.69 | 148.45 | 148.80 | 148.91 | 148.69 |
| 0382 | 1.008 | 148.85 | 148.92 | 148.81 | 149.03 | 149.10 | 148.98 |
| 0419 | 1.007 | 148.97 | 149.05 | 148.90 | 149.16 | 149.25 | 149.09 |
| 0472 | 1.006 | 149.11 | 149.20 | 149.15 | 149.25 | 149.38 | 149.22 |
| 0516 | 1.005 | 149.65 | 149.69 | 149.63 | 149.84 | 149.87 | 149.81 |
| 0567 | 1.004 | 149.77 | 149.86 | 149.41 | 149.93 | 150.02 | 149.53 |
| 0661 | 1.003 | 150.30 | 150.42 | 150.23 | 150.53 | 150.58 | 150.31 |
| 0774 | 1.002 | 151.07 | 151.18 | 151.01 | 151.23 | 151.33 | 151.06 |
| 0847 | 1.001 | 151.63 | 151.78 | 151.49 | 151.81 | 151.97 | 151.62 |

1 in 100 Year Event

Appendix 11 shows the model cross sections and long sections during the 1 in 100 year event. Appendix 12 shows that during the 1 in 100 year event the majority of the flow will be contained within the banks of the River Trannon. Table 11 shows the maximum water level within the River Trannon adjacent to the site, at cross section 0382 would be 148.85mAOD.

The external ground level at the location of the building is 149.76mAOD and the existing internal ground level of the building is 149.74mAOD to 151.15mAOD. The upper barn internal ground level has a minimum freeboard of 0.89m above the 1 in 100 year water level. Therefore, the upper barn will not be inundated with floodwater during the 1 in 100 year event, the upper barn would be flood free during the 1 in 100 year event.

The external ground level at the location of the lower barn is 147.90mAOD and the existing finished floor level of the lower barn is 148.45mAOD. Therefore, the lower barn may be inundated with floodwater during the 1 in 100 year event, to an internal depth of 0.40m.

1 in 100 Year (+25%) Event

Appendix 11 shows the model cross sections during the 1 in 100 year (+25%) event. Appendix 12 shows that during the 1 in 100 year (+25%) event the majority of the flow will be contained within the banks of the River Trannon. Table 11 shows the maximum water level within the River Trannon adjacent to the site, at cross section 0382 would be 149.03mAOD.

The external ground level at the location of the building is 149.76mAOD and the existing internal ground level of the building is 149.74mAOD to 151.15mAOD. The upper barn internal ground level has a minimum freeboard of 0.71m above the 1 in 100 year (+25%) water level. Therefore, the upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) event, the upper barn would be flood free during the 1 in 100 year (+25%) event.

The external ground level at the location of the lower barn is 147.90mAOD and the existing finished floor level of the lower barn is 148.45mAOD. Therefore, the lower barn may be inundated with floodwater during the 1 in 100 year (+25%) event, to an internal depth of 0.58m.

1 in 1000 Year Event

Appendix 11 shows the model cross sections during the 1 in 1000 year event. Appendix 12 shows that during the 1 in 1000 year event the majority of the flow will be contained within the banks of the River Trannon. Table 11 shows the maximum water level within the River Trannon adjacent to the site, at cross section 0382 would be 149.27mAOD.

The external ground level at the location of the building is 149.76mAOD and the existing internal ground level of the building is 149.74mAOD to 151.15mAOD. The upper barn internal ground level has a minimum freeboard of 0.47m above the 1 in 100 year water level. Therefore, the upper barn will not be inundated with floodwater during the 1 in 1000 year event, the upper barn would be flood free during the 1 in 1000 year event.

The external ground level at the location of the lower barn is 147.90mAOD and the existing finished floor level of the lower barn is 148.45mAOD. Therefore, the lower barn may be inundated with floodwater during the 1 in 1000 year event, to an internal depth of 0.82m.

Summary

These results are a more accurate representation of the flood outlines compared to the DAM outline shown in Figure 5 which can only be taken as a rough guide and compare favourably with the Natural Resources Wales Flood Risk Map shown in Figure 6.

The site is one of the last places in the area to flood and remains flood free when other areas close by are flooded. The site is at such a ground level that it would only flood in the most extreme flood events; the site will remain flood free for the vast majority of flood events during the lifetime of the proposed development.

Flood risk to the site from the River Trannon can be considered to be limited. Any overbank flow would follow the contours of the surrounding area and would flow directly to the east rather than flowing towards the site. The flood risk can also be considered to be limited due to the difference in elevations. The ground levels of the site are located a minimum of 3.00m above the normal water level of the River Trannon.

Any flooding would be of a minor nature due to the low flows and topography of the area. The flooding will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site.

Given the scale and nature of the proposed development it has been concluded that fluvial flooding poses a low flood risk to the site. Therefore, the risk of fluvial flooding is considered to be of **medium significance**. The risk of fluvial flooding will be further managed and mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site (see Section 4.0).

3.10 Tidal (coastal) Flooding

The site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be **not significant**.

3.11 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site conditions suggest a low probability of groundwater flooding. The local geology is not considered to yield significant volumes of groundwater. No below surface infrastructure and buildings are located or are proposed for the site. The risk of flooding from groundwater flooding is considered to be **not significant**.

3.12 Surface Water (pluvial) Flooding

The site is not situated near to large areas of poor permeability or areas with the geology and/or topography which may result in surface water flooding. The soil conditions at the site and within the vicinity of the site indicate that the site may be at risk of surface water flooding.

The Natural Resources Wales Surface Water flood map shows that the site has a very low risk of surface water flooding (see Figure 13) with a chance of surface water flooding of less than 1 in 1000 (0.1%) years. Therefore, the risk of flooding from surface water flooding is considered to be **not significant**.

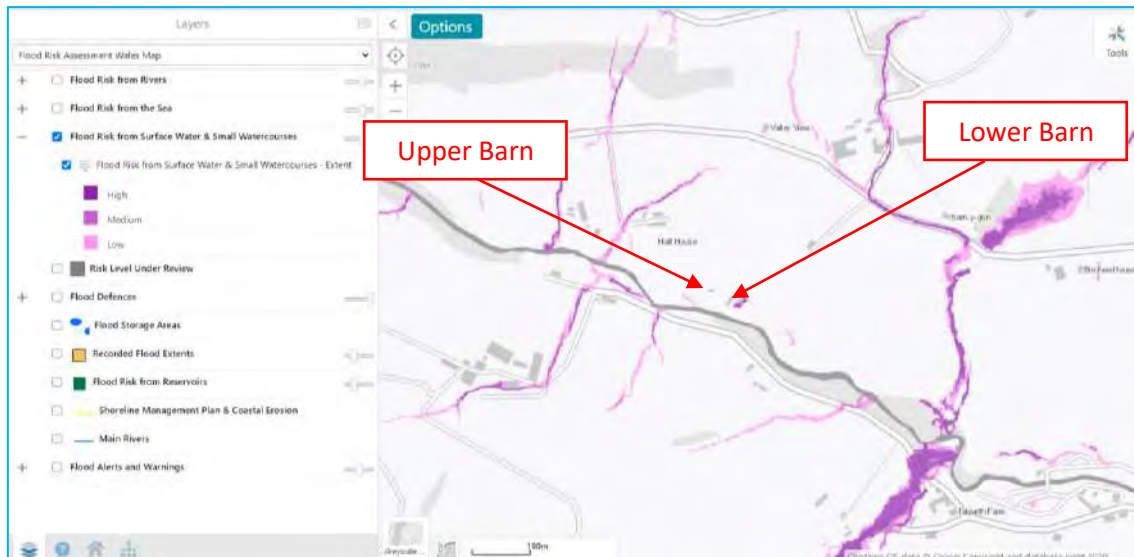


Figure 13 - Natural Resources Wales Surface Water Flood Map

3.13 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development.

Any sewers will inevitably have a limited capacity so in extreme conditions there would be surcharges, which may in turn cause flooding. Flood flows could also be generated by burst water mains, but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment.

Given the design parameters normally used for drainage design in recent times and allowing for some deterioration in the performance of the installed systems, which are likely to have been in place for many years, an appropriate flood risk probability from this source could be assumed to have a return period in the order of 1 in 10 to 1 in 20 years. The provision of adequate level difference between the ground floors and adjacent ground level would reduce the annual probability of damage to property from this source to 1 in 100 years or less. The risk of flooding from sewer flooding is considered to be **not significant**.

3.14 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no nearby artificial water bodies, water channels, reservoirs and artificial drainage systems that could be considered a flood risk to the property. The Natural Resources Wales Reservoir flood map shows that the site is not at risk of reservoir flooding (see Figure 14). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

(<0.1%) years. The lower barn is located within the high fluvial flood risk zone with a chance of flooding of greater than 1 in 30 (3.3%) years.

Hydraulic modelling shows that the upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) and 1 in 1000 year events, the upper barn would be flood free during the 1 in 100 year (+25%) and 1 in 1000 year events.

The lower barn may be inundated with floodwater to a depth of 0.40m during the 1 in 100 year event, to a depth of 0.58m during the 1 in 100 year (+25%) and to a depth of 0.82m during the 1 in 1000 year event.

These results are a more accurate representation of the flood outlines compared to the DAM outline shown in Figure 5 which can only be taken as a rough guide and compare favourably with the Natural Resources Wales Flood Risk Map shown in Figure 6.

Given the scale and nature of the proposed development and the size and location of the fluvial flooding sources it has been concluded that tidal flooding poses a low flood risk to the site therefore, the risk of flooding from fluvial flooding is considered to of **medium significance**.

The proposed development is classified as 'highly vulnerable'. However, the lower barn will be used as an events studio with storage and an office and can be classified as 'less vulnerable'. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building. The more flood-compatible uses the events studio, storage and office being situated in the lower part of the site at a higher risk of flooding.

The buildings are existing therefore, the proposed development will have no impact on the movement of floodwater across the site. This will ensure no detriment to the flood storage capacity of the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. There will be no increase in the flood water levels due to the proposed development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

4.0 RISK MANAGEMENT

4.1 Introduction

In this flood zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the use of flood mitigation measures.

A number of techniques and mitigation strategies to manage and reduce the overall flood risk in the area will be used. This will ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and;
- Minimal disruption to natural heritage.

The flood risk at the site will be reduced by using a number of risk management measures to manage and reduce the overall flood risk at the site.

4.2 Sequential Approach

The sequential approach has been applied within the site by locating the most vulnerable elements of the development in the lowest risk areas. The most vulnerable use, the accommodation classified as 'highly vulnerable', is situated within the upper barn on the higher part of the site at a lower risk of flooding within the upper barn.

The upper barn is shown to be located within the very low fluvial flood risk zone with a chance of flooding of less than 1 in 1000 (<0.1%) years and is shown to be situated above the 1 in 100 year (+25%) and 1 in 1000 year modelled flood outlines.

The more flood-compatible uses the events studio, storage and office (i.e. 'less vulnerable') will be situated in the lower part of the site, within the lower barn, at a higher risk of flooding. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building.

4.3 Finished Floor Levels

The finished floor levels of the buildings will be set no lower than the existing levels. The upper barn internal ground level has a minimum freeboard of 0.71m above the 1 in 100 year (+25%) water level. Therefore, the upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) event, the upper barn would be flood free during the 1 in 100 year (+25%) event.

It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the building sign up to receive flood warnings from Natural Resources Wales and implement a flood evacuation plan to a safe area away from the buildings during times of flood. It is also proposed that flood protection measures are employed within the building design to reduce the overall risk to the occupants.

A combination of resistance (proofing) and resilience measures will be included to provide further protection. This is discussed below.

4.4 First Floor Accommodation

Accommodation will be located on the first floor as well as the ground floor of the upper barn. This will allow occupants to retreat to higher floor levels if needed. The levels of the first floor are located a minimum of 2.50m above the ground floor finished floor level well above any floodwater levels.

This provides a 'safe haven' above any floodwater levels. This will enable rapid escape should flooding occur which is unlikely. The upper floors are accessed via internal stairs and are sufficient in size to safely house all occupants of the building. The 'safe haven' will only be required in very extreme events or if a flood warning has not been received.

4.5 Flood Resilience and Resistance

The development of the layout should always consider that the site is potentially at risk from an extreme event and as such the implementation of flood resilience and resistance methods should be assessed. Flood resilient and resistant measures will be used, including:

- The walls of the buildings will be thick.
- Sealant will be used around external doors and windows.
- All external doors and windows will be constructed from hard wearing materials with flood seals.
- Solid ground floors in preference to suspended floors with under voids.
- Any new cavity walls with polyisocyanurate (PIR) rigid closed-cell insulation that retains structural integrity and have low moisture take will be used.
- Mortar joints will be thoroughly filled to reduce the risk of water penetration.
- If frogged bricks are used, they will be laid frog up so that filling becomes easier and coverage more certain.
- Bricks manufactured with perforations will not be used. Low-water-absorbing blocks/bricks and mortar mixes will be used up to the predicted 1 in 100 year flood level, plus one course of blocks/bricks to provide freeboard (up to a maximum depth of 600 mm above floor level). This increases resistance to water penetration.
- Fixings will be galvanized/stainless steel/copper (no mild steel to be used - cause rust/staining or walls).
- Hardcore and binding will have good compaction to reduce the risk of settlement and consequential cracking.
- A proprietary damp-proof membrane system will be used that is bonded to the slab rather than below the insulation and installed in accordance with the manufacturer's requirements

will be used. Care should be taken not to stretch the membrane in order to retain a waterproof layer.

- All electrics wiring, switches, sockets, socket outlets etc. to be located a minimum of 450mm above the finished floor level which provides a further freeboard above the 1 in 100 year (+25%) water level.
- Ensure that external paving's slope away from the building and not towards them.
- All other below ground service penetrations will be sealed.

4.6 Flood Warning and Evacuation

The site is located in a flood risk area therefore; the site will participate in Natural Resources Wales flood warning telephone service. The site will register contact details with the Natural Resources Wales Flood Warning Service in order to receive Flood Alerts. Natural Resources Wales operate a free flood warning service providing alerts by phone, text or email when flooding is anticipated providing an opportunity for owners to take necessary precautions, giving enough time for the building to be safely evacuated and mitigation measures to be put in place.

All occupants of the site will be made aware of the Natural Resources Wales Floodline telephone number and the Flood Warning Codes and their meaning. The owner of the properties will carry out the role of Flood Warden for the site and ensure they have an understanding of the flood mechanisms of the site and will ensure that the safety of the occupants and visitors will not be compromised.

Natural Resources Wales uses Flood Warnings Codes. They can be issued in any order, usually ending with an 'all clear'. They are issued by Natural Resources Wales through their website and issue Flood Alerts for this area. The flood warning will be passed onto the occupiers and visitors of the site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

4.7 Flood Plan

A Flood Plan outlining the precautions and actions you should take when a flood event is anticipated to help reduce the impact and damage flooding may cause will be developed. Sensible precautions would include raising electrical items, irreplaceable items and sentimental items off the ground or where possible moving them to a higher floor, rolling up carpets and rugs and turning off utilities. In addition, consider what actions you would take should the property need to be evacuated including access and egress routes and preparing a flood kit in advance containing warm clothing, medication, a torch, food and wellingtons.

The Flood Plan is a 'living' document and therefore should be periodically reviewed and updated to provide advice and guidance to occupants in the event of an extreme flood. The Flood Plan will therefore reduce the vulnerability of the occupants to flooding and makes them aware of the mechanisms of flooding at the site. If required a 'safe haven' can also be maintained and may be required in very extreme events if a flood warning has not been received.

4.8 Safe Access and Egress Route

Access routes should be such that occupants can safely access and exit their buildings in design flood conditions. These routes must also provide the emergency services with access to the development during a flood event and enable flood defence authorities to carry out any necessary duties during the

period of flood. A safe access and egress route, including emergency access can be maintained for vehicles and/or by foot by the access road to the north.

The Safe Access and Egress Route shown in Figure 15 indicates the exit route that all people (i.e. occupants and visitors) on site should follow once a flood warning has been received. People should make their way to areas outside of the flood zone.

Given that the site is located within a flood warning area, site users would be aware of the flood risk and should have more than sufficient time to evacuate the site before flooding of the access road would be expected. Therefore, the lead time of the flooding will provide site users with more than ample time to evacuate the site and seek safe refuge outside the floodplain. In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site.

In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site using the routes shown in Figure 15.

Therefore, safe access and egress from the site will be possible. The above factors would, therefore, allow safe access and egress as per TAN15 and Natural Resources Wales guidance. In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site.

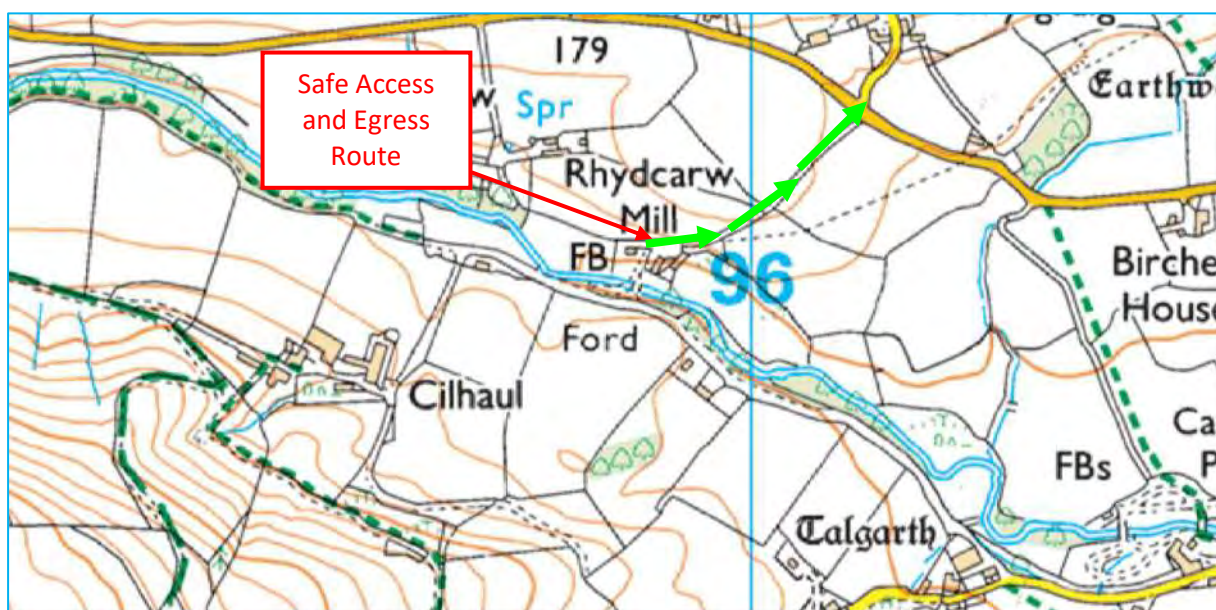


Figure 15 - Safe Access and Egress Route

4.9 Flooding Consequences

The proposed development of the site will provide betterment compared to the existing situation due to the proposed mitigation measures as discussed above, the change from a single storey building to two storey buildings and the fact that the proposed development is for office and warehousing compared to the existing use of the site as a children's day nursery.

The site can be justified in accordance with TAN15 as it can be demonstrated that the consequences of flooding can be managed down to a level which is acceptable for the nature and type of site. The

mitigation measures detailed above show that the flood risk can be effectively managed and therefore the consequences of flooding are acceptable.

5.0 JUSTIFYING THE LOCATION OF THE DEVELOPMENT

5.1 Justification Test

The Justification Test sets out the details required to justify siting a new development in an area believed to be at risk of flooding and is defined in Section 6 of TAN15. The required criteria a site / development must fulfil are:

- i) its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or
 - ii) its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
- and
- iii) it concurs with the aims of PPW and meets the definition of previously developed land; and,
 - iv) the potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

The proposed development has been assessed against the requirements of the Justification Test.

Criterion i

The proposed development will help in sustaining the existing settlement of Trefeglwys.

Criterion ii

TAN15 states that a development will be justified if it complies with either criteria (i) or (ii). The proposed development complies with criterion (ii) it is not necessary to consider criterion (i).

Criterion iii

Previously developed land is defined in Planning Policy Wales (PPW) as:

“...that which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure.”

The site is occupied by existing buildings and is therefore, defined as previously developed land.

Criterion iv

The potential consequences of a flooding event for the particular type of development have been considered within this FCA. This FCA details the potential consequences of flooding from all sources taking into account the proposed development type has been considered and has been found to be acceptable. The development proposals should be considered by the LPA to satisfy the Justification Test as set out in TAN15.

5.2 Assessment of Acceptability Criteria

New development should be directed away from Zone C and towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of an issue. However, in some areas where developable land is in short supply, there can be an overriding need to build in areas that are at risk of flooding.

The Council's objectives are to sustain and enhance the vitality and viability of the region, and to ensure a wide range of employment to which people have easy access by a range of transport therefore, improving the overall quality of life. This is underpinned by the quality of the physical environment, social well-being and economic and environmental improvements. The Council seeks to grant permission for developments that add to the vitality and viability of the region.

The site is suitable in size and location to accommodate the proposed development. The wider area surrounding the proposed development site is affected by a very similar, and in many cases, higher risk of flooding. The application is for a new, suitable flood-resilient design which is preferable to the existing buildings.

The exposure of people and property will be minimised. From the above it is shown that there are overriding sustainability reasons for the development to be granted planning permission at the site. The proposed development will improve the sites resilience, resistance to flooding and by using property level protection measures to protect the site from flooding, the vulnerability of the site will be improved.

There is an indicative frequency threshold of flooding below which flooding of developed may not be allowed (see Table A1.14 TAN15) and indicative consequences of flooding as set out in A1.15 of TAN15.

The upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) and 1 in 1000 year events, the upper barn may be flood free during the 1 in 100 year (+25%) and 1 in 1000 year events.

The lower barn will be used as an events studio with storage and an office and can be classified as 'less vulnerable'. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building. The more flood-compatible uses the events studio, storage and office being situated in the lower part of the site at a higher risk of flooding.

The mechanism for flooding is generally prolonged episodes of rainfall, which affords good time for flood warnings to be issued. The likelihood of a rapid water level rise and possible rapid inundation of areas posing a risk to life is considered to be minimal. The maximum speed of inundation will be more than 4 hours, the maximum rate of rise of floodwaters will be less than 0.10m/hr and the maximum water velocity will be less than 0.15m/s.

The site is compliant with the indicative frequency threshold and the consequences of flooding can be acceptably managed for the lifetime of the development recognising the small scale proposal on the edge of floodplain. Therefore, the indicative requirements of A1.14 and A1.15 of TAN15 are passed. The development proposals should therefore be considered by the LPA to satisfy the Acceptability Criteria as set out in TAN15.

6.0 SUMMARY AND CONCLUSIONS

6.1 Introduction

This report presents an FCA in accordance with TAN15 for the proposed development at Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU.

This FCA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

6.2 Flood Risk

The site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk posed to the site is from fluvial flooding from the River Trannon. The DAM shows that the site is located within C2 - Areas of the floodplain without significant flood defence infrastructure.

A review of the Natural Resources Wales Flood Risk Map indicates that the upper barn is shown to be located within the very low fluvial flood risk zone with a chance of flooding of less than 1 in 1000 (<0.1%) years. The lower barn is located within the high fluvial flood risk zone with a chance of flooding of greater than 1 in 30 (3.3%) years.

Hydraulic modelling shows that the upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) and 1 in 1000 year events, the upper barn would be flood free during the 1 in 100 year (+25%) and 1 in 1000 year events.

The lower barn may be inundated with floodwater to a depth of 0.40m during the 1 in 100 year event, to a depth of 0.58m during the 1 in 100 year (+25%) and to a depth of 0.82m during the 1 in 1000 year event.

These results are a more accurate representation of the flood outlines compared to the DAM outline shown in Figure 5 which can only be taken as a rough guide and compare favourably with the Natural Resources Wales Flood Risk Map shown in Figure 6.

Given the scale and nature of the proposed development and the size and location of the fluvial flooding sources it has been concluded that tidal flooding poses a low flood risk to the site therefore, the risk of flooding from fluvial flooding is considered to of **medium significance**.

The proposed development is classified as 'highly vulnerable'. However, the lower barn will be used as an events studio with storage and an office and can be classified as 'less vulnerable'. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building. The more flood-compatible uses the events studio, storage and office being situated in the lower part of the site at a higher risk of flooding.

The buildings are existing therefore, the proposed development will have no impact on the movement of floodwater across the site. This will ensure no detriment to the flood storage capacity of the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. There will be no increase in the flood water levels due to the proposed development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

6.3 Risk Management

The flood risk at the site will be reduced by using a number of risk management measures to manage and reduce the overall flood risk at the site. Measures used:

Sequential Approach: The sequential approach has been applied within the site by locating the most vulnerable elements of the development in the lowest risk areas. The most vulnerable use, the accommodation classified as 'highly vulnerable', is situated within the upper barn on the higher part of the site at a lower risk of flooding within the upper barn.

The upper barn is shown to be located within the very low fluvial flood risk zone with a chance of flooding of less than 1 in 1000 (<0.1%) years and is shown to be situated above the 1 in 100 year (+25%) and 1 in 1000 year modelled flood outlines.

The more flood-compatible uses the events studio, storage and office (i.e. 'less vulnerable') will be situated in the lower part of the site, within the lower barn, at a higher risk of flooding. It should also be taken into account that the existing use of the lower barn is a kennels and can be classified as 'less vulnerable' therefore, the proposed development of the lower barn will not change the vulnerability of the building.

Finished Floor Levels: The finished floor levels of the buildings will be set no lower than the existing levels. The upper barn internal ground level has a minimum freeboard of 0.71m above the 1 in 100 year (+25%) water level. Therefore, the upper barn will not be inundated with floodwater during the 1 in 100 year (+25%) event, the upper barn would be flood free during the 1 in 100 year (+25%) event.

It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the building sign up to receive flood warnings from Natural Resources Wales and implement a flood evacuation plan to a safe area away from the buildings during times of flood. It is also proposed that flood protection measures are employed within the building design to reduce the overall risk to the occupants.

A combination of resistance (proofing) and resilience measures will be included to provide further protection. This is discussed below.

First Floor Accommodation: Accommodation will be located on the first floor as well as the ground floor of the upper barn. This will allow occupants to retreat to higher floor levels if needed. The levels of the first floor are located a minimum of 2.50m above the ground floor finished floor level well above any floodwater levels.

This provides a 'safe haven' above any floodwater levels. This will enable rapid escape should flooding occur which is unlikely. The upper floors are accessed via internal stairs and are sufficient in size to safely house all occupants of the building. The 'safe haven' will only be required in very extreme events or if a flood warning has not been received.

Flood Resilience and Resistance: Flood resilient and resistant measures will be used, including:

- The walls of the buildings will be thick.
- Sealant will be used around external doors and windows.
- All external doors and windows will be constructed from hard wearing materials with flood seals.

- Solid ground floors in preference to suspended floors with under voids.
- Any new cavity walls with polyisocyanurate (PIR) rigid closed-cell insulation that retains structural integrity and have low moisture take will be used.
- Mortar joints will be thoroughly filled to reduce the risk of water penetration.
- If frogged bricks are used, they will be laid frog up so that filling becomes easier and coverage more certain.
- Bricks manufactured with perforations will not be used. Low-water-absorbing blocks/bricks and mortar mixes will be used up to the predicted 1 in 100 year flood level, plus one course of blocks/bricks to provide freeboard (up to a maximum depth of 600 mm above floor level). This increases resistance to water penetration.
- Fixings will be galvanized/stainless steel/copper (no mild steel to be used - cause rust/staining or walls).
- Hardcore and binding will have good compaction to reduce the risk of settlement and consequential cracking.
- A proprietary damp-proof membrane system will be used that is bonded to the slab rather than below the insulation and installed in accordance with the manufacturer's requirements will be used. Care should be taken not to stretch the membrane in order to retain a waterproof layer.
- All electrics wiring, switches, sockets, socket outlets etc. to be located a minimum of 450mm above the finished floor level which provides a further freeboard above the 1 in 100 year (+25%) water level.
- Ensure that external paving's slope away from the building and not towards them.
- All other below ground service penetrations will be sealed.

Flood Warning and Evacuation: The site is located in a flood risk area therefore; the site will participate in Natural Resources Wales flood warning telephone service. The site will register contact details with the Natural Resources Wales Flood Warnings Direct Service (Floodline 0845 988 1188) in order to receive Flood Warnings.

Flood Plan: A Flood Plan outlining the precautions and actions you should take when a flood event is anticipated to help reduce the impact and damage flooding may cause will be developed.

Safe Access and Egress Route: A safe access and egress route, including emergency access can be maintained for vehicles and/or by foot by the access road to the north.

Given that the site is located within a flood warning area, site users would be aware of the flood risk and should have more than sufficient time to evacuate the site before flooding of the access road would be expected. Therefore, the lead time of the flooding will provide site users with more than ample time to evacuate the site and seek safe refuge outside the floodplain. In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication and essentials for

infants and children will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site.

In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site using the routes shown in Figure 15.

Therefore, safe access and egress from the site will be possible. The above factors would, therefore, allow safe access and egress as per TAN15 and Natural Resources Wales guidance. In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site.

6.4 Justifying the Location of the Development

The development proposals should be considered by the LPA to satisfy the Justification Test and Acceptability Criteria as set out in TAN15.

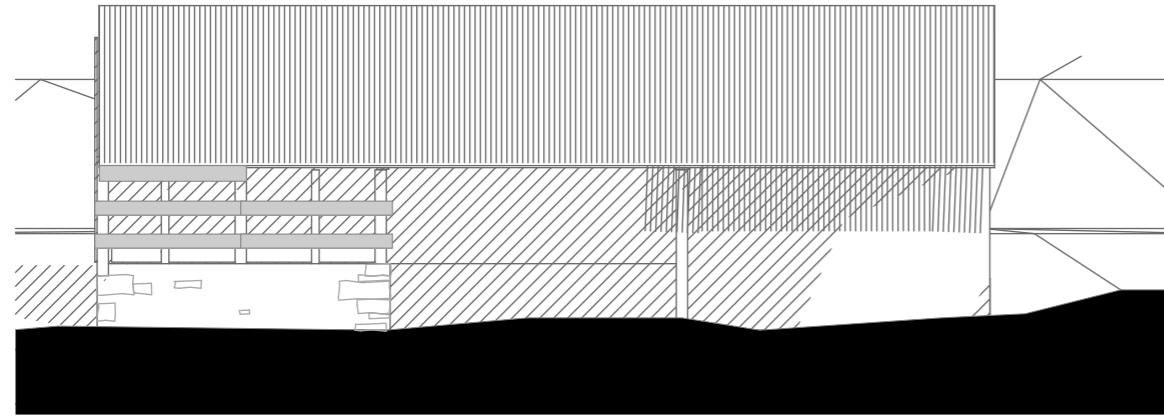
6.5 Conclusion

In conclusion, the proposed development would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FCA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable and the development would be in accordance with the requirements of TAN15. The proposed development of the site will provide betterment compared to the existing situation.

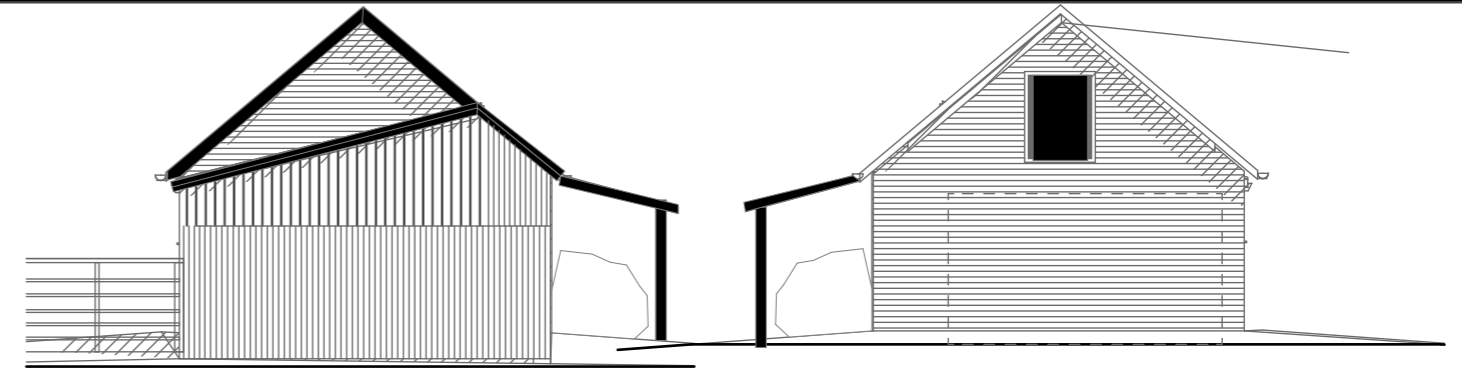
This FCA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of TAN15. The development should not therefore be precluded on the grounds of flood risk.

APPENDIX 1 – Existing Site Layout

South Elevation 1:100



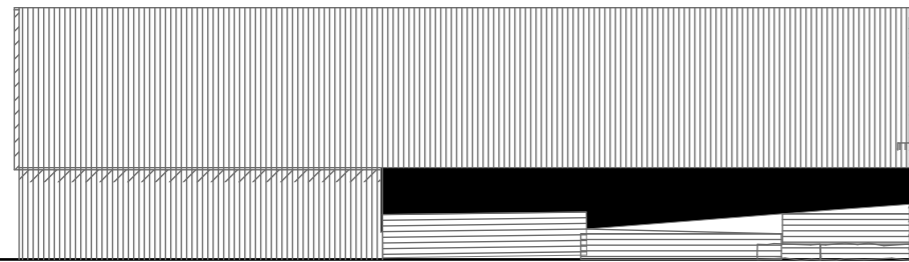
Northwest Elevation 1:100



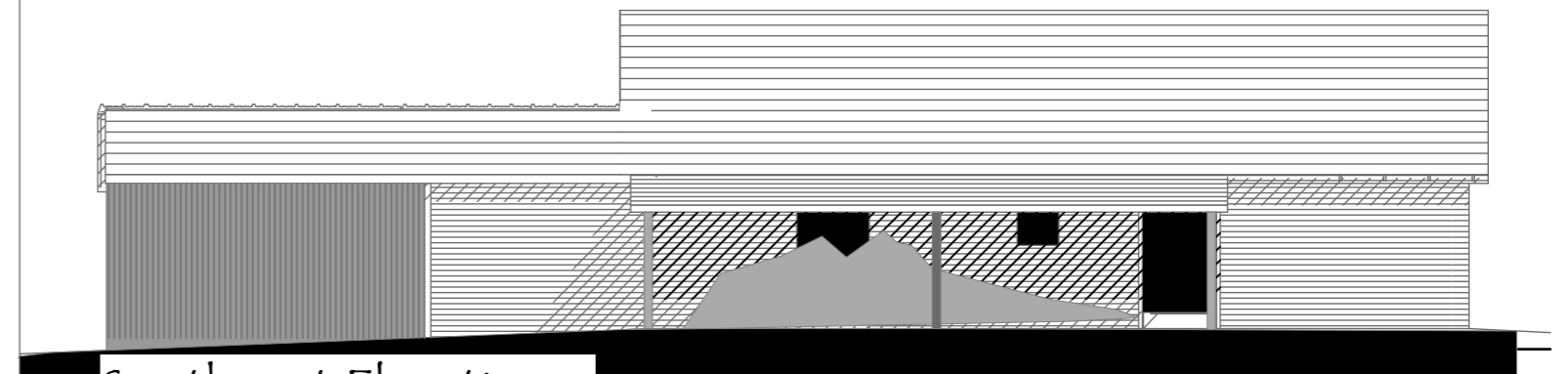
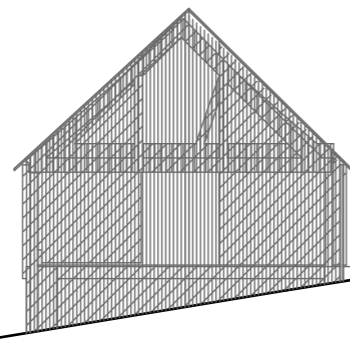
Southeast Elevation

Northeast Elevation

West Elevation

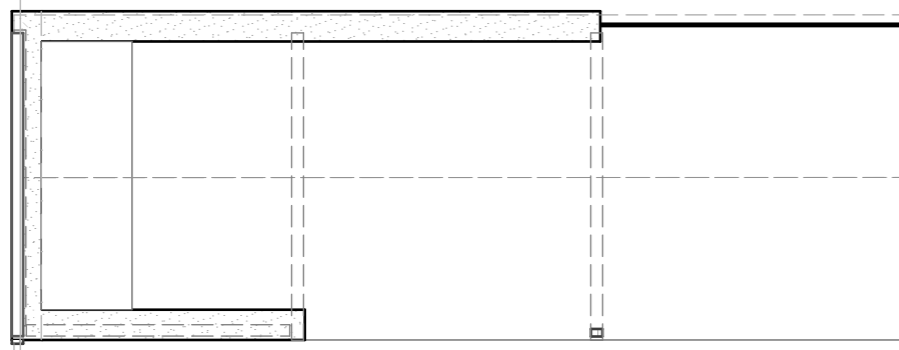


East Elevation



Southwest Elevation

North Elevation



Plan 1:100

Plan 1:100

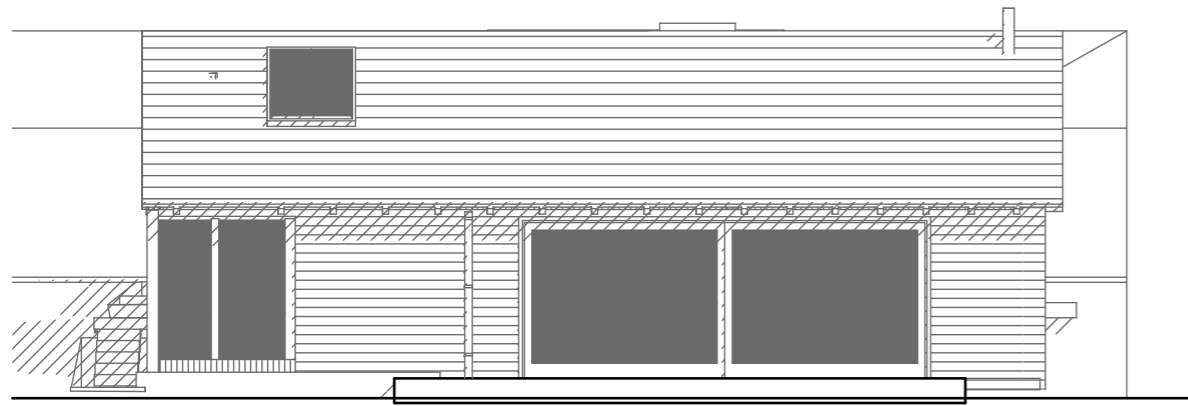
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Design, Detailing and Visualization
Architectural Services

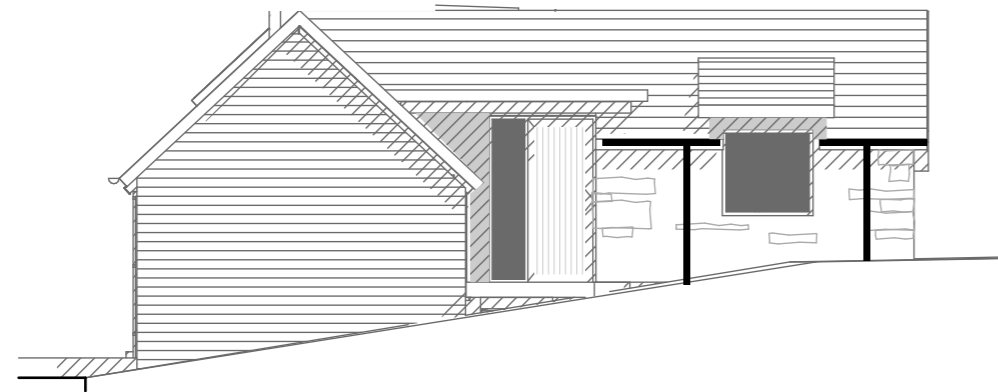
Frederick Carter
Mob: 07985226376
Tel: 01085 627238
Email: frederick@fco.com

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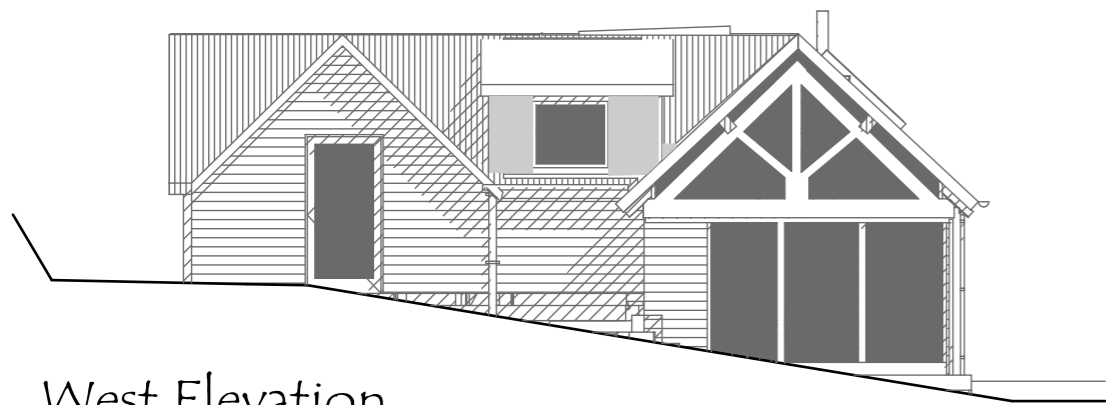
APPENDIX 2 – Proposed Site Layout



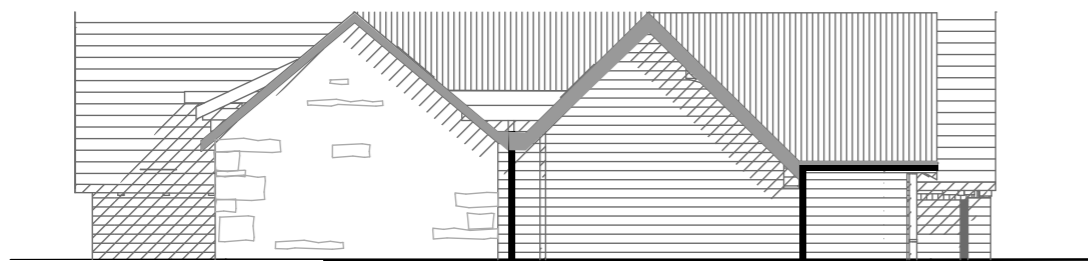
South Elevation 1:100



East Elevation

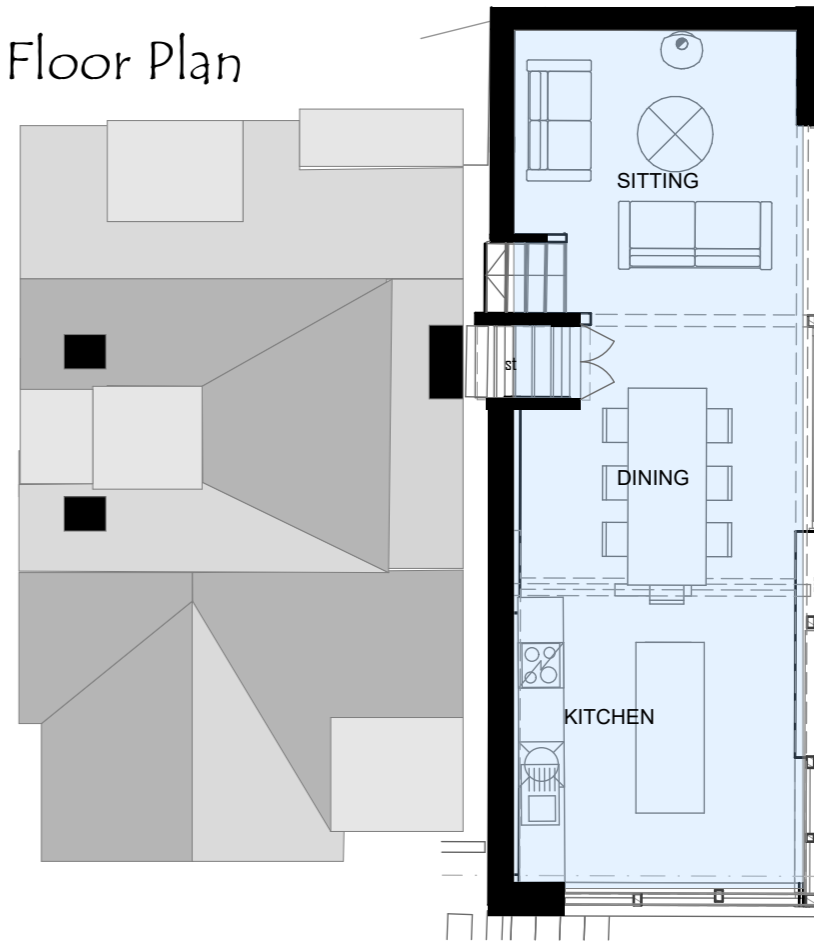


West Elevation

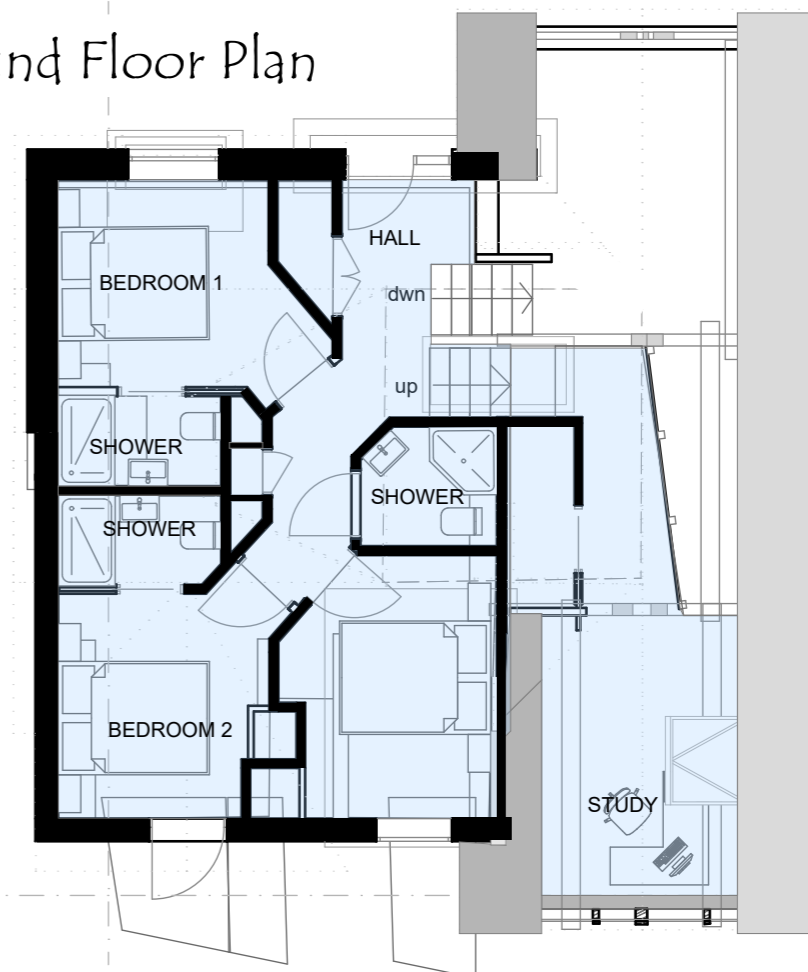


North Elevation

First Floor Plan

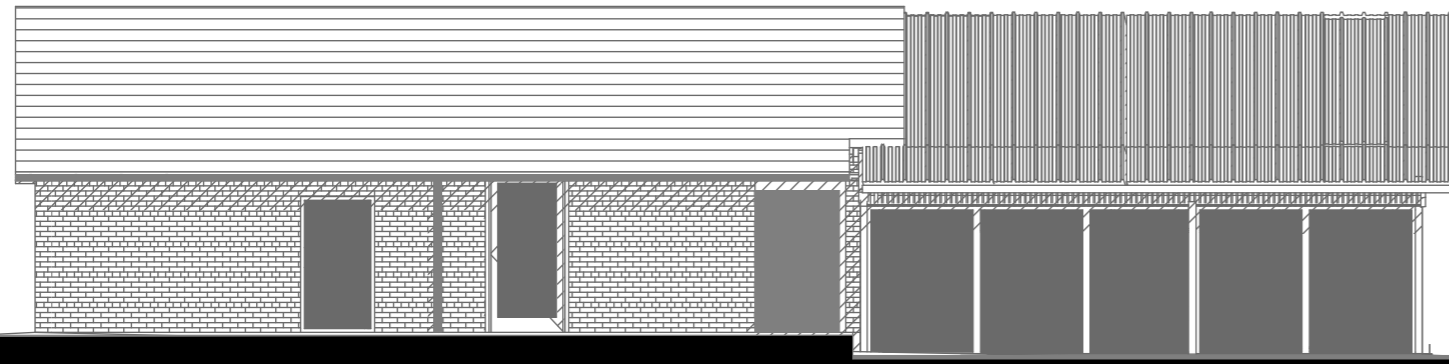


Ground Floor Plan

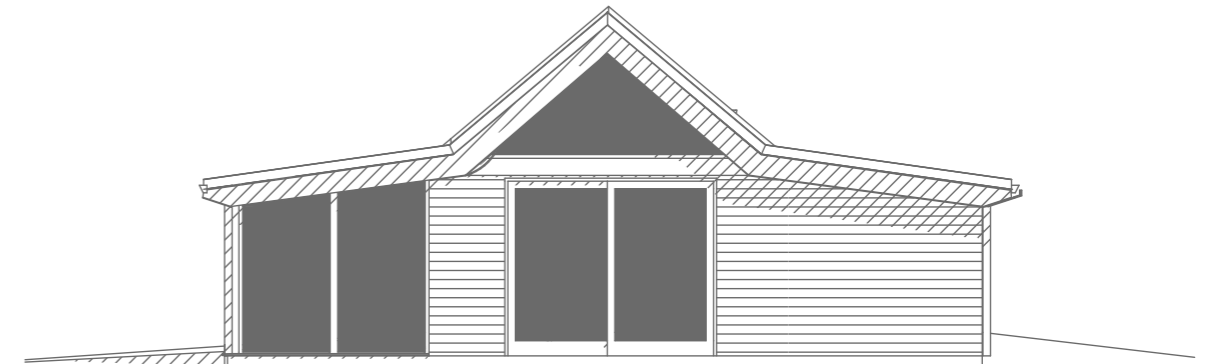


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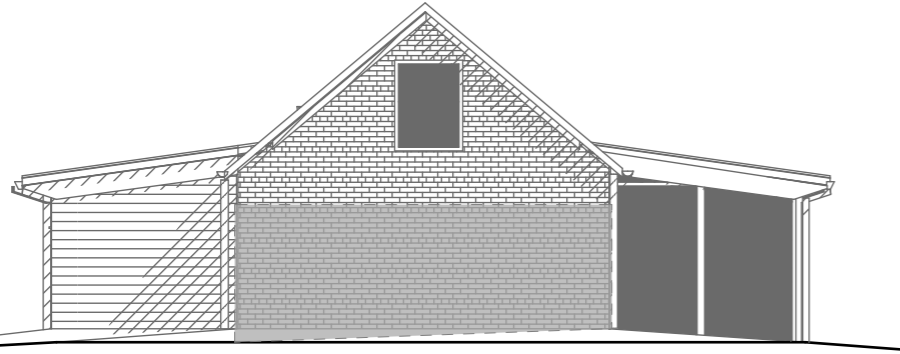
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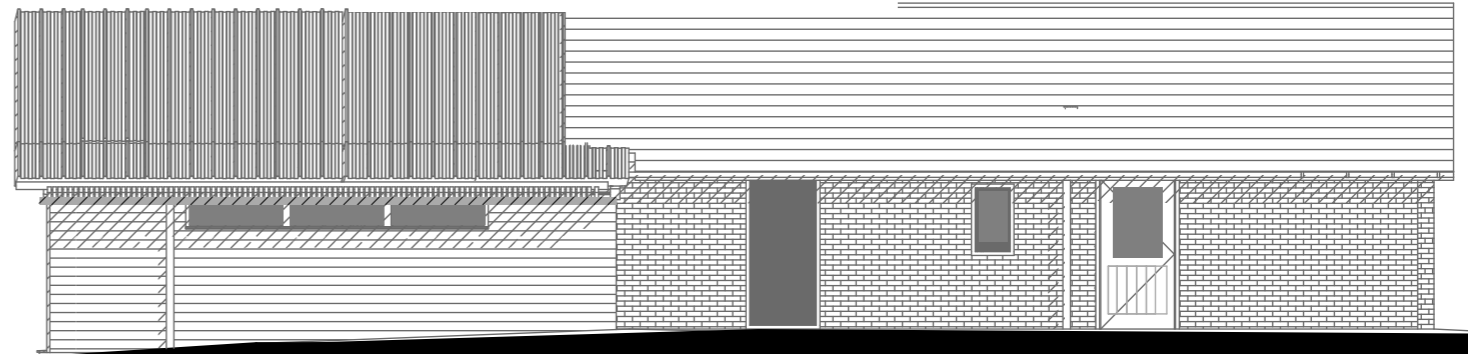
Northwest Elevation 1:100



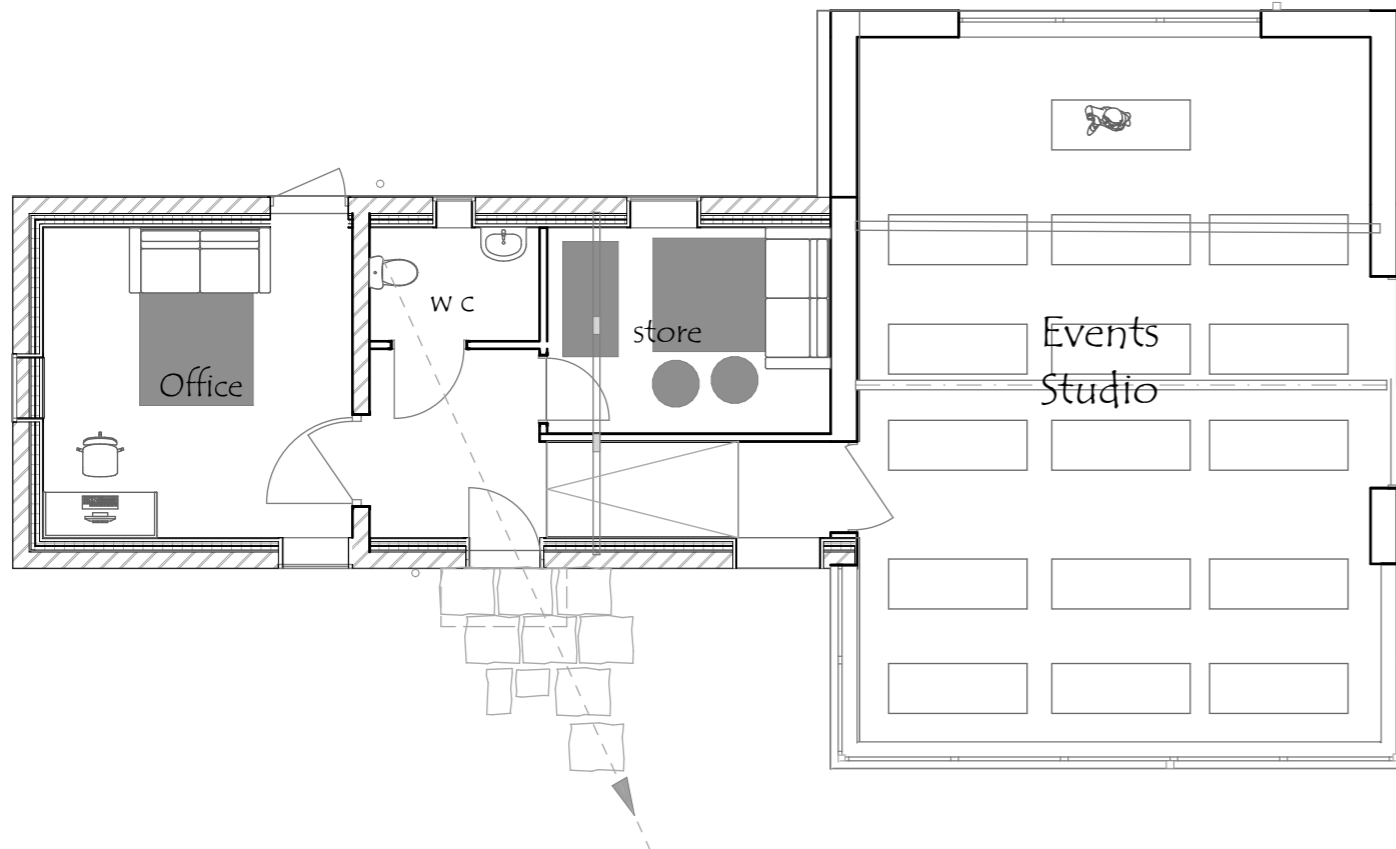
Southeast Elevation



Northeast Elevation



Southwest Elevation

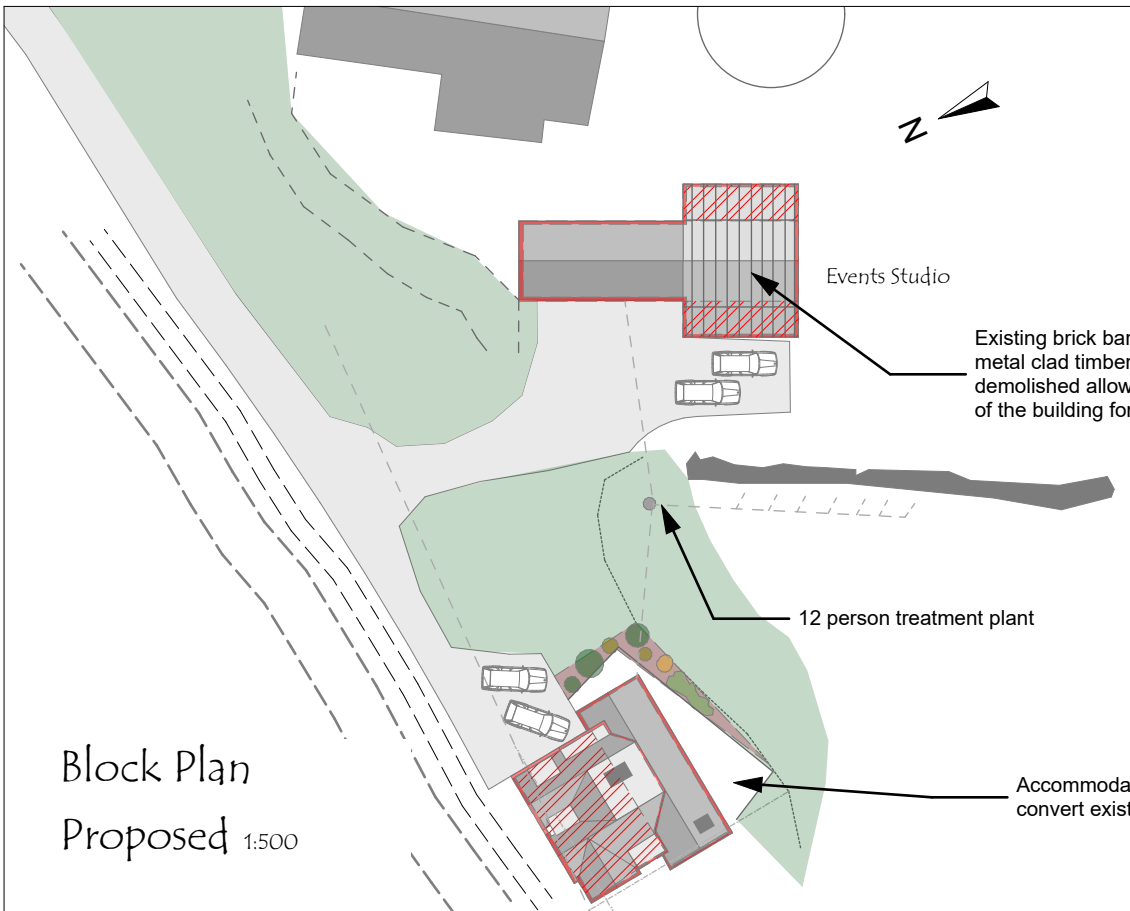
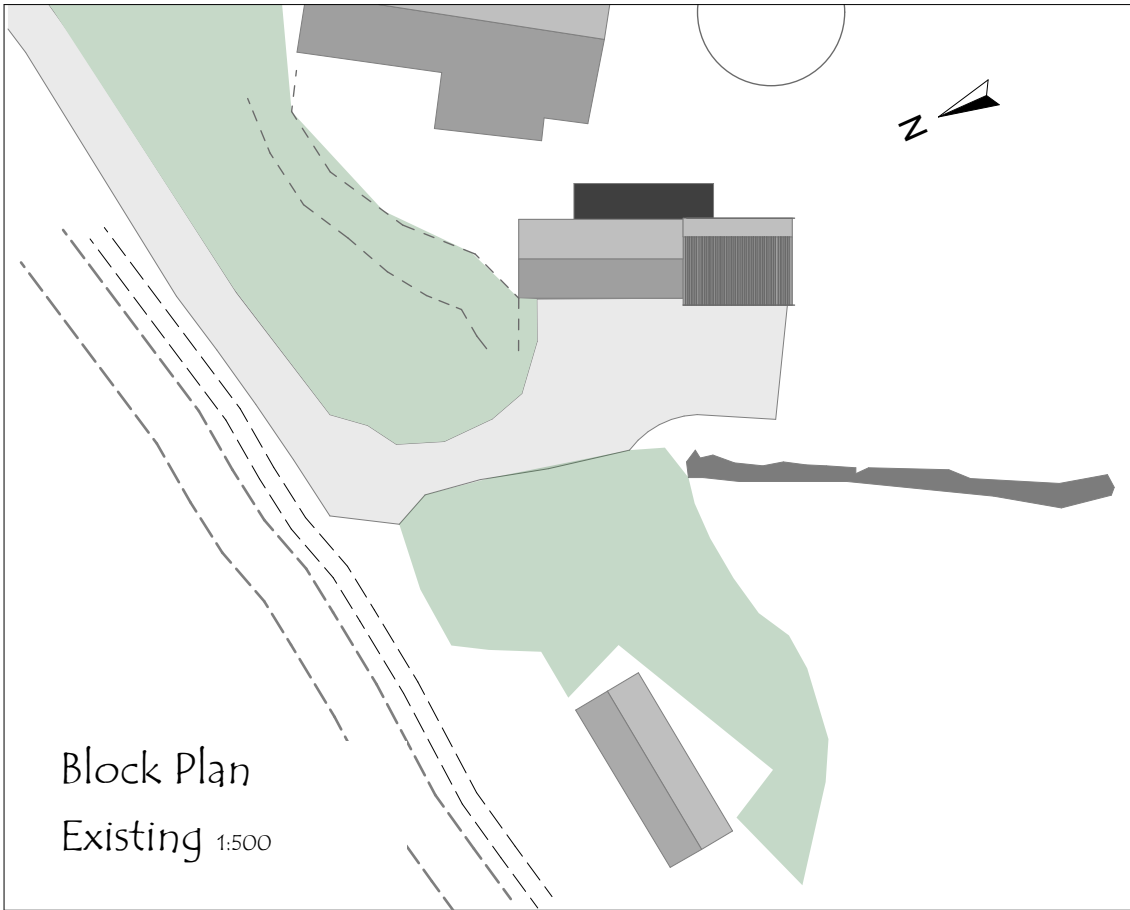


PROPOSED MULTIFUNCTIONAL CORPORATE RETREAT/ EVENTS DEVELOPMENT, RHYD Y CARW MILL, TREFEGLWYS.

Design, Detailing and Visualization
Architectural Services

Frederick Carter
Mob: 07985226376
Tel: 01686 627238
Email: frederickc@live.com

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RETREAT/ EVENTS DEVELOPMENT,
RHYD Y CARW MILL, TREFEGLWYS.

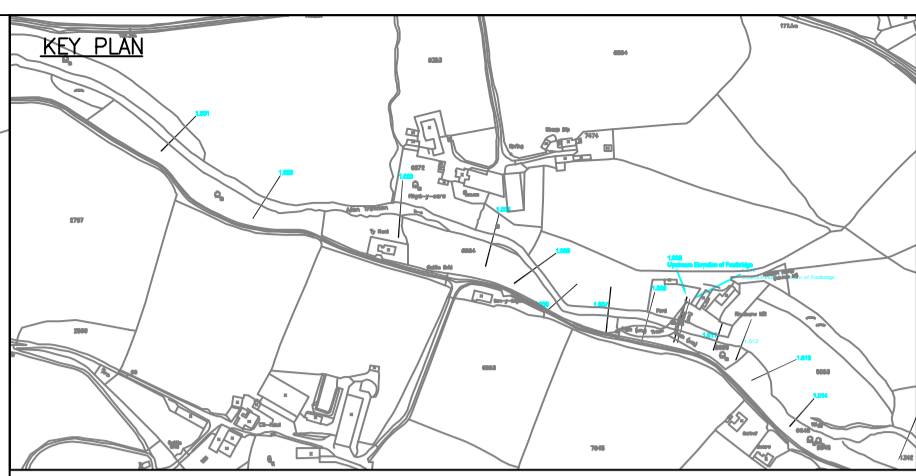
Design, Detailing and Visualization
Architectural Services

Frederick Carter

Mob: 07989226376
Tel: 01686 427288
Email: frederickc@live.com

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|------|--------------|-------|----|
| DATE | 1/8/2020 | Drawn | FC |
| DWG | P/2020/50/03 | | |

APPENDIX 3 – Topographical Survey



- Notes:
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 - Due to unavoidable inaccuracies during the reproduction process these drawings should not be scaled. Where dimensions are critical Usk Land Survey should be requested to confirm dimensions based on survey information. Scales appearing at the base of this plan are for indicative purposes only.
 - This plan has been prepared in accordance with B.S. 1192, Part 1 in relation to scale and dimension. Tolerances permitted within the British Standard should be observed.
 - All dimensions and particulars should be checked on site. Any discrepancies should be reported to Usk Land Survey before any work commences.

| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
| | | | | | |

| SURVEY LEGEND | |
|---------------|-------------------------------|
| AB | AIR BRICK |
| AV | AIR VALVE |
| B | BOLLARD |
| BB | BELISHA BEACON |
| BDY | BOUNDARY |
| BH | BORSHOLE |
| BL | BED LEVEL |
| BRK | BRICKWORK |
| BS | BUS STOP |
| BM | BENCH MARK |
| BW | BRICK WALL |
| BWF | BARBED WIRE FENCE |
| CSF | CLOSE BOARDED FENCE |
| CF | CORRUGATED IRON FENCE |
| CL | COVER LEVEL |
| CLP | CHAIN LINK FENCE |
| CONC | CONCRETE |
| CP | CONCRETE POST |
| CPF | CHESTNUT PALING FENCE |
| CR | CYCLE RACK |
| CTV | CABLE T.V. MANHOLE |
| CUL | CULVERT |
| DK | DROP KERB |
| DL | DECK LEVEL |
| DP | DOWNPIPE |
| DPC | DAMP PROOF COURSE |
| DR | DRAIN |
| DWB | DOG WASTE BIN |
| EA | ENVIRONMENT AGENCY |
| EB | ELECTRICITY BOX |
| EOP | ELECTRIC CABLE FENCE |
| ECP | ELECTRICITY CABLE PIT |
| EMH | ELECTRICITY MANHOLE |
| EP | ELECTRICITY POLE |
| ER | EARTHING ROD |
| ETL | ELECTRICITY TRANSMISSION LINE |
| FB | FLOWER BED |
| FBR | FOOTBRIDGE |
| FI | FIRE HYDRANT |
| FHM | FIRE HYDRANT MARKER |
| FL | FLOOR LEVEL |
| FP | FENCE POST |
| FWM | FUILL WATER MANHOLE |
| G | GULLY |
| GL | GROUND LEVEL |
| GP | GATE POST |
| GM | GAS MARKER |
| GV | GAS VALVE |
| HW | HEAD WALL |
| IC | INSPECTION CHAMBER |
| IL | INVERT LEVEL |
| IRF | IRON RAILING FENCE |
| IRF | INTERMOVING FENCE |
| JB | JUNCTION BOX |
| KG | KEYS INLET GULLY |
| LB | LEFT BANK |
| LFB | LIFEBUOY |
| LP | LAMP POST |
| MB | MOORING BOLLARD |
| MF | MISCELLANEOUS FENCING |
| MH | MANHOLE |
| MCR | MARKER |
| MP | MOORING PILE |
| MSF | METAL PALING FENCE |
| MS | MILE STONE |
| NB | NOTICE BOARD |
| NRA | NATIONAL RIVERS AUTHORITY |
| OHC | OVERHEAD CABLE |
| OS | ORDNANCE SURVEY |
| OSR | OPEN STEEL RAILINGS |
| P | PILE |
| PB | PILLAR BOX |
| PM | PARKING METER |
| PO | POST |
| PPF | POST & RAIL FENCE |
| PTM | PARKING TICKET MACHINE |
| PWF | POST & WIRE FENCE |
| RB | RIGHT BANK |
| RE | ROAD SIGN |
| RE | ROAD SIGN |
| RTW | RETAINING WALL |
| RWP | RAINWATER PIPE |
| SC | STOP SIGN |
| SDP | STAND PIPE |
| SK | SKIRTING |
| SL | SOFTT LEVEL |
| SMH | SURFACE WATER MANHOLE |
| SMP | SHEET METAL PLUMBING |
| SP | SIGN POST |
| STN | STATION |
| SV | SLUCE VALVE |
| SVP | SOIL VENT PIPE |
| SWF | SHEEP WIRE FENCE |
| TM | TEMPORARY BENCH MARK |
| TCB/TCR | TELEPHONE CALL BOX/POST |
| TC | TELECOM CABINET |
| TMH | TELECOM MANHOLE |
| TL | THRESHOLD LEVEL |
| TL | TELEGRAPH POLE |
| TLB | TRAFFIC LIGHT BOX |
| TP | TELEGRAPH POLE |
| TRS | TIMBER RUBBING STRIP |
| TS | TREE STUMP |
| TSR | TUBULAR STEEL RAILINGS |
| VP | VENT PIPE |
| WB | WASTE BIN |
| WL | WATER LEVEL/WATER LINE |
| WM | WATER METER |
| WMF | WIRE MESH FENCE |
| WP | WOODEN POST |
| WPR | WOODEN POST & RAIL FENCE |
| WV | WATER VALVE |
| YG | YARD GULLY |

(Abbreviations apply to survey data only)

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

| NATIONAL GRID. | CONTROL USED: | VALUE(M) |
|----------------|---------------|----------|
| TYPE | REFERENCE | |
| | | |

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Client
 KRS Environmental Ltd
 No.3 Princes Square, Princes Street
 Montgomery, Powys, SY15 6PZ

Usk Land Survey
 No.40 ABERGAVENNY ROAD, USK, NP15 1SB
 TEL: 01291 673491 MOB: 0787 2560386
 EMAIL: jonbarton@usklandsurvey.co.uk

Project
 Rhyd Y Carw Mill
 Topographical Survey

Site
 Rhyd Y Carw Mill
 Trefeglwys
 Caersws
 SY17 5PW

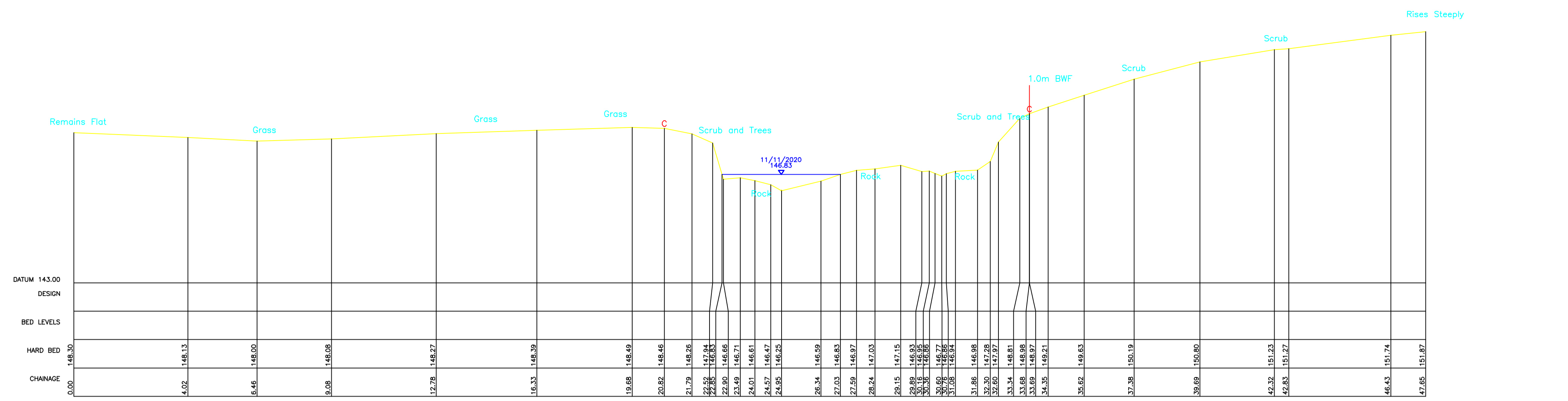
Surveyed by J.Barton Date: NOV 2020
 Checked by J.Barton Date: NOV 2020
 Drawn by J.Barton Date: NOV 2020

Drawing No. _____ Revision _____

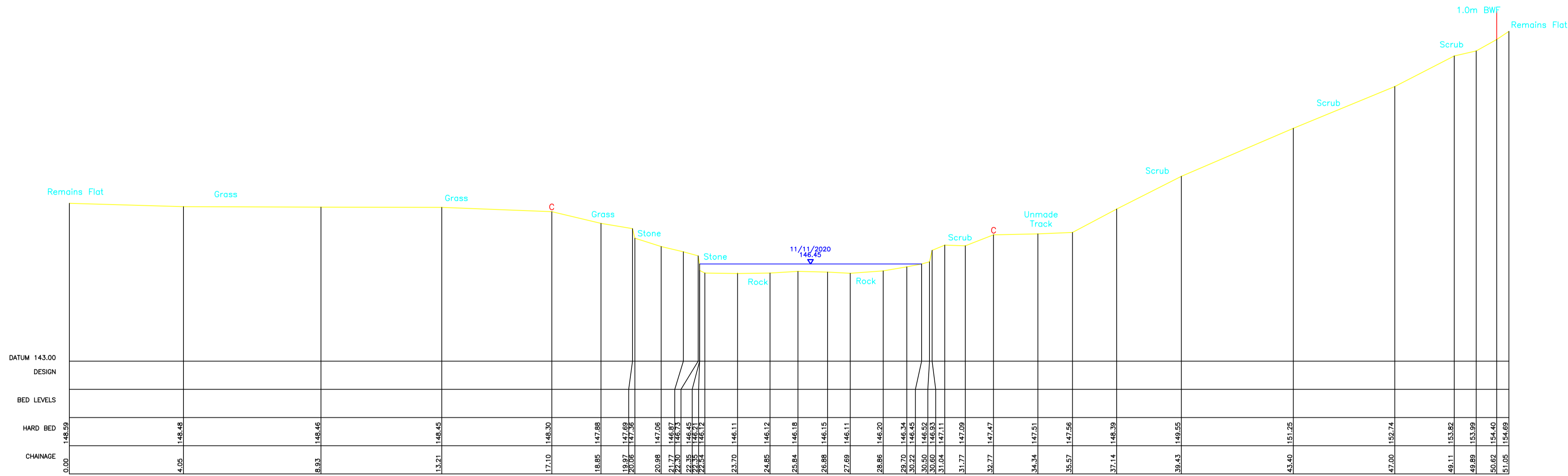
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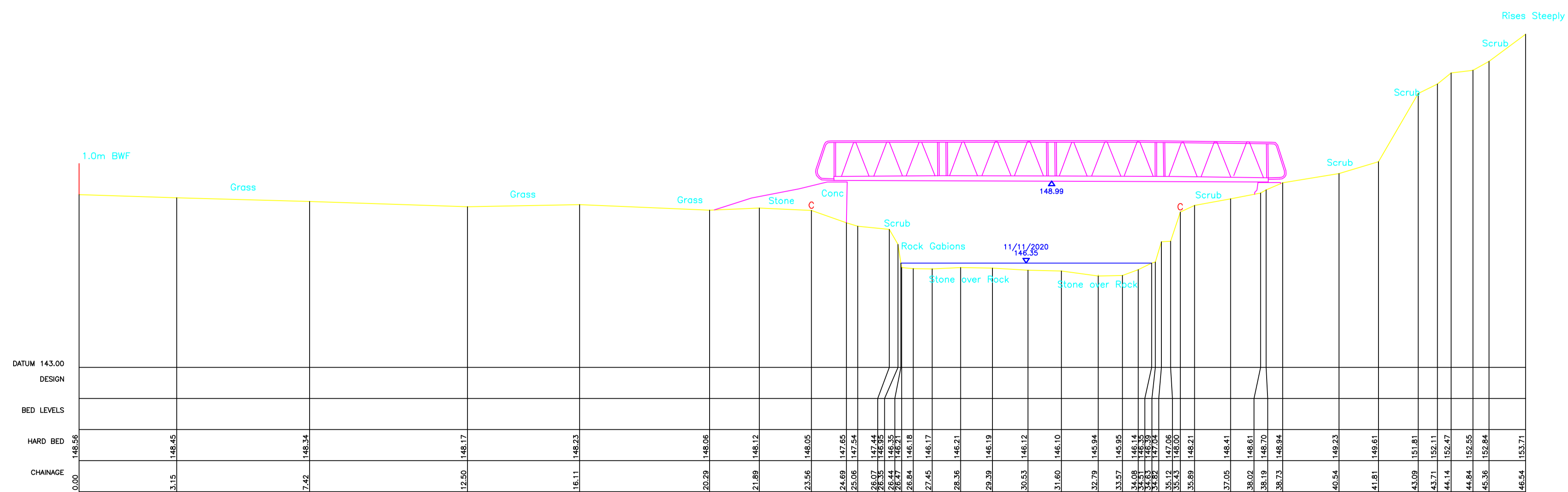
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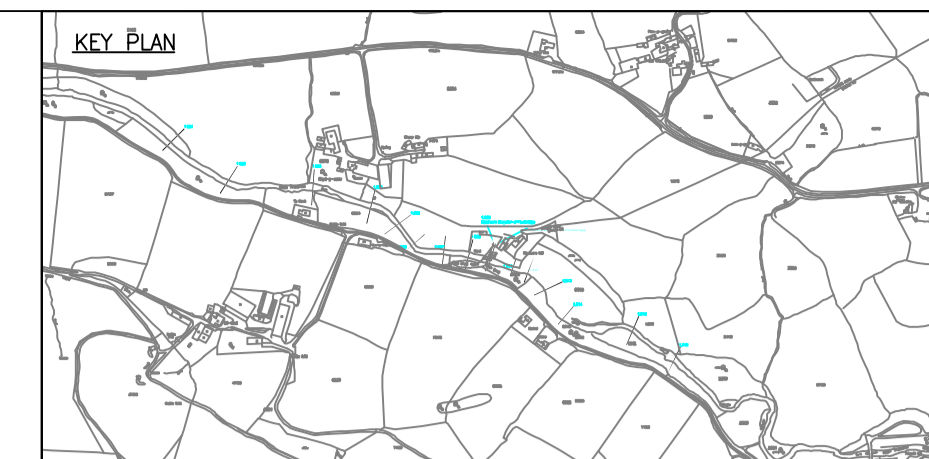
1.007



1.008



1.009
Upstream Elevation of Footbridge



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| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
| | | | | | |

| SURVEY LEGEND | |
|---------------|-------------------------------|
| AB | AIR BRICK |
| AV | AIR VALVE |
| B | BOLLARD |
| BB | BELISHA BEACON |
| BDY | BOUNDARY |
| BH | BORSHOLE |
| BL | BED LEVEL |
| BRK | BRICKWORK |
| BS | BUS STOP |
| BM | BENCH MARK |
| BW | BRICK WALL |
| BWF | BARRED WIRE FENCE |
| CBF | CLOSE BOARD FENCE |
| CF | CORRUGATED IRON FENCE |
| CL | COVER LEVEL |
| CLP | CHAIN LINK FENCE |
| CONC | CONCRETE |
| CP | CONCRETE POST |
| CSF | CHESTNUT PALING FENCE |
| CR | CYCLE RACK |
| CTV | CABLE T.V. MANHOLE |
| CUL | CULVERT |
| DK | DROP KERB |
| DL | DECK LEVEL |
| DPC | DOWNPIPE |
| DPC | DAMP PROOF COURSE |
| DR | DRAIN |
| DWB | DWG WASTE BIN |
| EA | ENVIRONMENT AGENCY |
| EB | ELECTRICITY BOX |
| ECP | ELECTRIC CABLE FENCE |
| ECP | ELECTRICITY CABLE PIT |
| EMH | ELECTRICITY MANHOLE |
| EP | ELECTRICITY POLE |
| EP | EARTHING ROD |
| ETL | ELECTRICITY TRANSMISSION LINE |
| FB | FLOWER BED |
| FBR | FOOTBRIDGE |
| FH | FIRE HYDRANT |
| FHM | FIRE HYDRANT MARKER |
| FL | FLOOR LEVEL |
| FP | FENCE POST |
| FWM | FUUL WATER MANHOLE |
| G | GULLY |
| GL | GROUND LEVEL |
| GP | GATE POST |
| GM | GAS MARKER |
| GV | GAS VALVE |
| HW | HEAD WALL |
| IC | INSPECTION CHAMBER |
| IL | INVERT LEVEL |
| IRF | IRON RAILING FENCE |
| IRF | INTERMOVING FENCE |
| JB | JUNCTION BOX |
| KS | KERB INLET GULLY |
| LB | LEFT BANK |
| LFB | LIFEBUOY |
| LP | LAMP POST |
| MB | MOORING BOLLARD |
| MF | MISCELLANEOUS FENCING |
| MH | MANHOLE |
| MOR | MARKER |
| MP | MOORING PILE |
| MSF | METAL RAILING FENCE |
| MS | MILE STONE |
| NB | NOTICE BOARD |
| NBA | NATIONAL RIVERS AUTHORITY |
| OHC | OVERHEAD CABLE |
| OS | ORDNANCE SURVEY |
| OSR | OPEN STEEL RAILINGS |
| P | PILE |
| PB | PILLAR BOX |
| PM | PARKING METER |
| POST | POST |
| PPF | POST & RAIL FENCE |
| PTM | PARKING TICKET MACHINE |
| PWF | POST & WIRE FENCE |
| RB | RIGHT BANK |
| RE | ROADWAY |
| RE | ROADWAY EYE |
| RS | ROAD SIGN |
| RTW | RETAINING WALL |
| RWP | RANMETER PIPE |
| SC | STOP COCK |
| SDP | STAND PIPE |
| SK | SKAMWAY |
| SL | SOFTTT LEVEL |
| SMH | SURFACE WATER MANHOLE |
| SMP | SHEET METAL PLUNG |
| SP | SIGN POST |
| STN | STATION |
| SV | SUICE VALVE |
| SWP | SOIL VENT PIPE |
| SWF | SHEEP WIRE FENCE |
| TMH | TEMPORARY BENCH MARK |
| TCP/TCB | TELEPHONE CALL BOX/POST |
| TCB | TELECOM CABINET |
| TMH | TELECOM MANHOLE |
| TL | THRESHOLD LEVEL |
| TL | TELEGRAPH POLE |
| TLC | TRAFFIC LIGHT |
| TLP | TRAFFIC LIGHT BOX |
| TR | TRE TRUMP |
| TRS | TIMBER RUBBING STRIP |
| TSR | TUBULAR STEEL RAILINGS |
| TSR | TUBULAR STEEL RAILINGS |
| TV | VENT PIPE |
| WB | WASTE BIN |
| WL | WATER LEVEL/WATER LINE |
| WM | WATER METER |
| WMF | WIRE MESH FENCE |
| WP | WOODEN POST |
| WPR | WOODEN POST & RAIL FENCE |
| WV | WATER VALVE |
| YG | YARD GULLY |

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

| NATIONAL GRID. | CONTROL USED: | VALUE(M) |
|----------------|---------------|----------|
| TYPE | REFERENCE | |
| | | |

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Montgomery, Powys, SY15 6PZ

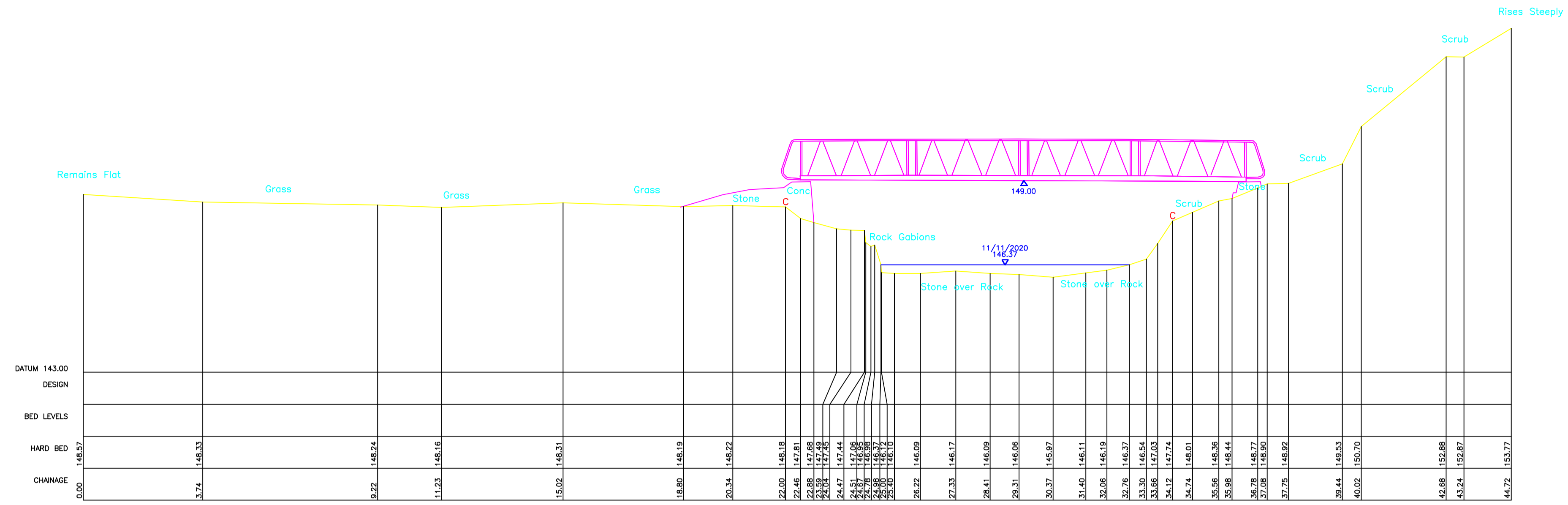
Usk Land Survey
No.40 ABERGAVENNY ROAD, USK, NP15 1SB
TEL: 01291 673491 MOB: 0787 2560386
EMAIL: jonbarton@usklandsurvey.co.uk

Project
Rhyd Y Carw Mill
Topographical Survey

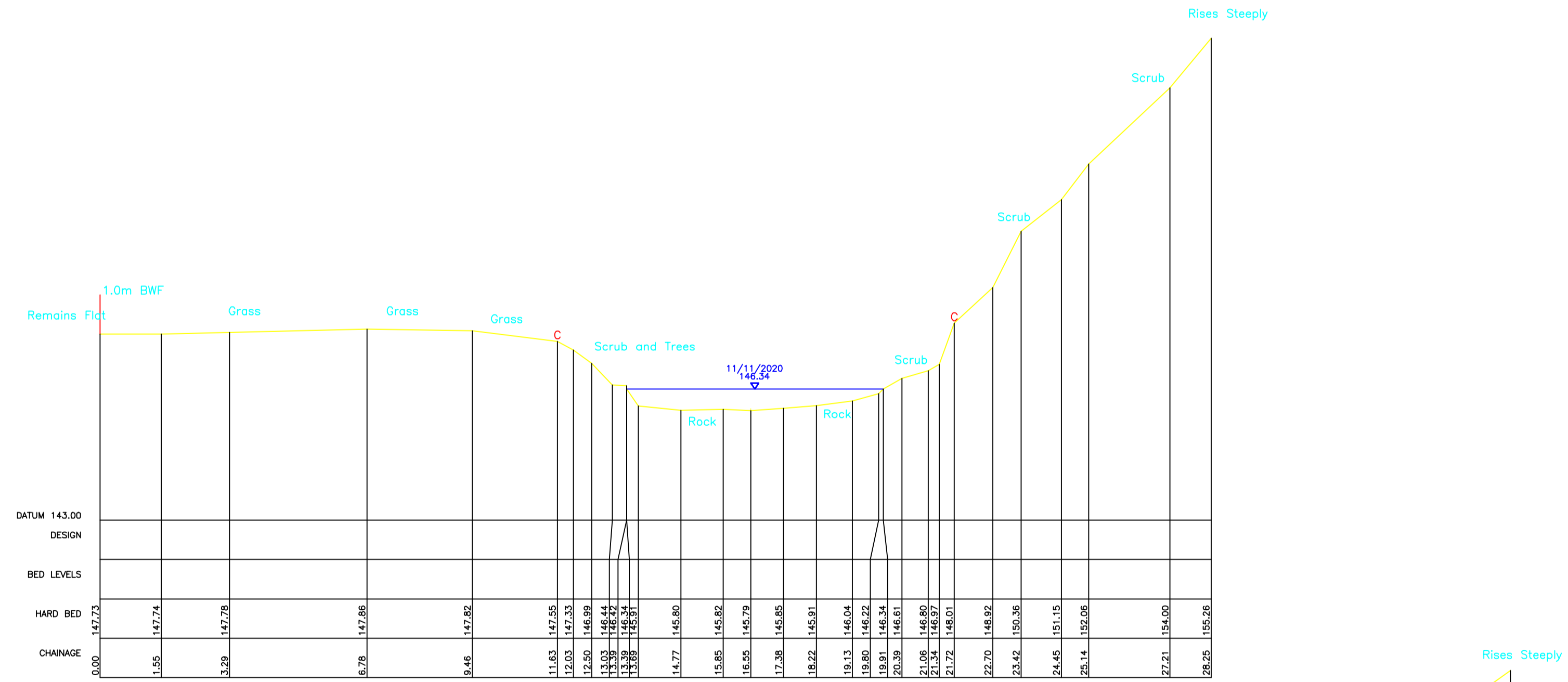
Site
Rhyd Y Carw Mill
Trefeglwys
Caersws
SY17 5PW

Surveyed by J.Barton Date: NOV 2020
Checked by J.Barton Date: NOV 2020
Drawn by J.Barton Date: NOV 2020

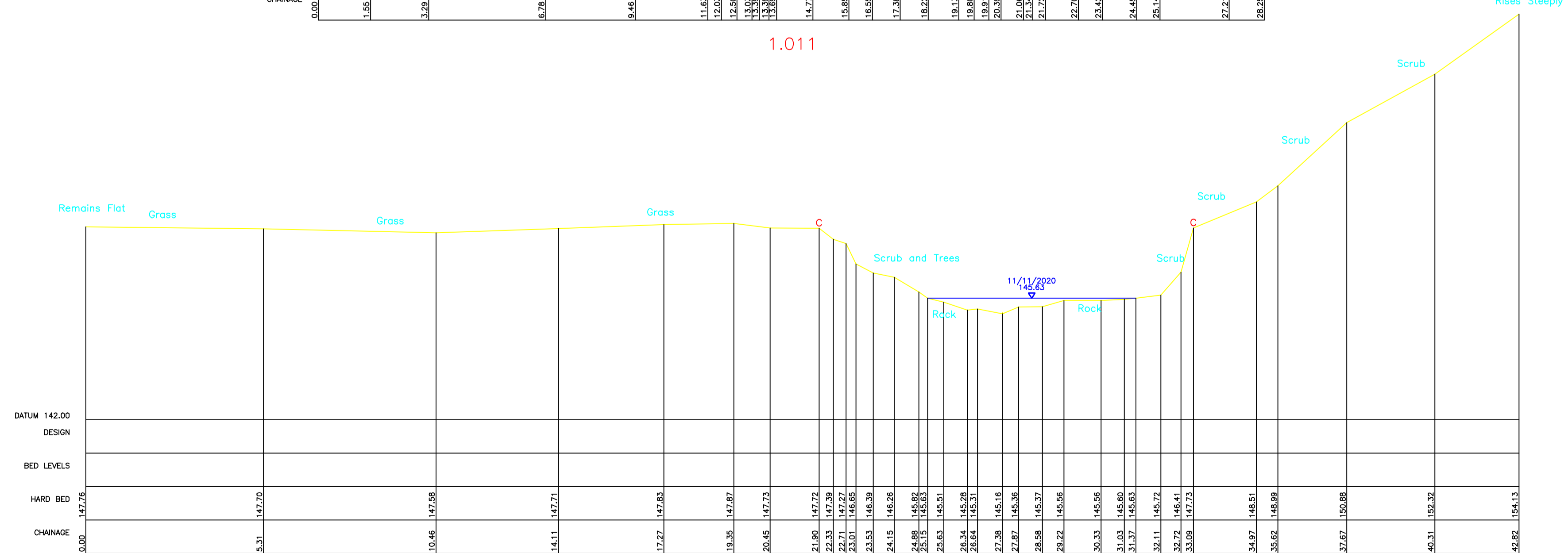
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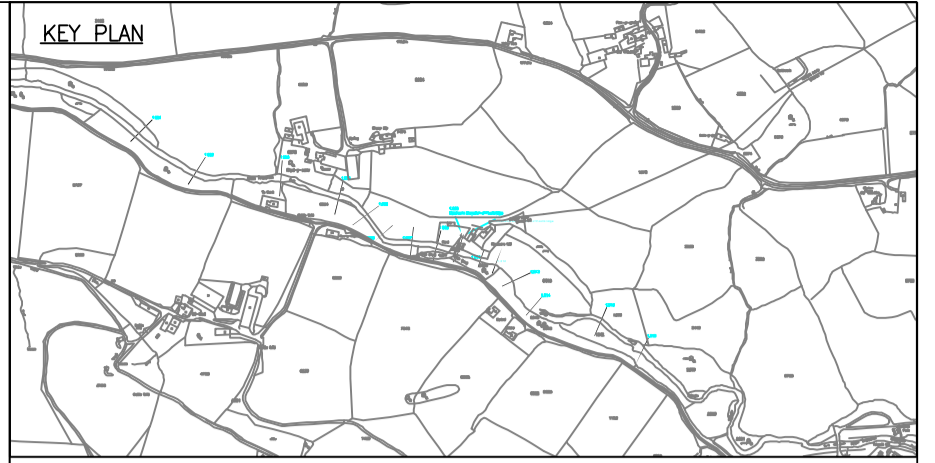
1.010
Downstream Elevation of Footbridge



1.011



1.012



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| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
| | | | | | |

| SURVEY LEGEND | | | |
|---------------|-------------------------------|---------|---------------------------|
| AB | AIR BRICK | LP | LAMP POST |
| AV | AIR VALVE | MB | MOORING BOLLARD |
| B | BOLLARD | MF | MISCELLANEOUS FENCING |
| BB | BELISHA BEACON | MH | MANHOLE |
| BOY | BOUNDARY MARKER | MKR | MARKER |
| BH | BORSHOLE | MP | MOORING PILE |
| BL | BED LEVEL | MWF | METAL RAILING FENCE |
| BRK | BRICKWORK | MS | MILE STONE |
| BS | BUS STOP | NB | NOTICE BOARD |
| BM | BENCH MARK | NBA | NATIONAL RIVERS AUTHORITY |
| BW | BRICK WALL | OHC | OVERHEAD CABLE |
| BWF | BARBED WIRE FENCE | OS | ORDNANCE SURVEY |
| CSF | CLOSE BOARD FENCE | OSR | OPEN STEEL RAILINGS |
| CF | CORRUGATED IRON FENCE | P | PILE |
| CL | COVER LEVEL | PB | PILLAR BOX |
| CLP | CHAIN LINK FENCE | PM | PARKING METER |
| CONC | CONCRETE | PO | POST |
| CP | CONCRETE POST | PPF | POST & RAIL FENCE |
| CSF | CHESTNUT PALING FENCE | PTM | PARKING TICKET MACHINE |
| CR | CYCLE RACK | PWF | POST & WIRE FENCE |
| CTV | CABLE T.V. MANHOLE | RB | RIGHT BANK |
| CUL | CULVERT | RE | RODDING EYE |
| DK | DROP KERB | RS | ROAD SIGN |
| DL | DECK LEVEL | RTW | RETAINING WALL |
| DP | DOWNPIPE | RWP | RANMETER PIPE |
| DPC | DAMP PROOF COURSE | SC | STOP COCK |
| DR | DRAIN | SDP | STAND PIPE |
| DWB | DIG WASTE BIN | SK | SKAMWAY |
| EA | ENVIRONMENT AGENCY | SL | SOFTT LEVEL |
| EB | ELECTRICITY BOX | SMH | SURFACE WATER MANHOLE |
| ECP | ELECTRIC CABLE FENCE | SMP | SHEET METAL PILING |
| ECB | ELECTRICITY CABLE PIT | SP | SPIN POST |
| EMH | ELECTRICITY MANHOLE | STN | STATION |
| EP | ELECTRICITY POLE | SV | SUICE VALVE |
| ER | EARTHING ROD | SVP | SOIL VENT PIPE |
| ETL | ELECTRICITY TRANSMISSION LINE | SWF | SHEEP WIRE FENCE |
| FB | FLOWER BED | TM | TEMPORARY BENCH MARK |
| FR | FOOTBRIDGE | TCP/TCR | TELEPHONE CALL BOX/POST |
| FH | FIRE HYDRANT | TC | TELECOM CABINET |
| FHM | FIRE HYDRANT MARKER | TMH | TELECOM MANHOLE |
| FL | FLOOR LEVEL | TL | THRESHOLD LEVEL |
| FP | FENCE POST | TL | TRAFFIC LIGHT |
| FWM | FUUL WATER MANHOLE | TBL | TRAFFIC LIGHT BOX |
| G | GULLY | TP | TELEGRAPH POLE |
| GL | GROUND LEVEL | TRS | TIMBER RUBBING STRIP |
| GP | GATE POST | TS | TREE STUMP |
| GM | GAS MARKER | TSR | TUBULAR STEEL RAILINGS |
| GV | GAS VALVE | VS | VENT PIPE |
| HW | HEAD WALL | WB | WASTE BIN |
| IC | INSPECTION CHAMBER | WL | WATER LEVEL/WATER LINE |
| IL | INVERT LEVEL | WM | WATER METER |
| IRF | IRON RAILING FENCE | WMF | WIRE MESH FENCE |
| IRF | INTERLOCK FENCE | WP | WOODEN POST |
| JB | JUNCTION BOX | WPR | WOODEN POST & RAIL FENCE |
| KS | KEYS INLET GULLY | WV | WATER VALVE |
| LB | LEFT BANK | YG | YARD GULLY |
| LFB | LIFEBUOY | | |

(Abbreviations apply to survey data only)

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

| NATIONAL GRID. | CONTROL USED: | VALUE(M) |
|----------------|---------------|----------|
| TYPE | REFERENCE | |
| | | |

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 KRS Environmental Ltd
 No.3 Princes Square, Princes Street
 Montgomery, Powys, SY15 6PZ

Usk Land Survey
 No.40 ABERGAVENNY ROAD, USK, NP15 1SB
 TEL: 01291 673491 MOB: 0787 2560386
 EMAIL: jonbarton@usklandsurvey.co.uk

Project
 Rhyd Y Carw Mill
 Topographical Survey

Site
 Rhyd Y Carw Mill
 Trefeglwys
 Caersws
 SY17 5PW

Surveyed by J.Barton Date: NOV 2020
 Checked by J.Barton Date: NOV 2020
 Drawn by J.Barton Date: NOV 2020

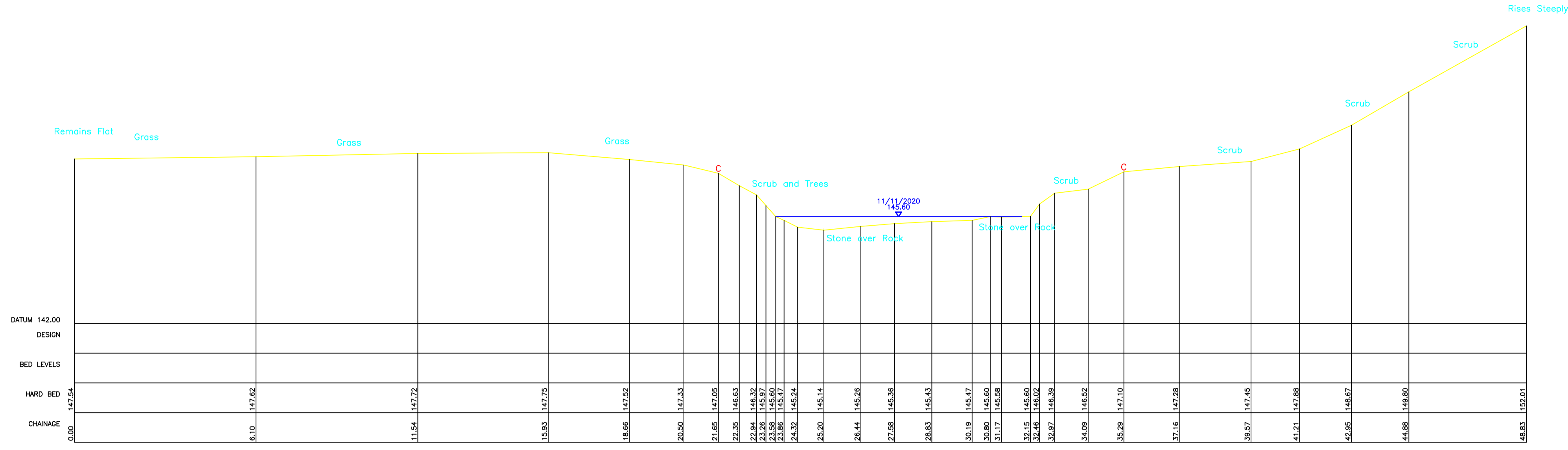
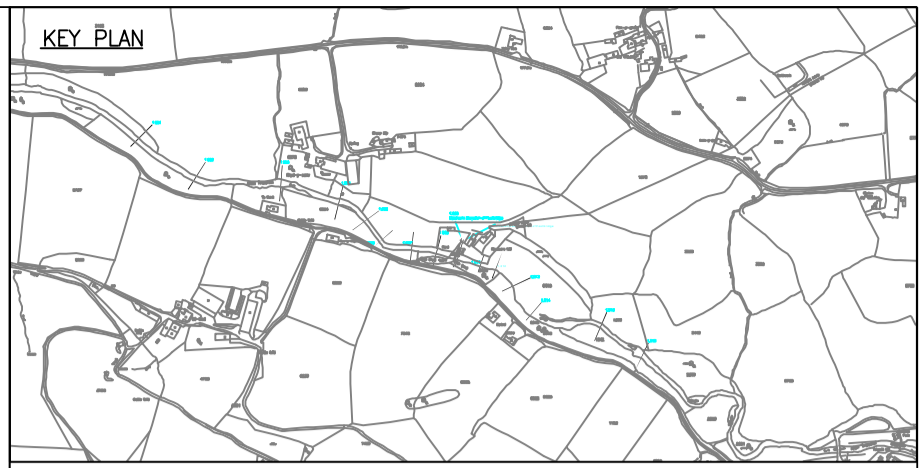
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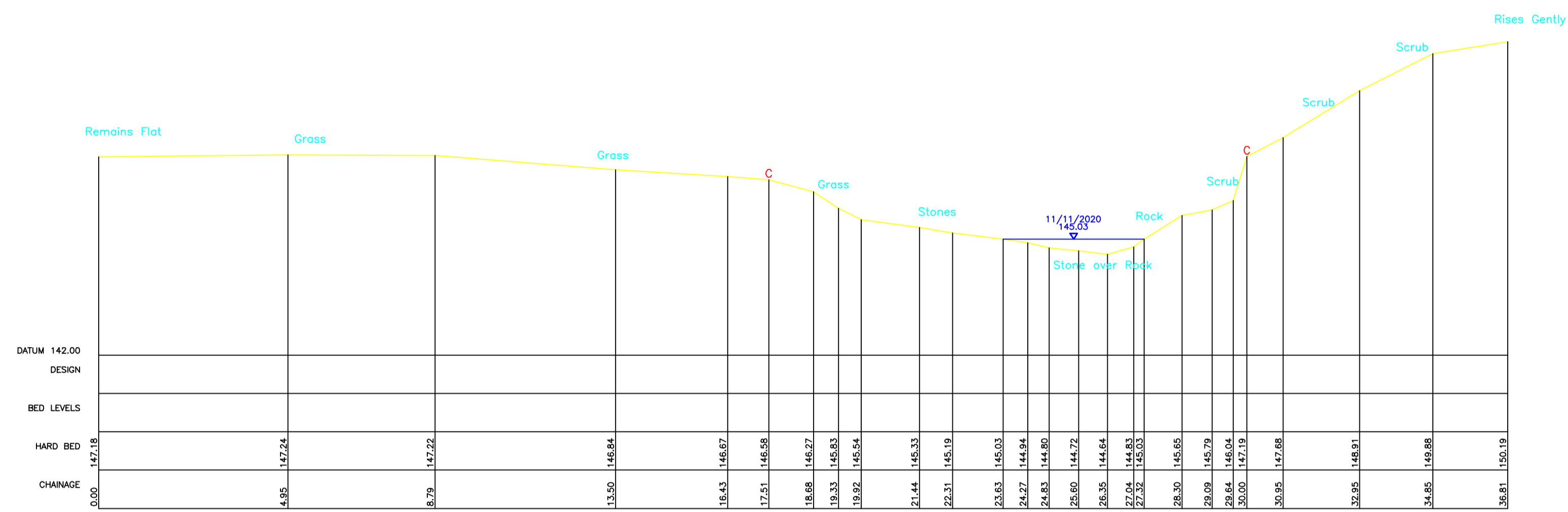
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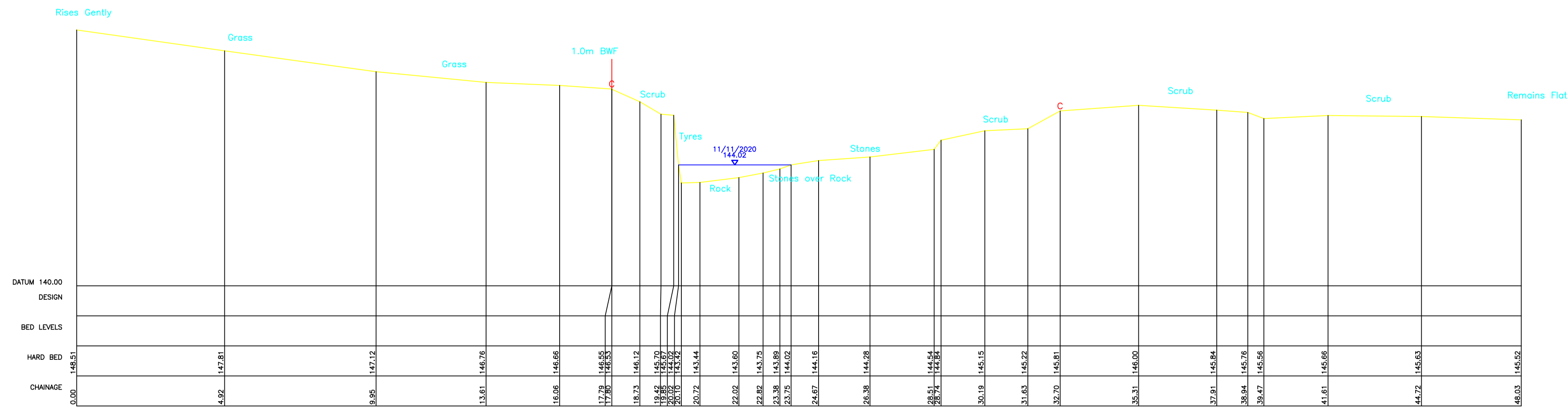
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1.013



1.014



1.015

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| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
|----------|----|---------|----------|------|-------------|

SURVEY LEGEND

| | | | |
|------|-------------------------------|---------|---------------------------|
| AB | AIR BRICK | LP | LAMP POST |
| AV | AIR VALVE | MB | MOORING BOLLARD |
| B | BOLLARD | MF | MISCELLANEOUS FENCING |
| BB | BELISHA BEACON | MH | MANHOLE |
| BDY | BOUNDARY MARKER | MKR | MARKER |
| BH | BORSHOLE | MP | MOORING PILE |
| BL | BED LEVEL | MRF | METAL RAILING FENCE |
| BRK | BROCKWORK | MS | MILE STONE |
| BS | BUS STOP | NB | NOTICE BOARD |
| BM | BENCH MARK | NBA | NATIONAL RIVERS AUTHORITY |
| BW | BRICK WALL | OHC | OVERHEAD CABLE |
| BWF | BARRIED WIRE FENCE | OS | ORDNANCE SURVEY |
| CBF | CLOSE BOARDED FENCE | OSR | OPEN STEEL RAILINGS |
| CF | CORRUGATED IRON FENCE | P | PILE |
| CL | COVER LEVEL | PB | PILLAR BOX |
| CLP | CHAIN LINK FENCE | PM | PARKING METER |
| CONC | CONCRETE | PO | POST |
| CP | CONCRETE POST | PPF | POST & RAIL FENCE |
| CPF | CHESTNUT PALING FENCE | PTM | PARKING TICKET MACHINE |
| CR | CYCLE RACK | PWF | POST & WIRE FENCE |
| CTV | CABLE T.V. MANHOLE | RB | ROAD BANK |
| CUL | CULVERT | RE | ROADWAY EYE |
| DK | DROP KERB | RS | ROAD SIGN |
| DL | DECK LEVEL | RTW | RETAINING WALL |
| DP | DOWNPIPE | RWP | RAINWATER PIPE |
| DPC | DAMP PROOF COURSE | SC | STOP COCK |
| DR | DRAIN | SDP | STAND PIPE |
| DWB | DOG WASTE BIN | SK | SKIDWAY |
| EA | ENVIRONMENT AGENCY | SL | SOFTT LEVEL |
| EB | ELECTRICITY BOX | SMH | SURFACE WATER MANHOLE |
| ECP | ELECTRIC CABLE FENCE | SMP | SHEET METAL PILING |
| ECS | ELECTRICITY CABLE PIT | SP | SPIN POST |
| EMH | ELECTRICITY MANHOLE | STN | STATION |
| EP | ELECTRICITY POLE | SV | SUICIDE VALVE |
| ER | EARTHING ROD | SVP | SOIL VENT PIPE |
| ETL | ELECTRICITY TRANSMISSION LINE | SWF | SHEEP WIRE FENCE |
| FB | FLOWER BED | TM | TEMPORARY BENCH MARK |
| FBR | FOOTBRIDGE | TCP/TCP | TELEPHONE CALL BOX/POST |
| FI | FIRE HYDRANT | TC | TELECOM CABINET |
| FHM | FIRE HYDRANT MARKER | TMH | TELECOM MANHOLE |
| FL | FLOOR LEVEL | TL | THRESHOLD LEVEL |
| FP | FENCE POST | TL | TRAFFIC LIGHT |
| FWM | FUILL WATER MANHOLE | TLB | TRAFFIC LIGHT BOX |
| G | GULLY | TP | TELEGRAPH POLE |
| GL | GROUND LEVEL | TRS | TIMBER RUBBING STRIP |
| GP | GATE POST | TS | TREE STUMP |
| GM | GAS MARKER | TSR | TUBULAR STEEL RAILINGS |
| GV | GAS VALVE | VP | VENT PIPE |
| HW | HEAD WALL | WB | WASTE BIN |
| IC | INSPECTION CHAMBER | WL | WATER LEVEL/WATER LINE |
| IL | INVERT LEVEL | WM | WATER METER |
| IRF | IRON RAILING FENCE | WMF | WIRE MESH FENCE |
| IRF | INTERLOCKING FENCE | WP | WOODEN POST |
| JB | JUNCTION BOX | WPR | WOODEN POST & RAIL FENCE |
| KS | KERB INLET GULLY | WV | WATER VALVE |
| LB | LEFT BANK | YG | YARD GULLY |
| LFB | LIFEBUOY | | |

(Abbreviations apply to survey data only)

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

| NATIONAL GRID. | CONTROL USED: | VALUE(M) |
|----------------|---------------|----------|
| TYPE | REFERENCE | |
| | | |

ALL LEVELS RELATE TO ORDNANCE DATUM NEWLYN.

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 KRS Environmental Ltd
 No.3 Princes Square, Princes Street
 Montgomery, Powys, SY15 6PZ

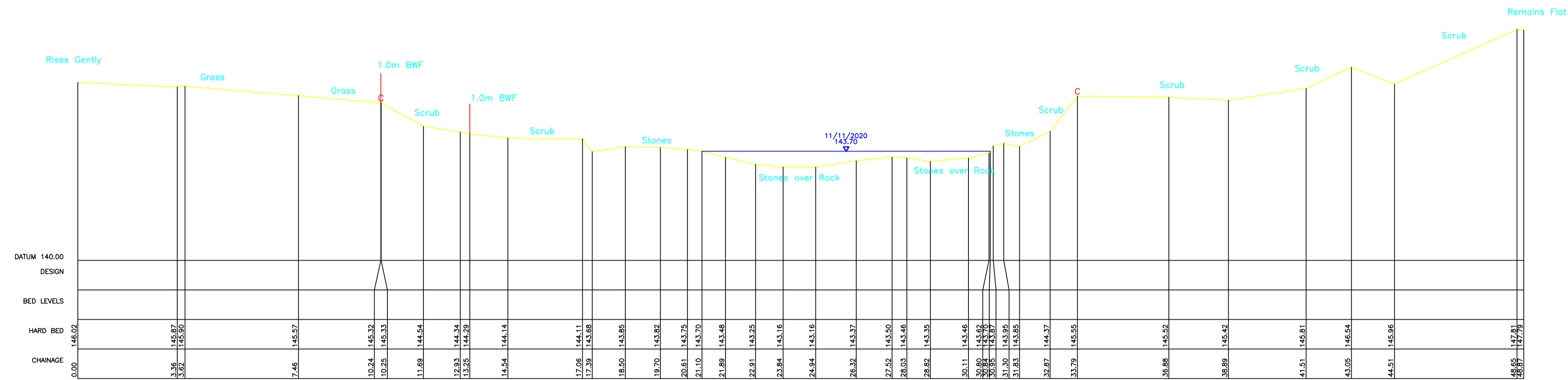
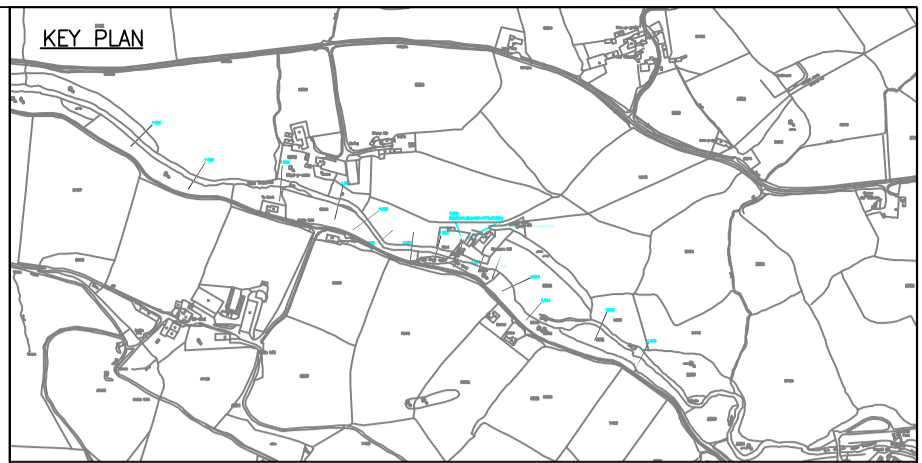
Usk Land Survey
 No.40 ABERGAVENNY ROAD, USK, NP15 1SB
 TEL: 01291 673491 MOB: 0787 2560386
 EMAIL: jonbarton@usklandsurvey.co.uk

Project
 Rhyd Y Carw Mill
 Topographical Survey

Site
 Rhyd Y Carw Mill
 Trefeglwys
 Caersws
 SY17 5PW

Surveyed by J.Barton Date: NOV 2020
 Checked by J.Barton Date: NOV 2020
 Drawn by J.Barton Date: NOV 2020

Drawing No. Section_5 Revision
 Drawing Scale: 1:100 Job Ref 1029
 CAD Filename: 1029.dwg Plot Scale: 1=1
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1.016

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 - All dimensions and particulars should be checked on site. Any discrepancies should be reported to Usk Land Survey before any work commences.

| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
| | | | | | |

| SURVEY LEGEND | |
|---------------|-------------------------------|
| AB | AIR BRICK |
| AV | AIR VALVE |
| B | BOLLARD |
| BB | BELISHA BEACON |
| BDY | BOUNDARY |
| BH | BORSHOLE |
| BL | BED LEVEL |
| BRK | BRICKWORK |
| BS | BUS STOP |
| BM | BENCH MARK |
| BW | BRICK WALL |
| BWF | BARRIED WIRE FENCE |
| CBF | CLOSE BARBED FENCE |
| CF | CORRUGATED IRON FENCE |
| CL | COVER LEVEL |
| CLP | CHAIN LINK FENCE |
| CONC | CONCRETE |
| CP | CONCRETE POST |
| CPF | CHESTNUT PALING FENCE |
| CR | CYCLE RACK |
| CTV | CABLE T.V. MANHOLE |
| CUL | CULVERT |
| DK | DROP KERB |
| DL | DECK LEVEL |
| DP | DOWNPIPE |
| DPC | DAMP PROOF COURSE |
| DR | DRAIN |
| DWB | DOG WASTE BIN |
| EA | ENVIRONMENT AGENCY |
| EB | ELECTRICITY BOX |
| ECP | ELECTRIC CABLE FENCE |
| ECB | ELECTRICITY CABLE PIT |
| EMH | ELECTRICITY MANHOLE |
| EP | ELECTRICITY POLE |
| EP | EARTHING ROD |
| ETL | ELECTRICITY TRANSMISSION LINE |
| FB | FLOWER BED |
| FBR | FOOTBRIDGE |
| FI | FIRE HYDRANT |
| FHM | FIRE HYDRANT MARKER |
| FL | FLOOR LEVEL |
| FP | FENCE POST |
| FWM | FOUL WATER MANHOLE |
| G | GULLY |
| GL | GROUND LEVEL |
| GP | GATE POST |
| GM | GAS MARKER |
| GV | GAS VALVE |
| HW | HEAD WALL |
| IC | INSPECTION CHAMBER |
| IL | INVERT LEVEL |
| IRF | IRON RAILING FENCE |
| IRF | INTERMOVING FENCE |
| JB | JUNCTION BOX |
| KS | KEB INLET GULLY |
| LB | LEFT BANK |
| LFB | LIFEBUOY |
| LP | LAMP POST |
| MB | MOORING BOLLARD |
| MF | MISCELLANEOUS FENCING |
| MH | MANHOLE |
| MKR | MARKER |
| MP | MOORING PILE |
| MSF | METAL RAILING FENCE |
| MS | MILE STONE |
| NSA | NOTICE BOARD |
| NRA | NATIONAL RIVERS AUTHORITY |
| OHC | OVERHEAD CABLE |
| OS | ORDNANCE SURVEY |
| OSR | OPEN STEEL RAILINGS |
| P | PILE |
| PB | PILLAR BOX |
| PM | PARKING METER |
| PO | POST |
| PPF | POST & RAIL FENCE |
| PTM | PARKING TICKET MACHINE |
| PWF | POST & WIRE FENCE |
| RB | RIGHT BANK |
| RE | ROAD SIGN |
| RE | ROADWAY EYE |
| RS | ROAD SIGN |
| RTW | RETAINING WALL |
| RWP | RAINWATER PIPE |
| SC | STOP COCK |
| SDP | STAND PIPE |
| SK | SKAMWAY |
| SL | SOFTEN LEVEL |
| SMH | SURFACE WATER MANHOLE |
| SMP | SHEET METAL PILING |
| SP | SPIN POST |
| STN | STATION |
| SV | SUICIDE VALVE |
| SVP | SOIL VENT PIPE |
| SWF | SHEEP WIRE FENCE |
| TM | TEMPORARY BENCH MARK |
| TCS/TCB | TELEPHONE CALL BOX/POST |
| TEL | TELEPHONE GABINET |
| TMH | TELECOM MANHOLE |
| TL | THRESHOLD LEVEL |
| TL | TRAFFIC LIGHT |
| TB | TRAFFIC LIGHT BOX |
| TP | TELEGRAM POLE |
| TRS | TIMBER RUBBING STRIP |
| TS | TREE STUMP |
| TSS | TUBULAR STEEL RAILINGS |
| VP | VENT PIPE |
| WB | WASTE BIN |
| WL | WATER LEVEL/WATER LINE |
| WM | WATER METER |
| WMF | WIRE MESH FENCE |
| WP | WOODEN POST |
| WPR | WOODEN POST & RAIL FENCE |
| WV | WATER VALVE |
| YG | YARD GULLY |

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

| NATIONAL GRID. | CONTROL USED: | VALUE(M) |
|----------------|---------------|----------|
| TYPE | REFERENCE | |
| | | |

Client
 KRS Environmental Ltd
 No.3 Princes Square, Princes Street
 Montgomery, Powys, SY15 6PZ

Usk Land Survey
 No.40 ABERGAVENNY ROAD, USK, NP15 1SB
 TEL: 01291 673491 MOB: 0787 2560386
 EMAIL: jonbarton@usklandsurvey.co.uk

Project
 Rhyd Y Carw Mill
 Topographical Survey

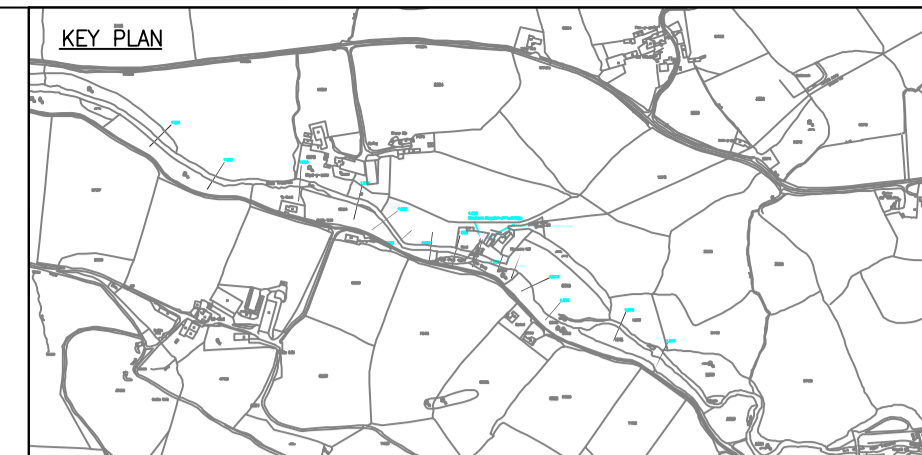
Site
 Rhyd Y Carw Mill
 Trefeglwys
 Caerswys
 SY17 5PW

Surveyed by J.Barton Date: NOV 2020
 Checked by J.Barton Date: NOV 2020
 Drawn by J.Barton Date: NOV 2020

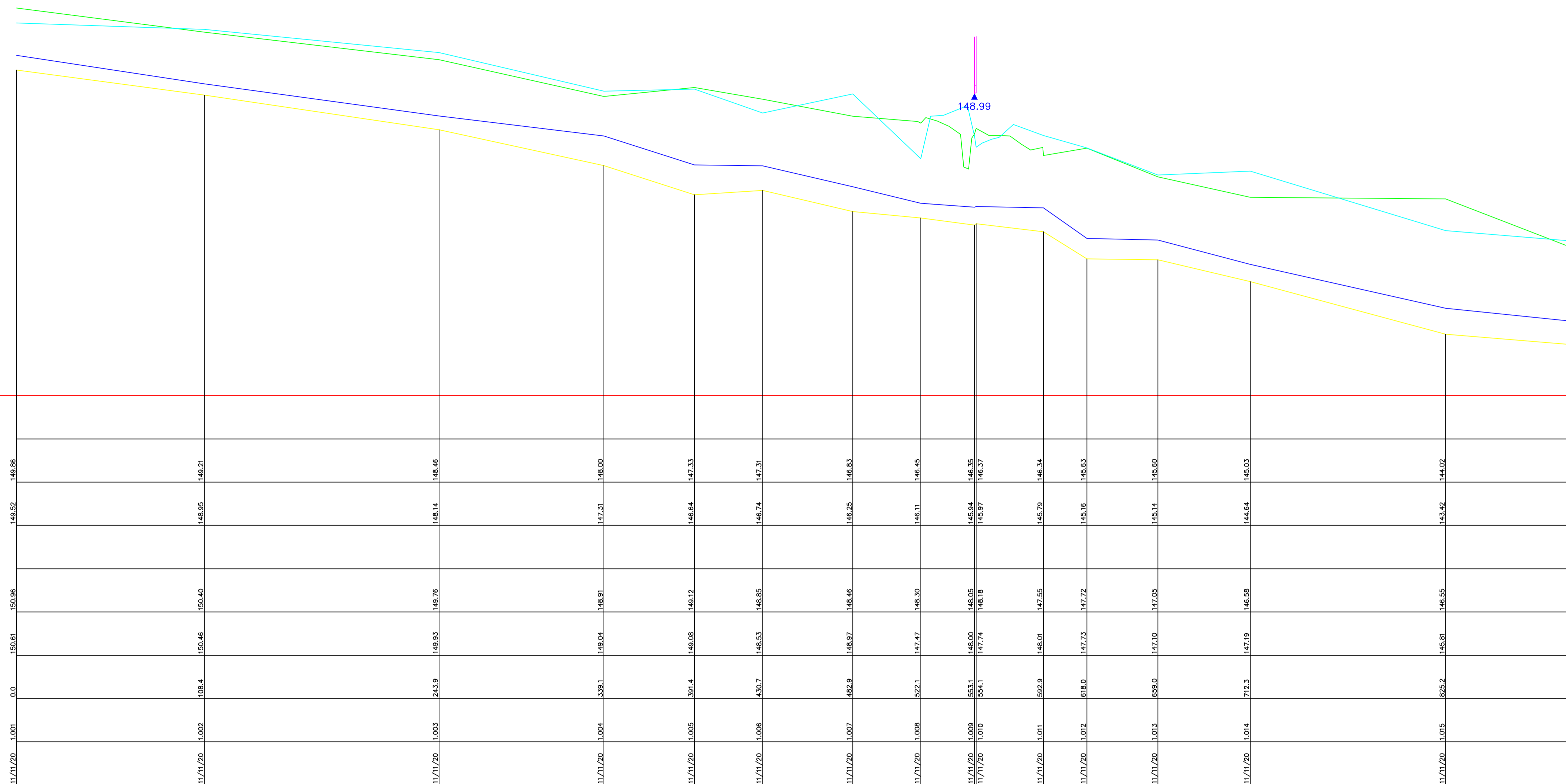
Drawing No. Section_6 Revision

Drawing Scale: 1:100 Job Ref: 1029
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Datum 142.00M



Inclusion: Elevation of Footbridge
Downstream Elevation of Footbridge

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| Revision | By | Checked | Approved | Date | Description |
|----------|----|---------|----------|------|-------------|
| | | | | | |

| SURVEY LEGEND | |
|---------------|-------------------------------|
| AB | AIR BRICK |
| AV | AIR VALVE |
| B | BOLLARD |
| BB | BELISHA BEACON |
| BDY | BOUNDARY |
| BH | BOREHOLE |
| BL | BED LEVEL |
| BRK | BRICKWORK |
| BS | BUS STOP |
| BM | BENCH MARK |
| BW | BRICK WALL |
| BWF | BARRIED WIRE FENCE |
| CBF | CLOSE BOARDED FENCE |
| CF | CORRUGATED IRON FENCE |
| CL | COVER LEVEL |
| CLP | CHAIN LINK FENCE |
| CONC | CONCRETE |
| CP | CONCRETE POST |
| CSF | CHESTNUT PALING FENCE |
| CR | CYCLE RACK |
| CTY | CABLE T.V. MANHOLE |
| CUL | CULVERT |
| DK | DROP KERB |
| DL | DECK LEVEL |
| DP | DOWNPIPE |
| DPC | DAMP PROOF COURSE |
| DR | DRAIN |
| DWB | DIG WASTE BIN |
| EA | ENVIRONMENT AGENCY |
| EB | ELECTRICITY BOX |
| ECP | ELECTRIC CABLE PIPE |
| ECB | ELECTRICITY CABLE PIT |
| EMH | ELECTRICITY MANHOLE |
| EP | ELECTRICITY POLE |
| EPH | EARTHING ROD |
| ETL | ELECTRICITY TRANSMISSION LINE |
| FB | FLOWER BED |
| FBR | FOOTBRIDGE |
| FH | FIRE HYDRANT |
| FHM | FIRE HYDRANT MARKER |
| FL | FLOOR LEVEL |
| FP | FENCE POST |
| FWM | FUUL WATER MANHOLE |
| G | GULLY |
| GL | GROUND LEVEL |
| GM | GATE POST |
| GM | GAS MARKER |
| GV | GAS VALVE |
| HW | HEAD WALL |
| I | INSPECTION CHAMBER |
| I | INVERT LEVEL |
| IRF | IRON RAILING FENCE |
| IRF | INTERLOCK FENCE |
| JB | JUNCTION BOX |
| KSB | KERB INLET GULLY |
| LB | LEFT BANK |
| LFB | LIFEBUOY |
| LP | LAMP POST |
| MB | MOORING BOLLARD |
| MF | MISCELLANEOUS FENCING |
| MH | MANHOLE |
| MKR | MARKER |
| MP | MOORING PILE |
| MRF | METAL RAILING FENCE |
| MS | MILE STONE |
| NB | NOTICE BOARD |
| NSA | NATIONAL POWER AUTHORITY |
| OHC | OVERHEAD CABLE |
| OS | ORDNANCE SURVEY |
| OSR | OPEN STEEL RAILINGS |
| P | PILLAR |
| PB | PILLAR BOX |
| PM | PARKING METER |
| PO | POST |
| PPF | POST & RAIL FENCE |
| PTM | PARKING TICKET MACHINE |
| PMF | POST & WIRE FENCE |
| RB | ROAD BANK |
| RE | RODDING EYE |
| RS | ROAD SIGN |
| RTW | RETAINING WALL |
| RWP | RANWATER PIPE |
| SC | STOP COCK |
| SDP | STAND PIPE |
| SK | SUKKAWAY |
| SL | SOFFIT LEVEL |
| SMH | SURFACE WATER MANHOLE |
| SMP | SHEET METAL PLUNG |
| SP | SIGN POST |
| STN | STATION |
| SV | SLUCE VALVE |
| SVP | SOIL VENT PIPE |
| SWF | SHEEP WIRE FENCE |
| TM | TEMPORARY BENCH MARK |
| TBM | TELECOM BENCH MARK |
| TCS/TCP | TELEPHONE CALL BOX/POST |
| TC | TELECOM CABINET |
| TMH | TELECOM MANHOLE |
| TL | THRESHOLD LEVEL |
| TL | TRAFFIC LIGHT |
| TB | TRAFFIC LIGHT BOX |
| TP | TELEGRAPH POLE |
| TRS | TIMBER RUBBER STRIP |
| TS | TREE STUMP |
| TSS | TUBULAR STEEL RAILINGS |
| UP | UPSTAKE |
| VB | VENT PIPE |
| WB | WASTE BIN |
| WL | WATER LEVEL/WATER LINE |
| WM | WATER METER |
| WMF | WIRE MESH FENCE |
| WP | WOODEN POST |
| WPR | WOODEN POST & RAIL FENCE |
| WV | WATER VALVE |
| YG | YARD GULLY |
| YLB | YARD LAMP |

| STN | CO-ORDINATES | LEVEL | STN | CO-ORDINATES | LEVEL |
|-----|--------------|-------|-----|--------------|-------|
| | | | | | |

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TEL: 01291 673491 MOB: 0787 2560386
EMAIL: jonbarton@usklandsurvey.co.uk

Project: Rhyd Y Carw Mill
Topographical Survey

Site: Rhyd Y Carw Mill
Trefeglwys
Caerswys
SY17 5PW

Surveyed by J.Barton Date: NOV 2020
Checked by J.Barton Date: NOV 2020
Drawn by J.Barton Date: NOV 2020

Drawing No. _____ Revision _____
Long Section

Drawing Scale: 1:N/A Job Ref 1029
CAD Filename: 1029.dwg Plot Scale: 1=1

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APPENDIX 4 – Natural Resources Wales Correspondence

Keelan

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 15 January 2019 12:09
To: Keelan
Subject: ATI 16695A - Product 4 : RHYD Y CARW MILL, TREFEGLWYS, CAERSWS SY17 5PU

Hello Keelan

Unfortunately we do not hold any detailed flood modelling for this area, nor do we have any historic flood information.

Therefore we cannot provide the requested Product 4.

Regards

Kathy Banner
Swyddog Cysylltiadu Allanol / External Relations Officer
Cyfoeth Naturiol Cymru / Natural Resources Wales
03000 653568
Llys Afon, Hwlfordd / River Court, Haverfordwest
[Dysgwr Cymraeg](#)

www.cyfoethnaturiol.cymru / www.naturalresources.wales

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.



Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi

Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay

From: Keelan <Keelan@krsenvironmental.com>
Sent: 19 December 2018 20:42
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: RHYD Y CARW MILL, TREFEGLWYS, CAERSWS SY17 5PU

Dear Sir/Madam,

RE: RHYD Y CARW MILL, TREFEGLWYS, CAERSWS SY17 5PU

I have been commissioned by my client to assess the flood risk issues for the site shown above, see attached.

I wish to obtain Product 4: Detailed Flood Risk Assessment Map for the site.

If you have any queries do not hesitate to contact me.

Regards,

Keelan Serjeant | Director
BSc, MSc, MCIWEM
KRS Environmental Ltd

T: 01686 668957

T: 01484 437420

M: 07857 264 376

E: keelan@krsenvironmental.com

W: krsenvironmental.com

Please think about the environment, only print this email if you need to.

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APPENDIX 5 – FEH Calculation Record

FLOOD ESTIMATION REPORT

Introduction

This report template is based on a supporting document to the Environment Agency’s flood estimation guidelines (Version 5, 2015). It provides a record of the hydrological context, the method statement, the calculations and decisions made during flood estimation and the results.

Contents

| | | |
|------------|---|-----------|
| 1.0 | Method statement | 3 |
| 2.0 | Locations where flood estimates are required | 9 |
| 3.0 | Statistical method | 10 |
| 4.0 | Revitalised flood hydrograph (ReFH) 2 method | 14 |
| 5.0 | Discussion and summary of results | 15 |
| 6.0 | Annex | 18 |

Approval

| | Name and Qualifications | Date |
|---------------------------|---|-------------|
| Calculations prepared by: | Keelan Serjeant BSc (Hons), MSc, MCIWEM | 19/01/2021 |
| Calculations reviewed by: | Emma Serjeant LL.B, MSc | 19/01/2021 |

Abbreviations

| | |
|------------|--|
| AM | Annual maximum |
| AREA | Catchment area (km ²) |
| BFI | Base flow index |
| BFIHOST | Base flow index derived using the HOST soil classification |
| DPLBAR | Mean drainage path length (km) |
| DPSBAR | Mean drainage path slope (m/km) |
| FARL | FEH index of flood attenuation due to reservoirs and lakes |
| FEH | Flood Estimation Handbook |
| FPEXT | Floodplain extent |
| FSR | Flood Studies Report |
| HOST | Hydrology of soil types |
| NRFA | National River Flow Archive |
| NRW | Natural Resources Wales |
| POT | Peaks over a threshold |
| QMED | Median annual flood (with return period 2 years) |
| ReFH | Revitalised flood hydrograph method – used for rainfall runoff method |
| SAAR | Standard average annual rainfall (mm) |
| SPR | Standard percentage run-off |
| SPRHOST | Standard percentage run-off derived using the HOST soil classification |
| Tp (0) | Time to peak of the instantaneous unit hydrograph |
| URBAN | Flood Studies Report index of fractional urban extent |
| URBEXT2000 | Revised index of urban extent |
| WINFAP | Windows Frequency Analysis Package – used for FEH statistical method |

1.0 Method statement

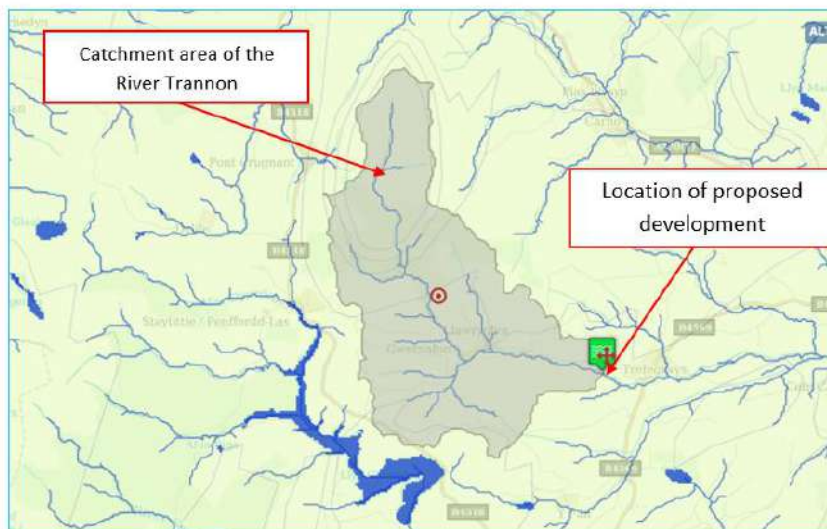
1.1 Requirements for flood estimates

| Item | Comments |
|---|---|
| <p>Overview</p> <ul style="list-style-type: none"> • Purpose of study • Peak flows or hydrographs? • Range of return periods and locations | <p>The purpose of this assessment is to provide inflows into a 1D hydraulic model of the River Trannon, to support a Flood Consequence Assessment.</p> <p>The site for the estimation of inflows is located at Rhyd Y Carw Mill, Trefeglwys, Caersws, SY17 5PU. Flood estimates are only required for one location just downstream of the site.</p> <p>The peak inflow estimates for the site have been obtained by assessment using ReFH v2.2 and WINFAP FEH (3.0.003) methods and have been undertaken in accordance with Natural Resources Wales flood estimation technical guidance.</p> <p>The effects of climate change will be accounted for.</p> <p>The study is being undertaken for a small development application; the project scope reflects this purpose.</p> |

1.2 Overview of catchment

| Item | Comments |
|--|--|
| <p>Brief description of catchment, or reference to section in accompanying report. Include maps where necessary.</p> | <p>The catchment boundary has been checked against the OS mapping and no changes are necessary. Qualitative checks on FARL using mapping and BFIHOST checked using soil maps was undertaken. The soil catchment details were checked by using soil maps the catchment location. A visual assessment using Google Maps and the FEH Webservice Map was used to check the URBEXT2000 value and FARL. With a low URBEXT value, it was not necessary to consider any updating. These values were consistent with the maps. No catchment descriptors were altered from the initial FEH catchment descriptors.</p> <p>The catchment area is small at 29.58km², the SPRHOST value (Standard Percentage Runoff) is 44.95% and indicates a low permeable catchment. Approximately 44.95% of the rainfall will contribute to direct runoff rather than be stored and reflects the low permeability of the underlying geology. The BFIHOST value (Baseflow Index) is low at 0.410.</p> <p>The descriptors BFIHOST and SPRHOST are representative of the permeability of catchment soils and geology, a high BFIHOST and a low SPRHOST value indicate a very permeable catchment, whilst a low BFIHOST and high SPRHOST indicate a very impermeable catchment. Based on the relatively broad scale data sets that inform the catchment descriptors, the catchment descriptors values indicate a reasonably impermeable catchment.</p> <p>The SAAR6190 (Standard Average Annual Rainfall) value is high at 1559. The URBEXT2000 value is 0.00 and therefore, the catchment is essentially</p> |

rural. The catchment descriptors were used to calculate the design flow on River Trannon, using the FEH Statistical Method and the ReFH2 method.



River Trannon Upstream Catchment as shown on the FEH webservice

1.3 Source of flood peak data

| Item | Comments |
|--|--|
| Was the NRFA Peak Flows dataset used? If so, which version? If not, why not? Record any changes made. | Access was made to the annual maximum flow data available via the NRFA web site. |

1.4 Gauging stations (flow or level)

At the sites of flood estimates or nearby at potential donor sites. Also state gauging authority number where it is different to the NRFA number.

| Watercourse | Station Name | Gauging authority number | NRFA number (used in FEH) | Grid Reference | Catchment area (km ²) | Type (rated / ultrasonic / level...) | Start and end of flow record |
|-------------|--------------|--------------------------|---------------------------|----------------|-----------------------------------|--------------------------------------|------------------------------|
| N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1.5 Data available at each flow gauging station

| Station Name | Start and end date on NRFA | Update for this study? | Suitable for QMED? | Suitable for pooling? | Data quality check needed? | Other comments on station and flow quality e.g. information from NRFA Peak Flows, trends in flood peaks, outliers |
|---|----------------------------|------------------------|--------------------|-----------------------|----------------------------|--|
| N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Give link/reference to any further data quality checks if carried out | | | | | | |

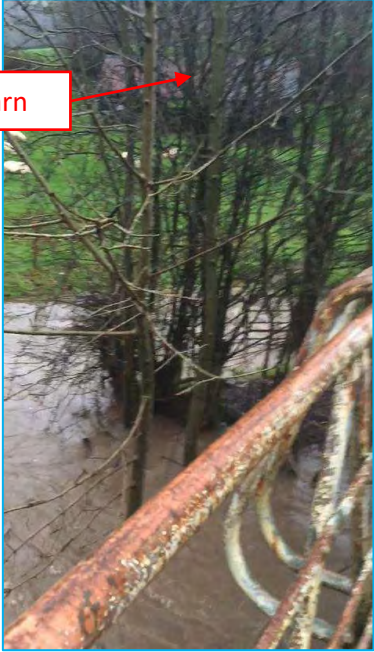

1.6 Rating equations

| Station name | Type of rating e.g. theoretical, empirical, degree of extrapolation | Rating review needed? | Reasons e.g. availability of recent flow gaugings, amount of scatter in the rating |
|---|--|-----------------------|---|
| N/A | N/A | N/A | N/A |
| Include a link or reference to any rating reviews carried out | | | |

1.7 Other data available and how it has been obtained

| Type of data | Data relevant to this study? | Data available? | Source of data | Details |
|---|------------------------------|-----------------|----------------|---|
| Check flow gaugings (if planned to review ratings) | No | N/A | | |
| Historic flood data – give link to historic review if carried out | Yes | | | <p>The Natural Resource Wales historic flood outline map shows that the site has not historically flooded. The British Hydrological Society (BHS) “Chronology of British Hydrological Events¹” has no information on flooding within the vicinity of the site. No other historical records of flooding for the site have been recorded.</p> <p>The River Trannon does overtop its banks within the vicinity of the site but this does not result in flooding of the site, as shown in the photographs below.</p> |

¹ <http://www.dundee.ac.uk/geography/cbhe/>

| | | |
|---|----|---|
| | |  <p style="text-align: center;">Flooding on the 29/10/2020 from the Footbridge Looking at the Upper Barn</p>  <p style="text-align: center;">Figure 4 - Flooding on the 29/10/2020</p> |
| Flow data for events | No | Flood event analysis is not within the scope of this study. |
| Rainfall data for events | No | N/A |
| Results from previous studies | No | N/A |
| Other data or information e.g. groundwater, tides | No | N/A |

1.8 Initial choice of approach

| Item | Comment |
|--|---|
| <p>Is FEH appropriate? (it may not be for very small, heavily urbanised or complex catchments) If not, describe other methods to be used.</p> | <p>FEH is considered to be appropriate for the catchment.</p> <p>Both the FEH Statistical and ReFH2 methods are suitable for peak flow estimation. The study catchments are <1000km², not highly permeable or heavily urbanised. Natural Resources Wales requires the use of ReFH v2 with FEH13 rainfall statistics when applying a rainfall-runoff approach. The FEH Statistical and ReFH2 methods will both be applied, and the results compared.</p> |
| <p>Outline the conceptual model, addressing questions such as:</p> <ul style="list-style-type: none"> • Where are the main sites of interest? • What is likely to cause flooding at those locations? (peak flows, flood volumes, combinations of peaks, groundwater, snowmelt, tides...) • Might those locations flood from runoff generated on part of the catchment only, e.g. downstream of a reservoir? • Is there a need to consider temporary debris dams that could collapse? | <p>The conceptual model considered the main cause of flooding at this location to occur by peak flows and volumes from the nearby River Trannon.</p> <p>The main site of interest is the proposed development site located in the valley bottom adjacent to natural floodplain environment. Flooding is likely to result from peak flows and volumes exceeding channel capacity in the River Trannon.</p> <p>It is likely that flooding would occur from the entire catchment and would not be caused only by sub-catchment runoff. There are no records to suggest that the site is at risk from temporary debris dams collapsing.</p> |
| <p>Any unusual catchment features to take into account? e.g.</p> <ul style="list-style-type: none"> • highly permeable (BFIHOST > 0.65) – consider permeable catchment adjustment for statistical method if SPRHOST < 20% • highly urbanised – consider choice of method carefully; consider method that can account for differing sewer and topographic catchments • pumped watercourse – consider lowland catchment version of rainfall-runoff method • major reservoir influence (FARL < 0.90) – consider flood routing • extensive floodplain storage – consider choice of method carefully | <p>The catchment is not considered permeable with a BFIHOST < 0.65 and SPRHOST > 20%. The catchment has no reservoir influence. The catchment is predominantly rural.</p> |

Flood Estimation Report

| | |
|--|---|
| <p>Initial choice of method(s) and reasons Will the catchment be split into subcatchments? If so, how?</p> | <p>ReFH2 and FEH Statistical methods are appropriate.</p> <p>The flow estimates at the bottom of the modelled extents will be input into the top of the model as inflows.</p> |
| <p>Software to be used (with version numbers) edit or delete as applicable, or add others</p> | <p>FEH Webservice ReFH version 2.2 WINFAP-FEH Version 3.0.003 HEC-RAS 5.0.7</p> |

2.0 Locations where flood estimates are required

2.1 Summary of subject sites

The table below lists the locations of subject sites. Include site codes in all subsequent tables to save space.

| Site code | Watercourse | Site | Easting | Northing | AREA on FEH Web Service (km ²) | Revised AREA if altered |
|---|---------------|--|---------|----------|--|-------------------------|
| gb 295900, 290600 | River Trannon | Rhyd Y Carw Mill | 295900 | 290600 | 29.58 | N/A |
| Reasons for choosing above locations | | This is at the downstream end of the site. | | | | |

2.2 Important catchment descriptors at each subject site (incorporating any changes made)

| Site code | FARL | PROPWET | BFIHOST | DPLBAR (km) | DPSBAR (m/km) | SAAR (mm) | SPRHOST | URBEXT 2000 | FPEXT |
|-------------------|------|---------|---------|-------------|---------------|-----------|---------|-------------|--------|
| gb 295900, 290600 | 1.00 | 0.660 | 0.410 | 6.59 | 145.00 | 1559 | 44.95 | 0.0000 | 0.0360 |

2.3 Checking catchment descriptors

| Item | Comment |
|---|--|
| <p>Record how catchment boundary was checked</p> <ul style="list-style-type: none"> describe any changes refer to maps if needed | <p>The catchment boundary was checked by visually analysing its extent on the FEH Webservice Map and checking that the boundary appeared to be consistent with Ordnance Survey maps and Opendata LIDAR. The catchment was considered to be appropriate.</p> |
| <p>Record how other catchment descriptors were checked, especially soils</p> <ul style="list-style-type: none"> describe any changes include a before and after table if necessary | <p>Qualitative check on FARL using mapping. BFIHOST checked using BGS soil maps. The soil catchment details were checked by using Soilscales soil type viewer for the catchment location.</p> <p>A visual assessment using Google Maps and the FEH Webservice Map was used to check the URBEXT2000 value and FARL. These values were consistent with the maps. No catchment descriptors were altered from the initial FEH catchment descriptors.</p> |
| Source of URBEXT | FEH Webservice – URBEXT2000 |
| Method for updating URBEXT / URBAN | With a very low URBEXT value, it was not necessary to consider any updating. |

3.0 Statistical method

3.1 Search for donor sites for QMED (if applicable)

Note that donor catchments will usually be rural but may be urban provided the data is deurbanised prior to the adjustment process. Please include a map if necessary.

| | |
|---|---|
| <p>Comment on potential donor sites Mention:</p> <ul style="list-style-type: none"> • Number of potential donor sites available • Distances from subject site • Similarity in terms of AREA, BFIHOST, FARL and other catchment descriptors • Quality of flood peak data <p>Include a map if necessary. Note that donor catchments should usually be rural.</p> | <p>An assessment of donor stations was carried out for this study using WINFAPFEH to assess stations that are suitable for QMED within the HiFlows-UK dataset.</p> <p>The search area was restricted to 10km because the effect that the new data transfer method has on QMED adjustment becomes negligible when the distance between catchment centroids is greater than 10km.</p> |
|---|---|

3.2 Donor sites chosen and QMED adjustment factors

| NRFA number | Reasons for choosing or rejecting | Method (AM or POT) | Adjusted for climatic variation? | QMED from flow data (A) | QMED from catchment descriptors (B) | Adjustment ratio (A/B) |
|---|---|--------------------|----------------------------------|-------------------------|-------------------------------------|------------------------|
| 54014 (Severn @ Abermule) | Too large a catchment area at 574.66km ² . | - | - | - | 8.64 | - |
| 54091 (Severn @ Hafren Flume) | Too large a catchment area at 3.44km ² and SAAR value is too high at 2514. | - | - | - | 9.47 | - |
| 54022 (Severn @ Plynlimon Flume) | Too large a catchment area at 8.69km ² and SAAR value is too high at 2483. | - | - | - | 9.75 | - |
| Which version of the urban adjustment was used for QMED at donor sites, and why? Note: The guidelines recommend great caution in urban adjustment of QMED on catchments that are also highly permeable (BFIHOST>0.8). | | | | None | | |

3.3 Overview of estimation of QMED at each subject site

| Site code | Method | Initial estimate of QMED | Data transfer | | | | | | Final estimate of QMED (m ³ /s) |
|---|--------|--------------------------|---|-------------------------------------|---------------|--|------------------------|------------------------------------|--|
| | | | NRFA numbers for donor sites used (see 3.2) | Distance between centroids dij (km) | Power term, a | Moderated QMED adjustment factor, (A/B) ^a | If more than one donor | | |
| | | | | | | | Weight | Weighted average adjustment factor | |
| gb 295900, 290600 | CD | 26.58 | N/A | N/A | N/A | N/A | N/A | N/A | 26.58 |
| Are the values of QMED consistent, for example at successive points along the watercourse and at confluences? | | | | | | N/A | | | |
| Which version of the urban adjustment was used for QMED, and why? | | | | | | None considered necessary. | | | |
| <p>Notes</p> <p>Methods: AM – Annual maxima; POT – Peaks over threshold; DT – Data transfer; CD – Catchment descriptors alone.</p> <p>When QMED is estimated from POT data, it should also be adjusted for climatic variation. Details should be added. When QMED is estimated from catchment descriptors, the revised 2008 equation from Science Report SC050050 should be used. If the original FEH equation has been used, say so and give the reason why.</p> <p>The guidelines recommend great caution in urban adjustment of QMED on catchments that are also highly permeable (BFIHOST>0.8). The adjustment method used in WINFAP-FEH v3.0.003 is likely to overestimate adjustment factors for such catchments. In this case the only reliable flood estimates are likely to be derived from local flow data.</p> <p>The data transfer procedure is from Science Report SC050050. The QMED adjustment factor A/B for each donor site is given in Table 3.3. This is moderated using the power term, a, which is a function of the distance between the centroids of the subject catchment and the donor catchment. The final estimate of QMED is (A/B)^a times the initial estimate from catchment descriptors.</p> <p>If more than one donor has been used, use multiple rows for the site and give the weights used in the averaging. Record the weighted average adjustment factor in the penultimate column.</p> | | | | | | | | | |

3.4 Derivation of pooling groups

The composition of pooling groups is given in the Annex. Several subject sites may use the same pooling group.

| Name of group | Site code from whose descriptors group was derived | Subject site treated as gauged? (enhanced single site analysis) | Changes made to default pooling group, with reasons. Include any sites that were investigated but retained in the group |
|---------------|---|---|---|
| River Trannon | gb 295900, 290600 | No | None. See the FRA for further information. 524 years of data. |
| Notes | Pooling groups were derived using the procedures from Science Report SC050050 (2008). | | |

3.5 Derivation of flood growth curves at subject sites

| Site code | Method (SS, P, ESS, FH) | If P, ESS, or FH, name of pooling group (3.4) | Distribution used and reason for choice | Note any urban adjustment or permeable adjustment | Parameters of distribution (location, scale, and shape) after adjustments | Growth factor for 100-year return period |
|---|-------------------------|---|---|---|---|--|
| gb 295900, 290600 | P | River Trannon | GL has a lowest Z value | None, as catchment is rural | N/A | 2.66 |
| <p>Notes</p> <p>Methods: SS – Single site; P – Pooled; ESS – Enhanced single site; J – Joint analysis</p> <p>A pooling group (or ESS analysis) derived at one gauge can be applied to estimate growth curves at a number of ungauged sites. Each site may have a different urban adjustment, and therefore different growth curve parameters.</p> <p>Urban adjustments to growth curves should use the version 3 option in WINFAP-FEH: Kjeldsen (2010).</p> <p>Growth curves were derived using the revised procedures from Science Report SC050050 (2008).</p> | | | | | | |

3.6 Flood estimates from the statistical method

| | Flood peak (m³/s) for the following return periods (in years) | | | | | | | | |
|-------------------------|---|----------|-----------|-----------|-----------|------------|------------|------------|-------------|
| Site code | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
| gb 295900, 290600 | 26.58 | 36.69 | 42.41 | 49.78 | 60.91 | 70.80 | 82.22 | 100.12 | 116.19 |

4.0 Revitalised flood hydrograph (ReFH) 2 method

4.1 Parameters for ReFH2 model

If parameters are estimated from catchment descriptors, they are easily reproducible, so it is not essential to enter them in the table.

| Site code | Details of method OPT: optimisation BR: base flow recession fitting CD: catchment descriptors DT: data transfer | T _p (hours) Time to peak | C _{max} (mm) maximum storage capacity | BL (hours) baseflow lag | BR baseflow recharge |
|---|---|--|---|----------------------------|-------------------------|
| gb 295900, 290600 | CD | 1.87 | 112.01 | 33.01 | 1.27 |
| Brief description of any flood event analysis carried out Provide further details either here or in a project report | | | N/A | | |

4.2 Design events for ReFH2 method

We recommend that the ReFH2 technical guidance should be referred to when completing this table

| Site code | Urban or rural | Season of design event (summer or winter) | Storm duration (hours) | Storm area for ARF (if not catchment area) | Source of design rainfall statistic (FEH13 or FEH99) |
|---|----------------|---|------------------------|--|--|
| gb 295900, 290600 | Rural | Winter | 4.45 | - | FEH13 |
| Are the storm durations likely to be changed in the next stage of the study, e.g. by optimisation within a hydraulic model? | | | | No | |

4.3 Flood estimates from the ReFH2 method

| Site code | Flood peak (m ³ /s) or volumes (m ³) for the following return periods (in years) | | | | | | | | |
|-------------------------|---|-------|-------|-------|-------|-------|-------|-----|--------|
| | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
| gb 295900, 290600 | 25.32 | 35.15 | 42.39 | 50.21 | 62.29 | 72.91 | 85.17 | N/A | 119.93 |

5.0 Discussion and summary of results

5.1 Comparison of results from different methods

This table compares peak flows from the ReFH2 method with those from the FEH Statistical method at each site for two key return periods.

| Site code | Return period 2 years (QMED) | | | Return period 100 years | | |
|-------------------------|------------------------------|-------|-----------------------------|-------------------------|-------|-----------------------------|
| | Statistical | ReFH2 | Ratio (ReFH2 / statistical) | Statistical | ReFH2 | Ratio (ReFH2 / statistical) |
| gb 295900, 290600 | 26.58 | 25.32 | 0.95 | 70.80 | 72.91 | 1.03 |

5.2 Final choice of method

| | |
|---|--|
| <p>Choice of method and reasons</p> <p>Include reference to type of study, nature of catchment, and type of data available</p> | <p>The ReFH2 Method yielded more conservative results than the FEH Statistical Method. Although in this case they are very similar and suggests that either method can be used on this occasion for a permeable catchment.</p> <p>The FEH Statistical method is the preferred method as a larger dataset of gauged data was used in the calibration of the method and it has been more directly calibrated to reproduce flood frequency on UK catchments.</p> <p>The ReFH2 method flows presented here are based solely on catchment descriptors. For this reason, there is lower confidence in the flow estimates derived from the ReFH model.</p> <p>The growth curves for the ReFH2 and the Statistical method are shown in Section 5.4. The growth curves show a relatively consistent relationship between the ReFH2 and Statistical growth curves.</p> <p>Although the Statistical method is preferred here over the ReFH2 method, there are significant uncertainties associated with applying it to events beyond the 1 in 200 year event, due to the typically short length of river gauge records. To reduce these uncertainties, a hybrid approach has been taken to derive the 1 in 1000 year event flow, as recommended in Natural Resources Wales guidance on flood estimation. The 1 in 1000 year event peak flows from the Statistical method have been adjusted using the ratio of the 1 in 1000 year and 1 in 100 year event flows from the ReFH2 model.</p> |
|---|--|

5.3 Assumptions, limitations, and uncertainty

| | |
|---|---|
| <p>List the main assumptions made specific to the study</p> | <p>It is assumed that:</p> <ul style="list-style-type: none"> • QMED estimated from the catchment descriptors is representative • The pooling group is representative of the study catchment • ReFH2 hydrograph shape is representative of the catchment response. |
|---|---|

| | |
|--|--|
| Discuss any particular limitations For example applying methods outside the range of catchment types or return periods for which they were developed | The FEH Statistical method is generally believed to only be suitable for return periods up to 200 years (0.5% AEP event). ReFH is calibrated for return periods up to 150 years (0.67% AEP event). Estimates of flows beyond these return periods are extrapolations and have a higher degree of uncertainty. |
| Give what information you can on uncertainty in the results For example using the methods detailed in 'Making better use of local and historic data, and estimating uncertainty in FEH design flood estimation (FEH Local) SC130009 | For the FEH Statistical method, the uncertainty will depend on a variety of factors, for example, how unusual the catchment is relative to the pooling group and donor catchment, and the uncertainty in flow measurement at other gauges. Recent guidance on the reliability of design flood estimates in the UK (Kjeldsen, 2014) quotes average UK measures of uncertainty. The 95% confidence limits for a 1% AEP event flood estimate are: <ul style="list-style-type: none"> • Without donor adjustment of QMED (CDs): 0.42 - 2.37 times the best estimate • With donor adjustment of QMED (DT): 0.45 - 2.25 times the best estimate |
| Comment on the suitability of the results for future studies For example at nearby locations or for different purposes | It is emphasised that the results of the analysis should be considered in the context of the needs of this study. The results of this assessment should be revisited for use on future studies. |
| Give any other comments on the study For example suggestions for additional work | None, other than efforts to make good records of flood events – especially in respect of peak flood levels. |

5.4 Checks

| | |
|--|---|
| Are the results consistent, for example at confluences? | None with study reach |
| What do the results imply regarding the return periods of floods during the period of record? | There is no flow gauge at the site of interest against which to compare the design flow estimates. |
| What is the 100-year growth factor? Is this realistic? (The guidance suggests a typical range of 2.1 - 4.0) | 2.66. The normal range of values is 2.1-4.0. This is considered to be reasonable although at the lower end of the range. These values are realistic for a steep, wet catchment where flows are expected to be high for less frequent events (therefore constraining the flood growth curves). |
| If 1000-year flows have been derived, what is the range of ratios for the 1000-year flow over 100-year flow? | WINFAP FEH scaling factor: 1.64. ReFH 2 scaling factor: 1.65. |
| What is the range of specific runoffs (l/s/ha)? Are there any inconsistencies? | For the 1 in 100 year event, the range of specific runoffs equate to 23.94l/s/ha to 24.65l/s/ha. These are reasonable. |
| How did the results compare with those of other studies? | N/A |

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| | |
|--|---|
| Explain any differences and conclude which results should be preferred | |
| Are the results compatible with the longer-term flood history? | Yes – in relation to the paucity of observed floods in the observational record. |
| Describe any other checks on the results | Modelled flood levels and extents will be sensibility-checked to ensure that flow inputs result in realistic outputs. |

5.5 Final results

| Site code | Flood peak (m ³ /s) for the following return periods (in years) | | | | | | | | |
|-------------------------|--|-------|-------|-------|-------|-------|-------|--------|---------|
| | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
| gb 295900, 290600 | 26.58 | 36.69 | 42.41 | 49.78 | 60.91 | 70.80 | 82.22 | 100.12 | 116.46* |

* Guidance confirms that flood estimates for the FEH Statistical 1 in 1000 year event should be obtained by applying a scaling factor to the 1 in 100 year event. The scaling factor is obtained by dividing the 1 in 1000 year event by the 1 in 100 year estimate from the ReFH2 method.

| | |
|--|--------------|
| If flood hydrographs are needed for the next stage of the study, where are they provided? For example give a name of spreadsheet, name of hydraulic model, or reference to table below | Not required |
|--|--------------|

6.0 Annex

A.1 Pooling Group composition

| | Station | Distance | Years of data | QMED AM | L-CV | L-SKEW | Discordancy |
|----|--------------------------------------|----------|---------------|---------|-------|--------|-------------|
| 1 | 55017 (Chwefru @ Carreg-y-wen) | 0.144 | 7 | 21.421 | 0.428 | 0.535 | 2.314 |
| 2 | 61003 (Gwaun @ Cilrhedyn Bridge) | 0.167 | 39 | 20.679 | 0.157 | 0.030 | 0.915 |
| 3 | 21029 (Tweed @ Glenbreck) | 0.269 | 9 | 37.765 | 0.069 | 0.138 | 2.384 |
| 4 | 48004 (Warleggan @ Trengoffe) | 0.299 | 39 | 9.565 | 0.244 | 0.207 | 0.234 |
| 5 | 25012 (Harwood Beck @ Harwood) | 0.308 | 39 | 31.368 | 0.176 | 0.264 | 0.572 |
| 6 | 60004 (Dewi Fawr @ Glasfryn Ford) | 0.325 | 34 | 17.911 | 0.053 | -0.097 | 1.809 |
| 7 | 67013 (Hirnant @ Plas Rhiwedog) | 0.329 | 12 | 24.081 | 0.200 | -0.026 | 2.375 |
| 8 | 72007 (Brock @ U/s a6) | 0.337 | 30 | 29.438 | 0.194 | 0.273 | 2.025 |
| 9 | 48009 (st Neot @ Craigshill Wood) | 0.409 | 12 | 8.469 | 0.246 | 0.372 | 0.426 |
| 10 | 48801 (Cober @ Trenear Intake) | 0.454 | 21 | 2.591 | 0.265 | 0.252 | 0.309 |
| 11 | 27032 (Hebden Beck @ Hebden) | 0.465 | 42 | 3.910 | 0.222 | 0.267 | 0.173 |
| 12 | 76811 (Dacre Beck @ Dacre Bridge) | 0.481 | 9 | 34.576 | 0.250 | 0.345 | 2.185 |
| 13 | 21017 (Ettrick Water @ Brockhoperig) | 0.504 | 41 | 60.364 | 0.203 | 0.276 | 0.167 |
| 14 | 48001 (Fowey @ Trekeivesteps) | 0.512 | 39 | 16.858 | 0.220 | 0.300 | 0.169 |
| 15 | 48010 (Seaton @) | 0.517 | 36 | 6.470 | 0.236 | 0.254 | 0.262 |

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| | Station | Distance | Years of data | QMED AM | L-CV | L-SKEW | Discordancy |
|----|---|-----------------|----------------------|----------------|-------------|---------------|--------------------|
| | Trebrownbridge) | | | | | | |
| 16 | 55015 (Honddu @ Tafolog) | 0.521 | 29 | 16.682 | 0.337 | 0.355 | 0.920 |
| 17 | 47009 (Tiddy @ Tideford) | 0.522 | 39 | 5.916 | 0.175 | 0.133 | 0.617 |
| 18 | 72013 (Borrowbeck @ Borrow Bridge Weir) | 0.528 | 5 | 73.779 | 0.255 | 0.426 | 0.950 |
| 19 | 49003 (de Lank @ de Lank) | 0.543 | 42 | 12.994 | 0.223 | 0.250 | 0.194 |
| | | | | | | | |
| | Total | | 524 | | | | |

APPENDIX 6 – FEH Statistical Method Calculations

Growth Curve Fittings

Standardised by median

Pooled L-moments

L-CV: 0.212
L-skewness: 0.215

Fitted parameters

| | Location | Scale | Shape | Bound |
|----|----------|-------|--------|-------|
| GL | 1.000 | 0.212 | -0.215 | 0.015 |

Return periods

| | GL |
|------|-------|
| 2 | 1.000 |
| 5 | 1.343 |
| 10 | 1.596 |
| 20 | 1.872 |
| 50 | 2.292 |
| 100 | 2.664 |
| 200 | 3.093 |
| 500 | 3.767 |
| 1000 | 4.371 |

Fittings for FFC

Standardised by median

Return periods

| | GL |
|------|---------|
| 2 | 26.580 |
| 5 | 35.685 |
| 10 | 42.415 |
| 20 | 49.748 |
| 50 | 60.911 |
| 100 | 70.801 |
| 200 | 82.216 |
| 500 | 100.118 |
| 1000 | 116.186 |

WINMAP-FEH 5 Project - File Options Single click Pooled analysis View Window Help

Sites Pooling group

21017 (Etbeck Water @ Etbeckhop)
 21029 (Tweed @ Glenbeck)
 23012 (Harwood Beck @ Harwood)
 27022 (Hadden Beck @ Hadden)
 47026 (Taddy @ Tadder)
 48001 (Fowey @ Talskewsteph)
 48004 (Marleggan @ Trancliffe)
 48007 (Harwood Beck @ Harwood)
 48009 (at Nest @ Craighill Wood)
 48010 (Seaton @ Trebronnabridge)
 48021 (Coler @ Trenez intake)
 49005 (de Lank @ de Lank)
 53015 (Hindou @ Talloig)
 55017 (Chardra @ Carrig j uen)
 60004 (Denn Fawr @ Gladwyn For)
 61003 (Gwaan @ Cahedyn Baid)
 67013 (Hemar @ Plas Rhawrol)
 72007 (Etbeck @ Urz 20)
 72011 (Boscowbeck @ Boscow Br)
 76811 (Dacre Beck @ Dacre Baid)
 994000 (egs 212900 230600 (on 99)
 Annual Maxima
 Peak Over Threshold
 Catchment Descriptors

AM Data | Catchment Descriptors

| Station | Distance | Years of data | QMED AM | L CV | L-SKEW | Discoordin | Key |
|-------------------------------------|----------|---------------|---------|-------|--------|------------|---------|
| 1 55017 (Chardra @ Carrig j uen) | 0.144 | 7 | 21 471 | 0.439 | 0.535 | 2.214 | Key |
| 2 21017 (Etbeck Water @ Etbeckhop) | 0.157 | 39 | 20 575 | 0.157 | 0.200 | 0.915 | Short |
| 3 47026 (Taddy @ Tadder) | 0.269 | 9 | 37 765 | 0.069 | 0.138 | 2.384 | Records |
| 4 48004 (Marleggan @ Trancliffe) | 0.299 | 39 | 8 565 | 0.244 | 0.207 | 0.224 | |
| 5 25012 (Harwood Beck @ Harwood) | 0.337 | 39 | 21 360 | 0.179 | 0.203 | 0.213 | |
| 6 48007 (Harwood Beck @ Harwood) | 0.325 | 34 | 17 911 | 0.023 | 0.0 | 0.0 | |
| 7 67013 (Hemar @ Plas Rhawrol) | 0.328 | 12 | 24 081 | 0.200 | 0.0 | 0.0 | |
| 8 72007 (Etbeck @ Urz 20) | 0.327 | 30 | 29 438 | 0.194 | 0.2 | 0.2 | |
| 9 48021 (Coler @ Trenez intake) | 0.403 | 12 | 8 423 | 0.746 | 0.3 | 0.3 | |
| 10 48001 (Fowey @ Talskewsteph) | 0.454 | 21 | 2 591 | 0.293 | 0.2 | 0.2 | |
| 11 27022 (Hadden Beck @ Hadden) | 0.465 | 42 | 3 810 | 0.222 | 0.2 | 0.2 | |
| 12 76811 (Dacre Beck @ Dacre Baid) | 0.481 | 9 | 34 576 | 0.250 | 0.2 | 0.2 | |
| 13 21017 (Etbeck Water @ Etbeckhop) | 0.504 | 41 | 60 764 | 0.293 | 0.2 | 0.2 | |
| 14 48001 (Fowey @ Talskewsteph) | 0.512 | 39 | 16 458 | 0.220 | 0.3 | 0.3 | |
| 15 48010 (Seaton @ Trebronnabridge) | 0.512 | 36 | 6 470 | 0.236 | 0.2 | 0.2 | |
| 16 48004 (Marleggan @ Trancliffe) | 0.521 | 29 | 16 882 | 0.352 | 0.2 | 0.2 | |
| 17 47003 (Taddy @ Tadder) | 0.522 | 39 | 5 916 | 0.175 | 0.1 | 0.1 | |
| 18 72011 (Boscowbeck @ Boscow Br) | 0.538 | 15 | 73 778 | 0.295 | 0.4 | 0.4 | |
| 19 49005 (de Lank @ de Lank) | 0.543 | 42 | 12 994 | 0.222 | 0.2 | 0.2 | |
| 20 | | | | | | | |
| 21 Total | | 524 | | | | | |
| 22 Selected mean: | | | | | | 0.215 | 0.2 |

Number of simulations: 101 L-Of No. Simulations

L-Of / Lockness distance
 Observed average: 0.1162
 Simulated mean of average: 0.0948
 Simulated S.D. of average: 0.0166
 Standardized value H0: 0.9379

The pooling group is acceptable!
 (no regression, i.e. a review of the pooling group is not required)

Standard deviation of L-Of
 Observed: 0.0059
 Simulated value: 0.0149
 Simulated S.D.: 0.0068
 Standardized test value H1: 4.5415

Save Cancel

AM Graphs Add Site Remove Site OK

For Help, press F1

1 Stations: 20 Project: 1 Run: 3:15 14:34 13/01/2011

APPENDIX 7 – ReFH2 Method Calculations

UK Design Flood Estimation

Generated on 14 January 2021 08:59:21 by Emma
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 8F9D-35EA

Site name: FEH_Catchment_Descriptors_295900_290600

Easting: 295900

Northing: 290600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 29.58

Using plot scale calculations: No

Model: ReFH2.2

Site description: None

Model run: 2 year

Summary of results

| | | | |
|---------------------------------|-------|--------------------------------|--------|
| Rainfall - FEH 2013 model (mm): | 30.51 | Total runoff (ML): | 317.52 |
| Total Rainfall (mm): | 24.30 | Total flow (ML): | 720.17 |
| Peak Rainfall (mm): | 3.31 | Peak flow (m ³ /s): | 25.32 |

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

| Name | Value | User-defined? |
|----------------------------------|----------|---------------|
| Duration (hh:mm:ss) | 04:45:00 | No |
| Timestep (hh:mm:ss) | 00:15:00 | No |
| SCF (Seasonal correction factor) | 0.86 | No |
| ARF (Areal reduction factor) | 0.93 | No |
| Seasonality | Winter | No |

Loss model parameters

| Name | Value | User-defined? |
|---------------------------------|--------|---------------|
| Cini (mm) | 112.01 | No |
| Cmax (mm) | 281.13 | No |
| Use alpha correction factor | No | No |
| Alpha correction factor | n/a | No |
| Use seasonal Cini for equations | Yes | No |

Routing model parameters

| Name | Value | User-defined? |
|---------|-------|---------------|
| Tp (hr) | 1.87 | No |
| Up | 0.65 | No |
| Uk | 0.8 | No |

Baseflow model parameters

| Name | Value | User-defined? |
|-------------------------|-------|---------------|
| BFO (m ³ /s) | 2.39 | No |
| BL (hr) | 33.01 | No |
| BR | 1.27 | No |

Urbanisation parameters

| Name | Value | User-defined? |
|---|-------|---------------|
| Urban area (km ²) | 0 | No |
| Urbext 2000 | 0 | No |
| Impervious runoff factor | 0.7 | No |
| Imperviousness factor | 0.3 | No |
| Tp scaling factor | 0.5 | No |
| Exporting drained area (km ²) | 0.00 | Yes |
| Sewer capacity (m ³ /s) | 0.00 | Yes |

Time series data

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 00:00:00 | 0.275 | 0.000 | 0.110 | 0.000 | 2.389 | 2.389 |
| 00:15:00 | 0.371 | 0.000 | 0.148 | 0.021 | 2.371 | 2.392 |
| 00:30:00 | 0.500 | 0.000 | 0.201 | 0.091 | 2.354 | 2.445 |
| 00:45:00 | 0.673 | 0.000 | 0.272 | 0.229 | 2.338 | 2.566 |
| 01:00:00 | 0.904 | 0.000 | 0.367 | 0.457 | 2.323 | 2.780 |
| 01:15:00 | 1.210 | 0.000 | 0.497 | 0.807 | 2.312 | 3.119 |
| 01:30:00 | 1.615 | 0.000 | 0.671 | 1.322 | 2.305 | 3.627 |
| 01:45:00 | 2.142 | 0.000 | 0.904 | 2.062 | 2.303 | 4.365 |
| 02:00:00 | 2.806 | 0.000 | 1.209 | 3.093 | 2.311 | 5.403 |
| 02:15:00 | 3.314 | 0.000 | 1.464 | 4.466 | 2.329 | 6.795 |
| 02:30:00 | 2.806 | 0.000 | 1.270 | 6.259 | 2.363 | 8.622 |
| 02:45:00 | 2.142 | 0.000 | 0.988 | 8.450 | 2.416 | 10.866 |
| 03:00:00 | 1.615 | 0.000 | 0.756 | 10.906 | 2.490 | 13.396 |
| 03:15:00 | 1.210 | 0.000 | 0.572 | 13.467 | 2.588 | 16.055 |
| 03:30:00 | 0.904 | 0.000 | 0.431 | 15.976 | 2.709 | 18.685 |
| 03:45:00 | 0.673 | 0.000 | 0.323 | 18.261 | 2.852 | 21.113 |
| 04:00:00 | 0.500 | 0.000 | 0.241 | 20.139 | 3.015 | 23.153 |
| 04:15:00 | 0.371 | 0.000 | 0.179 | 21.406 | 3.191 | 24.596 |
| 04:30:00 | 0.275 | 0.000 | 0.133 | 21.920 | 3.374 | 25.294 |
| 04:45:00 | 0.000 | 0.000 | 0.000 | 21.765 | 3.557 | 25.322 |
| 05:00:00 | 0.000 | 0.000 | 0.000 | 21.077 | 3.735 | 24.812 |
| 05:15:00 | 0.000 | 0.000 | 0.000 | 19.986 | 3.904 | 23.889 |
| 05:30:00 | 0.000 | 0.000 | 0.000 | 18.620 | 4.059 | 22.679 |
| 05:45:00 | 0.000 | 0.000 | 0.000 | 17.093 | 4.199 | 21.292 |
| 06:00:00 | 0.000 | 0.000 | 0.000 | 15.504 | 4.323 | 19.827 |
| 06:15:00 | 0.000 | 0.000 | 0.000 | 13.937 | 4.431 | 18.368 |
| 06:30:00 | 0.000 | 0.000 | 0.000 | 12.429 | 4.524 | 16.953 |
| 06:45:00 | 0.000 | 0.000 | 0.000 | 10.987 | 4.602 | 15.589 |
| 07:00:00 | 0.000 | 0.000 | 0.000 | 9.651 | 4.666 | 14.317 |
| 07:15:00 | 0.000 | 0.000 | 0.000 | 8.409 | 4.717 | 13.126 |
| 07:30:00 | 0.000 | 0.000 | 0.000 | 7.246 | 4.756 | 12.003 |
| 07:45:00 | 0.000 | 0.000 | 0.000 | 6.154 | 4.785 | 10.939 |
| 08:00:00 | 0.000 | 0.000 | 0.000 | 5.130 | 4.802 | 9.933 |
| 08:15:00 | 0.000 | 0.000 | 0.000 | 4.177 | 4.811 | 8.987 |
| 08:30:00 | 0.000 | 0.000 | 0.000 | 3.303 | 4.810 | 8.113 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 08:45:00 | 0.000 | 0.000 | 0.000 | 2.518 | 4.802 | 7.320 |
| 09:00:00 | 0.000 | 0.000 | 0.000 | 1.842 | 4.786 | 6.629 |
| 09:15:00 | 0.000 | 0.000 | 0.000 | 1.303 | 4.765 | 6.068 |
| 09:30:00 | 0.000 | 0.000 | 0.000 | 0.896 | 4.740 | 5.636 |
| 09:45:00 | 0.000 | 0.000 | 0.000 | 0.599 | 4.711 | 5.310 |
| 10:00:00 | 0.000 | 0.000 | 0.000 | 0.384 | 4.680 | 5.065 |
| 10:15:00 | 0.000 | 0.000 | 0.000 | 0.234 | 4.648 | 4.882 |
| 10:30:00 | 0.000 | 0.000 | 0.000 | 0.131 | 4.615 | 4.746 |
| 10:45:00 | 0.000 | 0.000 | 0.000 | 0.064 | 4.581 | 4.645 |
| 11:00:00 | 0.000 | 0.000 | 0.000 | 0.025 | 4.547 | 4.571 |
| 11:15:00 | 0.000 | 0.000 | 0.000 | 0.005 | 4.512 | 4.517 |
| 11:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.478 | 4.478 |
| 11:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.445 | 4.445 |
| 12:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.411 | 4.411 |
| 12:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.378 | 4.378 |
| 12:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.345 | 4.345 |
| 12:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.312 | 4.312 |
| 13:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.279 | 4.279 |
| 13:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.247 | 4.247 |
| 13:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.215 | 4.215 |
| 13:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.183 | 4.183 |
| 14:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.152 | 4.152 |
| 14:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.120 | 4.120 |
| 14:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.089 | 4.089 |
| 14:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.058 | 4.058 |
| 15:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.028 | 4.028 |
| 15:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.997 | 3.997 |
| 15:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.967 | 3.967 |
| 15:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.937 | 3.937 |
| 16:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.908 | 3.908 |
| 16:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.878 | 3.878 |
| 16:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.849 | 3.849 |
| 16:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.820 | 3.820 |
| 17:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.791 | 3.791 |
| 17:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.762 | 3.762 |
| 17:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.734 | 3.734 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 17:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.706 | 3.706 |
| 18:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.678 | 3.678 |
| 18:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.650 | 3.650 |
| 18:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.623 | 3.623 |
| 18:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.595 | 3.595 |
| 19:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.568 | 3.568 |
| 19:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.541 | 3.541 |
| 19:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.515 | 3.515 |
| 19:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.488 | 3.488 |
| 20:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.462 | 3.462 |
| 20:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.436 | 3.436 |
| 20:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.410 | 3.410 |
| 20:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.384 | 3.384 |
| 21:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.358 | 3.358 |
| 21:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.333 | 3.333 |
| 21:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.308 | 3.308 |
| 21:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.283 | 3.283 |
| 22:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.258 | 3.258 |
| 22:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.234 | 3.234 |
| 22:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.209 | 3.209 |
| 22:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.185 | 3.185 |
| 23:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.161 | 3.161 |
| 23:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.137 | 3.137 |
| 23:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.113 | 3.113 |
| 23:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.090 | 3.090 |
| 24:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.067 | 3.067 |
| 24:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.043 | 3.043 |
| 24:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.020 | 3.020 |
| 24:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.998 | 2.998 |
| 25:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.975 | 2.975 |
| 25:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.953 | 2.953 |
| 25:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.930 | 2.930 |
| 25:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.908 | 2.908 |
| 26:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.886 | 2.886 |
| 26:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.865 | 2.865 |
| 26:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.843 | 2.843 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 26:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.821 | 2.821 |
| 27:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.800 | 2.800 |
| 27:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.779 | 2.779 |
| 27:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.758 | 2.758 |
| 27:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.737 | 2.737 |
| 28:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.717 | 2.717 |
| 28:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.696 | 2.696 |
| 28:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.676 | 2.676 |
| 28:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.656 | 2.656 |
| 29:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.636 | 2.636 |
| 29:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.616 | 2.616 |
| 29:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.596 | 2.596 |
| 29:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.576 | 2.576 |
| 30:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.557 | 2.557 |
| 30:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.538 | 2.538 |
| 30:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.518 | 2.518 |
| 30:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.499 | 2.499 |
| 31:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.481 | 2.481 |
| 31:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.462 | 2.462 |
| 31:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.443 | 2.443 |
| 31:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.425 | 2.425 |
| 32:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.407 | 2.407 |

Appendix

Catchment descriptors

| Name | Value | User-defined value used? |
|-----------------------------------|-------|--------------------------|
| Area (km ²) | 29.58 | No |
| ALTBAR | 358 | No |
| ASPBAR | 147 | No |
| ASPVAR | 0.16 | No |
| BFIHOST | 0.41 | No |
| DPLBAR (km) | 6.59 | No |
| DPSBAR (mkm ⁻¹) | 145 | No |
| FARL | 1 | No |
| LDP | 12.94 | No |
| PROPWET (mm) | 0.66 | No |
| RMED1H | 10.9 | No |
| RMED1D | 50.4 | No |
| RMED2D | 62.8 | No |
| SAAR (mm) | 1559 | No |
| SAAR4170 (mm) | 1492 | No |
| SPRHOST | 44.95 | No |
| Urbext2000 | 0 | No |
| Urbext1990 | 0 | No |
| URBCONC | 0 | No |
| URBLOC | 0 | No |
| DDF parameter C | -0.03 | No |
| DDF parameter D1 | 0.48 | No |
| DDF parameter D2 | 0.39 | No |
| DDF parameter D3 | 0.38 | No |
| DDF parameter E | 0.29 | No |
| DDF parameter F | 2.47 | No |
| DDF parameter C (1km grid value) | -0.03 | No |
| DDF parameter D1 (1km grid value) | 0.48 | No |
| DDF parameter D2 (1km grid value) | 0.38 | No |
| DDF parameter D3 (1km grid value) | 0.38 | No |
| DDF parameter E (1km grid value) | 0.29 | No |
| DDF parameter F (1km grid value) | 2.37 | No |

UK Design Flood Estimation

Generated on 14 January 2021 08:59:45 by Emma
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 8F9D-35EA

Site name: FEH_Catchment_Descriptors_295900_290600

Easting: 295900

Northing: 290600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 29.58

Using plot scale calculations: No

Model: ReFH2.2

Site description: None

Model run: 20 year

Summary of results

| | | | |
|---------------------------------|-------|--------------------------------|---------|
| Rainfall - FEH 2013 model (mm): | 57.94 | Total runoff (ML): | 655.97 |
| Total Rainfall (mm): | 46.15 | Total flow (ML): | 1486.88 |
| Peak Rainfall (mm): | 6.29 | Peak flow (m ³ /s): | 50.21 |

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

* Indicates that the user locked the duration/timestep

Rainfall parameters (Rainfall - FEH 2013 model)

| Name | Value | User-defined? |
|----------------------------------|----------|---------------|
| Duration (hh:mm:ss) | 04:45:00 | No |
| Timestep (hh:mm:ss) | 00:15:00 | No |
| SCF (Seasonal correction factor) | 0.86 | No |
| ARF (Areal reduction factor) | 0.93 | No |
| Seasonality | Winter | No |

Loss model parameters

| Name | Value | User-defined? |
|---------------------------------|--------|---------------|
| Cini (mm) | 112.01 | No |
| Cmax (mm) | 281.13 | No |
| Use alpha correction factor | No | No |
| Alpha correction factor | n/a | No |
| Use seasonal Cini for equations | Yes | No |

Routing model parameters

| Name | Value | User-defined? |
|---------|-------|---------------|
| Tp (hr) | 1.87 | No |
| Up | 0.65 | No |
| Uk | 0.8 | No |

Baseflow model parameters

| Name | Value | User-defined? |
|-------------------------|-------|---------------|
| BFO (m ³ /s) | 2.39 | No |
| BL (hr) | 33.01 | No |
| BR | 1.27 | No |

Urbanisation parameters

| Name | Value | User-defined? |
|---|-------|---------------|
| Urban area (km ²) | 0 | No |
| Urbext 2000 | 0 | No |
| Impervious runoff factor | 0.7 | No |
| Imperviousness factor | 0.3 | No |
| Tp scaling factor | 0.5 | No |
| Exporting drained area (km ²) | 0.00 | Yes |
| Sewer capacity (m ³ /s) | 0.00 | Yes |

Time series data

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 00:00:00 | 0.522 | 0.000 | 0.209 | 0.000 | 2.389 | 2.389 |
| 00:15:00 | 0.705 | 0.000 | 0.283 | 0.040 | 2.371 | 2.411 |
| 00:30:00 | 0.950 | 0.000 | 0.384 | 0.174 | 2.354 | 2.528 |
| 00:45:00 | 1.278 | 0.000 | 0.522 | 0.436 | 2.340 | 2.775 |
| 01:00:00 | 1.716 | 0.000 | 0.710 | 0.871 | 2.328 | 3.199 |
| 01:15:00 | 2.298 | 0.000 | 0.967 | 1.542 | 2.322 | 3.864 |
| 01:30:00 | 3.066 | 0.000 | 1.320 | 2.535 | 2.324 | 4.859 |
| 01:45:00 | 4.067 | 0.000 | 1.802 | 3.965 | 2.338 | 6.303 |
| 02:00:00 | 5.327 | 0.000 | 2.450 | 5.975 | 2.368 | 8.343 |
| 02:15:00 | 6.293 | 0.000 | 3.024 | 8.681 | 2.420 | 11.101 |
| 02:30:00 | 5.327 | 0.000 | 2.670 | 12.259 | 2.502 | 14.761 |
| 02:45:00 | 4.067 | 0.000 | 2.106 | 16.689 | 2.621 | 19.311 |
| 03:00:00 | 3.066 | 0.000 | 1.627 | 21.710 | 2.785 | 24.495 |
| 03:15:00 | 2.298 | 0.000 | 1.241 | 27.005 | 2.997 | 30.003 |
| 03:30:00 | 1.716 | 0.000 | 0.939 | 32.250 | 3.258 | 35.508 |
| 03:45:00 | 1.278 | 0.000 | 0.706 | 37.092 | 3.565 | 40.658 |
| 04:00:00 | 0.950 | 0.000 | 0.529 | 41.147 | 3.913 | 45.060 |
| 04:15:00 | 0.705 | 0.000 | 0.394 | 43.976 | 4.290 | 48.267 |
| 04:30:00 | 0.522 | 0.000 | 0.293 | 45.258 | 4.685 | 49.942 |
| 04:45:00 | 0.000 | 0.000 | 0.000 | 45.132 | 5.082 | 50.214 |
| 05:00:00 | 0.000 | 0.000 | 0.000 | 43.865 | 5.469 | 49.334 |
| 05:15:00 | 0.000 | 0.000 | 0.000 | 41.718 | 5.837 | 47.556 |
| 05:30:00 | 0.000 | 0.000 | 0.000 | 38.964 | 6.179 | 45.143 |
| 05:45:00 | 0.000 | 0.000 | 0.000 | 35.837 | 6.490 | 42.327 |
| 06:00:00 | 0.000 | 0.000 | 0.000 | 32.551 | 6.768 | 39.319 |
| 06:15:00 | 0.000 | 0.000 | 0.000 | 29.289 | 7.013 | 36.302 |
| 06:30:00 | 0.000 | 0.000 | 0.000 | 26.139 | 7.225 | 33.364 |
| 06:45:00 | 0.000 | 0.000 | 0.000 | 23.123 | 7.406 | 30.529 |
| 07:00:00 | 0.000 | 0.000 | 0.000 | 20.329 | 7.558 | 27.887 |
| 07:15:00 | 0.000 | 0.000 | 0.000 | 17.736 | 7.683 | 25.420 |
| 07:30:00 | 0.000 | 0.000 | 0.000 | 15.312 | 7.783 | 23.096 |
| 07:45:00 | 0.000 | 0.000 | 0.000 | 13.035 | 7.860 | 20.896 |
| 08:00:00 | 0.000 | 0.000 | 0.000 | 10.898 | 7.915 | 18.814 |
| 08:15:00 | 0.000 | 0.000 | 0.000 | 8.905 | 7.950 | 16.856 |
| 08:30:00 | 0.000 | 0.000 | 0.000 | 7.073 | 7.967 | 15.039 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 08:45:00 | 0.000 | 0.000 | 0.000 | 5.418 | 7.966 | 13.385 |
| 09:00:00 | 0.000 | 0.000 | 0.000 | 3.985 | 7.951 | 11.936 |
| 09:15:00 | 0.000 | 0.000 | 0.000 | 2.831 | 7.924 | 10.755 |
| 09:30:00 | 0.000 | 0.000 | 0.000 | 1.955 | 7.887 | 9.842 |
| 09:45:00 | 0.000 | 0.000 | 0.000 | 1.309 | 7.843 | 9.152 |
| 10:00:00 | 0.000 | 0.000 | 0.000 | 0.842 | 7.794 | 8.637 |
| 10:15:00 | 0.000 | 0.000 | 0.000 | 0.513 | 7.742 | 8.255 |
| 10:30:00 | 0.000 | 0.000 | 0.000 | 0.288 | 7.687 | 7.975 |
| 10:45:00 | 0.000 | 0.000 | 0.000 | 0.142 | 7.631 | 7.773 |
| 11:00:00 | 0.000 | 0.000 | 0.000 | 0.054 | 7.575 | 7.629 |
| 11:15:00 | 0.000 | 0.000 | 0.000 | 0.011 | 7.518 | 7.529 |
| 11:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.461 | 7.461 |
| 11:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.405 | 7.405 |
| 12:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.349 | 7.349 |
| 12:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.294 | 7.294 |
| 12:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.239 | 7.239 |
| 12:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.184 | 7.184 |
| 13:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.130 | 7.130 |
| 13:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.076 | 7.076 |
| 13:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.023 | 7.023 |
| 13:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.970 | 6.970 |
| 14:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.917 | 6.917 |
| 14:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.865 | 6.865 |
| 14:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.813 | 6.813 |
| 14:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.762 | 6.762 |
| 15:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.711 | 6.711 |
| 15:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.660 | 6.660 |
| 15:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.610 | 6.610 |
| 15:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.560 | 6.560 |
| 16:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.510 | 6.510 |
| 16:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.461 | 6.461 |
| 16:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.412 | 6.412 |
| 16:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.364 | 6.364 |
| 17:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.316 | 6.316 |
| 17:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.268 | 6.268 |
| 17:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.221 | 6.221 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 17:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.174 | 6.174 |
| 18:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.128 | 6.128 |
| 18:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.081 | 6.081 |
| 18:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.035 | 6.035 |
| 18:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.990 | 5.990 |
| 19:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.945 | 5.945 |
| 19:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.900 | 5.900 |
| 19:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.855 | 5.855 |
| 19:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.811 | 5.811 |
| 20:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.767 | 5.767 |
| 20:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.724 | 5.724 |
| 20:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.681 | 5.681 |
| 20:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.638 | 5.638 |
| 21:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.595 | 5.595 |
| 21:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.553 | 5.553 |
| 21:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.511 | 5.511 |
| 21:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.469 | 5.469 |
| 22:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.428 | 5.428 |
| 22:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.387 | 5.387 |
| 22:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.347 | 5.347 |
| 22:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.306 | 5.306 |
| 23:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.266 | 5.266 |
| 23:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.226 | 5.226 |
| 23:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.187 | 5.187 |
| 23:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.148 | 5.148 |
| 24:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.109 | 5.109 |
| 24:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.070 | 5.070 |
| 24:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.032 | 5.032 |
| 24:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.994 | 4.994 |
| 25:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.957 | 4.957 |
| 25:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.919 | 4.919 |
| 25:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.882 | 4.882 |
| 25:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.845 | 4.845 |
| 26:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.809 | 4.809 |
| 26:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.772 | 4.772 |
| 26:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.736 | 4.736 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 26:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.701 | 4.701 |
| 27:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.665 | 4.665 |
| 27:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.630 | 4.630 |
| 27:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.595 | 4.595 |
| 27:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.560 | 4.560 |
| 28:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.526 | 4.526 |
| 28:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.492 | 4.492 |
| 28:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.458 | 4.458 |
| 28:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.424 | 4.424 |
| 29:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.391 | 4.391 |
| 29:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.358 | 4.358 |
| 29:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.325 | 4.325 |
| 29:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.292 | 4.292 |
| 30:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.260 | 4.260 |
| 30:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.228 | 4.228 |
| 30:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.196 | 4.196 |
| 30:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.164 | 4.164 |
| 31:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.133 | 4.133 |
| 31:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.102 | 4.102 |
| 31:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.071 | 4.071 |
| 31:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.040 | 4.040 |
| 32:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.009 | 4.009 |
| 32:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.979 | 3.979 |
| 32:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.949 | 3.949 |
| 32:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.919 | 3.919 |
| 33:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.890 | 3.890 |
| 33:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.860 | 3.860 |
| 33:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.831 | 3.831 |
| 33:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.802 | 3.802 |
| 34:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.774 | 3.774 |
| 34:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.745 | 3.745 |
| 34:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.717 | 3.717 |
| 34:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.689 | 3.689 |
| 35:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.661 | 3.661 |
| 35:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.633 | 3.633 |
| 35:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.606 | 3.606 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 35:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.579 | 3.579 |
| 36:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.552 | 3.552 |
| 36:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.525 | 3.525 |
| 36:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.498 | 3.498 |
| 36:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.472 | 3.472 |
| 37:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.446 | 3.446 |
| 37:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.420 | 3.420 |
| 37:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.394 | 3.394 |
| 37:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.368 | 3.368 |
| 38:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.343 | 3.343 |
| 38:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.318 | 3.318 |
| 38:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.293 | 3.293 |
| 38:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.268 | 3.268 |
| 39:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.243 | 3.243 |
| 39:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.219 | 3.219 |
| 39:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.194 | 3.194 |
| 39:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.170 | 3.170 |
| 40:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.146 | 3.146 |
| 40:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.123 | 3.123 |
| 40:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.099 | 3.099 |
| 40:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.076 | 3.076 |
| 41:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.053 | 3.053 |
| 41:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.029 | 3.029 |
| 41:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.007 | 3.007 |
| 41:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.984 | 2.984 |
| 42:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.961 | 2.961 |
| 42:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.939 | 2.939 |
| 42:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.917 | 2.917 |
| 42:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.895 | 2.895 |
| 43:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.873 | 2.873 |
| 43:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.851 | 2.851 |
| 43:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.830 | 2.830 |
| 43:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.808 | 2.808 |
| 44:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.787 | 2.787 |
| 44:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.766 | 2.766 |
| 44:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.745 | 2.745 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 44:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.725 | 2.725 |
| 45:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.704 | 2.704 |
| 45:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.684 | 2.684 |
| 45:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.663 | 2.663 |
| 45:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.643 | 2.643 |
| 46:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.623 | 2.623 |
| 46:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.604 | 2.604 |
| 46:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.584 | 2.584 |
| 46:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.564 | 2.564 |
| 47:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.545 | 2.545 |
| 47:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.526 | 2.526 |
| 47:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.507 | 2.507 |
| 47:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.488 | 2.488 |
| 48:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.469 | 2.469 |
| 48:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.451 | 2.451 |
| 48:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.432 | 2.432 |
| 48:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.414 | 2.414 |

Appendix

Catchment descriptors

| Name | Value | User-defined value used? |
|-----------------------------------|-------|--------------------------|
| Area (km ²) | 29.58 | No |
| ALTBAR | 358 | No |
| ASPBAR | 147 | No |
| ASPVAR | 0.16 | No |
| BFIHOST | 0.41 | No |
| DPLBAR (km) | 6.59 | No |
| DPSBAR (mkm ⁻¹) | 145 | No |
| FARL | 1 | No |
| LDP | 12.94 | No |
| PROPWET (mm) | 0.66 | No |
| RMED1H | 10.9 | No |
| RMED1D | 50.4 | No |
| RMED2D | 62.8 | No |
| SAAR (mm) | 1559 | No |
| SAAR4170 (mm) | 1492 | No |
| SPRHOST | 44.95 | No |
| Urbext2000 | 0 | No |
| Urbext1990 | 0 | No |
| URBCONC | 0 | No |
| URBLOC | 0 | No |
| DDF parameter C | -0.03 | No |
| DDF parameter D1 | 0.48 | No |
| DDF parameter D2 | 0.39 | No |
| DDF parameter D3 | 0.38 | No |
| DDF parameter E | 0.29 | No |
| DDF parameter F | 2.47 | No |
| DDF parameter C (1km grid value) | -0.03 | No |
| DDF parameter D1 (1km grid value) | 0.48 | No |
| DDF parameter D2 (1km grid value) | 0.38 | No |
| DDF parameter D3 (1km grid value) | 0.38 | No |
| DDF parameter E (1km grid value) | 0.29 | No |
| DDF parameter F (1km grid value) | 2.37 | No |

UK Design Flood Estimation

Generated on 14 January 2021 08:59:59 by Emma
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 8F9D-35EA

Site name: FEH_Catchment_Descriptors_295900_290600

Easting: 295900

Northing: 290600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 29.58

Using plot scale calculations: No

Model: ReFH2.2

Site description: None

Model run: 50 year

Summary of results

| | | | |
|---------------------------------|-------|--------------------------------|---------|
| Rainfall - FEH 2013 model (mm): | 69.94 | Total runoff (ML): | 819.83 |
| Total Rainfall (mm): | 55.71 | Total flow (ML): | 1859.81 |
| Peak Rainfall (mm): | 7.60 | Peak flow (m ³ /s): | 62.29 |

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

| Name | Value | User-defined? |
|----------------------------------|----------|---------------|
| Duration (hh:mm:ss) | 04:45:00 | No |
| Timestep (hh:mm:ss) | 00:15:00 | No |
| SCF (Seasonal correction factor) | 0.86 | No |
| ARF (Areal reduction factor) | 0.93 | No |
| Seasonality | Winter | No |

Loss model parameters

| Name | Value | User-defined? |
|---------------------------------|--------|---------------|
| Cini (mm) | 112.01 | No |
| Cmax (mm) | 281.13 | No |
| Use alpha correction factor | No | No |
| Alpha correction factor | n/a | No |
| Use seasonal Cini for equations | Yes | No |

Routing model parameters

| Name | Value | User-defined? |
|---------|-------|---------------|
| Tp (hr) | 1.87 | No |
| Up | 0.65 | No |
| Uk | 0.8 | No |

Baseflow model parameters

| Name | Value | User-defined? |
|-------------------------|-------|---------------|
| BFO (m ³ /s) | 2.39 | No |
| BL (hr) | 33.01 | No |
| BR | 1.27 | No |

Urbanisation parameters

| Name | Value | User-defined? |
|---|-------|---------------|
| Urban area (km ²) | 0 | No |
| Urbext 2000 | 0 | No |
| Impervious runoff factor | 0.7 | No |
| Imperviousness factor | 0.3 | No |
| Tp scaling factor | 0.5 | No |
| Exporting drained area (km ²) | 0.00 | Yes |
| Sewer capacity (m ³ /s) | 0.00 | Yes |

Time series data

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 00:00:00 | 0.630 | 0.000 | 0.252 | 0.000 | 2.389 | 2.389 |
| 00:15:00 | 0.851 | 0.000 | 0.342 | 0.048 | 2.371 | 2.420 |
| 00:30:00 | 1.146 | 0.000 | 0.465 | 0.210 | 2.355 | 2.565 |
| 00:45:00 | 1.543 | 0.000 | 0.633 | 0.527 | 2.340 | 2.867 |
| 01:00:00 | 2.071 | 0.000 | 0.864 | 1.054 | 2.330 | 3.384 |
| 01:15:00 | 2.774 | 0.000 | 1.180 | 1.867 | 2.327 | 4.194 |
| 01:30:00 | 3.701 | 0.000 | 1.618 | 3.072 | 2.333 | 5.405 |
| 01:45:00 | 4.909 | 0.000 | 2.221 | 4.813 | 2.353 | 7.166 |
| 02:00:00 | 6.431 | 0.000 | 3.039 | 7.267 | 2.393 | 9.660 |
| 02:15:00 | 7.596 | 0.000 | 3.779 | 10.585 | 2.460 | 13.045 |
| 02:30:00 | 6.431 | 0.000 | 3.360 | 14.996 | 2.564 | 17.560 |
| 02:45:00 | 4.909 | 0.000 | 2.664 | 20.485 | 2.715 | 23.200 |
| 03:00:00 | 3.701 | 0.000 | 2.065 | 26.735 | 2.920 | 29.655 |
| 03:15:00 | 2.774 | 0.000 | 1.580 | 33.354 | 3.185 | 36.540 |
| 03:30:00 | 2.071 | 0.000 | 1.197 | 39.939 | 3.512 | 43.451 |
| 03:45:00 | 1.543 | 0.000 | 0.902 | 46.050 | 3.897 | 49.947 |
| 04:00:00 | 1.146 | 0.000 | 0.676 | 51.203 | 4.333 | 55.536 |
| 04:15:00 | 0.851 | 0.000 | 0.504 | 54.842 | 4.807 | 59.649 |
| 04:30:00 | 0.630 | 0.000 | 0.375 | 56.549 | 5.304 | 61.853 |
| 04:45:00 | 0.000 | 0.000 | 0.000 | 56.486 | 5.804 | 62.291 |
| 05:00:00 | 0.000 | 0.000 | 0.000 | 54.978 | 6.294 | 61.272 |
| 05:15:00 | 0.000 | 0.000 | 0.000 | 52.348 | 6.760 | 59.108 |
| 05:30:00 | 0.000 | 0.000 | 0.000 | 48.937 | 7.193 | 56.130 |
| 05:45:00 | 0.000 | 0.000 | 0.000 | 45.042 | 7.588 | 52.631 |
| 06:00:00 | 0.000 | 0.000 | 0.000 | 40.934 | 7.942 | 48.876 |
| 06:15:00 | 0.000 | 0.000 | 0.000 | 36.846 | 8.254 | 45.100 |
| 06:30:00 | 0.000 | 0.000 | 0.000 | 32.892 | 8.526 | 41.417 |
| 06:45:00 | 0.000 | 0.000 | 0.000 | 29.104 | 8.758 | 37.862 |
| 07:00:00 | 0.000 | 0.000 | 0.000 | 25.597 | 8.953 | 34.550 |
| 07:15:00 | 0.000 | 0.000 | 0.000 | 22.344 | 9.115 | 31.459 |
| 07:30:00 | 0.000 | 0.000 | 0.000 | 19.303 | 9.246 | 28.548 |
| 07:45:00 | 0.000 | 0.000 | 0.000 | 16.447 | 9.347 | 25.794 |
| 08:00:00 | 0.000 | 0.000 | 0.000 | 13.766 | 9.421 | 23.187 |
| 08:15:00 | 0.000 | 0.000 | 0.000 | 11.264 | 9.469 | 20.733 |
| 08:30:00 | 0.000 | 0.000 | 0.000 | 8.960 | 9.495 | 18.455 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 08:45:00 | 0.000 | 0.000 | 0.000 | 6.877 | 9.499 | 16.376 |
| 09:00:00 | 0.000 | 0.000 | 0.000 | 5.067 | 9.484 | 14.551 |
| 09:15:00 | 0.000 | 0.000 | 0.000 | 3.606 | 9.454 | 13.060 |
| 09:30:00 | 0.000 | 0.000 | 0.000 | 2.494 | 9.412 | 11.906 |
| 09:45:00 | 0.000 | 0.000 | 0.000 | 1.672 | 9.361 | 11.032 |
| 10:00:00 | 0.000 | 0.000 | 0.000 | 1.076 | 9.303 | 10.380 |
| 10:15:00 | 0.000 | 0.000 | 0.000 | 0.656 | 9.241 | 9.897 |
| 10:30:00 | 0.000 | 0.000 | 0.000 | 0.368 | 9.177 | 9.545 |
| 10:45:00 | 0.000 | 0.000 | 0.000 | 0.181 | 9.110 | 9.291 |
| 11:00:00 | 0.000 | 0.000 | 0.000 | 0.069 | 9.042 | 9.112 |
| 11:15:00 | 0.000 | 0.000 | 0.000 | 0.014 | 8.975 | 8.988 |
| 11:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.907 | 8.907 |
| 11:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.840 | 8.840 |
| 12:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.773 | 8.773 |
| 12:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.707 | 8.707 |
| 12:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.641 | 8.641 |
| 12:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.576 | 8.576 |
| 13:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.511 | 8.511 |
| 13:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.447 | 8.447 |
| 13:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.383 | 8.383 |
| 13:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.320 | 8.320 |
| 14:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.257 | 8.257 |
| 14:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.195 | 8.195 |
| 14:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.133 | 8.133 |
| 14:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.072 | 8.072 |
| 15:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.011 | 8.011 |
| 15:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.950 | 7.950 |
| 15:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.890 | 7.890 |
| 15:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.831 | 7.831 |
| 16:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.772 | 7.772 |
| 16:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.713 | 7.713 |
| 16:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.655 | 7.655 |
| 16:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.597 | 7.597 |
| 17:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.540 | 7.540 |
| 17:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.483 | 7.483 |
| 17:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.426 | 7.426 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 17:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.370 | 7.370 |
| 18:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.315 | 7.315 |
| 18:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.260 | 7.260 |
| 18:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.205 | 7.205 |
| 18:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.150 | 7.150 |
| 19:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.097 | 7.097 |
| 19:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.043 | 7.043 |
| 19:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.990 | 6.990 |
| 19:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.937 | 6.937 |
| 20:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.885 | 6.885 |
| 20:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.833 | 6.833 |
| 20:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.781 | 6.781 |
| 20:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.730 | 6.730 |
| 21:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.679 | 6.679 |
| 21:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.629 | 6.629 |
| 21:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.579 | 6.579 |
| 21:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.529 | 6.529 |
| 22:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.480 | 6.480 |
| 22:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.431 | 6.431 |
| 22:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.383 | 6.383 |
| 22:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.334 | 6.334 |
| 23:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.287 | 6.287 |
| 23:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.239 | 6.239 |
| 23:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.192 | 6.192 |
| 23:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.145 | 6.145 |
| 24:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.099 | 6.099 |
| 24:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.053 | 6.053 |
| 24:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.007 | 6.007 |
| 24:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.962 | 5.962 |
| 25:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.917 | 5.917 |
| 25:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.872 | 5.872 |
| 25:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.828 | 5.828 |
| 25:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.784 | 5.784 |
| 26:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.740 | 5.740 |
| 26:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.697 | 5.697 |
| 26:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.654 | 5.654 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 26:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.611 | 5.611 |
| 27:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.569 | 5.569 |
| 27:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.527 | 5.527 |
| 27:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.485 | 5.485 |
| 27:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.444 | 5.444 |
| 28:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.403 | 5.403 |
| 28:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.362 | 5.362 |
| 28:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.322 | 5.322 |
| 28:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.281 | 5.281 |
| 29:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.242 | 5.242 |
| 29:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.202 | 5.202 |
| 29:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.163 | 5.163 |
| 29:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.124 | 5.124 |
| 30:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.085 | 5.085 |
| 30:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.047 | 5.047 |
| 30:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.009 | 5.009 |
| 30:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.971 | 4.971 |
| 31:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.933 | 4.933 |
| 31:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.896 | 4.896 |
| 31:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.859 | 4.859 |
| 31:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.823 | 4.823 |
| 32:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.786 | 4.786 |
| 32:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.750 | 4.750 |
| 32:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.714 | 4.714 |
| 32:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.679 | 4.679 |
| 33:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.643 | 4.643 |
| 33:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.608 | 4.608 |
| 33:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.574 | 4.574 |
| 33:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.539 | 4.539 |
| 34:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.505 | 4.505 |
| 34:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.471 | 4.471 |
| 34:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.437 | 4.437 |
| 34:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.404 | 4.404 |
| 35:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.370 | 4.370 |
| 35:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.337 | 4.337 |
| 35:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.305 | 4.305 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 35:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.272 | 4.272 |
| 36:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.240 | 4.240 |
| 36:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.208 | 4.208 |
| 36:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.176 | 4.176 |
| 36:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.145 | 4.145 |
| 37:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.113 | 4.113 |
| 37:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.082 | 4.082 |
| 37:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.052 | 4.052 |
| 37:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.021 | 4.021 |
| 38:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.991 | 3.991 |
| 38:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.961 | 3.961 |
| 38:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.931 | 3.931 |
| 38:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.901 | 3.901 |
| 39:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.872 | 3.872 |
| 39:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.842 | 3.842 |
| 39:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.813 | 3.813 |
| 39:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.785 | 3.785 |
| 40:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.756 | 3.756 |
| 40:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.728 | 3.728 |
| 40:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.700 | 3.700 |
| 40:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.672 | 3.672 |
| 41:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.644 | 3.644 |
| 41:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.616 | 3.616 |
| 41:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.589 | 3.589 |
| 41:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.562 | 3.562 |
| 42:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.535 | 3.535 |
| 42:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.509 | 3.509 |
| 42:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.482 | 3.482 |
| 42:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.456 | 3.456 |
| 43:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.430 | 3.430 |
| 43:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.404 | 3.404 |
| 43:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.378 | 3.378 |
| 43:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.353 | 3.353 |
| 44:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.327 | 3.327 |
| 44:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.302 | 3.302 |
| 44:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.277 | 3.277 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 44:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.253 | 3.253 |
| 45:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.228 | 3.228 |
| 45:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.204 | 3.204 |
| 45:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.180 | 3.180 |
| 45:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.156 | 3.156 |
| 46:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.132 | 3.132 |
| 46:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.108 | 3.108 |
| 46:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.085 | 3.085 |
| 46:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.061 | 3.061 |
| 47:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.038 | 3.038 |
| 47:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.015 | 3.015 |
| 47:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.993 | 2.993 |
| 47:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.970 | 2.970 |
| 48:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.948 | 2.948 |
| 48:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.925 | 2.925 |
| 48:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.903 | 2.903 |
| 48:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.881 | 2.881 |
| 49:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.860 | 2.860 |
| 49:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.838 | 2.838 |
| 49:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.817 | 2.817 |
| 49:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.795 | 2.795 |
| 50:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.774 | 2.774 |
| 50:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.753 | 2.753 |
| 50:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.733 | 2.733 |
| 50:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.712 | 2.712 |
| 51:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.692 | 2.692 |
| 51:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.671 | 2.671 |
| 51:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.651 | 2.651 |
| 51:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.631 | 2.631 |
| 52:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.611 | 2.611 |
| 52:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.591 | 2.591 |
| 52:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.572 | 2.572 |
| 52:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.553 | 2.553 |
| 53:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.533 | 2.533 |
| 53:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.514 | 2.514 |
| 53:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.495 | 2.495 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 53:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.476 | 2.476 |
| 54:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.458 | 2.458 |
| 54:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.439 | 2.439 |
| 54:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.421 | 2.421 |
| 54:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.402 | 2.402 |

Appendix

Catchment descriptors

| Name | Value | User-defined value used? |
|-----------------------------------|-------|--------------------------|
| Area (km ²) | 29.58 | No |
| ALTBAR | 358 | No |
| ASPBAR | 147 | No |
| ASPVAR | 0.16 | No |
| BFIHOST | 0.41 | No |
| DPLBAR (km) | 6.59 | No |
| DPSBAR (mkm ⁻¹) | 145 | No |
| FARL | 1 | No |
| LDP | 12.94 | No |
| PROPWET (mm) | 0.66 | No |
| RMED1H | 10.9 | No |
| RMED1D | 50.4 | No |
| RMED2D | 62.8 | No |
| SAAR (mm) | 1559 | No |
| SAAR4170 (mm) | 1492 | No |
| SPRHOST | 44.95 | No |
| Urbext2000 | 0 | No |
| Urbext1990 | 0 | No |
| URBCONC | 0 | No |
| URBLOC | 0 | No |
| DDF parameter C | -0.03 | No |
| DDF parameter D1 | 0.48 | No |
| DDF parameter D2 | 0.39 | No |
| DDF parameter D3 | 0.38 | No |
| DDF parameter E | 0.29 | No |
| DDF parameter F | 2.47 | No |
| DDF parameter C (1km grid value) | -0.03 | No |
| DDF parameter D1 (1km grid value) | 0.48 | No |
| DDF parameter D2 (1km grid value) | 0.38 | No |
| DDF parameter D3 (1km grid value) | 0.38 | No |
| DDF parameter E (1km grid value) | 0.29 | No |
| DDF parameter F (1km grid value) | 2.37 | No |

UK Design Flood Estimation

Generated on 14 January 2021 09:00:15 by Emma
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 8F9D-35EA

Site name: FEH_Catchment_Descriptors_295900_290600

Easting: 295900

Northing: 290600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 29.58

Using plot scale calculations: No

Model: ReFH2.2

Site description: None

Model run: 100 year

Summary of results

| | | | |
|---------------------------------|-------|--------------------------------|---------|
| Rainfall - FEH 2013 model (mm): | 79.94 | Total runoff (ML): | 963.73 |
| Total Rainfall (mm): | 63.67 | Total flow (ML): | 2184.85 |
| Peak Rainfall (mm): | 8.68 | Peak flow (m ³ /s): | 72.91 |

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

| Name | Value | User-defined? |
|----------------------------------|----------|---------------|
| Duration (hh:mm:ss) | 04:45:00 | No |
| Timestep (hh:mm:ss) | 00:15:00 | No |
| SCF (Seasonal correction factor) | 0.86 | No |
| ARF (Areal reduction factor) | 0.93 | No |
| Seasonality | Winter | No |

Loss model parameters

| Name | Value | User-defined? |
|---------------------------------|--------|---------------|
| Cini (mm) | 112.01 | No |
| Cmax (mm) | 281.13 | No |
| Use alpha correction factor | No | No |
| Alpha correction factor | n/a | No |
| Use seasonal Cini for equations | Yes | No |

Routing model parameters

| Name | Value | User-defined? |
|---------|-------|---------------|
| Tp (hr) | 1.87 | No |
| Up | 0.65 | No |
| Uk | 0.8 | No |

Baseflow model parameters

| Name | Value | User-defined? |
|-------------------------|-------|---------------|
| BFO (m ³ /s) | 2.39 | No |
| BL (hr) | 33.01 | No |
| BR | 1.27 | No |

Urbanisation parameters

| Name | Value | User-defined? |
|---|-------|---------------|
| Urban area (km ²) | 0 | No |
| Urbext 2000 | 0 | No |
| Impervious runoff factor | 0.7 | No |
| Imperviousness factor | 0.3 | No |
| Tp scaling factor | 0.5 | No |
| Exporting drained area (km ²) | 0.00 | Yes |
| Sewer capacity (m ³ /s) | 0.00 | Yes |

Time series data

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 00:00:00 | 0.720 | 0.000 | 0.288 | 0.000 | 2.389 | 2.389 |
| 00:15:00 | 0.972 | 0.000 | 0.392 | 0.055 | 2.371 | 2.427 |
| 00:30:00 | 1.310 | 0.000 | 0.533 | 0.240 | 2.355 | 2.595 |
| 00:45:00 | 1.763 | 0.000 | 0.727 | 0.603 | 2.341 | 2.944 |
| 01:00:00 | 2.367 | 0.000 | 0.993 | 1.206 | 2.332 | 3.538 |
| 01:15:00 | 3.171 | 0.000 | 1.362 | 2.139 | 2.331 | 4.470 |
| 01:30:00 | 4.230 | 0.000 | 1.872 | 3.523 | 2.340 | 5.863 |
| 01:45:00 | 5.611 | 0.000 | 2.582 | 5.526 | 2.366 | 7.892 |
| 02:00:00 | 7.350 | 0.000 | 3.551 | 8.358 | 2.414 | 10.772 |
| 02:15:00 | 8.682 | 0.000 | 4.442 | 12.199 | 2.494 | 14.694 |
| 02:30:00 | 7.350 | 0.000 | 3.971 | 17.328 | 2.617 | 19.945 |
| 02:45:00 | 5.611 | 0.000 | 3.161 | 23.738 | 2.794 | 26.531 |
| 03:00:00 | 4.230 | 0.000 | 2.457 | 31.061 | 3.035 | 34.096 |
| 03:15:00 | 3.171 | 0.000 | 1.883 | 38.844 | 3.346 | 42.190 |
| 03:30:00 | 2.367 | 0.000 | 1.429 | 46.612 | 3.730 | 50.341 |
| 03:45:00 | 1.763 | 0.000 | 1.077 | 53.850 | 4.182 | 58.033 |
| 04:00:00 | 1.310 | 0.000 | 0.808 | 59.986 | 4.695 | 64.681 |
| 04:15:00 | 0.972 | 0.000 | 0.603 | 64.358 | 5.255 | 69.613 |
| 04:30:00 | 0.720 | 0.000 | 0.449 | 66.462 | 5.841 | 72.303 |
| 04:45:00 | 0.000 | 0.000 | 0.000 | 66.476 | 6.432 | 72.908 |
| 05:00:00 | 0.000 | 0.000 | 0.000 | 64.772 | 7.012 | 71.783 |
| 05:15:00 | 0.000 | 0.000 | 0.000 | 61.728 | 7.564 | 69.292 |
| 05:30:00 | 0.000 | 0.000 | 0.000 | 57.747 | 8.078 | 65.826 |
| 05:45:00 | 0.000 | 0.000 | 0.000 | 53.182 | 8.548 | 61.730 |
| 06:00:00 | 0.000 | 0.000 | 0.000 | 48.351 | 8.969 | 57.320 |
| 06:15:00 | 0.000 | 0.000 | 0.000 | 43.534 | 9.341 | 52.875 |
| 06:30:00 | 0.000 | 0.000 | 0.000 | 38.871 | 9.664 | 48.535 |
| 06:45:00 | 0.000 | 0.000 | 0.000 | 34.401 | 9.942 | 44.343 |
| 07:00:00 | 0.000 | 0.000 | 0.000 | 30.264 | 10.176 | 40.441 |
| 07:15:00 | 0.000 | 0.000 | 0.000 | 26.428 | 10.371 | 36.799 |
| 07:30:00 | 0.000 | 0.000 | 0.000 | 22.844 | 10.528 | 33.372 |
| 07:45:00 | 0.000 | 0.000 | 0.000 | 19.478 | 10.651 | 30.129 |
| 08:00:00 | 0.000 | 0.000 | 0.000 | 16.316 | 10.742 | 27.058 |
| 08:15:00 | 0.000 | 0.000 | 0.000 | 13.364 | 10.803 | 24.167 |
| 08:30:00 | 0.000 | 0.000 | 0.000 | 10.644 | 10.836 | 21.480 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 08:45:00 | 0.000 | 0.000 | 0.000 | 8.181 | 10.844 | 19.025 |
| 09:00:00 | 0.000 | 0.000 | 0.000 | 6.037 | 10.830 | 16.867 |
| 09:15:00 | 0.000 | 0.000 | 0.000 | 4.301 | 10.798 | 15.099 |
| 09:30:00 | 0.000 | 0.000 | 0.000 | 2.977 | 10.752 | 13.729 |
| 09:45:00 | 0.000 | 0.000 | 0.000 | 1.997 | 10.694 | 12.691 |
| 10:00:00 | 0.000 | 0.000 | 0.000 | 1.287 | 10.629 | 11.916 |
| 10:15:00 | 0.000 | 0.000 | 0.000 | 0.784 | 10.559 | 11.343 |
| 10:30:00 | 0.000 | 0.000 | 0.000 | 0.441 | 10.485 | 10.926 |
| 10:45:00 | 0.000 | 0.000 | 0.000 | 0.217 | 10.409 | 10.626 |
| 11:00:00 | 0.000 | 0.000 | 0.000 | 0.083 | 10.332 | 10.415 |
| 11:15:00 | 0.000 | 0.000 | 0.000 | 0.016 | 10.255 | 10.271 |
| 11:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.177 | 10.177 |
| 11:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.100 | 10.100 |
| 12:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.024 | 10.024 |
| 12:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.949 | 9.949 |
| 12:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.873 | 9.873 |
| 12:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.799 | 9.799 |
| 13:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.725 | 9.725 |
| 13:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.652 | 9.652 |
| 13:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.579 | 9.579 |
| 13:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.507 | 9.507 |
| 14:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.435 | 9.435 |
| 14:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.364 | 9.364 |
| 14:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.293 | 9.293 |
| 14:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.223 | 9.223 |
| 15:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.153 | 9.153 |
| 15:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.084 | 9.084 |
| 15:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.016 | 9.016 |
| 15:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.948 | 8.948 |
| 16:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.880 | 8.880 |
| 16:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.813 | 8.813 |
| 16:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.747 | 8.747 |
| 16:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.681 | 8.681 |
| 17:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.615 | 8.615 |
| 17:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.550 | 8.550 |
| 17:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.486 | 8.486 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 17:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.422 | 8.422 |
| 18:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.358 | 8.358 |
| 18:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.295 | 8.295 |
| 18:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.232 | 8.232 |
| 18:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.170 | 8.170 |
| 19:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.109 | 8.109 |
| 19:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.047 | 8.047 |
| 19:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.987 | 7.987 |
| 19:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.926 | 7.926 |
| 20:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.867 | 7.867 |
| 20:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.807 | 7.807 |
| 20:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.748 | 7.748 |
| 20:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.690 | 7.690 |
| 21:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.632 | 7.632 |
| 21:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.574 | 7.574 |
| 21:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.517 | 7.517 |
| 21:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.460 | 7.460 |
| 22:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.404 | 7.404 |
| 22:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.348 | 7.348 |
| 22:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.293 | 7.293 |
| 22:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.238 | 7.238 |
| 23:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.183 | 7.183 |
| 23:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.129 | 7.129 |
| 23:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.075 | 7.075 |
| 23:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.022 | 7.022 |
| 24:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.969 | 6.969 |
| 24:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.916 | 6.916 |
| 24:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.864 | 6.864 |
| 24:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.812 | 6.812 |
| 25:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.761 | 6.761 |
| 25:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.710 | 6.710 |
| 25:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.659 | 6.659 |
| 25:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.609 | 6.609 |
| 26:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.559 | 6.559 |
| 26:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.510 | 6.510 |
| 26:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.460 | 6.460 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 26:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.412 | 6.412 |
| 27:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.363 | 6.363 |
| 27:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.315 | 6.315 |
| 27:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.268 | 6.268 |
| 27:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.220 | 6.220 |
| 28:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.173 | 6.173 |
| 28:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.127 | 6.127 |
| 28:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.081 | 6.081 |
| 28:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.035 | 6.035 |
| 29:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.989 | 5.989 |
| 29:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.944 | 5.944 |
| 29:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.899 | 5.899 |
| 29:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.855 | 5.855 |
| 30:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.810 | 5.810 |
| 30:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.767 | 5.767 |
| 30:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.723 | 5.723 |
| 30:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.680 | 5.680 |
| 31:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.637 | 5.637 |
| 31:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.595 | 5.595 |
| 31:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.552 | 5.552 |
| 31:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.510 | 5.510 |
| 32:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.469 | 5.469 |
| 32:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.428 | 5.428 |
| 32:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.387 | 5.387 |
| 32:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.346 | 5.346 |
| 33:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.306 | 5.306 |
| 33:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.266 | 5.266 |
| 33:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.226 | 5.226 |
| 33:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.186 | 5.186 |
| 34:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.147 | 5.147 |
| 34:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.108 | 5.108 |
| 34:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.070 | 5.070 |
| 34:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.032 | 5.032 |
| 35:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.994 | 4.994 |
| 35:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.956 | 4.956 |
| 35:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.919 | 4.919 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 35:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.882 | 4.882 |
| 36:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.845 | 4.845 |
| 36:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.808 | 4.808 |
| 36:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.772 | 4.772 |
| 36:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.736 | 4.736 |
| 37:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.700 | 4.700 |
| 37:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.665 | 4.665 |
| 37:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.629 | 4.629 |
| 37:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.595 | 4.595 |
| 38:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.560 | 4.560 |
| 38:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.525 | 4.525 |
| 38:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.491 | 4.491 |
| 38:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.457 | 4.457 |
| 39:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.424 | 4.424 |
| 39:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.390 | 4.390 |
| 39:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.357 | 4.357 |
| 39:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.324 | 4.324 |
| 40:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.292 | 4.292 |
| 40:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.259 | 4.259 |
| 40:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.227 | 4.227 |
| 40:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.195 | 4.195 |
| 41:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.164 | 4.164 |
| 41:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.132 | 4.132 |
| 41:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.101 | 4.101 |
| 41:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.070 | 4.070 |
| 42:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.039 | 4.039 |
| 42:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.009 | 4.009 |
| 42:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.979 | 3.979 |
| 42:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.949 | 3.949 |
| 43:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.919 | 3.919 |
| 43:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.889 | 3.889 |
| 43:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.860 | 3.860 |
| 43:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.831 | 3.831 |
| 44:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.802 | 3.802 |
| 44:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.773 | 3.773 |
| 44:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.745 | 3.745 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 44:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.717 | 3.717 |
| 45:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.688 | 3.688 |
| 45:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.661 | 3.661 |
| 45:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.633 | 3.633 |
| 45:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.606 | 3.606 |
| 46:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.578 | 3.578 |
| 46:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.551 | 3.551 |
| 46:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.525 | 3.525 |
| 46:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.498 | 3.498 |
| 47:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.472 | 3.472 |
| 47:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.445 | 3.445 |
| 47:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.419 | 3.419 |
| 47:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.394 | 3.394 |
| 48:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.368 | 3.368 |
| 48:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.343 | 3.343 |
| 48:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.317 | 3.317 |
| 48:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.292 | 3.292 |
| 49:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.267 | 3.267 |
| 49:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.243 | 3.243 |
| 49:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.218 | 3.218 |
| 49:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.194 | 3.194 |
| 50:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.170 | 3.170 |
| 50:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.146 | 3.146 |
| 50:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.122 | 3.122 |
| 50:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.099 | 3.099 |
| 51:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.075 | 3.075 |
| 51:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.052 | 3.052 |
| 51:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.029 | 3.029 |
| 51:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.006 | 3.006 |
| 52:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.984 | 2.984 |
| 52:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.961 | 2.961 |
| 52:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.939 | 2.939 |
| 52:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.917 | 2.917 |
| 53:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.895 | 2.895 |
| 53:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.873 | 2.873 |
| 53:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.851 | 2.851 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 53:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.830 | 2.830 |
| 54:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.808 | 2.808 |
| 54:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.787 | 2.787 |
| 54:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.766 | 2.766 |
| 54:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.745 | 2.745 |
| 55:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.724 | 2.724 |
| 55:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.704 | 2.704 |
| 55:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.683 | 2.683 |
| 55:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.663 | 2.663 |
| 56:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.643 | 2.643 |
| 56:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.623 | 2.623 |
| 56:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.603 | 2.603 |
| 56:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.584 | 2.584 |
| 57:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.564 | 2.564 |
| 57:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.545 | 2.545 |
| 57:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.526 | 2.526 |
| 57:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.507 | 2.507 |
| 58:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.488 | 2.488 |
| 58:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.469 | 2.469 |
| 58:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.450 | 2.450 |
| 58:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.432 | 2.432 |
| 59:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.413 | 2.413 |

Appendix

Catchment descriptors

| Name | Value | User-defined value used? |
|-----------------------------------|-------|--------------------------|
| Area (km ²) | 29.58 | No |
| ALTBAR | 358 | No |
| ASPBAR | 147 | No |
| ASPVAR | 0.16 | No |
| BFIHOST | 0.41 | No |
| DPLBAR (km) | 6.59 | No |
| DPSBAR (mkm ⁻¹) | 145 | No |
| FARL | 1 | No |
| LDP | 12.94 | No |
| PROPWET (mm) | 0.66 | No |
| RMED1H | 10.9 | No |
| RMED1D | 50.4 | No |
| RMED2D | 62.8 | No |
| SAAR (mm) | 1559 | No |
| SAAR4170 (mm) | 1492 | No |
| SPRHOST | 44.95 | No |
| Urbext2000 | 0 | No |
| Urbext1990 | 0 | No |
| URBCONC | 0 | No |
| URBLOC | 0 | No |
| DDF parameter C | -0.03 | No |
| DDF parameter D1 | 0.48 | No |
| DDF parameter D2 | 0.39 | No |
| DDF parameter D3 | 0.38 | No |
| DDF parameter E | 0.29 | No |
| DDF parameter F | 2.47 | No |
| DDF parameter C (1km grid value) | -0.03 | No |
| DDF parameter D1 (1km grid value) | 0.48 | No |
| DDF parameter D2 (1km grid value) | 0.38 | No |
| DDF parameter D3 (1km grid value) | 0.38 | No |
| DDF parameter E (1km grid value) | 0.29 | No |
| DDF parameter F (1km grid value) | 2.37 | No |

UK Design Flood Estimation

Generated on 14 January 2021 09:00:28 by Emma
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 8F9D-35EA

Site name: FEH_Catchment_Descriptors_295900_290600

Easting: 295900

Northing: 290600

Country: England, Wales or Northern Ireland

Catchment Area (km²): 29.58

Using plot scale calculations: No

Model: ReFH2.2

Site description: None

Model run: 1000 year

Summary of results

| | | | |
|---------------------------------|--------|--------------------------------|---------|
| Rainfall - FEH 2013 model (mm): | 119.57 | Total runoff (ML): | 1599.72 |
| Total Rainfall (mm): | 95.24 | Total flow (ML): | 3627.06 |
| Peak Rainfall (mm): | 12.99 | Peak flow (m ³ /s): | 119.93 |

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

| Name | Value | User-defined? |
|----------------------------------|----------|---------------|
| Duration (hh:mm:ss) | 04:45:00 | No |
| Timestep (hh:mm:ss) | 00:15:00 | No |
| SCF (Seasonal correction factor) | 0.86 | No |
| ARF (Areal reduction factor) | 0.93 | No |
| Seasonality | Winter | No |

Loss model parameters

| Name | Value | User-defined? |
|---------------------------------|--------|---------------|
| Cini (mm) | 112.01 | No |
| Cmax (mm) | 281.13 | No |
| Use alpha correction factor | No | No |
| Alpha correction factor | n/a | No |
| Use seasonal Cini for equations | Yes | No |

Routing model parameters

| Name | Value | User-defined? |
|---------|-------|---------------|
| Tp (hr) | 1.87 | No |
| Up | 0.65 | No |
| Uk | 0.8 | No |

Baseflow model parameters

| Name | Value | User-defined? |
|-------------------------|-------|---------------|
| BFO (m ³ /s) | 2.39 | No |
| BL (hr) | 33.01 | No |
| BR | 1.27 | No |

Urbanisation parameters

| Name | Value | User-defined? |
|---|-------|---------------|
| Urban area (km ²) | 0 | No |
| Urbext 2000 | 0 | No |
| Impervious runoff factor | 0.7 | No |
| Imperviousness factor | 0.3 | No |
| Tp scaling factor | 0.5 | No |
| Exporting drained area (km ²) | 0.00 | Yes |
| Sewer capacity (m ³ /s) | 0.00 | Yes |

Time series data

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 00:00:00 | 1.077 | 0.000 | 0.431 | 0.000 | 2.389 | 2.389 |
| 00:15:00 | 1.454 | 0.000 | 0.589 | 0.083 | 2.372 | 2.454 |
| 00:30:00 | 1.960 | 0.000 | 0.805 | 0.361 | 2.356 | 2.716 |
| 00:45:00 | 2.637 | 0.000 | 1.105 | 0.905 | 2.344 | 3.249 |
| 01:00:00 | 3.541 | 0.000 | 1.523 | 1.816 | 2.339 | 4.156 |
| 01:15:00 | 4.742 | 0.000 | 2.110 | 3.230 | 2.346 | 5.576 |
| 01:30:00 | 6.328 | 0.000 | 2.939 | 5.340 | 2.369 | 7.709 |
| 01:45:00 | 8.393 | 0.000 | 4.119 | 8.417 | 2.417 | 10.834 |
| 02:00:00 | 10.994 | 0.000 | 5.774 | 12.808 | 2.500 | 15.308 |
| 02:15:00 | 12.986 | 0.000 | 7.374 | 18.846 | 2.633 | 21.479 |
| 02:30:00 | 10.994 | 0.000 | 6.712 | 27.037 | 2.833 | 29.870 |
| 02:45:00 | 8.393 | 0.000 | 5.413 | 37.425 | 3.120 | 40.545 |
| 03:00:00 | 6.328 | 0.000 | 4.247 | 49.448 | 3.512 | 52.960 |
| 03:15:00 | 4.742 | 0.000 | 3.276 | 62.374 | 4.020 | 66.394 |
| 03:30:00 | 3.541 | 0.000 | 2.499 | 75.428 | 4.649 | 80.077 |
| 03:45:00 | 2.637 | 0.000 | 1.890 | 87.757 | 5.395 | 93.152 |
| 04:00:00 | 1.960 | 0.000 | 1.420 | 98.394 | 6.244 | 104.638 |
| 04:15:00 | 1.454 | 0.000 | 1.063 | 106.197 | 7.176 | 113.373 |
| 04:30:00 | 1.077 | 0.000 | 0.792 | 110.251 | 8.157 | 118.408 |
| 04:45:00 | 0.000 | 0.000 | 0.000 | 110.774 | 9.153 | 119.927 |
| 05:00:00 | 0.000 | 0.000 | 0.000 | 108.343 | 10.132 | 118.475 |
| 05:15:00 | 0.000 | 0.000 | 0.000 | 103.570 | 11.069 | 114.639 |
| 05:30:00 | 0.000 | 0.000 | 0.000 | 97.131 | 11.945 | 109.076 |
| 05:45:00 | 0.000 | 0.000 | 0.000 | 89.624 | 12.749 | 102.372 |
| 06:00:00 | 0.000 | 0.000 | 0.000 | 81.598 | 13.471 | 95.070 |
| 06:15:00 | 0.000 | 0.000 | 0.000 | 73.541 | 14.112 | 87.653 |
| 06:30:00 | 0.000 | 0.000 | 0.000 | 65.710 | 14.671 | 80.381 |
| 06:45:00 | 0.000 | 0.000 | 0.000 | 58.193 | 15.153 | 73.346 |
| 07:00:00 | 0.000 | 0.000 | 0.000 | 51.243 | 15.562 | 66.805 |
| 07:15:00 | 0.000 | 0.000 | 0.000 | 44.808 | 15.904 | 60.712 |
| 07:30:00 | 0.000 | 0.000 | 0.000 | 38.798 | 16.184 | 54.982 |
| 07:45:00 | 0.000 | 0.000 | 0.000 | 33.157 | 16.406 | 49.563 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 08:00:00 | 0.000 | 0.000 | 0.000 | 27.855 | 16.574 | 44.429 |
| 08:15:00 | 0.000 | 0.000 | 0.000 | 22.895 | 16.692 | 39.587 |
| 08:30:00 | 0.000 | 0.000 | 0.000 | 18.311 | 16.763 | 35.074 |
| 08:45:00 | 0.000 | 0.000 | 0.000 | 14.138 | 16.792 | 30.930 |
| 09:00:00 | 0.000 | 0.000 | 0.000 | 10.481 | 16.783 | 27.264 |
| 09:15:00 | 0.000 | 0.000 | 0.000 | 7.499 | 16.742 | 24.241 |
| 09:30:00 | 0.000 | 0.000 | 0.000 | 5.208 | 16.676 | 21.884 |
| 09:45:00 | 0.000 | 0.000 | 0.000 | 3.502 | 16.592 | 20.094 |
| 10:00:00 | 0.000 | 0.000 | 0.000 | 2.260 | 16.495 | 18.755 |
| 10:15:00 | 0.000 | 0.000 | 0.000 | 1.380 | 16.388 | 17.767 |
| 10:30:00 | 0.000 | 0.000 | 0.000 | 0.776 | 16.274 | 17.050 |
| 10:45:00 | 0.000 | 0.000 | 0.000 | 0.382 | 16.157 | 16.539 |
| 11:00:00 | 0.000 | 0.000 | 0.000 | 0.146 | 16.038 | 16.184 |
| 11:15:00 | 0.000 | 0.000 | 0.000 | 0.029 | 15.917 | 15.946 |
| 11:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.797 | 15.797 |
| 11:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.678 | 15.678 |
| 12:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.560 | 15.560 |
| 12:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.442 | 15.442 |
| 12:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.326 | 15.326 |
| 12:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.210 | 15.210 |
| 13:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 15.096 | 15.096 |
| 13:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.982 | 14.982 |
| 13:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.869 | 14.869 |
| 13:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.756 | 14.756 |
| 14:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.645 | 14.645 |
| 14:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.535 | 14.535 |
| 14:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.425 | 14.425 |
| 14:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.316 | 14.316 |
| 15:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.208 | 14.208 |
| 15:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 14.101 | 14.101 |
| 15:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.994 | 13.994 |
| 15:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.889 | 13.889 |
| 16:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.784 | 13.784 |
| 16:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.680 | 13.680 |
| 16:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.577 | 13.577 |
| 16:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.474 | 13.474 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 17:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.373 | 13.373 |
| 17:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.272 | 13.272 |
| 17:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.172 | 13.172 |
| 17:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 13.072 | 13.072 |
| 18:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.974 | 12.974 |
| 18:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.876 | 12.876 |
| 18:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.779 | 12.779 |
| 18:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.682 | 12.682 |
| 19:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.586 | 12.586 |
| 19:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.491 | 12.491 |
| 19:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.397 | 12.397 |
| 19:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.304 | 12.304 |
| 20:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.211 | 12.211 |
| 20:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.119 | 12.119 |
| 20:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 12.027 | 12.027 |
| 20:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.936 | 11.936 |
| 21:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.846 | 11.846 |
| 21:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.757 | 11.757 |
| 21:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.668 | 11.668 |
| 21:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.580 | 11.580 |
| 22:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.493 | 11.493 |
| 22:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.406 | 11.406 |
| 22:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.320 | 11.320 |
| 22:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.235 | 11.235 |
| 23:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.150 | 11.150 |
| 23:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 11.066 | 11.066 |
| 23:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.982 | 10.982 |
| 23:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.899 | 10.899 |
| 24:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.817 | 10.817 |
| 24:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.736 | 10.736 |
| 24:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.655 | 10.655 |
| 24:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.574 | 10.574 |
| 25:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.494 | 10.494 |
| 25:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.415 | 10.415 |
| 25:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.337 | 10.337 |
| 25:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.259 | 10.259 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 26:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.181 | 10.181 |
| 26:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.104 | 10.104 |
| 26:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 10.028 | 10.028 |
| 26:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.952 | 9.952 |
| 27:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.877 | 9.877 |
| 27:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.803 | 9.803 |
| 27:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.729 | 9.729 |
| 27:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.655 | 9.655 |
| 28:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.583 | 9.583 |
| 28:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.510 | 9.510 |
| 28:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.439 | 9.439 |
| 28:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.367 | 9.367 |
| 29:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.297 | 9.297 |
| 29:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.226 | 9.226 |
| 29:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.157 | 9.157 |
| 29:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.088 | 9.088 |
| 30:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 9.019 | 9.019 |
| 30:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.951 | 8.951 |
| 30:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.884 | 8.884 |
| 30:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.817 | 8.817 |
| 31:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.750 | 8.750 |
| 31:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.684 | 8.684 |
| 31:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.618 | 8.618 |
| 31:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.553 | 8.553 |
| 32:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.489 | 8.489 |
| 32:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.425 | 8.425 |
| 32:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.361 | 8.361 |
| 32:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.298 | 8.298 |
| 33:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.236 | 8.236 |
| 33:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.173 | 8.173 |
| 33:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.112 | 8.112 |
| 33:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 8.051 | 8.051 |
| 34:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.990 | 7.990 |
| 34:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.930 | 7.930 |
| 34:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.870 | 7.870 |
| 34:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.810 | 7.810 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 35:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.751 | 7.751 |
| 35:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.693 | 7.693 |
| 35:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.635 | 7.635 |
| 35:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.577 | 7.577 |
| 36:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.520 | 7.520 |
| 36:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.463 | 7.463 |
| 36:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.407 | 7.407 |
| 36:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.351 | 7.351 |
| 37:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.296 | 7.296 |
| 37:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.241 | 7.241 |
| 37:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.186 | 7.186 |
| 37:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.132 | 7.132 |
| 38:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.078 | 7.078 |
| 38:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 7.025 | 7.025 |
| 38:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.972 | 6.972 |
| 38:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.919 | 6.919 |
| 39:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.867 | 6.867 |
| 39:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.815 | 6.815 |
| 39:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.763 | 6.763 |
| 39:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.712 | 6.712 |
| 40:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.662 | 6.662 |
| 40:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.612 | 6.612 |
| 40:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.562 | 6.562 |
| 40:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.512 | 6.512 |
| 41:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.463 | 6.463 |
| 41:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.414 | 6.414 |
| 41:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.366 | 6.366 |
| 41:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.318 | 6.318 |
| 42:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.270 | 6.270 |
| 42:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.223 | 6.223 |
| 42:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.176 | 6.176 |
| 42:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.129 | 6.129 |
| 43:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.083 | 6.083 |
| 43:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 6.037 | 6.037 |
| 43:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.992 | 5.992 |
| 43:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.946 | 5.946 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 44:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.901 | 5.901 |
| 44:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.857 | 5.857 |
| 44:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.813 | 5.813 |
| 44:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.769 | 5.769 |
| 45:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.725 | 5.725 |
| 45:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.682 | 5.682 |
| 45:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.639 | 5.639 |
| 45:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.597 | 5.597 |
| 46:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.554 | 5.554 |
| 46:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.513 | 5.513 |
| 46:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.471 | 5.471 |
| 46:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.430 | 5.430 |
| 47:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.389 | 5.389 |
| 47:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.348 | 5.348 |
| 47:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.308 | 5.308 |
| 47:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.268 | 5.268 |
| 48:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.228 | 5.228 |
| 48:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.188 | 5.188 |
| 48:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.149 | 5.149 |
| 48:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.110 | 5.110 |
| 49:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.072 | 5.072 |
| 49:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 5.034 | 5.034 |
| 49:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.996 | 4.996 |
| 49:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.958 | 4.958 |
| 50:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.921 | 4.921 |
| 50:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.883 | 4.883 |
| 50:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.847 | 4.847 |
| 50:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.810 | 4.810 |
| 51:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.774 | 4.774 |
| 51:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.738 | 4.738 |
| 51:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.702 | 4.702 |
| 51:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.666 | 4.666 |
| 52:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.631 | 4.631 |
| 52:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.596 | 4.596 |
| 52:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.562 | 4.562 |
| 52:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.527 | 4.527 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 53:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.493 | 4.493 |
| 53:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.459 | 4.459 |
| 53:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.425 | 4.425 |
| 53:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.392 | 4.392 |
| 54:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.359 | 4.359 |
| 54:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.326 | 4.326 |
| 54:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.293 | 4.293 |
| 54:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.261 | 4.261 |
| 55:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.229 | 4.229 |
| 55:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.197 | 4.197 |
| 55:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.165 | 4.165 |
| 55:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.134 | 4.134 |
| 56:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.103 | 4.103 |
| 56:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.072 | 4.072 |
| 56:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.041 | 4.041 |
| 56:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 4.011 | 4.011 |
| 57:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.980 | 3.980 |
| 57:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.950 | 3.950 |
| 57:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.920 | 3.920 |
| 57:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.891 | 3.891 |
| 58:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.861 | 3.861 |
| 58:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.832 | 3.832 |
| 58:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.803 | 3.803 |
| 58:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.775 | 3.775 |
| 59:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.746 | 3.746 |
| 59:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.718 | 3.718 |
| 59:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.690 | 3.690 |
| 59:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.662 | 3.662 |
| 60:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.634 | 3.634 |
| 60:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.607 | 3.607 |
| 60:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.580 | 3.580 |
| 60:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.553 | 3.553 |
| 61:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.526 | 3.526 |
| 61:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.499 | 3.499 |
| 61:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.473 | 3.473 |
| 61:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.447 | 3.447 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 62:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.421 | 3.421 |
| 62:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.395 | 3.395 |
| 62:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.369 | 3.369 |
| 62:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.344 | 3.344 |
| 63:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.319 | 3.319 |
| 63:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.294 | 3.294 |
| 63:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.269 | 3.269 |
| 63:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.244 | 3.244 |
| 64:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.220 | 3.220 |
| 64:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.195 | 3.195 |
| 64:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.171 | 3.171 |
| 64:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.147 | 3.147 |
| 65:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.124 | 3.124 |
| 65:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.100 | 3.100 |
| 65:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.077 | 3.077 |
| 65:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.053 | 3.053 |
| 66:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.030 | 3.030 |
| 66:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 3.007 | 3.007 |
| 66:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.985 | 2.985 |
| 66:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.962 | 2.962 |
| 67:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.940 | 2.940 |
| 67:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.918 | 2.918 |
| 67:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.896 | 2.896 |
| 67:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.874 | 2.874 |
| 68:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.852 | 2.852 |
| 68:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.831 | 2.831 |
| 68:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.809 | 2.809 |
| 68:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.788 | 2.788 |
| 69:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.767 | 2.767 |
| 69:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.746 | 2.746 |
| 69:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.725 | 2.725 |
| 69:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.705 | 2.705 |
| 70:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.684 | 2.684 |
| 70:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.664 | 2.664 |
| 70:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.644 | 2.644 |
| 70:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.624 | 2.624 |

| Time (hh:mm:ss) | Rain (mm) | Sewer Loss (mm) | Net Rain (mm) | Runoff (m ³ /s) | Baseflow (m ³ /s) | Total Flow (m ³ /s) |
|--------------------|--------------|--------------------|------------------|-------------------------------|---------------------------------|-----------------------------------|
| 71:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.604 | 2.604 |
| 71:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.585 | 2.585 |
| 71:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.565 | 2.565 |
| 71:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.546 | 2.546 |
| 72:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.527 | 2.527 |
| 72:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.508 | 2.508 |
| 72:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.489 | 2.489 |
| 72:45:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.470 | 2.470 |
| 73:00:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.451 | 2.451 |
| 73:15:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.433 | 2.433 |
| 73:30:00 | 0.000 | 0.000 | 0.000 | 0.000 | 2.414 | 2.414 |

Appendix

Catchment descriptors

| Name | Value | User-defined value used? |
|-----------------------------------|-------|--------------------------|
| Area (km ²) | 29.58 | No |
| ALTBAR | 358 | No |
| ASPBAR | 147 | No |
| ASPVAR | 0.16 | No |
| BFIHOST | 0.41 | No |
| DPLBAR (km) | 6.59 | No |
| DPSBAR (mkm ⁻¹) | 145 | No |
| FARL | 1 | No |
| LDP | 12.94 | No |
| PROPWET (mm) | 0.66 | No |
| RMED1H | 10.9 | No |
| RMED1D | 50.4 | No |
| RMED2D | 62.8 | No |
| SAAR (mm) | 1559 | No |
| SAAR4170 (mm) | 1492 | No |
| SPRHOST | 44.95 | No |
| Urbext2000 | 0 | No |
| Urbext1990 | 0 | No |
| URBCONC | 0 | No |
| URBLOC | 0 | No |
| DDF parameter C | -0.03 | No |
| DDF parameter D1 | 0.48 | No |
| DDF parameter D2 | 0.39 | No |
| DDF parameter D3 | 0.38 | No |
| DDF parameter E | 0.29 | No |
| DDF parameter F | 2.47 | No |
| DDF parameter C (1km grid value) | -0.03 | No |
| DDF parameter D1 (1km grid value) | 0.48 | No |
| DDF parameter D2 (1km grid value) | 0.38 | No |
| DDF parameter D3 (1km grid value) | 0.38 | No |
| DDF parameter E (1km grid value) | 0.29 | No |
| DDF parameter F (1km grid value) | 2.37 | No |

APPENDIX 8 – HEC-RAS Baseline Modelling Results

HEC-RAS Plan: Baseline River: River Trannon Reach: 001

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0874 | 2 | 26.58 | 149.52 | 150.92 | 150.68 | 151.15 | 0.005192 | 2.21 | 13.17 | 14.17 | 0.64 |
| 001 | 0874 | 20 | 49.78 | 149.52 | 151.36 | 151.12 | 151.71 | 0.005442 | 2.79 | 20.48 | 20.39 | 0.70 |
| 001 | 0874 | 50 | 60.91 | 149.52 | 151.52 | 151.31 | 151.92 | 0.005641 | 3.02 | 23.85 | 22.99 | 0.72 |
| 001 | 0874 | 100 | 70.80 | 149.52 | 151.63 | 151.48 | 152.08 | 0.005899 | 3.21 | 26.53 | 24.69 | 0.74 |
| 001 | 0874 | 100 +5% | 74.34 | 149.52 | 151.67 | 151.53 | 152.13 | 0.005977 | 3.28 | 27.48 | 25.27 | 0.75 |
| 001 | 0874 | 100 +25% | 88.50 | 149.52 | 151.81 | 151.73 | 152.32 | 0.006220 | 3.50 | 31.13 | 26.38 | 0.77 |
| 001 | 0874 | 100 +70% | 120.36 | 149.52 | 152.09 | 152.04 | 152.69 | 0.006487 | 3.89 | 38.64 | 27.63 | 0.81 |
| 001 | 0874 | 1000 | 116.46 | 149.52 | 152.06 | 152.00 | 152.65 | 0.006453 | 3.84 | 37.79 | 27.52 | 0.80 |
| 001 | 864.00* | 2 | 26.58 | 149.47 | 150.86 | | 151.10 | 0.005246 | 2.21 | 13.12 | 14.51 | 0.65 |
| 001 | 864.00* | 20 | 49.78 | 149.47 | 151.31 | | 151.66 | 0.005357 | 2.76 | 20.62 | 20.74 | 0.69 |
| 001 | 864.00* | 50 | 60.91 | 149.47 | 151.46 | 151.26 | 151.86 | 0.005539 | 2.98 | 24.04 | 23.51 | 0.71 |
| 001 | 864.00* | 100 | 70.80 | 149.47 | 151.58 | 151.43 | 152.02 | 0.005798 | 3.18 | 26.74 | 25.30 | 0.74 |
| 001 | 864.00* | 100 +5% | 74.34 | 149.47 | 151.61 | 151.47 | 152.07 | 0.005916 | 3.25 | 27.65 | 25.86 | 0.75 |
| 001 | 864.00* | 100 +25% | 88.50 | 149.47 | 151.75 | 151.68 | 152.26 | 0.006117 | 3.46 | 31.35 | 26.78 | 0.77 |
| 001 | 864.00* | 100 +70% | 120.36 | 149.47 | 152.03 | 151.97 | 152.63 | 0.006391 | 3.85 | 38.90 | 28.08 | 0.80 |
| 001 | 864.00* | 1000 | 116.46 | 149.47 | 152.00 | 151.96 | 152.58 | 0.006356 | 3.80 | 38.04 | 27.96 | 0.80 |
| 001 | 854.00* | 2 | 26.58 | 149.41 | 150.81 | | 151.04 | 0.005329 | 2.21 | 13.02 | 14.79 | 0.65 |
| 001 | 854.00* | 20 | 49.78 | 149.41 | 151.26 | | 151.60 | 0.005289 | 2.74 | 20.74 | 21.09 | 0.69 |
| 001 | 854.00* | 50 | 60.91 | 149.41 | 151.41 | 151.21 | 151.80 | 0.005457 | 2.95 | 24.22 | 24.07 | 0.71 |
| 001 | 854.00* | 100 | 70.80 | 149.41 | 151.52 | 151.37 | 151.95 | 0.005716 | 3.15 | 26.94 | 25.95 | 0.73 |
| 001 | 854.00* | 100 +5% | 74.34 | 149.41 | 151.56 | 151.41 | 152.01 | 0.005821 | 3.21 | 27.87 | 26.25 | 0.74 |
| 001 | 854.00* | 100 +25% | 88.50 | 149.41 | 151.69 | 151.62 | 152.19 | 0.006025 | 3.43 | 31.57 | 27.17 | 0.76 |
| 001 | 854.00* | 100 +70% | 120.36 | 149.41 | 151.97 | 151.91 | 152.56 | 0.006311 | 3.81 | 39.16 | 28.56 | 0.80 |
| 001 | 854.00* | 1000 | 116.46 | 149.41 | 151.94 | 151.87 | 152.52 | 0.006274 | 3.77 | 38.31 | 28.43 | 0.79 |
| 001 | 844.00* | 2 | 26.58 | 149.35 | 150.75 | | 150.99 | 0.005439 | 2.21 | 12.89 | 15.02 | 0.66 |
| 001 | 844.00* | 20 | 49.78 | 149.35 | 151.21 | | 151.55 | 0.005239 | 2.71 | 20.85 | 21.34 | 0.68 |
| 001 | 844.00* | 50 | 60.91 | 149.35 | 151.36 | 151.16 | 151.74 | 0.005391 | 2.93 | 24.38 | 24.67 | 0.71 |
| 001 | 844.00* | 100 | 70.80 | 149.35 | 151.46 | 151.32 | 151.90 | 0.005684 | 3.12 | 27.10 | 26.41 | 0.73 |
| 001 | 844.00* | 100 +5% | 74.34 | 149.35 | 151.50 | 151.37 | 151.95 | 0.005749 | 3.18 | 28.07 | 26.68 | 0.74 |
| 001 | 844.00* | 100 +25% | 88.50 | 149.35 | 151.64 | 151.57 | 152.13 | 0.005958 | 3.39 | 31.78 | 27.59 | 0.76 |
| 001 | 844.00* | 100 +70% | 120.36 | 149.35 | 151.91 | 151.85 | 152.49 | 0.006254 | 3.78 | 39.41 | 29.07 | 0.79 |
| 001 | 844.00* | 1000 | 116.46 | 149.35 | 151.88 | 151.82 | 152.45 | 0.006215 | 3.73 | 38.55 | 28.93 | 0.79 |
| 001 | 834.00* | 2 | 26.58 | 149.29 | 150.69 | | 150.93 | 0.005581 | 2.22 | 12.71 | 15.16 | 0.67 |
| 001 | 834.00* | 20 | 49.78 | 149.29 | 151.15 | | 151.49 | 0.005215 | 2.69 | 20.91 | 21.54 | 0.68 |
| 001 | 834.00* | 50 | 60.91 | 149.29 | 151.31 | 151.11 | 151.69 | 0.005349 | 2.90 | 24.52 | 25.32 | 0.70 |
| 001 | 834.00* | 100 | 70.80 | 149.29 | 151.41 | 151.26 | 151.84 | 0.005638 | 3.10 | 27.26 | 26.85 | 0.73 |
| 001 | 834.00* | 100 +5% | 74.34 | 149.29 | 151.45 | 151.32 | 151.89 | 0.005704 | 3.15 | 28.23 | 27.14 | 0.73 |
| 001 | 834.00* | 100 +25% | 88.50 | 149.29 | 151.58 | 151.50 | 152.07 | 0.005913 | 3.36 | 31.96 | 28.04 | 0.76 |
| 001 | 834.00* | 100 +70% | 120.36 | 149.29 | 151.85 | 151.79 | 152.43 | 0.006219 | 3.75 | 39.63 | 29.64 | 0.79 |
| 001 | 834.00* | 1000 | 116.46 | 149.29 | 151.82 | 151.76 | 152.39 | 0.006177 | 3.70 | 38.77 | 29.49 | 0.79 |
| 001 | 824.00* | 2 | 26.58 | 149.23 | 150.63 | | 150.88 | 0.005726 | 2.22 | 12.52 | 15.17 | 0.67 |
| 001 | 824.00* | 20 | 49.78 | 149.23 | 151.10 | | 151.44 | 0.005206 | 2.68 | 20.96 | 21.64 | 0.68 |
| 001 | 824.00* | 50 | 60.91 | 149.23 | 151.25 | 151.05 | 151.63 | 0.005323 | 2.88 | 24.63 | 26.05 | 0.70 |
| 001 | 824.00* | 100 | 70.80 | 149.23 | 151.35 | 151.21 | 151.78 | 0.005614 | 3.07 | 27.38 | 27.34 | 0.73 |
| 001 | 824.00* | 100 +5% | 74.34 | 149.23 | 151.39 | 151.27 | 151.83 | 0.005679 | 3.13 | 28.36 | 27.64 | 0.73 |
| 001 | 824.00* | 100 +25% | 88.50 | 149.23 | 151.52 | 151.45 | 152.01 | 0.005890 | 3.34 | 32.11 | 28.54 | 0.75 |
| 001 | 824.00* | 100 +70% | 120.36 | 149.23 | 151.79 | 151.73 | 152.36 | 0.006232 | 3.73 | 39.83 | 30.51 | 0.79 |
| 001 | 824.00* | 1000 | 116.46 | 149.23 | 151.76 | 151.69 | 152.32 | 0.006178 | 3.68 | 38.96 | 30.27 | 0.79 |
| 001 | 814.00* | 2 | 26.58 | 149.18 | 150.57 | | 150.82 | 0.005830 | 2.21 | 12.34 | 14.66 | 0.68 |
| 001 | 814.00* | 20 | 49.78 | 149.18 | 151.05 | | 151.38 | 0.005213 | 2.66 | 20.98 | 21.39 | 0.68 |
| 001 | 814.00* | 50 | 60.91 | 149.18 | 151.19 | 151.02 | 151.58 | 0.005410 | 2.88 | 24.59 | 26.73 | 0.70 |
| 001 | 814.00* | 100 | 70.80 | 149.18 | 151.30 | 151.15 | 151.72 | 0.005613 | 3.05 | 27.47 | 27.87 | 0.72 |
| 001 | 814.00* | 100 +5% | 74.34 | 149.18 | 151.33 | 151.24 | 151.77 | 0.005675 | 3.11 | 28.46 | 28.14 | 0.73 |
| 001 | 814.00* | 100 +25% | 88.50 | 149.18 | 151.47 | 151.39 | 151.95 | 0.005895 | 3.32 | 32.22 | 29.13 | 0.75 |
| 001 | 814.00* | 100 +70% | 120.36 | 149.18 | 151.72 | 151.67 | 152.30 | 0.006247 | 3.71 | 40.05 | 31.46 | 0.79 |
| 001 | 814.00* | 1000 | 116.46 | 149.18 | 151.70 | 151.64 | 152.26 | 0.006195 | 3.66 | 39.17 | 31.22 | 0.79 |
| 001 | 804.00* | 2 | 26.58 | 149.12 | 150.52 | | 150.76 | 0.005899 | 2.19 | 12.21 | 13.92 | 0.68 |
| 001 | 804.00* | 20 | 49.78 | 149.12 | 150.99 | | 151.33 | 0.005236 | 2.64 | 20.97 | 21.88 | 0.68 |
| 001 | 804.00* | 50 | 60.91 | 149.12 | 151.14 | 150.96 | 151.52 | 0.005430 | 2.86 | 24.60 | 27.19 | 0.70 |
| 001 | 804.00* | 100 | 70.80 | 149.12 | 151.24 | 151.15 | 151.66 | 0.005634 | 3.03 | 27.51 | 28.42 | 0.72 |
| 001 | 804.00* | 100 +5% | 74.34 | 149.12 | 151.28 | 151.20 | 151.71 | 0.005697 | 3.09 | 28.52 | 28.73 | 0.73 |
| 001 | 804.00* | 100 +25% | 88.50 | 149.12 | 151.41 | 151.34 | 151.89 | 0.005940 | 3.30 | 32.29 | 29.94 | 0.75 |
| 001 | 804.00* | 100 +70% | 120.36 | 149.12 | 151.66 | 151.62 | 152.24 | 0.006291 | 3.69 | 40.33 | 32.94 | 0.79 |
| 001 | 804.00* | 1000 | 116.46 | 149.12 | 151.63 | 151.58 | 152.20 | 0.006240 | 3.64 | 39.43 | 32.64 | 0.79 |
| 001 | 794.00* | 2 | 26.58 | 149.06 | 150.46 | | 150.70 | 0.005888 | 2.17 | 12.27 | 12.01 | 0.68 |
| 001 | 794.00* | 20 | 49.78 | 149.06 | 150.94 | | 151.27 | 0.005255 | 2.63 | 20.95 | 22.42 | 0.68 |
| 001 | 794.00* | 50 | 60.91 | 149.06 | 151.08 | 150.91 | 151.47 | 0.005466 | 2.85 | 24.59 | 27.85 | 0.70 |
| 001 | 794.00* | 100 | 70.80 | 149.06 | 151.18 | 151.10 | 151.61 | 0.005675 | 3.02 | 27.53 | 29.18 | 0.72 |
| 001 | 794.00* | 100 +5% | 74.34 | 149.06 | 151.22 | 151.14 | 151.65 | 0.005748 | 3.08 | 28.53 | 29.56 | 0.73 |
| 001 | 794.00* | 100 +25% | 88.50 | 149.06 | 151.34 | 151.29 | 151.83 | 0.006022 | 3.30 | 32.35 | 31.17 | 0.76 |
| 001 | 794.00* | 100 +70% | 120.36 | 149.06 | 151.60 | 151.58 | 152.17 | 0.006253 | 3.65 | 40.84 | 34.33 | 0.79 |
| 001 | 794.00* | 1000 | 116.46 | 149.06 | 151.58 | 151.54 | 152.13 | 0.006208 | 3.61 | 39.90 | 34.02 | 0.78 |
| 001 | 784.00* | 2 | 26.58 | 149.00 | 150.41 | | 150.64 | 0.005776 | 2.14 | 12.43 | 11.96 | 0.67 |
| 001 | 784.00* | 20 | 49.78 | 149.00 | 150.88 | 150.63 | 151.22 | 0.005288 | 2.62 | 20.88 | 22.96 | 0.68 |
| 001 | 784.00* | 50 | 60.91 | 149.00 | 151.02 | 150.85 | 151.41 | 0.005539 | 2.84 | 24.50 | 28.79 | 0.71 |
| 001 | 784.00* | 100 | 70.80 | 149.00 | 151.13 | 151.05 | 151.55 | 0.005768 | 3.02 | 27.51 | 30.69 | 0.73 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 784.00* | 100 +5% | 74.34 | 149.00 | 151.16 | 151.10 | 151.60 | 0.005832 | 3.07 | 28.56 | 31.08 | 0.74 |
| 001 | 784.00* | 100 +25% | 88.50 | 149.00 | 151.28 | 151.25 | 151.77 | 0.006075 | 3.28 | 32.55 | 32.73 | 0.76 |
| 001 | 784.00* | 100 +70% | 120.36 | 149.00 | 151.54 | 151.51 | 152.10 | 0.006250 | 3.63 | 41.53 | 37.05 | 0.79 |
| 001 | 784.00* | 1000 | 116.46 | 149.00 | 151.52 | 151.47 | 152.07 | 0.006197 | 3.58 | 40.54 | 36.44 | 0.78 |
| 001 | 0774 | 2 | 26.58 | 148.95 | 150.35 | | 150.58 | 0.005602 | 2.11 | 12.61 | 12.09 | 0.66 |
| 001 | 0774 | 20 | 49.78 | 148.95 | 150.83 | 150.52 | 151.16 | 0.005315 | 2.60 | 20.80 | 23.68 | 0.68 |
| 001 | 0774 | 50 | 60.91 | 148.95 | 150.97 | 150.81 | 151.35 | 0.005623 | 2.84 | 24.45 | 30.88 | 0.71 |
| 001 | 0774 | 100 | 70.80 | 148.95 | 151.07 | 151.01 | 151.49 | 0.005783 | 3.00 | 27.71 | 32.27 | 0.73 |
| 001 | 0774 | 100 +5% | 74.34 | 148.95 | 151.10 | 151.06 | 151.54 | 0.005843 | 3.05 | 28.80 | 32.73 | 0.73 |
| 001 | 0774 | 100 +25% | 88.50 | 148.95 | 151.23 | 151.17 | 151.70 | 0.006047 | 3.25 | 32.99 | 34.42 | 0.75 |
| 001 | 0774 | 100 +70% | 120.36 | 148.95 | 151.50 | 151.49 | 152.03 | 0.006002 | 3.54 | 43.60 | 43.15 | 0.77 |
| 001 | 0774 | 1000 | 116.46 | 148.95 | 151.46 | 151.45 | 151.99 | 0.006085 | 3.53 | 42.10 | 42.19 | 0.77 |
| 001 | 764.58* | 2 | 26.58 | 148.88 | 150.29 | | 150.52 | 0.005800 | 2.14 | 12.43 | 12.00 | 0.67 |
| 001 | 764.58* | 20 | 49.78 | 148.88 | 150.77 | 150.47 | 151.11 | 0.005427 | 2.63 | 20.73 | 24.61 | 0.69 |
| 001 | 764.58* | 50 | 60.91 | 148.88 | 150.90 | 150.76 | 151.30 | 0.005717 | 2.86 | 24.45 | 31.49 | 0.72 |
| 001 | 764.58* | 100 | 70.80 | 148.88 | 151.01 | 150.96 | 151.43 | 0.005846 | 3.01 | 27.78 | 32.91 | 0.73 |
| 001 | 764.58* | 100 +5% | 74.34 | 148.88 | 151.04 | 151.00 | 151.48 | 0.005896 | 3.06 | 28.90 | 33.37 | 0.74 |
| 001 | 764.58* | 100 +25% | 88.50 | 148.88 | 151.17 | 151.13 | 151.64 | 0.006048 | 3.25 | 33.23 | 35.08 | 0.76 |
| 001 | 764.58* | 100 +70% | 120.36 | 148.88 | 151.41 | 151.41 | 151.96 | 0.006289 | 3.60 | 42.59 | 40.96 | 0.79 |
| 001 | 764.58* | 1000 | 116.46 | 148.88 | 151.38 | 151.38 | 151.93 | 0.006292 | 3.57 | 41.40 | 40.25 | 0.78 |
| 001 | 755.17* | 2 | 26.58 | 148.81 | 150.23 | | 150.47 | 0.006000 | 2.17 | 12.25 | 11.89 | 0.68 |
| 001 | 755.17* | 20 | 49.78 | 148.81 | 150.71 | 150.43 | 151.05 | 0.005538 | 2.65 | 20.65 | 25.55 | 0.70 |
| 001 | 755.17* | 50 | 60.91 | 148.81 | 150.84 | 150.72 | 151.24 | 0.005778 | 2.87 | 24.50 | 31.73 | 0.72 |
| 001 | 755.17* | 100 | 70.80 | 148.81 | 150.95 | 150.91 | 151.37 | 0.005892 | 3.02 | 27.90 | 33.59 | 0.74 |
| 001 | 755.17* | 100 +5% | 74.34 | 148.81 | 150.98 | 150.95 | 151.41 | 0.005931 | 3.07 | 29.05 | 34.06 | 0.74 |
| 001 | 755.17* | 100 +25% | 88.50 | 148.81 | 151.11 | 151.08 | 151.58 | 0.006032 | 3.25 | 33.53 | 35.82 | 0.76 |
| 001 | 755.17* | 100 +70% | 120.36 | 148.81 | 151.28 | 151.34 | 151.90 | 0.007389 | 3.81 | 39.89 | 38.90 | 0.85 |
| 001 | 755.17* | 1000 | 116.46 | 148.81 | 151.25 | 151.31 | 151.86 | 0.007423 | 3.78 | 38.73 | 38.32 | 0.85 |
| 001 | 745.75* | 2 | 26.58 | 148.74 | 150.16 | | 150.41 | 0.006198 | 2.20 | 12.08 | 11.78 | 0.69 |
| 001 | 745.75* | 20 | 49.78 | 148.74 | 150.64 | 150.37 | 151.00 | 0.005653 | 2.68 | 20.56 | 26.45 | 0.70 |
| 001 | 745.75* | 50 | 60.91 | 148.74 | 150.78 | 150.68 | 151.18 | 0.005832 | 2.89 | 24.57 | 32.19 | 0.72 |
| 001 | 745.75* | 100 | 70.80 | 148.74 | 150.88 | 150.86 | 151.31 | 0.005930 | 3.03 | 28.03 | 34.30 | 0.74 |
| 001 | 745.75* | 100 +5% | 74.34 | 148.74 | 150.92 | 150.89 | 151.35 | 0.005954 | 3.08 | 29.22 | 34.79 | 0.74 |
| 001 | 745.75* | 100 +25% | 88.50 | 148.74 | 151.05 | 151.04 | 151.51 | 0.005993 | 3.24 | 33.88 | 36.61 | 0.75 |
| 001 | 745.75* | 100 +70% | 120.36 | 148.74 | 151.21 | 151.28 | 151.83 | 0.007385 | 3.80 | 40.13 | 39.22 | 0.85 |
| 001 | 745.75* | 1000 | 116.46 | 148.74 | 151.18 | 151.25 | 151.79 | 0.007429 | 3.78 | 38.96 | 38.67 | 0.85 |
| 001 | 736.33* | 2 | 26.58 | 148.68 | 150.09 | | 150.35 | 0.006397 | 2.23 | 11.92 | 11.67 | 0.70 |
| 001 | 736.33* | 20 | 49.78 | 148.68 | 150.58 | 150.31 | 150.94 | 0.005769 | 2.70 | 20.46 | 27.33 | 0.71 |
| 001 | 736.33* | 50 | 60.91 | 148.68 | 150.72 | 150.64 | 151.12 | 0.005880 | 2.90 | 24.65 | 32.80 | 0.73 |
| 001 | 736.33* | 100 | 70.80 | 148.68 | 150.82 | 150.80 | 151.25 | 0.005953 | 3.04 | 28.19 | 35.07 | 0.74 |
| 001 | 736.33* | 100 +5% | 74.34 | 148.68 | 150.86 | 150.84 | 151.29 | 0.005960 | 3.08 | 29.43 | 35.58 | 0.74 |
| 001 | 736.33* | 100 +25% | 88.50 | 148.68 | 150.99 | 150.98 | 151.45 | 0.005921 | 3.23 | 34.32 | 37.46 | 0.75 |
| 001 | 736.33* | 100 +70% | 120.36 | 148.68 | 151.15 | 151.22 | 151.76 | 0.007426 | 3.81 | 40.31 | 39.66 | 0.85 |
| 001 | 736.33* | 1000 | 116.46 | 148.68 | 151.12 | 151.19 | 151.72 | 0.007476 | 3.78 | 39.12 | 39.13 | 0.85 |
| 001 | 726.92* | 2 | 26.58 | 148.61 | 150.02 | | 150.29 | 0.006585 | 2.26 | 11.76 | 11.55 | 0.71 |
| 001 | 726.92* | 20 | 49.78 | 148.61 | 150.52 | 150.23 | 150.88 | 0.005879 | 2.73 | 20.35 | 28.21 | 0.72 |
| 001 | 726.92* | 50 | 60.91 | 148.61 | 150.66 | 150.61 | 151.06 | 0.005905 | 2.91 | 24.76 | 33.51 | 0.73 |
| 001 | 726.92* | 100 | 70.80 | 148.61 | 150.76 | 150.75 | 151.19 | 0.005943 | 3.04 | 28.42 | 35.87 | 0.74 |
| 001 | 726.92* | 100 +5% | 74.34 | 148.61 | 150.80 | 150.79 | 151.23 | 0.005932 | 3.08 | 29.72 | 36.43 | 0.74 |
| 001 | 726.92* | 100 +25% | 88.50 | 148.61 | 150.93 | 150.92 | 151.38 | 0.005961 | 3.23 | 34.49 | 38.25 | 0.75 |
| 001 | 726.92* | 100 +70% | 120.36 | 148.61 | 151.08 | 151.15 | 151.69 | 0.007453 | 3.81 | 40.55 | 40.31 | 0.85 |
| 001 | 726.92* | 1000 | 116.46 | 148.61 | 151.05 | 151.12 | 151.65 | 0.007519 | 3.79 | 39.33 | 39.90 | 0.85 |
| 001 | 717.50* | 2 | 26.58 | 148.54 | 149.96 | | 150.22 | 0.006765 | 2.29 | 11.62 | 11.42 | 0.72 |
| 001 | 717.50* | 20 | 49.78 | 148.54 | 150.45 | 150.19 | 150.82 | 0.005986 | 2.75 | 20.24 | 29.08 | 0.72 |
| 001 | 717.50* | 50 | 60.91 | 148.54 | 150.60 | 150.57 | 151.00 | 0.005910 | 2.91 | 24.91 | 34.31 | 0.73 |
| 001 | 717.50* | 100 | 70.80 | 148.54 | 150.70 | 150.69 | 151.12 | 0.005895 | 3.03 | 28.72 | 36.68 | 0.74 |
| 001 | 717.50* | 100 +5% | 74.34 | 148.54 | 150.74 | 150.73 | 151.16 | 0.005868 | 3.07 | 30.08 | 37.34 | 0.74 |
| 001 | 717.50* | 100 +25% | 88.50 | 148.54 | 150.87 | 150.86 | 151.31 | 0.005888 | 3.22 | 34.94 | 39.16 | 0.75 |
| 001 | 717.50* | 100 +70% | 120.36 | 148.54 | 151.01 | 151.10 | 151.62 | 0.007470 | 3.81 | 40.83 | 41.14 | 0.85 |
| 001 | 717.50* | 1000 | 116.46 | 148.54 | 150.98 | 151.07 | 151.58 | 0.007543 | 3.79 | 39.59 | 40.73 | 0.85 |
| 001 | 708.08* | 2 | 26.58 | 148.48 | 149.89 | | 150.16 | 0.006931 | 2.31 | 11.49 | 11.30 | 0.73 |
| 001 | 708.08* | 20 | 49.78 | 148.48 | 150.38 | 150.13 | 150.76 | 0.006104 | 2.78 | 20.09 | 29.87 | 0.73 |
| 001 | 708.08* | 50 | 60.91 | 148.48 | 150.54 | 150.52 | 150.94 | 0.005912 | 2.92 | 25.05 | 35.11 | 0.73 |
| 001 | 708.08* | 100 | 70.80 | 148.48 | 150.65 | 150.64 | 151.06 | 0.005830 | 3.03 | 29.06 | 37.52 | 0.73 |
| 001 | 708.08* | 100 +5% | 74.34 | 148.48 | 150.68 | 150.68 | 151.10 | 0.005918 | 3.08 | 30.17 | 38.15 | 0.74 |
| 001 | 708.08* | 100 +25% | 88.50 | 148.48 | 150.81 | 150.81 | 151.25 | 0.005793 | 3.20 | 35.44 | 40.13 | 0.74 |
| 001 | 708.08* | 100 +70% | 120.36 | 148.48 | 150.95 | 151.04 | 151.55 | 0.007493 | 3.81 | 41.09 | 41.99 | 0.85 |
| 001 | 708.08* | 1000 | 116.46 | 148.48 | 150.92 | 151.01 | 151.51 | 0.007574 | 3.80 | 39.83 | 41.58 | 0.85 |
| 001 | 698.67* | 2 | 26.58 | 148.41 | 149.82 | | 150.09 | 0.007068 | 2.34 | 11.37 | 11.17 | 0.74 |
| 001 | 698.67* | 20 | 49.78 | 148.41 | 150.32 | 150.07 | 150.71 | 0.006214 | 2.80 | 19.93 | 30.66 | 0.73 |
| 001 | 698.67* | 50 | 60.91 | 148.41 | 150.48 | 150.46 | 150.87 | 0.005883 | 2.92 | 25.25 | 36.02 | 0.73 |
| 001 | 698.67* | 100 | 70.80 | 148.41 | 150.58 | 150.58 | 151.00 | 0.005833 | 3.03 | 29.24 | 38.38 | 0.73 |
| 001 | 698.67* | 100 +5% | 74.34 | 148.41 | 150.57 | 150.62 | 151.04 | 0.006718 | 3.23 | 28.66 | 38.05 | 0.78 |
| 001 | 698.67* | 100 +25% | 88.50 | 148.41 | 150.68 | 150.74 | 151.19 | 0.006874 | 3.41 | 33.18 | 40.20 | 0.80 |
| 001 | 698.67* | 100 +70% | 120.36 | 148.41 | 150.88 | 150.98 | 151.47 | 0.007502 | 3.81 | 41.39 | 42.89 | 0.85 |
| 001 | 698.67* | 1000 | 116.46 | 148.41 | 150.85 | 150.95 | 151.44 | 0.007590 | 3.80 | 40.10 | 42.48 | 0.85 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 689.25* | 2 | 26.58 | 148.34 | 149.75 | | 150.03 | 0.007184 | 2.36 | 11.27 | 11.04 | 0.75 |
| 001 | 689.25* | 20 | 49.78 | 148.34 | 150.25 | 150.01 | 150.65 | 0.006314 | 2.83 | 19.77 | 31.40 | 0.74 |
| 001 | 689.25* | 50 | 60.91 | 148.34 | 150.42 | 150.40 | 150.81 | 0.005825 | 2.91 | 25.50 | 37.01 | 0.72 |
| 001 | 689.25* | 100 | 70.80 | 148.34 | 150.48 | 150.52 | 150.93 | 0.006610 | 3.18 | 27.75 | 38.37 | 0.77 |
| 001 | 689.25* | 100 +5% | 74.34 | 148.34 | 150.51 | 150.56 | 150.97 | 0.006638 | 3.22 | 29.00 | 39.09 | 0.78 |
| 001 | 689.25* | 100 +25% | 88.50 | 148.34 | 150.62 | 150.67 | 151.12 | 0.006768 | 3.39 | 33.64 | 41.19 | 0.79 |
| 001 | 689.25* | 100 +70% | 120.36 | 148.34 | 150.81 | 150.92 | 151.40 | 0.007496 | 3.81 | 41.73 | 43.84 | 0.85 |
| 001 | 689.25* | 1000 | 116.46 | 148.34 | 150.78 | 150.89 | 151.37 | 0.007592 | 3.80 | 40.41 | 43.42 | 0.85 |
| 001 | 679.83* | 2 | 26.58 | 148.28 | 149.67 | | 149.96 | 0.007249 | 2.37 | 11.20 | 10.91 | 0.75 |
| 001 | 679.83* | 20 | 49.78 | 148.28 | 150.18 | 149.94 | 150.59 | 0.006411 | 2.85 | 19.59 | 32.08 | 0.74 |
| 001 | 679.83* | 50 | 60.91 | 148.28 | 150.36 | 150.35 | 150.75 | 0.005741 | 2.90 | 25.80 | 38.09 | 0.72 |
| 001 | 679.83* | 100 | 70.80 | 148.28 | 150.42 | 150.47 | 150.87 | 0.006507 | 3.16 | 28.11 | 39.50 | 0.77 |
| 001 | 679.83* | 100 +5% | 74.34 | 148.28 | 150.45 | 150.50 | 150.91 | 0.006614 | 3.22 | 29.22 | 40.15 | 0.78 |
| 001 | 679.83* | 100 +25% | 88.50 | 148.28 | 150.56 | 150.61 | 151.05 | 0.006742 | 3.39 | 33.92 | 42.11 | 0.79 |
| 001 | 679.83* | 100 +70% | 120.36 | 148.28 | 150.75 | 150.85 | 151.33 | 0.007486 | 3.81 | 42.06 | 44.80 | 0.85 |
| 001 | 679.83* | 1000 | 116.46 | 148.28 | 150.72 | 150.82 | 151.30 | 0.007589 | 3.80 | 40.71 | 44.38 | 0.85 |
| 001 | 670.42* | 2 | 26.58 | 148.21 | 149.60 | | 149.89 | 0.007253 | 2.38 | 11.16 | 10.79 | 0.75 |
| 001 | 670.42* | 20 | 49.78 | 148.21 | 150.12 | 149.87 | 150.52 | 0.006484 | 2.87 | 19.42 | 32.44 | 0.75 |
| 001 | 670.42* | 50 | 60.91 | 148.21 | 150.30 | 150.30 | 150.69 | 0.005720 | 2.90 | 25.95 | 39.12 | 0.71 |
| 001 | 670.42* | 100 | 70.80 | 148.21 | 150.36 | 150.40 | 150.81 | 0.006458 | 3.16 | 28.37 | 40.66 | 0.76 |
| 001 | 670.42* | 100 +5% | 74.34 | 148.21 | 150.38 | 150.44 | 150.85 | 0.006571 | 3.22 | 29.49 | 41.27 | 0.77 |
| 001 | 670.42* | 100 +25% | 88.50 | 148.21 | 150.50 | 150.57 | 150.98 | 0.006694 | 3.38 | 34.25 | 43.09 | 0.79 |
| 001 | 670.42* | 100 +70% | 120.36 | 148.21 | 150.68 | 150.78 | 151.26 | 0.007469 | 3.80 | 42.42 | 45.82 | 0.84 |
| 001 | 670.42* | 1000 | 116.46 | 148.21 | 150.65 | 150.76 | 151.23 | 0.007578 | 3.79 | 41.04 | 45.39 | 0.85 |
| 001 | 0661 | 2 | 26.58 | 148.14 | 149.54 | | 149.83 | 0.007162 | 2.38 | 11.17 | 10.67 | 0.74 |
| 001 | 0661 | 20 | 49.78 | 148.14 | 150.05 | 149.80 | 150.46 | 0.006501 | 2.88 | 19.31 | 32.41 | 0.75 |
| 001 | 0661 | 50 | 60.91 | 148.14 | 150.17 | 150.24 | 150.63 | 0.006789 | 3.10 | 23.80 | 38.59 | 0.77 |
| 001 | 0661 | 100 | 70.80 | 148.14 | 150.30 | 150.34 | 150.74 | 0.006380 | 3.15 | 28.68 | 41.93 | 0.76 |
| 001 | 0661 | 100 +5% | 74.34 | 148.14 | 150.32 | 150.39 | 150.78 | 0.006500 | 3.21 | 29.79 | 42.34 | 0.77 |
| 001 | 0661 | 100 +25% | 88.50 | 148.14 | 150.53 | 150.52 | 150.91 | 0.005104 | 3.06 | 38.76 | 45.58 | 0.69 |
| 001 | 0661 | 100 +70% | 120.36 | 148.14 | 150.73 | 150.71 | 151.17 | 0.005443 | 3.37 | 48.57 | 48.58 | 0.73 |
| 001 | 0661 | 1000 | 116.46 | 148.14 | 150.71 | 150.69 | 151.14 | 0.005417 | 3.34 | 47.40 | 48.24 | 0.72 |
| 001 | 651.60* | 2 | 26.58 | 148.06 | 149.47 | | 149.76 | 0.006997 | 2.37 | 11.22 | 10.58 | 0.73 |
| 001 | 651.60* | 20 | 49.78 | 148.06 | 149.98 | 149.73 | 150.39 | 0.006410 | 2.87 | 19.41 | 33.29 | 0.74 |
| 001 | 651.60* | 50 | 60.91 | 148.06 | 150.12 | 150.18 | 150.56 | 0.006549 | 3.07 | 24.14 | 38.64 | 0.76 |
| 001 | 651.60* | 100 | 70.80 | 148.06 | 150.23 | 150.27 | 150.67 | 0.006186 | 3.12 | 28.94 | 41.25 | 0.75 |
| 001 | 651.60* | 100 +5% | 74.34 | 148.06 | 150.26 | 150.33 | 150.71 | 0.006330 | 3.19 | 29.98 | 41.64 | 0.76 |
| 001 | 651.60* | 100 +25% | 88.50 | 148.06 | 150.42 | 150.42 | 150.84 | 0.005715 | 3.20 | 36.69 | 44.13 | 0.73 |
| 001 | 651.60* | 100 +70% | 120.36 | 148.06 | 150.66 | 150.65 | 151.11 | 0.005582 | 3.42 | 47.83 | 47.89 | 0.74 |
| 001 | 651.60* | 1000 | 116.46 | 148.06 | 150.63 | 150.63 | 151.08 | 0.005543 | 3.38 | 46.71 | 47.54 | 0.73 |
| 001 | 642.20* | 2 | 26.58 | 147.98 | 149.40 | | 149.69 | 0.006861 | 2.36 | 11.26 | 10.49 | 0.73 |
| 001 | 642.20* | 20 | 49.78 | 147.98 | 149.92 | 149.66 | 150.33 | 0.006323 | 2.86 | 19.54 | 33.47 | 0.74 |
| 001 | 642.20* | 50 | 60.91 | 147.98 | 150.05 | 150.10 | 150.49 | 0.006413 | 3.05 | 24.38 | 38.69 | 0.75 |
| 001 | 642.20* | 100 | 70.80 | 147.98 | 150.18 | 150.20 | 150.60 | 0.005991 | 3.09 | 29.29 | 40.82 | 0.74 |
| 001 | 642.20* | 100 +5% | 74.34 | 147.98 | 150.20 | 150.23 | 150.64 | 0.006157 | 3.16 | 30.27 | 41.17 | 0.75 |
| 001 | 642.20* | 100 +25% | 88.50 | 147.98 | 150.37 | 150.38 | 150.78 | 0.005391 | 3.14 | 37.49 | 43.89 | 0.71 |
| 001 | 642.20* | 100 +70% | 120.36 | 147.98 | 150.57 | 150.57 | 151.05 | 0.005972 | 3.52 | 46.40 | 47.08 | 0.76 |
| 001 | 642.20* | 1000 | 116.46 | 147.98 | 150.54 | 150.54 | 151.02 | 0.005957 | 3.49 | 45.22 | 46.66 | 0.76 |
| 001 | 632.80* | 2 | 26.58 | 147.89 | 149.34 | | 149.62 | 0.006759 | 2.36 | 11.28 | 10.40 | 0.72 |
| 001 | 632.80* | 20 | 49.78 | 147.89 | 149.84 | 149.59 | 150.26 | 0.006414 | 2.88 | 19.39 | 33.54 | 0.74 |
| 001 | 632.80* | 50 | 60.91 | 147.89 | 149.99 | 150.03 | 150.42 | 0.006239 | 3.02 | 24.72 | 38.29 | 0.74 |
| 001 | 632.80* | 100 | 70.80 | 147.89 | 150.13 | 150.13 | 150.53 | 0.005664 | 3.03 | 30.05 | 40.82 | 0.72 |
| 001 | 632.80* | 100 +5% | 74.34 | 147.89 | 150.14 | 150.19 | 150.57 | 0.005978 | 3.13 | 30.66 | 41.05 | 0.74 |
| 001 | 632.80* | 100 +25% | 88.50 | 147.89 | 150.22 | 150.29 | 150.72 | 0.006754 | 3.42 | 33.95 | 42.24 | 0.79 |
| 001 | 632.80* | 100 +70% | 120.36 | 147.89 | 150.51 | 150.51 | 150.98 | 0.005794 | 3.48 | 46.87 | 46.82 | 0.75 |
| 001 | 632.80* | 1000 | 116.46 | 147.89 | 150.48 | 150.49 | 150.95 | 0.005792 | 3.45 | 45.65 | 46.44 | 0.75 |
| 001 | 623.40* | 2 | 26.58 | 147.81 | 149.27 | | 149.55 | 0.006691 | 2.35 | 11.30 | 10.30 | 0.72 |
| 001 | 623.40* | 20 | 49.78 | 147.81 | 149.79 | 149.52 | 150.19 | 0.006243 | 2.86 | 19.79 | 34.49 | 0.73 |
| 001 | 623.40* | 50 | 60.91 | 147.81 | 149.94 | 149.97 | 150.35 | 0.005934 | 2.97 | 25.42 | 38.34 | 0.73 |
| 001 | 623.40* | 100 | 70.80 | 147.81 | 150.00 | 150.06 | 150.47 | 0.006705 | 3.23 | 27.77 | 39.58 | 0.78 |
| 001 | 623.40* | 100 +5% | 74.34 | 147.81 | 150.09 | 150.11 | 150.50 | 0.005659 | 3.07 | 31.49 | 41.33 | 0.72 |
| 001 | 623.40* | 100 +25% | 88.50 | 147.81 | 150.16 | 150.21 | 150.65 | 0.006539 | 3.38 | 34.49 | 42.50 | 0.78 |
| 001 | 623.40* | 100 +70% | 120.36 | 147.81 | 150.36 | 150.45 | 150.92 | 0.007092 | 3.76 | 43.18 | 45.35 | 0.82 |
| 001 | 623.40* | 1000 | 116.46 | 147.81 | 150.34 | 150.42 | 150.89 | 0.007083 | 3.73 | 42.06 | 45.00 | 0.82 |
| 001 | 614.00* | 2 | 26.58 | 147.73 | 149.20 | | 149.49 | 0.006647 | 2.35 | 11.29 | 10.21 | 0.71 |
| 001 | 614.00* | 20 | 49.78 | 147.73 | 149.71 | 149.45 | 150.12 | 0.006341 | 2.87 | 19.73 | 35.14 | 0.74 |
| 001 | 614.00* | 50 | 60.91 | 147.73 | 149.90 | 149.90 | 150.28 | 0.005508 | 2.88 | 26.50 | 38.95 | 0.70 |
| 001 | 614.00* | 100 | 70.80 | 147.73 | 149.94 | 150.00 | 150.40 | 0.006498 | 3.19 | 28.31 | 39.91 | 0.76 |
| 001 | 614.00* | 100 +5% | 74.34 | 147.73 | 149.96 | 150.03 | 150.44 | 0.006818 | 3.29 | 28.99 | 40.26 | 0.78 |
| 001 | 614.00* | 100 +25% | 88.50 | 147.73 | 150.10 | 150.14 | 150.57 | 0.006421 | 3.35 | 34.90 | 42.76 | 0.77 |
| 001 | 614.00* | 100 +70% | 120.36 | 147.73 | 150.30 | 150.35 | 150.84 | 0.006909 | 3.72 | 43.70 | 45.24 | 0.81 |
| 001 | 614.00* | 1000 | 116.46 | 147.73 | 150.28 | 150.34 | 150.81 | 0.006898 | 3.68 | 42.57 | 44.90 | 0.81 |
| 001 | 604.60* | 2 | 26.58 | 147.65 | 149.14 | | 149.42 | 0.006630 | 2.36 | 11.26 | 10.25 | 0.71 |
| 001 | 604.60* | 20 | 49.78 | 147.65 | 149.64 | 149.41 | 150.05 | 0.006495 | 2.89 | 19.62 | 35.26 | 0.74 |
| 001 | 604.60* | 50 | 60.91 | 147.65 | 149.74 | 149.82 | 150.22 | 0.007160 | 3.17 | 23.34 | 37.58 | 0.79 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 604.60* | 100 | 70.80 | 147.65 | 149.89 | 149.92 | 150.32 | 0.006241 | 3.13 | 29.07 | 40.67 | 0.75 |
| 001 | 604.60* | 100 +5% | 74.34 | 147.65 | 149.90 | 149.96 | 150.36 | 0.006607 | 3.24 | 29.63 | 40.86 | 0.77 |
| 001 | 604.60* | 100 +25% | 88.50 | 147.65 | 150.07 | 150.08 | 150.49 | 0.005837 | 3.23 | 36.51 | 43.15 | 0.73 |
| 001 | 604.60* | 100 +70% | 120.36 | 147.65 | 150.24 | 150.29 | 150.77 | 0.006818 | 3.69 | 44.05 | 45.18 | 0.80 |
| 001 | 604.60* | 1000 | 116.46 | 147.65 | 150.21 | 150.27 | 150.74 | 0.006807 | 3.65 | 42.94 | 44.89 | 0.80 |
| 001 | 595.20* | 2 | 26.58 | 147.56 | 149.07 | | 149.36 | 0.006672 | 2.37 | 11.21 | 10.25 | 0.71 |
| 001 | 595.20* | 20 | 49.78 | 147.56 | 149.56 | 149.36 | 149.98 | 0.006727 | 2.93 | 19.44 | 35.69 | 0.75 |
| 001 | 595.20* | 50 | 60.91 | 147.56 | 149.68 | 149.76 | 150.14 | 0.006980 | 3.13 | 23.95 | 38.90 | 0.78 |
| 001 | 595.20* | 100 | 70.80 | 147.56 | 149.78 | 149.85 | 150.25 | 0.006966 | 3.25 | 27.84 | 40.23 | 0.78 |
| 001 | 595.20* | 100 +5% | 74.34 | 147.56 | 149.87 | 149.88 | 150.28 | 0.005866 | 3.09 | 31.50 | 41.44 | 0.73 |
| 001 | 595.20* | 100 +25% | 88.50 | 147.56 | 149.92 | 150.00 | 150.43 | 0.007308 | 3.50 | 33.34 | 42.03 | 0.81 |
| 001 | 595.20* | 100 +70% | 120.36 | 147.56 | 150.20 | 150.22 | 150.68 | 0.006277 | 3.56 | 45.63 | 45.24 | 0.77 |
| 001 | 595.20* | 1000 | 116.46 | 147.56 | 150.17 | 150.20 | 150.65 | 0.006272 | 3.53 | 44.50 | 45.04 | 0.77 |
| 001 | 585.80* | 2 | 26.58 | 147.48 | 148.99 | | 149.29 | 0.006864 | 2.40 | 11.09 | 10.21 | 0.72 |
| 001 | 585.80* | 20 | 49.78 | 147.48 | 149.48 | 149.31 | 149.91 | 0.007036 | 2.97 | 19.25 | 36.97 | 0.77 |
| 001 | 585.80* | 50 | 60.91 | 147.48 | 149.62 | 149.68 | 150.06 | 0.006920 | 3.11 | 24.38 | 39.16 | 0.77 |
| 001 | 585.80* | 100 | 70.80 | 147.48 | 149.74 | 149.78 | 150.17 | 0.006332 | 3.12 | 29.40 | 40.79 | 0.75 |
| 001 | 585.80* | 100 +5% | 74.34 | 147.48 | 149.73 | 149.81 | 150.22 | 0.007279 | 3.33 | 28.84 | 40.61 | 0.80 |
| 001 | 585.80* | 100 +25% | 88.50 | 147.48 | 149.93 | 149.92 | 150.34 | 0.005704 | 3.17 | 37.28 | 43.13 | 0.72 |
| 001 | 585.80* | 100 +70% | 120.36 | 147.48 | 150.17 | 150.14 | 150.60 | 0.005555 | 3.38 | 47.87 | 45.01 | 0.73 |
| 001 | 585.80* | 1000 | 116.46 | 147.48 | 150.15 | 150.12 | 150.57 | 0.005518 | 3.34 | 46.82 | 44.86 | 0.72 |
| 001 | 576.40* | 2 | 26.58 | 147.40 | 148.91 | | 149.22 | 0.007168 | 2.44 | 10.91 | 10.14 | 0.73 |
| 001 | 576.40* | 20 | 49.78 | 147.40 | 149.49 | 149.48 | 149.83 | 0.005578 | 2.71 | 22.48 | 38.67 | 0.69 |
| 001 | 576.40* | 50 | 60.91 | 147.40 | 149.65 | 149.61 | 149.98 | 0.005056 | 2.75 | 28.74 | 40.66 | 0.66 |
| 001 | 576.40* | 100 | 70.80 | 147.40 | 149.76 | 149.70 | 150.09 | 0.004819 | 2.80 | 33.46 | 41.90 | 0.66 |
| 001 | 576.40* | 100 +5% | 74.34 | 147.40 | 149.79 | 149.73 | 150.12 | 0.004822 | 2.83 | 34.83 | 42.16 | 0.66 |
| 001 | 576.40* | 100 +25% | 88.50 | 147.40 | 149.93 | | 150.26 | 0.004596 | 2.90 | 40.82 | 43.28 | 0.65 |
| 001 | 576.40* | 100 +70% | 120.36 | 147.40 | 150.17 | | 150.53 | 0.004696 | 3.15 | 51.02 | 44.94 | 0.67 |
| 001 | 576.40* | 1000 | 116.46 | 147.40 | 150.14 | | 150.50 | 0.004643 | 3.11 | 50.02 | 44.80 | 0.66 |
| 001 | 0567 | 2 | 26.58 | 147.31 | 148.83 | | 149.15 | 0.007643 | 2.50 | 10.67 | 10.01 | 0.75 |
| 001 | 0567 | 20 | 49.78 | 147.31 | 149.48 | 149.41 | 149.76 | 0.004566 | 2.50 | 25.34 | 39.74 | 0.62 |
| 001 | 0567 | 50 | 60.91 | 147.31 | 149.65 | | 149.91 | 0.003956 | 2.49 | 32.32 | 41.23 | 0.59 |
| 001 | 0567 | 100 | 70.80 | 147.31 | 149.77 | | 150.02 | 0.003830 | 2.55 | 36.99 | 42.08 | 0.59 |
| 001 | 0567 | 100 +5% | 74.34 | 147.31 | 149.80 | | 150.06 | 0.003857 | 2.58 | 38.33 | 42.33 | 0.59 |
| 001 | 0567 | 100 +25% | 88.50 | 147.31 | 149.93 | | 150.21 | 0.003779 | 2.67 | 44.15 | 43.36 | 0.59 |
| 001 | 0567 | 100 +70% | 120.36 | 147.31 | 150.16 | | 150.48 | 0.004018 | 2.95 | 54.11 | 44.99 | 0.62 |
| 001 | 0567 | 1000 | 116.46 | 147.31 | 150.14 | | 150.45 | 0.003958 | 2.91 | 53.13 | 44.85 | 0.61 |
| 001 | 558.50* | 2 | 26.58 | 147.20 | 148.80 | | 149.08 | 0.006260 | 2.34 | 11.39 | 10.02 | 0.69 |
| 001 | 558.50* | 20 | 49.78 | 147.20 | 149.44 | 149.03 | 149.72 | 0.004264 | 2.47 | 25.26 | 40.14 | 0.60 |
| 001 | 558.50* | 50 | 60.91 | 147.20 | 149.62 | | 149.87 | 0.003697 | 2.46 | 32.58 | 41.77 | 0.57 |
| 001 | 558.50* | 100 | 70.80 | 147.20 | 149.73 | | 149.99 | 0.003603 | 2.52 | 37.36 | 42.74 | 0.57 |
| 001 | 558.50* | 100 +5% | 74.34 | 147.20 | 149.76 | | 150.03 | 0.003650 | 2.57 | 38.66 | 43.00 | 0.58 |
| 001 | 558.50* | 100 +25% | 88.50 | 147.20 | 149.90 | | 150.17 | 0.003580 | 2.66 | 44.69 | 44.18 | 0.58 |
| 001 | 558.50* | 100 +70% | 120.36 | 147.20 | 150.12 | | 150.44 | 0.003850 | 2.94 | 54.72 | 45.80 | 0.61 |
| 001 | 558.50* | 1000 | 116.46 | 147.20 | 150.10 | | 150.41 | 0.003772 | 2.89 | 53.81 | 45.62 | 0.60 |
| 001 | 550.00* | 2 | 26.58 | 147.09 | 148.77 | | 149.02 | 0.005313 | 2.21 | 12.05 | 9.84 | 0.64 |
| 001 | 550.00* | 20 | 49.78 | 147.09 | 149.40 | 148.94 | 149.68 | 0.004031 | 2.44 | 25.26 | 40.68 | 0.59 |
| 001 | 550.00* | 50 | 60.91 | 147.09 | 149.59 | | 149.84 | 0.003496 | 2.43 | 32.93 | 42.57 | 0.56 |
| 001 | 550.00* | 100 | 70.80 | 147.09 | 149.70 | | 149.96 | 0.003421 | 2.49 | 37.85 | 43.69 | 0.56 |
| 001 | 550.00* | 100 +5% | 74.34 | 147.09 | 149.73 | | 149.99 | 0.003480 | 2.54 | 39.14 | 43.98 | 0.56 |
| 001 | 550.00* | 100 +25% | 88.50 | 147.09 | 149.87 | | 150.14 | 0.003395 | 2.62 | 45.45 | 45.12 | 0.56 |
| 001 | 550.00* | 100 +70% | 120.36 | 147.09 | 150.09 | | 150.41 | 0.003722 | 2.92 | 55.57 | 47.33 | 0.60 |
| 001 | 550.00* | 1000 | 116.46 | 147.09 | 150.07 | | 150.38 | 0.003639 | 2.87 | 54.67 | 47.14 | 0.59 |
| 001 | 541.50* | 2 | 26.58 | 146.98 | 148.75 | | 148.97 | 0.004566 | 2.10 | 12.63 | 9.76 | 0.59 |
| 001 | 541.50* | 20 | 49.78 | 146.98 | 149.37 | 148.84 | 149.65 | 0.003914 | 2.42 | 25.11 | 41.45 | 0.58 |
| 001 | 541.50* | 50 | 60.91 | 146.98 | 149.56 | | 149.81 | 0.003353 | 2.39 | 33.32 | 43.77 | 0.54 |
| 001 | 541.50* | 100 | 70.80 | 146.98 | 149.68 | | 149.93 | 0.003265 | 2.45 | 38.51 | 44.89 | 0.54 |
| 001 | 541.50* | 100 +5% | 74.34 | 146.98 | 149.71 | | 149.96 | 0.003333 | 2.50 | 39.78 | 45.20 | 0.55 |
| 001 | 541.50* | 100 +25% | 88.50 | 146.98 | 149.85 | | 150.11 | 0.003262 | 2.58 | 46.36 | 46.98 | 0.55 |
| 001 | 541.50* | 100 +70% | 120.36 | 146.98 | 150.07 | | 150.38 | 0.003565 | 2.87 | 56.99 | 49.63 | 0.58 |
| 001 | 541.50* | 1000 | 116.46 | 146.98 | 150.05 | | 150.35 | 0.003481 | 2.82 | 56.08 | 49.40 | 0.57 |
| 001 | 533.00* | 2 | 26.58 | 146.86 | 148.72 | | 148.93 | 0.003989 | 2.02 | 13.14 | 9.56 | 0.55 |
| 001 | 533.00* | 20 | 49.78 | 146.86 | 149.33 | 148.75 | 149.61 | 0.003914 | 2.41 | 24.77 | 42.61 | 0.57 |
| 001 | 533.00* | 50 | 60.91 | 146.86 | 149.54 | | 149.78 | 0.003244 | 2.36 | 33.84 | 45.57 | 0.53 |
| 001 | 533.00* | 100 | 70.80 | 146.86 | 149.66 | | 149.90 | 0.003142 | 2.41 | 39.42 | 47.35 | 0.53 |
| 001 | 533.00* | 100 +5% | 74.34 | 146.86 | 149.68 | | 149.93 | 0.003209 | 2.46 | 40.76 | 47.75 | 0.53 |
| 001 | 533.00* | 100 +25% | 88.50 | 146.86 | 149.83 | | 150.08 | 0.003086 | 2.52 | 48.01 | 49.93 | 0.53 |
| 001 | 533.00* | 100 +70% | 120.36 | 146.86 | 150.06 | | 150.34 | 0.003302 | 2.77 | 59.70 | 53.06 | 0.55 |
| 001 | 533.00* | 1000 | 116.46 | 146.86 | 150.04 | | 150.31 | 0.003232 | 2.73 | 58.69 | 52.85 | 0.55 |
| 001 | 524.50* | 2 | 26.58 | 146.75 | 148.70 | | 148.90 | 0.003511 | 1.96 | 13.60 | 9.23 | 0.51 |
| 001 | 524.50* | 20 | 49.78 | 146.75 | 149.29 | 148.65 | 149.57 | 0.004020 | 2.42 | 24.30 | 44.64 | 0.57 |
| 001 | 524.50* | 50 | 60.91 | 146.75 | 149.52 | | 149.75 | 0.003099 | 2.30 | 35.12 | 49.15 | 0.51 |
| 001 | 524.50* | 100 | 70.80 | 146.75 | 149.64 | | 149.87 | 0.002933 | 2.33 | 41.46 | 51.49 | 0.50 |
| 001 | 524.50* | 100 +5% | 74.34 | 146.75 | 149.67 | | 149.90 | 0.002985 | 2.37 | 42.95 | 52.03 | 0.51 |
| 001 | 524.50* | 100 +25% | 88.50 | 146.75 | 149.83 | | 150.05 | 0.002780 | 2.39 | 51.27 | 54.18 | 0.50 |
| 001 | 524.50* | 100 +70% | 120.36 | 146.75 | 150.06 | | 150.31 | 0.002906 | 2.61 | 64.26 | 57.31 | 0.52 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 524.50* | 1000 | 116.46 | 146.75 | 150.04 | | 150.28 | 0.002849 | 2.57 | 63.14 | 57.10 | 0.51 |
| 001 | 0516 | 2 | 26.58 | 146.64 | 148.68 | | 148.87 | 0.003189 | 1.90 | 14.00 | 9.01 | 0.49 |
| 001 | 0516 | 20 | 49.78 | 146.64 | 149.26 | 148.57 | 149.54 | 0.004014 | 2.39 | 24.89 | 49.81 | 0.56 |
| 001 | 0516 | 50 | 60.91 | 146.64 | 149.52 | 148.82 | 149.72 | 0.002716 | 2.15 | 38.80 | 55.55 | 0.47 |
| 001 | 0516 | 100 | 70.80 | 146.64 | 149.65 | 149.42 | 149.83 | 0.002499 | 2.15 | 46.15 | 57.60 | 0.46 |
| 001 | 0516 | 100 +5% | 74.34 | 146.64 | 149.68 | | 149.87 | 0.002530 | 2.18 | 47.87 | 58.07 | 0.46 |
| 001 | 0516 | 100 +25% | 88.50 | 146.64 | 149.84 | | 150.01 | 0.002331 | 2.19 | 57.19 | 60.55 | 0.45 |
| 001 | 0516 | 100 +70% | 120.36 | 146.64 | 150.07 | | 150.27 | 0.002392 | 2.36 | 71.96 | 64.28 | 0.46 |
| 001 | 0516 | 1000 | 116.46 | 146.64 | 150.05 | | 150.24 | 0.002348 | 2.33 | 70.67 | 63.96 | 0.46 |
| 001 | 507.20* | 2 | 26.58 | 146.66 | 148.63 | | 148.83 | 0.003751 | 2.00 | 13.28 | 9.14 | 0.53 |
| 001 | 507.20* | 20 | 49.78 | 146.66 | 149.15 | 148.62 | 149.49 | 0.004954 | 2.62 | 21.19 | 32.42 | 0.63 |
| 001 | 507.20* | 50 | 60.91 | 146.66 | 149.28 | 148.87 | 149.67 | 0.005312 | 2.84 | 25.87 | 39.38 | 0.66 |
| 001 | 507.20* | 100 | 70.80 | 146.66 | 149.42 | 149.42 | 149.79 | 0.004970 | 2.88 | 32.20 | 51.19 | 0.65 |
| 001 | 507.20* | 100 +5% | 74.34 | 146.66 | 149.52 | 149.45 | 149.83 | 0.004097 | 2.70 | 37.47 | 53.50 | 0.59 |
| 001 | 507.20* | 100 +25% | 88.50 | 146.66 | 149.74 | 149.58 | 149.98 | 0.003142 | 2.52 | 49.68 | 57.72 | 0.53 |
| 001 | 507.20* | 100 +70% | 120.36 | 146.66 | 149.98 | | 150.24 | 0.003120 | 2.69 | 64.31 | 62.38 | 0.53 |
| 001 | 507.20* | 1000 | 116.46 | 146.66 | 149.97 | 149.75 | 150.21 | 0.003039 | 2.64 | 63.30 | 62.08 | 0.53 |
| 001 | 498.40* | 2 | 26.58 | 146.68 | 148.57 | | 148.80 | 0.004343 | 2.11 | 12.62 | 9.05 | 0.57 |
| 001 | 498.40* | 20 | 49.78 | 146.68 | 149.09 | 148.85 | 149.45 | 0.005358 | 2.71 | 20.76 | 31.67 | 0.66 |
| 001 | 498.40* | 50 | 60.91 | 146.68 | 149.22 | 149.20 | 149.62 | 0.005608 | 2.91 | 25.44 | 37.48 | 0.68 |
| 001 | 498.40* | 100 | 70.80 | 146.68 | 149.34 | 149.33 | 149.75 | 0.005533 | 3.01 | 30.01 | 41.25 | 0.68 |
| 001 | 498.40* | 100 +5% | 74.34 | 146.68 | 149.39 | 149.35 | 149.79 | 0.005315 | 3.00 | 32.17 | 43.08 | 0.67 |
| 001 | 498.40* | 100 +25% | 88.50 | 146.68 | 149.52 | 149.51 | 149.93 | 0.005420 | 3.16 | 37.88 | 48.53 | 0.69 |
| 001 | 498.40* | 100 +70% | 120.36 | 146.68 | 149.76 | 149.76 | 150.19 | 0.005283 | 3.35 | 51.07 | 57.38 | 0.69 |
| 001 | 498.40* | 1000 | 116.46 | 146.68 | 149.74 | 149.74 | 150.16 | 0.005265 | 3.32 | 49.69 | 56.88 | 0.69 |
| 001 | 489.60* | 2 | 26.58 | 146.70 | 148.51 | | 148.76 | 0.005188 | 2.22 | 11.99 | 9.15 | 0.62 |
| 001 | 489.60* | 20 | 49.78 | 146.70 | 149.03 | 148.65 | 149.41 | 0.005696 | 2.78 | 20.64 | 31.98 | 0.68 |
| 001 | 489.60* | 50 | 60.91 | 146.70 | 149.17 | 149.16 | 149.57 | 0.005781 | 2.95 | 25.53 | 36.87 | 0.69 |
| 001 | 489.60* | 100 | 70.80 | 146.70 | 149.29 | 149.28 | 149.70 | 0.005620 | 3.03 | 30.16 | 40.71 | 0.69 |
| 001 | 489.60* | 100 +5% | 74.34 | 146.70 | 149.35 | 149.34 | 149.73 | 0.005318 | 3.01 | 32.47 | 42.17 | 0.67 |
| 001 | 489.60* | 100 +25% | 88.50 | 146.70 | 149.44 | 149.44 | 149.88 | 0.005783 | 3.24 | 36.76 | 44.77 | 0.71 |
| 001 | 489.60* | 100 +70% | 120.36 | 146.70 | 149.68 | 149.69 | 150.15 | 0.005859 | 3.49 | 48.19 | 51.92 | 0.72 |
| 001 | 489.60* | 1000 | 116.46 | 146.70 | 149.65 | 149.66 | 150.12 | 0.005945 | 3.49 | 46.51 | 50.92 | 0.73 |
| 001 | 480.80* | 2 | 26.58 | 146.72 | 148.43 | | 148.71 | 0.006202 | 2.34 | 11.34 | 9.06 | 0.67 |
| 001 | 480.80* | 20 | 49.78 | 146.72 | 148.97 | 148.63 | 149.36 | 0.006010 | 2.83 | 20.68 | 32.63 | 0.69 |
| 001 | 480.80* | 50 | 60.91 | 146.72 | 149.12 | 149.11 | 149.52 | 0.005849 | 2.96 | 25.96 | 37.13 | 0.69 |
| 001 | 480.80* | 100 | 70.80 | 146.72 | 149.23 | 149.23 | 149.64 | 0.005884 | 3.08 | 30.01 | 40.17 | 0.70 |
| 001 | 480.80* | 100 +5% | 74.34 | 146.72 | 149.26 | 149.26 | 149.68 | 0.005876 | 3.11 | 31.46 | 41.20 | 0.70 |
| 001 | 480.80* | 100 +25% | 88.50 | 146.72 | 149.40 | 149.40 | 149.82 | 0.005712 | 3.21 | 37.41 | 44.80 | 0.70 |
| 001 | 480.80* | 100 +70% | 120.36 | 146.72 | 149.57 | 149.62 | 150.09 | 0.006881 | 3.70 | 45.15 | 48.94 | 0.78 |
| 001 | 480.80* | 1000 | 116.46 | 146.72 | 149.54 | 149.60 | 150.06 | 0.006874 | 3.67 | 43.90 | 48.27 | 0.78 |
| 001 | 0472 | 2 | 26.58 | 146.74 | 148.31 | | 148.64 | 0.007969 | 2.54 | 10.46 | 8.79 | 0.74 |
| 001 | 0472 | 20 | 49.78 | 146.74 | 148.91 | 148.91 | 149.30 | 0.006254 | 2.86 | 20.94 | 33.50 | 0.70 |
| 001 | 0472 | 50 | 60.91 | 146.74 | 149.06 | 149.06 | 149.46 | 0.006046 | 2.98 | 26.22 | 37.53 | 0.70 |
| 001 | 0472 | 100 | 70.80 | 146.74 | 149.11 | 149.17 | 149.58 | 0.007113 | 3.28 | 28.04 | 38.81 | 0.76 |
| 001 | 0472 | 100 +5% | 74.34 | 146.74 | 149.14 | 149.21 | 149.62 | 0.007181 | 3.33 | 29.24 | 39.64 | 0.76 |
| 001 | 0472 | 100 +25% | 88.50 | 146.74 | 149.25 | 149.33 | 149.76 | 0.007398 | 3.51 | 33.88 | 42.70 | 0.78 |
| 001 | 0472 | 100 +70% | 120.36 | 146.74 | 149.47 | 149.55 | 150.02 | 0.007638 | 3.82 | 43.77 | 48.15 | 0.81 |
| 001 | 0472 | 1000 | 116.46 | 146.74 | 149.45 | 149.52 | 149.99 | 0.007613 | 3.79 | 42.61 | 47.57 | 0.81 |
| 001 | 463.17* | 2 | 26.58 | 146.66 | 148.25 | | 148.56 | 0.007471 | 2.48 | 10.71 | 9.05 | 0.73 |
| 001 | 463.17* | 20 | 49.78 | 146.66 | 148.72 | 148.83 | 149.22 | 0.008567 | 3.19 | 17.41 | 27.71 | 0.81 |
| 001 | 463.17* | 50 | 60.91 | 146.66 | 148.88 | 148.98 | 149.39 | 0.008032 | 3.30 | 22.59 | 34.36 | 0.80 |
| 001 | 463.17* | 100 | 70.80 | 146.66 | 148.97 | 149.09 | 149.51 | 0.008306 | 3.47 | 25.82 | 36.58 | 0.82 |
| 001 | 463.17* | 100 +5% | 74.34 | 146.66 | 149.01 | 149.13 | 149.55 | 0.008335 | 3.52 | 27.01 | 37.37 | 0.82 |
| 001 | 463.17* | 100 +25% | 88.50 | 146.66 | 149.23 | 149.24 | 149.67 | 0.006273 | 3.29 | 36.07 | 42.90 | 0.73 |
| 001 | 463.17* | 100 +70% | 120.36 | 146.66 | 149.47 | 149.46 | 149.94 | 0.006260 | 3.53 | 46.93 | 48.45 | 0.74 |
| 001 | 463.17* | 1000 | 116.46 | 146.66 | 149.38 | 149.45 | 149.92 | 0.007281 | 3.72 | 42.84 | 46.47 | 0.79 |
| 001 | 454.33* | 2 | 26.58 | 146.58 | 148.20 | | 148.49 | 0.007035 | 2.42 | 10.97 | 9.30 | 0.71 |
| 001 | 454.33* | 20 | 49.78 | 146.58 | 148.66 | 148.70 | 149.14 | 0.008252 | 3.12 | 17.91 | 28.18 | 0.80 |
| 001 | 454.33* | 50 | 60.91 | 146.58 | 148.87 | 148.90 | 149.29 | 0.006620 | 3.04 | 24.99 | 35.85 | 0.73 |
| 001 | 454.33* | 100 | 70.80 | 146.58 | 148.97 | 149.01 | 149.41 | 0.006647 | 3.16 | 28.73 | 37.99 | 0.74 |
| 001 | 454.33* | 100 +5% | 74.34 | 146.58 | 149.00 | 149.04 | 149.45 | 0.006681 | 3.21 | 29.96 | 38.71 | 0.74 |
| 001 | 454.33* | 100 +25% | 88.50 | 146.58 | 149.16 | 149.15 | 149.59 | 0.006142 | 3.24 | 36.27 | 42.22 | 0.72 |
| 001 | 454.33* | 100 +70% | 120.36 | 146.58 | 149.45 | 149.37 | 149.86 | 0.005342 | 3.31 | 49.63 | 48.22 | 0.69 |
| 001 | 454.33* | 1000 | 116.46 | 146.58 | 149.42 | 149.35 | 149.83 | 0.005446 | 3.31 | 47.94 | 47.53 | 0.69 |
| 001 | 445.50* | 2 | 26.58 | 146.50 | 148.14 | | 148.43 | 0.006743 | 2.37 | 11.20 | 9.53 | 0.70 |
| 001 | 445.50* | 20 | 49.78 | 146.50 | 148.58 | 148.65 | 149.05 | 0.008115 | 3.10 | 18.11 | 28.34 | 0.79 |
| 001 | 445.50* | 50 | 60.91 | 146.50 | 148.83 | 148.82 | 149.20 | 0.006065 | 2.90 | 26.34 | 36.59 | 0.70 |
| 001 | 445.50* | 100 | 70.80 | 146.50 | 148.96 | 148.94 | 149.32 | 0.005499 | 2.91 | 31.51 | 39.31 | 0.68 |
| 001 | 445.50* | 100 +5% | 74.34 | 146.50 | 149.01 | 148.96 | 149.36 | 0.005380 | 2.92 | 33.19 | 40.15 | 0.67 |
| 001 | 445.50* | 100 +25% | 88.50 | 146.50 | 149.16 | 149.08 | 149.51 | 0.005035 | 2.97 | 39.56 | 43.29 | 0.66 |
| 001 | 445.50* | 100 +70% | 120.36 | 146.50 | 149.45 | | 149.80 | 0.004446 | 3.05 | 53.19 | 48.50 | 0.63 |
| 001 | 445.50* | 1000 | 116.46 | 146.50 | 149.42 | | 149.76 | 0.004511 | 3.04 | 51.54 | 47.91 | 0.63 |
| 001 | 436.67* | 2 | 26.58 | 146.41 | 148.09 | | 148.37 | 0.006588 | 2.33 | 11.39 | 9.74 | 0.69 |
| 001 | 436.67* | 20 | 49.78 | 146.41 | 148.60 | 148.57 | 148.97 | 0.006322 | 2.80 | 21.18 | 34.16 | 0.71 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 436.67* | 50 | 60.91 | 146.41 | 148.83 | 148.76 | 149.13 | 0.004888 | 2.64 | 29.47 | 38.17 | 0.63 |
| 001 | 436.67* | 100 | 70.80 | 146.41 | 148.97 | | 149.25 | 0.004445 | 2.64 | 34.88 | 40.76 | 0.61 |
| 001 | 436.67* | 100 +5% | 74.34 | 146.41 | 149.01 | | 149.30 | 0.004362 | 2.65 | 36.61 | 41.55 | 0.61 |
| 001 | 436.67* | 100 +25% | 88.50 | 146.41 | 149.16 | | 149.45 | 0.004120 | 2.71 | 43.15 | 44.26 | 0.60 |
| 001 | 436.67* | 100 +70% | 120.36 | 146.41 | 149.45 | | 149.75 | 0.003756 | 2.82 | 56.76 | 48.83 | 0.58 |
| 001 | 436.67* | 1000 | 116.46 | 146.41 | 149.42 | | 149.71 | 0.003796 | 2.81 | 55.12 | 48.30 | 0.58 |
| 001 | 427.83* | 2 | 26.58 | 146.33 | 148.03 | | 148.31 | 0.006718 | 2.33 | 11.43 | 9.92 | 0.69 |
| 001 | 427.83* | 20 | 49.78 | 146.33 | 148.60 | 148.53 | 148.90 | 0.005165 | 2.57 | 23.88 | 35.85 | 0.64 |
| 001 | 427.83* | 50 | 60.91 | 146.33 | 148.83 | | 149.07 | 0.003979 | 2.41 | 32.55 | 39.62 | 0.57 |
| 001 | 427.83* | 100 | 70.80 | 146.33 | 148.97 | | 149.20 | 0.003675 | 2.41 | 38.19 | 42.04 | 0.55 |
| 001 | 427.83* | 100 +5% | 74.34 | 146.33 | 149.01 | | 149.24 | 0.003616 | 2.43 | 39.97 | 42.79 | 0.55 |
| 001 | 427.83* | 100 +25% | 88.50 | 146.33 | 149.16 | | 149.40 | 0.003440 | 2.49 | 46.66 | 45.09 | 0.54 |
| 001 | 427.83* | 100 +70% | 120.36 | 146.33 | 149.45 | | 149.70 | 0.003216 | 2.62 | 60.32 | 49.19 | 0.54 |
| 001 | 427.83* | 1000 | 116.46 | 146.33 | 149.42 | | 149.67 | 0.003242 | 2.60 | 58.69 | 48.71 | 0.54 |
| 001 | 0419 | 2 | 26.58 | 146.25 | 147.96 | | 148.24 | 0.007253 | 2.35 | 11.29 | 10.12 | 0.71 |
| 001 | 0419 | 20 | 49.78 | 146.25 | 148.60 | | 148.84 | 0.004273 | 2.35 | 26.65 | 37.39 | 0.58 |
| 001 | 0419 | 50 | 60.91 | 146.25 | 148.83 | | 149.03 | 0.003294 | 2.21 | 35.65 | 40.92 | 0.51 |
| 001 | 0419 | 100 | 70.80 | 146.25 | 148.97 | | 149.16 | 0.003100 | 2.21 | 41.47 | 43.19 | 0.50 |
| 001 | 0419 | 100 +5% | 74.34 | 146.25 | 149.01 | | 149.20 | 0.003056 | 2.23 | 43.30 | 43.88 | 0.50 |
| 001 | 0419 | 100 +25% | 88.50 | 146.25 | 149.16 | | 149.36 | 0.002927 | 2.29 | 50.11 | 45.82 | 0.50 |
| 001 | 0419 | 100 +70% | 120.36 | 146.25 | 149.45 | | 149.67 | 0.002794 | 2.43 | 63.88 | 49.57 | 0.50 |
| 001 | 0419 | 1000 | 116.46 | 146.25 | 149.42 | | 149.63 | 0.002810 | 2.41 | 62.23 | 49.14 | 0.50 |
| 001 | 409.75* | 2 | 26.58 | 146.22 | 147.93 | | 148.17 | 0.005373 | 2.14 | 12.40 | 10.54 | 0.63 |
| 001 | 409.75* | 20 | 49.78 | 146.22 | 148.53 | 148.08 | 148.81 | 0.004255 | 2.41 | 24.66 | 34.33 | 0.59 |
| 001 | 409.75* | 50 | 60.91 | 146.22 | 148.74 | | 148.99 | 0.003607 | 2.40 | 32.11 | 38.52 | 0.55 |
| 001 | 409.75* | 100 | 70.80 | 146.22 | 148.87 | | 149.12 | 0.003407 | 2.44 | 37.52 | 41.06 | 0.54 |
| 001 | 409.75* | 100 +5% | 74.34 | 146.22 | 148.92 | | 149.17 | 0.003367 | 2.46 | 39.27 | 41.69 | 0.54 |
| 001 | 409.75* | 100 +25% | 88.50 | 146.22 | 149.07 | | 149.32 | 0.003268 | 2.54 | 45.80 | 43.98 | 0.54 |
| 001 | 409.75* | 100 +70% | 120.36 | 146.22 | 149.36 | | 149.63 | 0.003123 | 2.69 | 59.33 | 48.38 | 0.54 |
| 001 | 409.75* | 1000 | 116.46 | 146.22 | 149.33 | | 149.60 | 0.003146 | 2.68 | 57.68 | 47.89 | 0.54 |
| 001 | 400.50* | 2 | 26.58 | 146.18 | 147.92 | | 148.11 | 0.003967 | 1.94 | 13.74 | 11.18 | 0.55 |
| 001 | 400.50* | 20 | 49.78 | 146.18 | 148.50 | | 148.77 | 0.003505 | 2.34 | 24.70 | 32.78 | 0.55 |
| 001 | 400.50* | 50 | 60.91 | 146.18 | 148.70 | | 148.96 | 0.003235 | 2.40 | 31.62 | 38.11 | 0.54 |
| 001 | 400.50* | 100 | 70.80 | 146.18 | 148.83 | | 149.10 | 0.003157 | 2.48 | 36.86 | 41.02 | 0.54 |
| 001 | 400.50* | 100 +5% | 74.34 | 146.18 | 148.87 | | 149.14 | 0.003145 | 2.50 | 38.57 | 41.67 | 0.54 |
| 001 | 400.50* | 100 +25% | 88.50 | 146.18 | 149.02 | | 149.30 | 0.003164 | 2.62 | 44.77 | 43.94 | 0.55 |
| 001 | 400.50* | 100 +70% | 120.36 | 146.18 | 149.31 | | 149.61 | 0.003042 | 2.78 | 58.22 | 47.06 | 0.55 |
| 001 | 400.50* | 1000 | 116.46 | 146.18 | 149.28 | | 149.57 | 0.003062 | 2.76 | 56.60 | 46.70 | 0.55 |
| 001 | 391.25* | 2 | 26.58 | 146.14 | 147.92 | | 148.07 | 0.002707 | 1.74 | 15.66 | 13.27 | 0.47 |
| 001 | 391.25* | 20 | 49.78 | 146.14 | 148.51 | | 148.72 | 0.002494 | 2.11 | 27.80 | 33.85 | 0.48 |
| 001 | 391.25* | 50 | 60.91 | 146.14 | 148.70 | | 148.92 | 0.002400 | 2.20 | 34.78 | 38.80 | 0.47 |
| 001 | 391.25* | 100 | 70.80 | 146.14 | 148.83 | | 149.06 | 0.002415 | 2.29 | 39.93 | 41.08 | 0.48 |
| 001 | 391.25* | 100 +5% | 74.34 | 146.14 | 148.87 | | 149.10 | 0.002425 | 2.32 | 41.60 | 41.42 | 0.48 |
| 001 | 391.25* | 100 +25% | 88.50 | 146.14 | 149.01 | | 149.26 | 0.002512 | 2.46 | 47.53 | 42.64 | 0.50 |
| 001 | 391.25* | 100 +70% | 120.36 | 146.14 | 149.29 | | 149.57 | 0.002617 | 2.69 | 59.81 | 45.06 | 0.52 |
| 001 | 391.25* | 1000 | 116.46 | 146.14 | 149.26 | | 149.54 | 0.002616 | 2.67 | 58.30 | 44.77 | 0.51 |
| 001 | 0382 | 2 | 26.58 | 146.11 | 147.93 | | 148.04 | 0.001695 | 1.47 | 19.68 | 17.64 | 0.38 |
| 001 | 0382 | 20 | 49.78 | 146.11 | 148.54 | | 148.69 | 0.001616 | 1.79 | 32.90 | 35.74 | 0.39 |
| 001 | 0382 | 50 | 60.91 | 146.11 | 148.73 | | 148.88 | 0.001624 | 1.90 | 39.95 | 38.51 | 0.39 |
| 001 | 0382 | 100 | 70.80 | 146.11 | 148.85 | | 149.02 | 0.001689 | 2.00 | 44.85 | 39.38 | 0.41 |
| 001 | 0382 | 100 +5% | 74.34 | 146.11 | 148.89 | | 149.07 | 0.001719 | 2.04 | 46.40 | 39.66 | 0.41 |
| 001 | 0382 | 100 +25% | 88.50 | 146.11 | 149.03 | | 149.23 | 0.001860 | 2.20 | 51.88 | 40.61 | 0.43 |
| 001 | 0382 | 100 +70% | 120.36 | 146.11 | 149.30 | | 149.54 | 0.002093 | 2.49 | 63.10 | 42.48 | 0.46 |
| 001 | 0382 | 1000 | 116.46 | 146.11 | 149.27 | | 149.50 | 0.002075 | 2.46 | 61.72 | 42.26 | 0.46 |
| 001 | 372.33* | 2 | 26.58 | 146.05 | 147.83 | | 148.00 | 0.003937 | 1.87 | 14.35 | 13.49 | 0.55 |
| 001 | 372.33* | 20 | 49.78 | 146.05 | 148.42 | | 148.66 | 0.003132 | 2.19 | 25.57 | 30.35 | 0.53 |
| 001 | 372.33* | 50 | 60.91 | 146.05 | 148.62 | | 148.85 | 0.002952 | 2.28 | 32.38 | 38.54 | 0.52 |
| 001 | 372.33* | 100 | 70.80 | 146.05 | 148.75 | | 148.99 | 0.002869 | 2.35 | 37.71 | 40.22 | 0.52 |
| 001 | 372.33* | 100 +5% | 74.34 | 146.05 | 148.79 | | 149.04 | 0.002865 | 2.37 | 39.37 | 40.59 | 0.52 |
| 001 | 372.33* | 100 +25% | 88.50 | 146.05 | 148.93 | | 149.20 | 0.002934 | 2.51 | 45.14 | 41.81 | 0.53 |
| 001 | 372.33* | 100 +70% | 120.36 | 146.05 | 149.21 | | 149.51 | 0.002967 | 2.73 | 57.32 | 44.16 | 0.54 |
| 001 | 372.33* | 1000 | 116.46 | 146.05 | 149.18 | | 149.47 | 0.002981 | 2.71 | 55.79 | 43.88 | 0.54 |
| 001 | 362.67* | 2 | 26.58 | 146.00 | 147.70 | | 147.95 | 0.006746 | 2.21 | 12.04 | 11.69 | 0.70 |
| 001 | 362.67* | 20 | 49.78 | 146.00 | 148.31 | 147.92 | 148.61 | 0.005177 | 2.45 | 21.39 | 25.79 | 0.65 |
| 001 | 362.67* | 50 | 60.91 | 146.00 | 148.48 | 148.12 | 148.81 | 0.004961 | 2.59 | 26.61 | 34.29 | 0.64 |
| 001 | 362.67* | 100 | 70.80 | 146.00 | 148.61 | 148.38 | 148.95 | 0.004733 | 2.66 | 31.47 | 38.65 | 0.64 |
| 001 | 362.67* | 100 +5% | 74.34 | 146.00 | 148.66 | 148.48 | 148.99 | 0.004646 | 2.68 | 33.23 | 39.92 | 0.63 |
| 001 | 362.67* | 100 +25% | 88.50 | 146.00 | 148.82 | | 149.15 | 0.004312 | 2.74 | 40.03 | 42.40 | 0.62 |
| 001 | 362.67* | 100 +70% | 120.36 | 146.00 | 149.16 | | 149.48 | 0.003643 | 2.79 | 54.79 | 45.88 | 0.59 |
| 001 | 362.67* | 1000 | 116.46 | 146.00 | 149.12 | | 149.44 | 0.003697 | 2.78 | 53.10 | 45.51 | 0.59 |
| 001 | 0353 | 2 | 26.58 | 145.94 | 147.69 | | 147.88 | 0.004189 | 1.94 | 13.69 | 10.74 | 0.55 |
| 001 | 0353 | 20 | 49.78 | 145.94 | 148.27 | | 148.56 | 0.004648 | 2.40 | 21.98 | 26.72 | 0.60 |
| 001 | 0353 | 50 | 60.91 | 145.94 | 148.44 | | 148.75 | 0.004891 | 2.53 | 27.21 | 33.56 | 0.63 |
| 001 | 0353 | 100 | 70.80 | 145.94 | 148.58 | | 148.89 | 0.004887 | 2.59 | 32.10 | 38.18 | 0.63 |
| 001 | 0353 | 100 +5% | 74.34 | 145.94 | 148.62 | | 148.94 | 0.004807 | 2.60 | 33.92 | 39.04 | 0.63 |
| 001 | 0353 | 100 +25% | 88.50 | 145.94 | 148.80 | | 149.10 | 0.004399 | 2.61 | 41.14 | 42.00 | 0.61 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0353 | 100 +70% | 120.36 | 145.94 | 149.14 | | 149.43 | 0.003659 | 2.64 | 56.44 | 47.39 | 0.57 |
| 001 | 0353 | 1000 | 116.46 | 145.94 | 149.11 | | 149.39 | 0.003726 | 2.63 | 54.68 | 46.80 | 0.57 |
| 001 | 344.60* | 2 | 26.58 | 145.91 | 147.62 | | 147.84 | 0.004908 | 2.09 | 12.69 | 10.11 | 0.60 |
| 001 | 344.60* | 20 | 49.78 | 145.91 | 148.19 | 147.74 | 148.51 | 0.005618 | 2.53 | 20.81 | 27.45 | 0.67 |
| 001 | 344.60* | 50 | 60.91 | 145.91 | 148.40 | | 148.71 | 0.005023 | 2.56 | 27.25 | 33.66 | 0.64 |
| 001 | 344.60* | 100 | 70.80 | 145.91 | 148.54 | | 148.85 | 0.004764 | 2.61 | 32.17 | 37.00 | 0.63 |
| 001 | 344.60* | 100 +5% | 74.34 | 145.91 | 148.58 | | 148.90 | 0.004653 | 2.62 | 33.95 | 37.74 | 0.63 |
| 001 | 344.60* | 100 +25% | 88.50 | 145.91 | 148.76 | | 149.07 | 0.004241 | 2.64 | 41.00 | 40.50 | 0.61 |
| 001 | 344.60* | 100 +70% | 120.36 | 145.91 | 149.11 | | 149.40 | 0.003565 | 2.69 | 55.68 | 45.30 | 0.57 |
| 001 | 344.60* | 1000 | 116.46 | 145.91 | 149.07 | | 149.36 | 0.003618 | 2.68 | 54.01 | 44.84 | 0.57 |
| 001 | 336.20* | 2 | 26.58 | 145.88 | 147.53 | | 147.79 | 0.006354 | 2.27 | 11.70 | 10.35 | 0.68 |
| 001 | 336.20* | 20 | 49.78 | 145.88 | 148.13 | 147.76 | 148.47 | 0.005703 | 2.59 | 20.58 | 27.51 | 0.68 |
| 001 | 336.20* | 50 | 60.91 | 145.88 | 148.36 | | 148.67 | 0.004791 | 2.58 | 27.37 | 32.65 | 0.63 |
| 001 | 336.20* | 100 | 70.80 | 145.88 | 148.50 | | 148.81 | 0.004557 | 2.63 | 32.16 | 35.43 | 0.62 |
| 001 | 336.20* | 100 +5% | 74.34 | 145.88 | 148.55 | | 148.86 | 0.004465 | 2.64 | 33.87 | 36.14 | 0.62 |
| 001 | 336.20* | 100 +25% | 88.50 | 145.88 | 148.72 | | 149.04 | 0.004078 | 2.68 | 40.61 | 38.92 | 0.60 |
| 001 | 336.20* | 100 +70% | 120.36 | 145.88 | 149.07 | | 149.38 | 0.003532 | 2.77 | 54.64 | 43.25 | 0.57 |
| 001 | 336.20* | 1000 | 116.46 | 145.88 | 149.03 | | 149.34 | 0.003571 | 2.76 | 53.06 | 42.83 | 0.58 |
| 001 | 327.80* | 2 | 26.58 | 145.85 | 147.43 | | 147.73 | 0.007632 | 2.43 | 10.95 | 10.34 | 0.75 |
| 001 | 327.80* | 20 | 49.78 | 145.85 | 148.08 | 147.72 | 148.42 | 0.005602 | 2.65 | 20.36 | 26.83 | 0.68 |
| 001 | 327.80* | 50 | 60.91 | 145.85 | 148.32 | | 148.63 | 0.004594 | 2.60 | 27.36 | 31.33 | 0.63 |
| 001 | 327.80* | 100 | 70.80 | 145.85 | 148.46 | | 148.78 | 0.004391 | 2.67 | 31.93 | 33.80 | 0.62 |
| 001 | 327.80* | 100 +5% | 74.34 | 145.85 | 148.50 | | 148.83 | 0.004311 | 2.69 | 33.54 | 34.53 | 0.62 |
| 001 | 327.80* | 100 +25% | 88.50 | 145.85 | 148.68 | | 149.01 | 0.004000 | 2.75 | 39.98 | 37.12 | 0.60 |
| 001 | 327.80* | 100 +70% | 120.36 | 145.85 | 149.02 | | 149.35 | 0.003614 | 2.88 | 53.02 | 41.11 | 0.59 |
| 001 | 327.80* | 1000 | 116.46 | 145.85 | 148.98 | | 149.31 | 0.003641 | 2.86 | 51.53 | 40.70 | 0.59 |
| 001 | 319.40* | 2 | 26.58 | 145.82 | 147.34 | 147.15 | 147.66 | 0.008272 | 2.52 | 10.53 | 10.10 | 0.79 |
| 001 | 319.40* | 20 | 49.78 | 145.82 | 148.00 | 147.66 | 148.38 | 0.005858 | 2.76 | 19.54 | 25.54 | 0.70 |
| 001 | 319.40* | 50 | 60.91 | 145.82 | 148.27 | 148.07 | 148.60 | 0.004552 | 2.67 | 26.93 | 29.80 | 0.63 |
| 001 | 319.40* | 100 | 70.80 | 145.82 | 148.40 | 148.21 | 148.74 | 0.004385 | 2.75 | 31.25 | 32.02 | 0.62 |
| 001 | 319.40* | 100 +5% | 74.34 | 145.82 | 148.45 | 148.25 | 148.79 | 0.004328 | 2.77 | 32.77 | 32.71 | 0.62 |
| 001 | 319.40* | 100 +25% | 88.50 | 145.82 | 148.63 | 148.41 | 148.98 | 0.004079 | 2.85 | 38.84 | 35.13 | 0.61 |
| 001 | 319.40* | 100 +70% | 120.36 | 145.82 | 148.93 | 148.70 | 149.31 | 0.003997 | 3.07 | 50.01 | 38.62 | 0.62 |
| 001 | 319.40* | 1000 | 116.46 | 145.82 | 148.90 | 148.67 | 149.27 | 0.004014 | 3.05 | 48.66 | 38.22 | 0.62 |
| 001 | 0311 | 2 | 26.58 | 145.79 | 147.07 | 147.07 | 147.56 | 0.013841 | 3.08 | 8.64 | 8.99 | 1.00 |
| 001 | 0311 | 20 | 49.78 | 145.79 | 147.60 | 147.60 | 148.28 | 0.012898 | 3.66 | 13.60 | 10.33 | 1.00 |
| 001 | 0311 | 50 | 60.91 | 145.79 | 148.03 | 148.03 | 148.53 | 0.007242 | 3.22 | 21.44 | 25.62 | 0.77 |
| 001 | 0311 | 100 | 70.80 | 145.79 | 148.17 | 148.17 | 148.68 | 0.006945 | 3.32 | 25.15 | 27.59 | 0.76 |
| 001 | 0311 | 100 +5% | 74.34 | 145.79 | 148.21 | 148.21 | 148.73 | 0.006879 | 3.35 | 26.39 | 28.22 | 0.76 |
| 001 | 0311 | 100 +25% | 88.50 | 145.79 | 148.37 | 148.37 | 148.91 | 0.006771 | 3.50 | 30.97 | 30.42 | 0.77 |
| 001 | 0311 | 100 +70% | 120.36 | 145.79 | 148.67 | 148.67 | 149.25 | 0.006479 | 3.74 | 40.74 | 34.16 | 0.77 |
| 001 | 0311 | 1000 | 116.46 | 145.79 | 148.64 | 148.64 | 149.22 | 0.006458 | 3.70 | 39.72 | 33.82 | 0.77 |
| 001 | 301.67* | 2 | 26.58 | 145.58 | 146.80 | 146.90 | 147.40 | 0.019196 | 3.42 | 7.78 | 9.06 | 1.18 |
| 001 | 301.67* | 20 | 49.78 | 145.58 | 147.27 | 147.42 | 148.13 | 0.017668 | 4.09 | 12.16 | 9.70 | 1.17 |
| 001 | 301.67* | 50 | 60.91 | 145.58 | 147.52 | 147.60 | 148.41 | 0.015759 | 4.18 | 14.58 | 10.18 | 1.12 |
| 001 | 301.67* | 100 | 70.80 | 145.58 | 147.92 | 148.07 | 148.59 | 0.009324 | 3.68 | 21.31 | 28.18 | 0.88 |
| 001 | 301.67* | 100 +5% | 74.34 | 145.58 | 147.97 | 148.11 | 148.64 | 0.009168 | 3.71 | 22.67 | 29.17 | 0.87 |
| 001 | 301.67* | 100 +25% | 88.50 | 145.58 | 148.10 | 148.28 | 148.83 | 0.009331 | 3.92 | 26.85 | 32.02 | 0.89 |
| 001 | 301.67* | 100 +70% | 120.36 | 145.58 | 148.35 | 148.56 | 149.16 | 0.009662 | 4.32 | 35.32 | 37.08 | 0.93 |
| 001 | 301.67* | 1000 | 116.46 | 145.58 | 148.32 | 148.53 | 149.12 | 0.009615 | 4.27 | 34.36 | 36.60 | 0.92 |
| 001 | 292.33* | 2 | 26.58 | 145.37 | 146.94 | 146.73 | 147.25 | 0.007597 | 2.50 | 10.64 | 9.61 | 0.76 |
| 001 | 292.33* | 20 | 49.78 | 145.37 | 147.45 | 147.23 | 147.96 | 0.008434 | 3.15 | 15.79 | 10.41 | 0.82 |
| 001 | 292.33* | 50 | 60.91 | 145.37 | 147.63 | 147.45 | 148.24 | 0.009204 | 3.45 | 17.64 | 10.71 | 0.86 |
| 001 | 292.33* | 100 | 70.80 | 145.37 | 147.52 | 147.61 | 148.46 | 0.015019 | 4.29 | 16.51 | 10.53 | 1.09 |
| 001 | 292.33* | 100 +5% | 74.34 | 145.37 | 147.75 | 148.01 | 148.53 | 0.010977 | 3.92 | 19.49 | 21.91 | 0.94 |
| 001 | 292.33* | 100 +25% | 88.50 | 145.37 | 147.96 | 148.20 | 148.73 | 0.009887 | 3.99 | 25.62 | 34.73 | 0.91 |
| 001 | 292.33* | 100 +70% | 120.36 | 145.37 | 148.19 | 148.49 | 149.06 | 0.010297 | 4.39 | 34.82 | 42.27 | 0.95 |
| 001 | 292.33* | 1000 | 116.46 | 145.37 | 148.18 | 148.45 | 149.02 | 0.010063 | 4.32 | 34.08 | 41.78 | 0.93 |
| 001 | 0283 | 2 | 26.58 | 145.16 | 146.94 | | 147.17 | 0.004937 | 2.14 | 12.42 | 10.00 | 0.61 |
| 001 | 0283 | 20 | 49.78 | 145.16 | 147.46 | | 147.86 | 0.006079 | 2.79 | 17.84 | 10.78 | 0.69 |
| 001 | 0283 | 50 | 60.91 | 145.16 | 147.65 | 147.26 | 148.13 | 0.006696 | 3.07 | 19.99 | 15.47 | 0.73 |
| 001 | 0283 | 100 | 70.80 | 145.16 | 147.80 | 147.43 | 148.33 | 0.006816 | 3.24 | 23.55 | 31.92 | 0.74 |
| 001 | 0283 | 100 +5% | 74.34 | 145.16 | 147.87 | 147.48 | 148.39 | 0.006475 | 3.23 | 26.00 | 39.22 | 0.73 |
| 001 | 0283 | 100 +25% | 88.50 | 145.16 | 147.80 | 148.15 | 148.63 | 0.010748 | 4.06 | 23.41 | 31.50 | 0.93 |
| 001 | 0283 | 100 +70% | 120.36 | 145.16 | 148.07 | 148.36 | 148.96 | 0.010566 | 4.40 | 34.84 | 50.13 | 0.95 |
| 001 | 0283 | 1000 | 116.46 | 145.16 | 148.05 | 148.34 | 148.92 | 0.010355 | 4.33 | 33.92 | 49.11 | 0.94 |
| 001 | 274.00* | 2 | 26.58 | 145.16 | 146.90 | | 147.12 | 0.004674 | 2.08 | 12.78 | 10.52 | 0.60 |
| 001 | 274.00* | 20 | 49.78 | 145.16 | 147.43 | | 147.80 | 0.005567 | 2.69 | 18.52 | 11.40 | 0.67 |
| 001 | 274.00* | 50 | 60.91 | 145.16 | 147.61 | | 148.06 | 0.006076 | 2.95 | 20.70 | 15.24 | 0.71 |
| 001 | 274.00* | 100 | 70.80 | 145.16 | 147.76 | 147.37 | 148.26 | 0.006106 | 3.12 | 24.20 | 31.87 | 0.72 |
| 001 | 274.00* | 100 +5% | 74.34 | 145.16 | 147.83 | 147.43 | 148.32 | 0.005870 | 3.13 | 26.52 | 40.28 | 0.71 |
| 001 | 274.00* | 100 +25% | 88.50 | 145.16 | 147.70 | 148.04 | 148.54 | 0.010819 | 4.07 | 22.43 | 24.17 | 0.95 |
| 001 | 274.00* | 100 +70% | 120.36 | 145.16 | 148.06 | 148.34 | 148.84 | 0.008755 | 4.12 | 37.66 | 53.14 | 0.88 |
| 001 | 274.00* | 1000 | 116.46 | 145.16 | 148.05 | 148.32 | 148.81 | 0.008588 | 4.06 | 36.68 | 52.45 | 0.87 |
| 001 | 265.00* | 2 | 26.58 | 145.15 | 146.87 | | 147.08 | 0.004556 | 2.04 | 13.05 | 11.04 | 0.60 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 265.00* | 20 | 49.78 | 145.15 | 147.40 | | 147.74 | 0.005219 | 2.60 | 19.15 | 12.04 | 0.66 |
| 001 | 265.00* | 50 | 60.91 | 145.15 | 147.58 | | 147.99 | 0.005504 | 2.85 | 21.46 | 15.06 | 0.69 |
| 001 | 265.00* | 100 | 70.80 | 145.15 | 147.73 | 147.31 | 148.19 | 0.005514 | 3.01 | 25.05 | 32.00 | 0.70 |
| 001 | 265.00* | 100 +5% | 74.34 | 145.15 | 147.80 | 147.37 | 148.25 | 0.005294 | 3.02 | 27.46 | 41.25 | 0.69 |
| 001 | 265.00* | 100 +25% | 88.50 | 145.15 | 147.62 | 147.98 | 148.45 | 0.010687 | 4.03 | 22.24 | 20.14 | 0.96 |
| 001 | 265.00* | 100 +70% | 120.36 | 145.15 | 148.06 | 148.25 | 148.74 | 0.007414 | 3.88 | 40.68 | 57.91 | 0.83 |
| 001 | 265.00* | 1000 | 116.46 | 145.15 | 148.04 | 148.23 | 148.71 | 0.007281 | 3.83 | 39.62 | 57.37 | 0.82 |
| 001 | 256.00* | 2 | 26.58 | 145.15 | 146.83 | | 147.03 | 0.004571 | 2.01 | 13.22 | 11.54 | 0.60 |
| 001 | 256.00* | 20 | 49.78 | 145.15 | 147.36 | | 147.69 | 0.004975 | 2.53 | 19.68 | 12.94 | 0.65 |
| 001 | 256.00* | 50 | 60.91 | 145.15 | 147.55 | | 147.94 | 0.005065 | 2.76 | 22.33 | 15.42 | 0.67 |
| 001 | 256.00* | 100 | 70.80 | 145.15 | 147.70 | 147.26 | 148.13 | 0.005028 | 2.91 | 26.08 | 33.23 | 0.67 |
| 001 | 256.00* | 100 +5% | 74.34 | 145.15 | 147.77 | 147.32 | 148.19 | 0.004793 | 2.91 | 28.71 | 43.08 | 0.66 |
| 001 | 256.00* | 100 +25% | 88.50 | 145.15 | 147.90 | 147.53 | 148.36 | 0.005018 | 3.10 | 35.06 | 52.94 | 0.68 |
| 001 | 256.00* | 100 +70% | 120.36 | 145.15 | 148.23 | 148.22 | 148.62 | 0.004090 | 3.08 | 55.07 | 67.64 | 0.63 |
| 001 | 256.00* | 1000 | 116.46 | 145.15 | 148.20 | 148.19 | 148.59 | 0.004134 | 3.07 | 53.06 | 66.87 | 0.63 |
| 001 | 247.00* | 2 | 26.58 | 145.14 | 146.79 | | 146.99 | 0.004723 | 2.00 | 13.28 | 12.00 | 0.61 |
| 001 | 247.00* | 20 | 49.78 | 145.14 | 147.33 | | 147.64 | 0.004753 | 2.47 | 20.21 | 14.51 | 0.64 |
| 001 | 247.00* | 50 | 60.91 | 145.14 | 147.52 | | 147.88 | 0.004720 | 2.67 | 23.31 | 17.54 | 0.65 |
| 001 | 247.00* | 100 | 70.80 | 145.14 | 147.68 | 147.23 | 148.07 | 0.004596 | 2.79 | 27.46 | 35.75 | 0.65 |
| 001 | 247.00* | 100 +5% | 74.34 | 145.14 | 147.76 | 147.27 | 148.14 | 0.004321 | 2.78 | 30.48 | 46.64 | 0.63 |
| 001 | 247.00* | 100 +25% | 88.50 | 145.14 | 147.91 | 147.50 | 148.30 | 0.004290 | 2.91 | 38.38 | 57.63 | 0.64 |
| 001 | 247.00* | 100 +70% | 120.36 | 145.14 | 148.24 | 148.16 | 148.56 | 0.003343 | 2.83 | 61.06 | 73.60 | 0.58 |
| 001 | 247.00* | 1000 | 116.46 | 145.14 | 148.20 | 148.12 | 148.54 | 0.003499 | 2.87 | 57.93 | 72.61 | 0.59 |
| 001 | 0238 | 2 | 26.58 | 145.14 | 146.74 | | 146.95 | 0.005039 | 2.02 | 13.18 | 12.36 | 0.62 |
| 001 | 0238 | 20 | 49.78 | 145.14 | 147.29 | | 147.59 | 0.004643 | 2.42 | 20.79 | 16.67 | 0.63 |
| 001 | 0238 | 50 | 60.91 | 145.14 | 147.50 | | 147.83 | 0.004404 | 2.57 | 24.72 | 20.88 | 0.63 |
| 001 | 0238 | 100 | 70.80 | 145.14 | 147.68 | 147.19 | 148.02 | 0.004045 | 2.64 | 30.04 | 41.12 | 0.61 |
| 001 | 0238 | 100 +5% | 74.34 | 145.14 | 147.76 | 147.25 | 148.09 | 0.003741 | 2.61 | 33.80 | 53.56 | 0.59 |
| 001 | 0238 | 100 +25% | 88.50 | 145.14 | 147.92 | 147.47 | 148.24 | 0.003496 | 2.66 | 43.48 | 63.61 | 0.58 |
| 001 | 0238 | 100 +70% | 120.36 | 145.14 | 148.26 | | 148.52 | 0.002687 | 2.57 | 68.38 | 80.05 | 0.52 |
| 001 | 0238 | 1000 | 116.46 | 145.14 | 148.22 | | 148.49 | 0.002808 | 2.60 | 65.05 | 79.18 | 0.53 |
| 001 | 229.50* | 2 | 26.58 | 145.06 | 146.65 | | 146.90 | 0.006048 | 2.18 | 12.22 | 11.79 | 0.68 |
| 001 | 229.50* | 20 | 49.78 | 145.06 | 147.20 | | 147.54 | 0.005635 | 2.58 | 19.40 | 14.72 | 0.69 |
| 001 | 229.50* | 50 | 60.91 | 145.06 | 147.41 | | 147.79 | 0.005332 | 2.74 | 22.75 | 18.25 | 0.69 |
| 001 | 229.50* | 100 | 70.80 | 145.06 | 147.55 | 147.20 | 147.97 | 0.005292 | 2.89 | 25.99 | 31.01 | 0.70 |
| 001 | 229.50* | 100 +5% | 74.34 | 145.06 | 147.62 | 147.24 | 148.04 | 0.005053 | 2.90 | 28.40 | 41.40 | 0.68 |
| 001 | 229.50* | 100 +25% | 88.50 | 145.06 | 147.83 | 147.47 | 148.21 | 0.004293 | 2.87 | 38.98 | 55.95 | 0.64 |
| 001 | 229.50* | 100 +70% | 120.36 | 145.06 | 148.15 | 148.03 | 148.49 | 0.003534 | 2.87 | 59.85 | 74.38 | 0.60 |
| 001 | 229.50* | 1000 | 116.46 | 145.06 | 148.11 | 148.00 | 148.46 | 0.003678 | 2.90 | 56.71 | 71.68 | 0.61 |
| 001 | 221.00* | 2 | 26.58 | 144.97 | 146.57 | | 146.84 | 0.006505 | 2.29 | 11.62 | 10.97 | 0.71 |
| 001 | 221.00* | 20 | 49.78 | 144.97 | 147.11 | | 147.49 | 0.006471 | 2.72 | 18.39 | 14.37 | 0.74 |
| 001 | 221.00* | 50 | 60.91 | 144.97 | 147.32 | | 147.74 | 0.006230 | 2.88 | 21.62 | 17.26 | 0.74 |
| 001 | 221.00* | 100 | 70.80 | 144.97 | 147.46 | 147.18 | 147.92 | 0.006163 | 3.04 | 24.39 | 25.23 | 0.75 |
| 001 | 221.00* | 100 +5% | 74.34 | 144.97 | 147.53 | 147.23 | 147.99 | 0.005915 | 3.05 | 26.40 | 36.27 | 0.73 |
| 001 | 221.00* | 100 +25% | 88.50 | 144.97 | 147.74 | 147.71 | 148.17 | 0.004995 | 3.03 | 36.03 | 50.04 | 0.69 |
| 001 | 221.00* | 100 +70% | 120.36 | 144.97 | 148.07 | 147.97 | 148.45 | 0.004108 | 3.04 | 54.66 | 64.72 | 0.64 |
| 001 | 221.00* | 1000 | 116.46 | 144.97 | 148.02 | 147.94 | 148.42 | 0.004269 | 3.06 | 51.89 | 62.40 | 0.65 |
| 001 | 212.50* | 2 | 26.58 | 144.89 | 146.49 | | 146.78 | 0.007167 | 2.36 | 11.25 | 10.91 | 0.74 |
| 001 | 212.50* | 20 | 49.78 | 144.89 | 147.02 | | 147.43 | 0.007137 | 2.83 | 17.67 | 14.20 | 0.77 |
| 001 | 212.50* | 50 | 60.91 | 144.89 | 147.23 | 146.97 | 147.68 | 0.006840 | 2.99 | 20.92 | 17.29 | 0.77 |
| 001 | 212.50* | 100 | 70.80 | 144.89 | 147.37 | 147.15 | 147.87 | 0.006940 | 3.15 | 23.54 | 21.14 | 0.78 |
| 001 | 212.50* | 100 +5% | 74.34 | 144.89 | 147.44 | 147.22 | 147.94 | 0.006565 | 3.14 | 25.47 | 32.68 | 0.77 |
| 001 | 212.50* | 100 +25% | 88.50 | 144.89 | 147.66 | 147.65 | 148.12 | 0.005508 | 3.12 | 34.47 | 45.94 | 0.72 |
| 001 | 212.50* | 100 +70% | 120.36 | 144.89 | 147.99 | 147.91 | 148.41 | 0.004513 | 3.14 | 51.53 | 57.75 | 0.67 |
| 001 | 212.50* | 1000 | 116.46 | 144.89 | 147.95 | 147.89 | 148.37 | 0.004696 | 3.16 | 48.99 | 55.88 | 0.68 |
| 001 | 204.00* | 2 | 26.58 | 144.80 | 146.41 | | 146.71 | 0.007640 | 2.41 | 11.03 | 10.92 | 0.77 |
| 001 | 204.00* | 20 | 49.78 | 144.80 | 146.94 | | 147.37 | 0.007202 | 2.88 | 17.40 | 14.07 | 0.78 |
| 001 | 204.00* | 50 | 60.91 | 144.80 | 147.15 | 146.91 | 147.62 | 0.007047 | 3.04 | 20.70 | 17.54 | 0.78 |
| 001 | 204.00* | 100 | 70.80 | 144.80 | 147.29 | 147.10 | 147.80 | 0.007147 | 3.19 | 23.37 | 20.38 | 0.79 |
| 001 | 204.00* | 100 +5% | 74.34 | 144.80 | 147.38 | 147.18 | 147.87 | 0.006661 | 3.16 | 25.51 | 32.82 | 0.77 |
| 001 | 204.00* | 100 +25% | 88.50 | 144.80 | 147.62 | 147.58 | 148.06 | 0.005380 | 3.07 | 35.14 | 44.10 | 0.71 |
| 001 | 204.00* | 100 +70% | 120.36 | 144.80 | 147.98 | 147.85 | 148.36 | 0.004206 | 3.04 | 52.64 | 54.52 | 0.64 |
| 001 | 204.00* | 1000 | 116.46 | 144.80 | 147.93 | 147.83 | 148.32 | 0.004352 | 3.05 | 50.32 | 53.21 | 0.65 |
| 001 | 195.50* | 2 | 26.58 | 144.72 | 146.35 | | 146.64 | 0.007669 | 2.41 | 11.04 | 10.97 | 0.77 |
| 001 | 195.50* | 20 | 49.78 | 144.72 | 146.90 | | 147.30 | 0.006780 | 2.82 | 17.91 | 15.18 | 0.75 |
| 001 | 195.50* | 50 | 60.91 | 144.72 | 147.12 | 146.83 | 147.55 | 0.006371 | 2.95 | 21.54 | 18.52 | 0.74 |
| 001 | 195.50* | 100 | 70.80 | 144.72 | 147.26 | 147.02 | 147.74 | 0.006465 | 3.10 | 24.48 | 23.91 | 0.75 |
| 001 | 195.50* | 100 +5% | 74.34 | 144.72 | 147.33 | 147.09 | 147.82 | 0.006301 | 3.12 | 26.63 | 34.37 | 0.75 |
| 001 | 195.50* | 100 +25% | 88.50 | 144.72 | 147.62 | 147.51 | 148.00 | 0.004622 | 2.88 | 37.94 | 43.74 | 0.65 |
| 001 | 195.50* | 100 +70% | 120.36 | 144.72 | 147.97 | | 148.31 | 0.003789 | 2.91 | 54.58 | 52.39 | 0.61 |
| 001 | 195.50* | 1000 | 116.46 | 144.72 | 147.93 | | 148.28 | 0.003897 | 2.91 | 52.41 | 51.34 | 0.61 |
| 001 | 0187 | 2 | 26.58 | 144.63 | 146.30 | | 146.57 | 0.007120 | 2.33 | 11.39 | 11.15 | 0.74 |
| 001 | 0187 | 20 | 49.78 | 144.63 | 146.87 | | 147.24 | 0.006060 | 2.70 | 18.89 | 16.75 | 0.71 |
| 001 | 0187 | 50 | 60.91 | 144.63 | 147.10 | | 147.49 | 0.005477 | 2.80 | 23.11 | 19.74 | 0.69 |
| 001 | 0187 | 100 | 70.80 | 144.63 | 147.23 | 146.95 | 147.67 | 0.005737 | 2.99 | 26.07 | 31.32 | 0.71 |
| 001 | 0187 | 100 +5% | 74.34 | 144.63 | 147.34 | 147.01 | 147.74 | 0.005134 | 2.90 | 29.56 | 35.25 | 0.67 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0187 | 100 +25% | 88.50 | 144.63 | 147.63 | | 147.95 | 0.003847 | 2.69 | 41.07 | 43.41 | 0.59 |
| 001 | 0187 | 100 +70% | 120.36 | 144.63 | 147.97 | | 148.28 | 0.003340 | 2.76 | 57.04 | 50.76 | 0.57 |
| 001 | 0187 | 1000 | 116.46 | 144.63 | 147.93 | | 148.24 | 0.003414 | 2.76 | 54.98 | 49.87 | 0.57 |
| 001 | 177.00* | 2 | 26.58 | 144.51 | 146.21 | | 146.50 | 0.007340 | 2.39 | 11.14 | 10.76 | 0.75 |
| 001 | 177.00* | 20 | 49.78 | 144.51 | 146.78 | | 147.18 | 0.006359 | 2.78 | 18.32 | 15.71 | 0.73 |
| 001 | 177.00* | 50 | 60.91 | 144.51 | 147.00 | | 147.42 | 0.006078 | 2.92 | 21.95 | 18.30 | 0.72 |
| 001 | 177.00* | 100 | 70.80 | 144.51 | 147.16 | 146.89 | 147.61 | 0.006045 | 3.04 | 25.15 | 24.76 | 0.73 |
| 001 | 177.00* | 100 +5% | 74.34 | 144.51 | 147.21 | 146.98 | 147.69 | 0.006169 | 3.12 | 26.65 | 31.26 | 0.74 |
| 001 | 177.00* | 100 +25% | 88.50 | 144.51 | 147.56 | | 147.91 | 0.003958 | 2.76 | 39.62 | 41.19 | 0.61 |
| 001 | 177.00* | 100 +70% | 120.36 | 144.51 | 147.90 | | 148.24 | 0.003515 | 2.87 | 54.58 | 48.26 | 0.59 |
| 001 | 177.00* | 1000 | 116.46 | 144.51 | 147.86 | | 148.20 | 0.003589 | 2.87 | 52.60 | 47.37 | 0.59 |
| 001 | 167.00* | 2 | 26.58 | 144.39 | 146.12 | | 146.42 | 0.007557 | 2.44 | 10.90 | 10.37 | 0.76 |
| 001 | 167.00* | 20 | 49.78 | 144.39 | 146.67 | | 147.10 | 0.007108 | 2.92 | 17.41 | 14.54 | 0.77 |
| 001 | 167.00* | 50 | 60.91 | 144.39 | 146.88 | | 147.35 | 0.006935 | 3.06 | 20.77 | 17.13 | 0.77 |
| 001 | 167.00* | 100 | 70.80 | 144.39 | 147.05 | | 147.55 | 0.006725 | 3.16 | 23.87 | 19.48 | 0.77 |
| 001 | 167.00* | 100 +5% | 74.34 | 144.39 | 147.10 | 146.92 | 147.61 | 0.006783 | 3.22 | 24.83 | 22.31 | 0.77 |
| 001 | 167.00* | 100 +25% | 88.50 | 144.39 | 147.50 | 147.04 | 147.86 | 0.004025 | 2.84 | 38.30 | 39.18 | 0.62 |
| 001 | 167.00* | 100 +70% | 120.36 | 144.39 | 147.82 | | 148.20 | 0.003724 | 3.00 | 52.09 | 45.92 | 0.61 |
| 001 | 167.00* | 1000 | 116.46 | 144.39 | 147.78 | | 148.16 | 0.003807 | 3.00 | 50.14 | 45.01 | 0.61 |
| 001 | 157.00* | 2 | 26.58 | 144.27 | 146.02 | | 146.34 | 0.008043 | 2.52 | 10.54 | 9.94 | 0.78 |
| 001 | 157.00* | 20 | 49.78 | 144.27 | 146.55 | | 147.02 | 0.008174 | 3.05 | 16.54 | 13.83 | 0.82 |
| 001 | 157.00* | 50 | 60.91 | 144.27 | 146.76 | 146.59 | 147.27 | 0.007850 | 3.20 | 19.72 | 16.09 | 0.82 |
| 001 | 157.00* | 100 | 70.80 | 144.27 | 146.93 | 146.78 | 147.47 | 0.007411 | 3.31 | 22.57 | 18.00 | 0.81 |
| 001 | 157.00* | 100 +5% | 74.34 | 144.27 | 146.97 | 146.85 | 147.54 | 0.007436 | 3.38 | 23.40 | 18.72 | 0.81 |
| 001 | 157.00* | 100 +25% | 88.50 | 144.27 | 147.45 | 146.95 | 147.82 | 0.003926 | 2.87 | 37.78 | 37.49 | 0.61 |
| 001 | 157.00* | 100 +70% | 120.36 | 144.27 | 147.71 | 147.55 | 148.15 | 0.004199 | 3.20 | 48.44 | 43.42 | 0.65 |
| 001 | 157.00* | 1000 | 116.46 | 144.27 | 147.67 | | 148.11 | 0.004296 | 3.20 | 46.56 | 42.33 | 0.65 |
| 001 | 147.00* | 2 | 26.58 | 144.15 | 145.90 | | 146.25 | 0.008692 | 2.62 | 10.14 | 9.53 | 0.81 |
| 001 | 147.00* | 20 | 49.78 | 144.15 | 146.42 | 146.29 | 146.93 | 0.009310 | 3.18 | 15.80 | 13.29 | 0.87 |
| 001 | 147.00* | 50 | 60.91 | 144.15 | 146.63 | 146.50 | 147.19 | 0.008546 | 3.33 | 18.82 | 15.17 | 0.85 |
| 001 | 147.00* | 100 | 70.80 | 144.15 | 146.80 | 146.68 | 147.39 | 0.008013 | 3.45 | 21.51 | 17.03 | 0.84 |
| 001 | 147.00* | 100 +5% | 74.34 | 144.15 | 146.83 | 146.75 | 147.46 | 0.008207 | 3.54 | 22.11 | 17.50 | 0.85 |
| 001 | 147.00* | 100 +25% | 88.50 | 144.15 | 147.03 | 146.86 | 147.73 | 0.008082 | 3.77 | 25.98 | 26.85 | 0.86 |
| 001 | 147.00* | 100 +70% | 120.36 | 144.15 | 147.59 | 147.50 | 148.09 | 0.004734 | 3.41 | 45.26 | 42.33 | 0.69 |
| 001 | 147.00* | 1000 | 116.46 | 144.15 | 147.54 | 147.46 | 148.06 | 0.004885 | 3.42 | 43.27 | 41.29 | 0.70 |
| 001 | 137.00* | 2 | 26.58 | 144.03 | 145.78 | | 146.16 | 0.009440 | 2.72 | 9.77 | 9.21 | 0.84 |
| 001 | 137.00* | 20 | 49.78 | 144.03 | 146.29 | 146.20 | 146.84 | 0.010058 | 3.29 | 15.22 | 12.65 | 0.90 |
| 001 | 137.00* | 50 | 60.91 | 144.03 | 146.47 | 146.42 | 147.10 | 0.009820 | 3.54 | 17.63 | 14.26 | 0.91 |
| 001 | 137.00* | 100 | 70.80 | 144.03 | 146.62 | 146.60 | 147.31 | 0.009371 | 3.69 | 20.04 | 16.18 | 0.91 |
| 001 | 137.00* | 100 +5% | 74.34 | 144.03 | 146.69 | 146.67 | 147.37 | 0.009060 | 3.71 | 21.06 | 16.66 | 0.90 |
| 001 | 137.00* | 100 +25% | 88.50 | 144.03 | 146.85 | 146.82 | 147.63 | 0.009205 | 3.98 | 23.93 | 18.37 | 0.92 |
| 001 | 137.00* | 100 +70% | 120.36 | 144.03 | 147.47 | 147.47 | 148.03 | 0.005113 | 3.57 | 43.59 | 43.31 | 0.72 |
| 001 | 137.00* | 1000 | 116.46 | 144.03 | 147.42 | 147.42 | 147.99 | 0.005287 | 3.59 | 41.47 | 41.39 | 0.73 |
| 001 | 127.00* | 2 | 26.58 | 143.90 | 145.66 | 145.55 | 146.05 | 0.010520 | 2.78 | 9.56 | 9.50 | 0.89 |
| 001 | 127.00* | 20 | 49.78 | 143.90 | 146.16 | 146.09 | 146.74 | 0.010279 | 3.37 | 14.91 | 12.53 | 0.92 |
| 001 | 127.00* | 50 | 60.91 | 143.90 | 146.33 | 146.32 | 147.00 | 0.010382 | 3.65 | 17.15 | 14.44 | 0.94 |
| 001 | 127.00* | 100 | 70.80 | 143.90 | 146.50 | 146.50 | 147.21 | 0.009549 | 3.76 | 19.76 | 15.60 | 0.92 |
| 001 | 127.00* | 100 +5% | 74.34 | 143.90 | 146.57 | 146.57 | 147.28 | 0.009185 | 3.78 | 20.79 | 16.04 | 0.90 |
| 001 | 127.00* | 100 +25% | 88.50 | 143.90 | 146.73 | 146.73 | 147.54 | 0.009472 | 4.06 | 23.43 | 17.18 | 0.93 |
| 001 | 127.00* | 100 +70% | 120.36 | 143.90 | 147.21 | 147.39 | 147.96 | 0.007052 | 4.07 | 37.54 | 40.52 | 0.83 |
| 001 | 127.00* | 1000 | 116.46 | 143.90 | 147.19 | 147.36 | 147.92 | 0.006936 | 4.01 | 36.60 | 39.99 | 0.83 |
| 001 | 117.00* | 2 | 26.58 | 143.78 | 145.58 | | 145.95 | 0.009633 | 2.67 | 9.95 | 9.76 | 0.84 |
| 001 | 117.00* | 20 | 49.78 | 143.78 | 146.10 | 145.97 | 146.63 | 0.008806 | 3.25 | 15.72 | 13.58 | 0.85 |
| 001 | 117.00* | 50 | 60.91 | 143.78 | 146.28 | 146.21 | 146.89 | 0.008716 | 3.49 | 18.26 | 14.53 | 0.86 |
| 001 | 117.00* | 100 | 70.80 | 143.78 | 146.30 | 146.38 | 147.10 | 0.011197 | 3.99 | 18.60 | 14.66 | 0.98 |
| 001 | 117.00* | 100 +5% | 74.34 | 143.78 | 146.38 | 146.45 | 147.17 | 0.010557 | 3.99 | 19.69 | 15.09 | 0.96 |
| 001 | 117.00* | 100 +25% | 88.50 | 143.78 | 146.57 | 146.58 | 147.44 | 0.010173 | 4.20 | 22.80 | 17.71 | 0.96 |
| 001 | 117.00* | 100 +70% | 120.36 | 143.78 | 146.95 | 147.24 | 147.87 | 0.009125 | 4.48 | 33.53 | 37.18 | 0.94 |
| 001 | 117.00* | 1000 | 116.46 | 143.78 | 146.93 | 147.20 | 147.83 | 0.008996 | 4.41 | 32.65 | 36.64 | 0.93 |
| 001 | 107.00* | 2 | 26.58 | 143.66 | 145.53 | | 145.84 | 0.007385 | 2.47 | 10.81 | 10.09 | 0.74 |
| 001 | 107.00* | 20 | 49.78 | 143.66 | 146.09 | | 146.53 | 0.006649 | 2.99 | 17.49 | 13.91 | 0.74 |
| 001 | 107.00* | 50 | 60.91 | 143.66 | 146.27 | 146.08 | 146.78 | 0.006684 | 3.22 | 20.23 | 16.17 | 0.76 |
| 001 | 107.00* | 100 | 70.80 | 143.66 | 146.41 | 146.22 | 146.98 | 0.006961 | 3.44 | 23.08 | 26.34 | 0.78 |
| 001 | 107.00* | 100 +5% | 74.34 | 143.66 | 146.45 | 146.27 | 147.04 | 0.006990 | 3.50 | 24.32 | 28.52 | 0.79 |
| 001 | 107.00* | 100 +25% | 88.50 | 143.66 | 146.36 | 146.66 | 147.32 | 0.011994 | 4.45 | 21.87 | 24.17 | 1.02 |
| 001 | 107.00* | 100 +70% | 120.36 | 143.66 | 147.27 | 147.03 | 147.62 | 0.003244 | 3.00 | 55.01 | 46.79 | 0.57 |
| 001 | 107.00* | 1000 | 116.46 | 143.66 | 147.21 | 147.01 | 147.57 | 0.003413 | 3.03 | 52.34 | 45.83 | 0.58 |
| 001 | 97.00* | 2 | 26.58 | 143.54 | 145.52 | | 145.76 | 0.005215 | 2.21 | 12.31 | 11.92 | 0.62 |
| 001 | 97.00* | 20 | 49.78 | 143.54 | 146.11 | 145.70 | 146.44 | 0.004635 | 2.64 | 21.39 | 25.51 | 0.62 |
| 001 | 97.00* | 50 | 60.91 | 143.54 | 146.36 | | 146.67 | 0.003895 | 2.64 | 28.87 | 31.90 | 0.58 |
| 001 | 97.00* | 100 | 70.80 | 143.54 | 146.57 | | 146.84 | 0.003177 | 2.54 | 35.87 | 33.99 | 0.53 |
| 001 | 97.00* | 100 +5% | 74.34 | 143.54 | 146.64 | | 146.90 | 0.003018 | 2.52 | 38.20 | 35.21 | 0.52 |
| 001 | 97.00* | 100 +25% | 88.50 | 143.54 | 146.88 | 146.49 | 147.12 | 0.002548 | 2.47 | 47.71 | 42.22 | 0.49 |
| 001 | 97.00* | 100 +70% | 120.36 | 143.54 | 147.34 | | 147.55 | 0.001903 | 2.38 | 69.02 | 49.85 | 0.43 |
| 001 | 97.00* | 1000 | 116.46 | 143.54 | 147.29 | | 147.50 | 0.001960 | 2.39 | 66.45 | 49.10 | 0.44 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0087 | 2 | 26.58 | 143.42 | 145.52 | | 145.70 | 0.003502 | 1.92 | 14.59 | 12.44 | 0.50 |
| 001 | 0087 | 20 | 49.78 | 143.42 | 146.19 | | 146.36 | 0.002335 | 1.99 | 32.34 | 34.32 | 0.43 |
| 001 | 0087 | 50 | 60.91 | 143.42 | 146.45 | | 146.59 | 0.001889 | 1.92 | 41.33 | 36.74 | 0.39 |
| 001 | 0087 | 100 | 70.80 | 143.42 | 146.64 | | 146.78 | 0.001661 | 1.90 | 48.75 | 39.61 | 0.38 |
| 001 | 0087 | 100 +5% | 74.34 | 143.42 | 146.71 | | 146.84 | 0.001603 | 1.90 | 51.36 | 41.36 | 0.37 |
| 001 | 0087 | 100 +25% | 88.50 | 143.42 | 146.94 | | 147.07 | 0.001424 | 1.89 | 61.61 | 45.81 | 0.35 |
| 001 | 0087 | 100 +70% | 120.36 | 143.42 | 147.38 | | 147.51 | 0.001197 | 1.90 | 83.35 | 52.07 | 0.33 |
| 001 | 0087 | 1000 | 116.46 | 143.42 | 147.33 | | 147.46 | 0.001219 | 1.90 | 80.74 | 51.42 | 0.33 |
| 001 | 77.333* | 2 | 26.58 | 143.39 | 145.52 | | 145.66 | 0.002376 | 1.67 | 16.54 | 13.66 | 0.44 |
| 001 | 77.333* | 20 | 49.78 | 143.39 | 146.19 | | 146.33 | 0.001723 | 1.81 | 34.55 | 34.55 | 0.40 |
| 001 | 77.333* | 50 | 60.91 | 143.39 | 146.44 | | 146.57 | 0.001463 | 1.80 | 43.57 | 37.28 | 0.37 |
| 001 | 77.333* | 100 | 70.80 | 143.39 | 146.63 | | 146.76 | 0.001319 | 1.80 | 51.24 | 41.71 | 0.36 |
| 001 | 77.333* | 100 +5% | 74.34 | 143.39 | 146.70 | | 146.82 | 0.001278 | 1.80 | 54.00 | 43.33 | 0.35 |
| 001 | 77.333* | 100 +25% | 88.50 | 143.39 | 146.93 | | 147.05 | 0.001155 | 1.81 | 64.60 | 47.16 | 0.34 |
| 001 | 77.333* | 100 +70% | 120.36 | 143.39 | 147.37 | | 147.50 | 0.000997 | 1.85 | 86.93 | 53.37 | 0.33 |
| 001 | 77.333* | 1000 | 116.46 | 143.39 | 147.32 | | 147.45 | 0.001013 | 1.85 | 84.26 | 52.70 | 0.33 |
| 001 | 67.667* | 2 | 26.58 | 143.36 | 145.52 | | 145.63 | 0.001737 | 1.47 | 18.71 | 15.07 | 0.39 |
| 001 | 67.667* | 20 | 49.78 | 143.36 | 146.19 | | 146.31 | 0.001327 | 1.63 | 37.28 | 34.90 | 0.36 |
| 001 | 67.667* | 50 | 60.91 | 143.36 | 146.43 | | 146.55 | 0.001179 | 1.66 | 46.33 | 38.91 | 0.34 |
| 001 | 67.667* | 100 | 70.80 | 143.36 | 146.63 | | 146.74 | 0.001078 | 1.67 | 54.39 | 43.69 | 0.33 |
| 001 | 67.667* | 100 +5% | 74.34 | 143.36 | 146.69 | | 146.81 | 0.001048 | 1.67 | 57.26 | 44.78 | 0.33 |
| 001 | 67.667* | 100 +25% | 88.50 | 143.36 | 146.93 | | 147.04 | 0.000963 | 1.70 | 68.20 | 48.69 | 0.32 |
| 001 | 67.667* | 100 +70% | 120.36 | 143.36 | 147.37 | | 147.48 | 0.000852 | 1.76 | 91.15 | 54.86 | 0.31 |
| 001 | 67.667* | 1000 | 116.46 | 143.36 | 147.32 | | 147.43 | 0.000863 | 1.75 | 88.40 | 54.17 | 0.31 |
| 001 | 58.000* | 2 | 26.58 | 143.33 | 145.53 | | 145.61 | 0.001310 | 1.29 | 21.08 | 16.54 | 0.34 |
| 001 | 58.000* | 20 | 49.78 | 143.33 | 146.19 | | 146.29 | 0.001047 | 1.47 | 40.28 | 35.25 | 0.32 |
| 001 | 58.000* | 50 | 60.91 | 143.33 | 146.43 | | 146.53 | 0.000960 | 1.52 | 49.60 | 41.12 | 0.31 |
| 001 | 58.000* | 100 | 70.80 | 143.33 | 146.63 | | 146.73 | 0.000888 | 1.54 | 58.08 | 45.27 | 0.31 |
| 001 | 58.000* | 100 +5% | 74.34 | 143.33 | 146.69 | | 146.79 | 0.000870 | 1.55 | 60.98 | 46.35 | 0.30 |
| 001 | 58.000* | 100 +25% | 88.50 | 143.33 | 146.93 | | 147.03 | 0.000811 | 1.58 | 72.28 | 50.18 | 0.30 |
| 001 | 58.000* | 100 +70% | 120.36 | 143.33 | 147.37 | | 147.47 | 0.000734 | 1.65 | 95.91 | 56.54 | 0.29 |
| 001 | 58.000* | 1000 | 116.46 | 143.33 | 147.32 | | 147.42 | 0.000742 | 1.64 | 93.07 | 55.81 | 0.29 |
| 001 | 48.333* | 2 | 26.58 | 143.30 | 145.53 | | 145.59 | 0.001005 | 1.14 | 23.65 | 18.74 | 0.30 |
| 001 | 48.333* | 20 | 49.78 | 143.30 | 146.19 | | 146.28 | 0.000832 | 1.33 | 43.57 | 35.28 | 0.29 |
| 001 | 48.333* | 50 | 60.91 | 143.30 | 146.44 | | 146.52 | 0.000786 | 1.39 | 53.35 | 43.53 | 0.29 |
| 001 | 48.333* | 100 | 70.80 | 143.30 | 146.63 | | 146.72 | 0.000736 | 1.41 | 62.16 | 46.96 | 0.28 |
| 001 | 48.333* | 100 +5% | 74.34 | 143.30 | 146.69 | | 146.78 | 0.000724 | 1.42 | 65.17 | 48.07 | 0.28 |
| 001 | 48.333* | 100 +25% | 88.50 | 143.30 | 146.93 | | 147.02 | 0.000685 | 1.46 | 76.79 | 51.77 | 0.27 |
| 001 | 48.333* | 100 +70% | 120.36 | 143.30 | 147.37 | | 147.46 | 0.000633 | 1.55 | 101.22 | 58.42 | 0.27 |
| 001 | 48.333* | 1000 | 116.46 | 143.30 | 147.32 | | 147.41 | 0.000638 | 1.54 | 98.29 | 57.67 | 0.27 |
| 001 | 38.667* | 2 | 26.58 | 143.27 | 145.53 | | 145.58 | 0.000776 | 1.02 | 26.44 | 21.24 | 0.26 |
| 001 | 38.667* | 20 | 49.78 | 143.27 | 146.20 | | 146.26 | 0.000672 | 1.21 | 47.20 | 37.52 | 0.26 |
| 001 | 38.667* | 50 | 60.91 | 143.27 | 146.44 | | 146.51 | 0.000646 | 1.27 | 57.46 | 45.24 | 0.26 |
| 001 | 38.667* | 100 | 70.80 | 143.27 | 146.63 | | 146.71 | 0.000612 | 1.30 | 66.65 | 48.76 | 0.26 |
| 001 | 38.667* | 100 +5% | 74.34 | 143.27 | 146.70 | | 146.77 | 0.000604 | 1.31 | 69.76 | 49.88 | 0.26 |
| 001 | 38.667* | 100 +25% | 88.50 | 143.27 | 146.93 | | 147.01 | 0.000580 | 1.36 | 81.77 | 53.54 | 0.25 |
| 001 | 38.667* | 100 +70% | 120.36 | 143.27 | 147.37 | | 147.45 | 0.000545 | 1.45 | 107.04 | 60.36 | 0.25 |
| 001 | 38.667* | 1000 | 116.46 | 143.27 | 147.32 | | 147.40 | 0.000549 | 1.44 | 104.02 | 59.71 | 0.25 |
| 001 | 29.000* | 2 | 26.58 | 143.25 | 145.53 | | 145.57 | 0.000605 | 0.91 | 29.45 | 23.08 | 0.23 |
| 001 | 29.000* | 20 | 49.78 | 143.25 | 146.20 | | 146.25 | 0.000546 | 1.10 | 51.25 | 40.25 | 0.24 |
| 001 | 29.000* | 50 | 60.91 | 143.25 | 146.44 | | 146.50 | 0.000532 | 1.16 | 61.98 | 47.06 | 0.24 |
| 001 | 29.000* | 100 | 70.80 | 143.25 | 146.63 | | 146.70 | 0.000510 | 1.20 | 71.52 | 50.61 | 0.23 |
| 001 | 29.000* | 100 +5% | 74.34 | 143.25 | 146.70 | | 146.76 | 0.000505 | 1.21 | 74.76 | 51.66 | 0.23 |
| 001 | 29.000* | 100 +25% | 88.50 | 143.25 | 146.93 | | 147.00 | 0.000491 | 1.26 | 87.19 | 55.51 | 0.23 |
| 001 | 29.000* | 100 +70% | 120.36 | 143.25 | 147.37 | | 147.45 | 0.000470 | 1.35 | 113.37 | 62.26 | 0.23 |
| 001 | 29.000* | 1000 | 116.46 | 143.25 | 147.32 | | 147.40 | 0.000472 | 1.34 | 110.25 | 61.61 | 0.23 |
| 001 | 19.333* | 2 | 26.58 | 143.22 | 145.53 | | 145.56 | 0.000475 | 0.82 | 32.69 | 25.01 | 0.21 |
| 001 | 19.333* | 20 | 49.78 | 143.22 | 146.20 | | 146.25 | 0.000446 | 1.00 | 55.75 | 42.63 | 0.21 |
| 001 | 19.333* | 50 | 60.91 | 143.22 | 146.44 | | 146.49 | 0.000440 | 1.07 | 66.90 | 49.00 | 0.21 |
| 001 | 19.333* | 100 | 70.80 | 143.22 | 146.64 | | 146.69 | 0.000426 | 1.10 | 76.82 | 52.54 | 0.21 |
| 001 | 19.333* | 100 +5% | 74.34 | 143.22 | 146.70 | | 146.76 | 0.000424 | 1.12 | 80.17 | 53.65 | 0.21 |
| 001 | 19.333* | 100 +25% | 88.50 | 143.22 | 146.93 | | 146.99 | 0.000416 | 1.17 | 93.09 | 57.73 | 0.22 |
| 001 | 19.333* | 100 +70% | 120.36 | 143.22 | 147.38 | | 147.44 | 0.000404 | 1.26 | 120.21 | 64.23 | 0.22 |
| 001 | 19.333* | 1000 | 116.46 | 143.22 | 147.32 | | 147.39 | 0.000406 | 1.25 | 116.99 | 63.57 | 0.22 |
| 001 | 9.667* | 2 | 26.58 | 143.19 | 145.53 | | 145.56 | 0.000376 | 0.74 | 36.15 | 27.41 | 0.18 |
| 001 | 9.667* | 20 | 49.78 | 143.19 | 146.20 | | 146.24 | 0.000365 | 0.92 | 60.62 | 44.62 | 0.19 |
| 001 | 9.667* | 50 | 60.91 | 143.19 | 146.44 | | 146.49 | 0.000361 | 0.97 | 72.24 | 50.89 | 0.19 |
| 001 | 9.667* | 100 | 70.80 | 143.19 | 146.64 | | 146.69 | 0.000357 | 1.02 | 82.54 | 54.69 | 0.20 |
| 001 | 9.667* | 100 +5% | 74.34 | 143.19 | 146.70 | | 146.75 | 0.000356 | 1.03 | 86.03 | 55.87 | 0.20 |
| 001 | 9.667* | 100 +25% | 88.50 | 143.19 | 146.93 | | 146.98 | 0.000354 | 1.09 | 99.49 | 60.21 | 0.20 |
| 001 | 9.667* | 100 +70% | 120.36 | 143.19 | 147.38 | | 147.43 | 0.000348 | 1.18 | 127.57 | 66.26 | 0.20 |
| 001 | 9.667* | 1000 | 116.46 | 143.19 | 147.33 | | 147.38 | 0.000349 | 1.17 | 124.25 | 65.60 | 0.20 |
| 001 | 0000 | 2 | 26.58 | 143.16 | 145.53 | 144.23 | 145.55 | 0.000300 | 0.67 | 39.89 | 29.56 | 0.17 |
| 001 | 0000 | 20 | 49.78 | 143.16 | 146.20 | 144.55 | 146.24 | 0.000301 | 0.84 | 65.87 | 46.77 | 0.18 |
| 001 | 0000 | 50 | 60.91 | 143.16 | 146.44 | 144.67 | 146.48 | 0.000300 | 0.90 | 77.99 | 52.78 | 0.18 |
| 001 | 0000 | 100 | 70.80 | 143.16 | 146.64 | 144.77 | 146.68 | 0.000300 | 0.94 | 88.72 | 57.11 | 0.18 |

HEC-RAS Plan: Baseline River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0000 | 100 +5% | 74.34 | 143.16 | 146.70 | 144.81 | 146.74 | 0.000300 | 0.96 | 92.36 | 58.37 | 0.18 |
| 001 | 0000 | 100 +25% | 88.50 | 143.16 | 146.94 | 144.94 | 146.98 | 0.000300 | 1.01 | 106.43 | 62.50 | 0.18 |
| 001 | 0000 | 100 +70% | 120.36 | 143.16 | 147.38 | 145.22 | 147.43 | 0.000300 | 1.10 | 135.44 | 68.35 | 0.19 |
| 001 | 0000 | 1000 | 116.46 | 143.16 | 147.33 | 145.18 | 147.38 | 0.000300 | 1.09 | 132.01 | 67.68 | 0.19 |

APPENDIX 9 – HEC-RAS Model Results: Manning's n +20%

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0874 | 2 | 26.58 | 149.52 | 151.04 | 150.68 | 151.22 | 0.005279 | 1.98 | 14.88 | 15.25 | 0.55 |
| 001 | 0874 | 20 | 49.78 | 149.52 | 151.50 | 151.12 | 151.78 | 0.005679 | 2.50 | 23.40 | 22.69 | 0.60 |
| 001 | 0874 | 50 | 60.91 | 149.52 | 151.66 | 151.31 | 151.97 | 0.005952 | 2.71 | 27.14 | 25.07 | 0.62 |
| 001 | 0874 | 100 | 70.80 | 149.52 | 151.78 | 151.48 | 152.12 | 0.006159 | 2.87 | 30.26 | 26.17 | 0.64 |
| 001 | 0874 | 100 +5% | 74.34 | 149.52 | 151.82 | 151.53 | 152.18 | 0.006213 | 2.92 | 31.33 | 26.43 | 0.65 |
| 001 | 0874 | 100 +25% | 88.50 | 149.52 | 151.97 | 151.73 | 152.36 | 0.006389 | 3.11 | 35.43 | 27.19 | 0.66 |
| 001 | 0874 | 100 +70% | 120.36 | 149.52 | 152.26 | 152.04 | 152.73 | 0.006734 | 3.46 | 43.50 | 28.29 | 0.69 |
| 001 | 0874 | 1000 | 116.46 | 149.52 | 152.23 | 152.00 | 152.69 | 0.006691 | 3.42 | 42.58 | 28.17 | 0.69 |
| 001 | 864.00* | 2 | 26.58 | 149.47 | 150.98 | | 151.16 | 0.005279 | 1.97 | 14.88 | 15.61 | 0.55 |
| 001 | 864.00* | 20 | 49.78 | 149.47 | 151.44 | | 151.72 | 0.005597 | 2.48 | 23.55 | 23.18 | 0.60 |
| 001 | 864.00* | 50 | 60.91 | 149.47 | 151.60 | | 151.91 | 0.005867 | 2.69 | 27.33 | 25.67 | 0.62 |
| 001 | 864.00* | 100 | 70.80 | 149.47 | 151.72 | | 152.06 | 0.006067 | 2.84 | 30.46 | 26.56 | 0.64 |
| 001 | 864.00* | 100 +5% | 74.34 | 149.47 | 151.76 | | 152.11 | 0.006124 | 2.89 | 31.53 | 26.82 | 0.64 |
| 001 | 864.00* | 100 +25% | 88.50 | 149.47 | 151.91 | | 152.30 | 0.006312 | 3.08 | 35.62 | 27.61 | 0.66 |
| 001 | 864.00* | 100 +70% | 120.36 | 149.47 | 152.20 | | 152.67 | 0.006669 | 3.43 | 43.73 | 28.76 | 0.69 |
| 001 | 864.00* | 1000 | 116.46 | 149.47 | 152.16 | | 152.62 | 0.006624 | 3.39 | 42.81 | 28.64 | 0.69 |
| 001 | 854.00* | 2 | 26.58 | 149.41 | 150.93 | | 151.11 | 0.005307 | 1.96 | 14.85 | 15.96 | 0.55 |
| 001 | 854.00* | 20 | 49.78 | 149.41 | 151.39 | | 151.66 | 0.005533 | 2.46 | 23.69 | 23.69 | 0.59 |
| 001 | 854.00* | 50 | 60.91 | 149.41 | 151.54 | | 151.85 | 0.005824 | 2.67 | 27.49 | 26.15 | 0.62 |
| 001 | 854.00* | 100 | 70.80 | 149.41 | 151.66 | | 152.00 | 0.005994 | 2.82 | 30.64 | 26.98 | 0.63 |
| 001 | 854.00* | 100 +5% | 74.34 | 149.41 | 151.70 | | 152.05 | 0.006049 | 2.87 | 31.72 | 27.20 | 0.64 |
| 001 | 854.00* | 100 +25% | 88.50 | 149.41 | 151.85 | | 152.23 | 0.006247 | 3.05 | 35.82 | 28.02 | 0.66 |
| 001 | 854.00* | 100 +70% | 120.36 | 149.41 | 152.13 | | 152.60 | 0.006624 | 3.41 | 43.95 | 29.27 | 0.69 |
| 001 | 854.00* | 1000 | 116.46 | 149.41 | 152.10 | | 152.56 | 0.006578 | 3.37 | 43.02 | 29.14 | 0.69 |
| 001 | 844.00* | 2 | 26.58 | 149.35 | 150.87 | | 151.06 | 0.005362 | 1.96 | 14.79 | 16.29 | 0.56 |
| 001 | 844.00* | 20 | 49.78 | 149.35 | 151.33 | | 151.60 | 0.005488 | 2.44 | 23.81 | 24.24 | 0.59 |
| 001 | 844.00* | 50 | 60.91 | 149.35 | 151.49 | | 151.79 | 0.005770 | 2.64 | 27.64 | 26.56 | 0.62 |
| 001 | 844.00* | 100 | 70.80 | 149.35 | 151.60 | | 151.94 | 0.005943 | 2.79 | 30.81 | 27.38 | 0.63 |
| 001 | 844.00* | 100 +5% | 74.34 | 149.35 | 151.64 | | 151.99 | 0.006000 | 2.84 | 31.89 | 27.61 | 0.64 |
| 001 | 844.00* | 100 +25% | 88.50 | 149.35 | 151.79 | | 152.17 | 0.006207 | 3.03 | 35.99 | 28.46 | 0.65 |
| 001 | 844.00* | 100 +70% | 120.36 | 149.35 | 152.07 | | 152.53 | 0.006628 | 3.39 | 44.12 | 29.94 | 0.69 |
| 001 | 844.00* | 1000 | 116.46 | 149.35 | 152.04 | | 152.49 | 0.006570 | 3.35 | 43.20 | 29.74 | 0.69 |
| 001 | 834.00* | 2 | 26.58 | 149.29 | 150.82 | | 151.00 | 0.005449 | 1.96 | 14.67 | 16.60 | 0.56 |
| 001 | 834.00* | 20 | 49.78 | 149.29 | 151.28 | | 151.55 | 0.005466 | 2.42 | 23.89 | 24.82 | 0.59 |
| 001 | 834.00* | 50 | 60.91 | 149.29 | 151.43 | | 151.73 | 0.005741 | 2.62 | 27.77 | 27.00 | 0.61 |
| 001 | 834.00* | 100 | 70.80 | 149.29 | 151.54 | | 151.88 | 0.005915 | 2.77 | 30.95 | 27.81 | 0.63 |
| 001 | 834.00* | 100 +5% | 74.34 | 149.29 | 151.58 | | 151.93 | 0.005975 | 2.82 | 32.03 | 28.05 | 0.63 |
| 001 | 834.00* | 100 +25% | 88.50 | 149.29 | 151.73 | | 152.11 | 0.006192 | 3.01 | 36.13 | 28.95 | 0.65 |
| 001 | 834.00* | 100 +70% | 120.36 | 149.29 | 152.00 | | 152.46 | 0.006668 | 3.38 | 44.26 | 30.75 | 0.69 |
| 001 | 834.00* | 1000 | 116.46 | 149.29 | 151.97 | | 152.42 | 0.006609 | 3.33 | 43.33 | 30.54 | 0.69 |
| 001 | 824.00* | 2 | 26.58 | 149.23 | 150.76 | | 150.95 | 0.005554 | 1.96 | 14.52 | 16.88 | 0.56 |
| 001 | 824.00* | 20 | 49.78 | 149.23 | 151.23 | | 151.49 | 0.005463 | 2.40 | 23.95 | 25.44 | 0.59 |
| 001 | 824.00* | 50 | 60.91 | 149.23 | 151.37 | | 151.68 | 0.005732 | 2.60 | 27.87 | 27.51 | 0.61 |
| 001 | 824.00* | 100 | 70.80 | 149.23 | 151.49 | | 151.82 | 0.005909 | 2.75 | 31.06 | 28.29 | 0.63 |
| 001 | 824.00* | 100 +5% | 74.34 | 149.23 | 151.52 | | 151.87 | 0.005974 | 2.80 | 32.13 | 28.55 | 0.63 |
| 001 | 824.00* | 100 +25% | 88.50 | 149.23 | 151.67 | | 152.04 | 0.006204 | 2.99 | 36.24 | 29.50 | 0.65 |
| 001 | 824.00* | 100 +70% | 120.36 | 149.23 | 151.93 | | 152.40 | 0.006745 | 3.37 | 44.37 | 31.71 | 0.69 |
| 001 | 824.00* | 1000 | 116.46 | 149.23 | 151.90 | | 152.36 | 0.006666 | 3.32 | 43.46 | 31.40 | 0.69 |
| 001 | 814.00* | 2 | 26.58 | 149.18 | 150.70 | | 150.89 | 0.005657 | 1.95 | 14.34 | 16.97 | 0.57 |
| 001 | 814.00* | 20 | 49.78 | 149.18 | 151.17 | | 151.44 | 0.005482 | 2.39 | 23.97 | 26.13 | 0.59 |
| 001 | 814.00* | 50 | 60.91 | 149.18 | 151.32 | | 151.62 | 0.005744 | 2.59 | 27.93 | 27.99 | 0.61 |
| 001 | 814.00* | 100 | 70.80 | 149.18 | 151.43 | | 151.76 | 0.005933 | 2.74 | 31.12 | 28.84 | 0.63 |
| 001 | 814.00* | 100 +5% | 74.34 | 149.18 | 151.46 | | 151.81 | 0.006004 | 2.79 | 32.20 | 29.12 | 0.63 |
| 001 | 814.00* | 100 +25% | 88.50 | 149.18 | 151.60 | | 151.98 | 0.006275 | 2.98 | 36.28 | 30.34 | 0.65 |
| 001 | 814.00* | 100 +70% | 120.36 | 149.18 | 151.86 | | 152.33 | 0.006885 | 3.37 | 44.46 | 33.07 | 0.70 |
| 001 | 814.00* | 1000 | 116.46 | 149.18 | 151.83 | | 152.29 | 0.006820 | 3.33 | 43.50 | 32.80 | 0.69 |
| 001 | 804.00* | 2 | 26.58 | 149.12 | 150.64 | | 150.83 | 0.005747 | 1.95 | 14.14 | 16.83 | 0.57 |
| 001 | 804.00* | 20 | 49.78 | 149.12 | 151.11 | | 151.38 | 0.005612 | 2.40 | 23.85 | 26.78 | 0.59 |
| 001 | 804.00* | 50 | 60.91 | 149.12 | 151.26 | | 151.56 | 0.005782 | 2.58 | 27.95 | 28.56 | 0.61 |
| 001 | 804.00* | 100 | 70.80 | 149.12 | 151.37 | | 151.70 | 0.005996 | 2.73 | 31.13 | 29.53 | 0.63 |
| 001 | 804.00* | 100 +5% | 74.34 | 149.12 | 151.40 | | 151.74 | 0.006080 | 2.78 | 32.20 | 29.90 | 0.64 |
| 001 | 804.00* | 100 +25% | 88.50 | 149.12 | 151.54 | | 151.92 | 0.006371 | 2.98 | 36.32 | 31.34 | 0.66 |
| 001 | 804.00* | 100 +70% | 120.36 | 149.12 | 151.79 | | 152.26 | 0.006969 | 3.36 | 44.68 | 34.29 | 0.70 |
| 001 | 804.00* | 1000 | 116.46 | 149.12 | 151.76 | | 152.22 | 0.006903 | 3.32 | 43.71 | 34.00 | 0.70 |
| 001 | 794.00* | 2 | 26.58 | 149.06 | 150.59 | | 150.77 | 0.005789 | 1.93 | 13.97 | 15.70 | 0.57 |
| 001 | 794.00* | 20 | 49.78 | 149.06 | 151.05 | | 151.32 | 0.005672 | 2.39 | 23.77 | 27.17 | 0.60 |
| 001 | 794.00* | 50 | 60.91 | 149.06 | 151.20 | | 151.50 | 0.005863 | 2.57 | 27.90 | 29.32 | 0.61 |
| 001 | 794.00* | 100 | 70.80 | 149.06 | 151.30 | | 151.64 | 0.006127 | 2.73 | 31.06 | 30.75 | 0.63 |
| 001 | 794.00* | 100 +5% | 74.34 | 149.06 | 151.34 | | 151.68 | 0.006210 | 2.78 | 32.15 | 31.11 | 0.64 |
| 001 | 794.00* | 100 +25% | 88.50 | 149.06 | 151.47 | | 151.86 | 0.006508 | 2.98 | 36.37 | 32.80 | 0.66 |
| 001 | 794.00* | 100 +70% | 120.36 | 149.06 | 151.72 | | 152.19 | 0.007108 | 3.36 | 44.90 | 36.01 | 0.71 |
| 001 | 794.00* | 1000 | 116.46 | 149.06 | 151.69 | | 152.15 | 0.007022 | 3.31 | 43.94 | 35.56 | 0.70 |
| 001 | 784.00* | 2 | 26.58 | 149.00 | 150.53 | | 150.72 | 0.005771 | 1.91 | 14.00 | 13.41 | 0.57 |
| 001 | 784.00* | 20 | 49.78 | 149.00 | 150.99 | | 151.27 | 0.005770 | 2.39 | 23.62 | 27.74 | 0.60 |
| 001 | 784.00* | 50 | 60.91 | 149.00 | 151.13 | | 151.44 | 0.006002 | 2.57 | 27.80 | 30.80 | 0.62 |
| 001 | 784.00* | 100 | 70.80 | 149.00 | 151.24 | | 151.58 | 0.006252 | 2.73 | 31.07 | 32.14 | 0.64 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 784.00* | 100 +5% | 74.34 | 149.00 | 151.27 | | 151.62 | 0.006341 | 2.78 | 32.18 | 32.59 | 0.65 |
| 001 | 784.00* | 100 +25% | 88.50 | 149.00 | 151.40 | | 151.79 | 0.006604 | 2.97 | 36.55 | 34.21 | 0.67 |
| 001 | 784.00* | 100 +70% | 120.36 | 149.00 | 151.65 | 151.51 | 152.12 | 0.007264 | 3.36 | 45.42 | 39.14 | 0.71 |
| 001 | 784.00* | 1000 | 116.46 | 149.00 | 151.62 | 151.47 | 152.08 | 0.007206 | 3.32 | 44.34 | 38.62 | 0.71 |
| 001 | 0774 | 2 | 26.58 | 148.95 | 150.48 | | 150.66 | 0.005743 | 1.88 | 14.16 | 13.33 | 0.56 |
| 001 | 0774 | 20 | 49.78 | 148.95 | 150.94 | | 151.21 | 0.005790 | 2.37 | 23.56 | 29.40 | 0.60 |
| 001 | 0774 | 50 | 60.91 | 148.95 | 151.07 | | 151.38 | 0.006090 | 2.57 | 27.85 | 32.33 | 0.62 |
| 001 | 0774 | 100 | 70.80 | 148.95 | 151.18 | | 151.51 | 0.006330 | 2.72 | 31.24 | 33.72 | 0.64 |
| 001 | 0774 | 100 +5% | 74.34 | 148.95 | 151.21 | 151.06 | 151.56 | 0.006417 | 2.77 | 32.38 | 34.18 | 0.65 |
| 001 | 0774 | 100 +25% | 88.50 | 148.95 | 151.33 | 151.17 | 151.72 | 0.006867 | 2.99 | 36.74 | 38.28 | 0.68 |
| 001 | 0774 | 100 +70% | 120.36 | 148.95 | 151.58 | 151.49 | 152.04 | 0.007178 | 3.31 | 47.29 | 45.42 | 0.71 |
| 001 | 0774 | 1000 | 116.46 | 148.95 | 151.55 | 151.45 | 152.00 | 0.007165 | 3.28 | 45.99 | 44.63 | 0.70 |
| 001 | 764.58* | 2 | 26.58 | 148.88 | 150.41 | | 150.60 | 0.005911 | 1.91 | 13.97 | 13.07 | 0.57 |
| 001 | 764.58* | 20 | 49.78 | 148.88 | 150.87 | | 151.15 | 0.005890 | 2.39 | 23.56 | 29.98 | 0.60 |
| 001 | 764.58* | 50 | 60.91 | 148.88 | 151.01 | 150.76 | 151.32 | 0.006172 | 2.58 | 27.90 | 32.96 | 0.63 |
| 001 | 764.58* | 100 | 70.80 | 148.88 | 151.11 | 150.96 | 151.45 | 0.006403 | 2.73 | 31.32 | 34.34 | 0.64 |
| 001 | 764.58* | 100 +5% | 74.34 | 148.88 | 151.15 | 151.00 | 151.49 | 0.006488 | 2.78 | 32.47 | 34.79 | 0.65 |
| 001 | 764.58* | 100 +25% | 88.50 | 148.88 | 151.27 | 151.13 | 151.66 | 0.006854 | 2.98 | 36.84 | 37.31 | 0.68 |
| 001 | 764.58* | 100 +70% | 120.36 | 148.88 | 151.51 | 151.41 | 151.97 | 0.007274 | 3.32 | 46.70 | 42.95 | 0.71 |
| 001 | 764.58* | 1000 | 116.46 | 148.88 | 151.48 | 151.38 | 151.93 | 0.007248 | 3.29 | 45.50 | 42.38 | 0.71 |
| 001 | 755.17* | 2 | 26.58 | 148.81 | 150.35 | | 150.54 | 0.006082 | 1.93 | 13.79 | 12.83 | 0.58 |
| 001 | 755.17* | 20 | 49.78 | 148.81 | 150.81 | 150.43 | 151.09 | 0.006014 | 2.41 | 23.59 | 30.78 | 0.61 |
| 001 | 755.17* | 50 | 60.91 | 148.81 | 150.95 | 150.72 | 151.26 | 0.006246 | 2.60 | 27.97 | 33.61 | 0.63 |
| 001 | 755.17* | 100 | 70.80 | 148.81 | 151.05 | 150.91 | 151.39 | 0.006466 | 2.74 | 31.43 | 35.00 | 0.65 |
| 001 | 755.17* | 100 +5% | 74.34 | 148.81 | 151.08 | 150.95 | 151.43 | 0.006550 | 2.79 | 32.60 | 35.46 | 0.65 |
| 001 | 755.17* | 100 +25% | 88.50 | 148.81 | 151.20 | 151.08 | 151.59 | 0.006862 | 2.98 | 37.03 | 37.40 | 0.68 |
| 001 | 755.17* | 100 +70% | 120.36 | 148.81 | 151.44 | 151.34 | 151.90 | 0.007317 | 3.33 | 46.61 | 42.15 | 0.71 |
| 001 | 755.17* | 1000 | 116.46 | 148.81 | 151.42 | 151.31 | 151.86 | 0.007278 | 3.29 | 45.46 | 41.61 | 0.71 |
| 001 | 745.75* | 2 | 26.58 | 148.74 | 150.29 | | 150.48 | 0.006256 | 1.95 | 13.61 | 12.57 | 0.59 |
| 001 | 745.75* | 20 | 49.78 | 148.74 | 150.75 | 150.37 | 151.03 | 0.006090 | 2.43 | 23.62 | 31.28 | 0.61 |
| 001 | 745.75* | 50 | 60.91 | 148.74 | 150.88 | 150.68 | 151.20 | 0.006319 | 2.61 | 28.03 | 34.30 | 0.63 |
| 001 | 745.75* | 100 | 70.80 | 148.74 | 150.98 | 150.86 | 151.32 | 0.006528 | 2.75 | 31.55 | 35.71 | 0.65 |
| 001 | 745.75* | 100 +5% | 74.34 | 148.74 | 151.02 | 150.89 | 151.37 | 0.006609 | 2.80 | 32.72 | 36.17 | 0.66 |
| 001 | 745.75* | 100 +25% | 88.50 | 148.74 | 151.14 | 151.04 | 151.52 | 0.006873 | 2.98 | 37.25 | 37.82 | 0.68 |
| 001 | 745.75* | 100 +70% | 120.36 | 148.74 | 151.38 | 151.28 | 151.83 | 0.007314 | 3.32 | 46.76 | 41.91 | 0.71 |
| 001 | 745.75* | 1000 | 116.46 | 148.74 | 151.35 | 151.25 | 151.79 | 0.007275 | 3.28 | 45.63 | 41.46 | 0.71 |
| 001 | 736.33* | 2 | 26.58 | 148.68 | 150.22 | | 150.42 | 0.006435 | 1.98 | 13.45 | 12.30 | 0.60 |
| 001 | 736.33* | 20 | 49.78 | 148.68 | 150.69 | 150.31 | 150.97 | 0.006156 | 2.44 | 23.66 | 31.73 | 0.62 |
| 001 | 736.33* | 50 | 60.91 | 148.68 | 150.82 | 150.64 | 151.14 | 0.006391 | 2.62 | 28.10 | 35.03 | 0.64 |
| 001 | 736.33* | 100 | 70.80 | 148.68 | 150.92 | 150.80 | 151.26 | 0.006584 | 2.76 | 31.68 | 36.48 | 0.65 |
| 001 | 736.33* | 100 +5% | 74.34 | 148.68 | 150.95 | 150.84 | 151.30 | 0.006662 | 2.81 | 32.87 | 36.94 | 0.66 |
| 001 | 736.33* | 100 +25% | 88.50 | 148.68 | 151.08 | 150.98 | 151.46 | 0.006897 | 2.99 | 37.49 | 38.57 | 0.68 |
| 001 | 736.33* | 100 +70% | 120.36 | 148.68 | 151.31 | 151.22 | 151.76 | 0.007303 | 3.31 | 47.04 | 42.20 | 0.71 |
| 001 | 736.33* | 1000 | 116.46 | 148.68 | 151.29 | 151.19 | 151.72 | 0.007267 | 3.28 | 45.91 | 41.80 | 0.71 |
| 001 | 726.92* | 2 | 26.58 | 148.61 | 150.15 | | 150.36 | 0.006600 | 2.00 | 13.29 | 12.06 | 0.60 |
| 001 | 726.92* | 20 | 49.78 | 148.61 | 150.63 | 150.23 | 150.91 | 0.006217 | 2.45 | 23.70 | 32.48 | 0.62 |
| 001 | 726.92* | 50 | 60.91 | 148.61 | 150.76 | 150.61 | 151.07 | 0.006445 | 2.63 | 28.20 | 35.77 | 0.64 |
| 001 | 726.92* | 100 | 70.80 | 148.61 | 150.86 | 150.75 | 151.20 | 0.006622 | 2.77 | 31.84 | 37.29 | 0.66 |
| 001 | 726.92* | 100 +5% | 74.34 | 148.61 | 150.89 | 150.79 | 151.24 | 0.006693 | 2.82 | 33.06 | 37.75 | 0.66 |
| 001 | 726.92* | 100 +25% | 88.50 | 148.61 | 151.01 | 150.92 | 151.39 | 0.006901 | 2.99 | 37.77 | 39.38 | 0.68 |
| 001 | 726.92* | 100 +70% | 120.36 | 148.61 | 151.25 | 151.15 | 151.68 | 0.007276 | 3.30 | 47.42 | 42.78 | 0.71 |
| 001 | 726.92* | 1000 | 116.46 | 148.61 | 151.22 | 151.12 | 151.65 | 0.007245 | 3.27 | 46.28 | 42.42 | 0.71 |
| 001 | 717.50* | 2 | 26.58 | 148.54 | 150.09 | | 150.30 | 0.006760 | 2.02 | 13.14 | 11.82 | 0.61 |
| 001 | 717.50* | 20 | 49.78 | 148.54 | 150.56 | 150.19 | 150.85 | 0.006275 | 2.46 | 23.74 | 33.31 | 0.62 |
| 001 | 717.50* | 50 | 60.91 | 148.54 | 150.69 | 150.57 | 151.01 | 0.006476 | 2.64 | 28.32 | 36.44 | 0.64 |
| 001 | 717.50* | 100 | 70.80 | 148.54 | 150.79 | 150.69 | 151.13 | 0.006646 | 2.78 | 32.03 | 38.16 | 0.66 |
| 001 | 717.50* | 100 +5% | 74.34 | 148.54 | 150.83 | 150.73 | 151.17 | 0.006706 | 2.82 | 33.28 | 38.59 | 0.66 |
| 001 | 717.50* | 100 +25% | 88.50 | 148.54 | 150.95 | 150.86 | 151.32 | 0.006888 | 2.98 | 38.10 | 40.23 | 0.68 |
| 001 | 717.50* | 100 +70% | 120.36 | 148.54 | 151.18 | 151.10 | 151.61 | 0.007237 | 3.29 | 47.87 | 43.55 | 0.71 |
| 001 | 717.50* | 1000 | 116.46 | 148.54 | 151.15 | 151.07 | 151.58 | 0.007212 | 3.26 | 46.71 | 43.21 | 0.70 |
| 001 | 708.08* | 2 | 26.58 | 148.48 | 150.02 | | 150.23 | 0.006907 | 2.04 | 13.00 | 11.61 | 0.62 |
| 001 | 708.08* | 20 | 49.78 | 148.48 | 150.50 | 150.13 | 150.79 | 0.006341 | 2.48 | 23.75 | 34.15 | 0.63 |
| 001 | 708.08* | 50 | 60.91 | 148.48 | 150.63 | 150.52 | 150.95 | 0.006511 | 2.65 | 28.44 | 37.17 | 0.64 |
| 001 | 708.08* | 100 | 70.80 | 148.48 | 150.73 | 150.64 | 151.07 | 0.006670 | 2.78 | 32.22 | 39.03 | 0.66 |
| 001 | 708.08* | 100 +5% | 74.34 | 148.48 | 150.76 | 150.68 | 151.11 | 0.006720 | 2.82 | 33.50 | 39.48 | 0.66 |
| 001 | 708.08* | 100 +25% | 88.50 | 148.48 | 150.88 | 150.81 | 151.25 | 0.006866 | 2.98 | 38.44 | 41.13 | 0.68 |
| 001 | 708.08* | 100 +70% | 120.36 | 148.48 | 151.12 | 151.04 | 151.54 | 0.007172 | 3.28 | 48.41 | 44.41 | 0.70 |
| 001 | 708.08* | 1000 | 116.46 | 148.48 | 151.09 | 151.01 | 151.51 | 0.007145 | 3.25 | 47.23 | 44.01 | 0.70 |
| 001 | 698.67* | 2 | 26.58 | 148.41 | 149.95 | | 150.17 | 0.007024 | 2.06 | 12.89 | 11.48 | 0.62 |
| 001 | 698.67* | 20 | 49.78 | 148.41 | 150.43 | 150.07 | 150.73 | 0.006395 | 2.49 | 23.77 | 35.02 | 0.63 |
| 001 | 698.67* | 50 | 60.91 | 148.41 | 150.57 | 150.46 | 150.88 | 0.006530 | 2.65 | 28.58 | 38.01 | 0.64 |
| 001 | 698.67* | 100 | 70.80 | 148.41 | 150.66 | 150.58 | 151.00 | 0.006665 | 2.78 | 32.46 | 39.93 | 0.66 |
| 001 | 698.67* | 100 +5% | 74.34 | 148.41 | 150.70 | 150.62 | 151.04 | 0.006706 | 2.82 | 33.77 | 40.40 | 0.66 |
| 001 | 698.67* | 100 +25% | 88.50 | 148.41 | 150.82 | 150.74 | 151.19 | 0.006815 | 2.97 | 38.85 | 42.08 | 0.67 |
| 001 | 698.67* | 100 +70% | 120.36 | 148.41 | 151.05 | 150.98 | 151.47 | 0.007059 | 3.26 | 49.06 | 45.27 | 0.70 |
| 001 | 698.67* | 1000 | 116.46 | 148.41 | 151.03 | 150.95 | 151.44 | 0.007040 | 3.23 | 47.86 | 44.89 | 0.70 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 689.25* | 2 | 26.58 | 148.34 | 149.88 | | 150.10 | 0.007118 | 2.08 | 12.78 | 11.34 | 0.63 |
| 001 | 689.25* | 20 | 49.78 | 148.34 | 150.37 | 150.01 | 150.67 | 0.006437 | 2.50 | 23.79 | 35.91 | 0.63 |
| 001 | 689.25* | 50 | 60.91 | 148.34 | 150.50 | 150.40 | 150.82 | 0.006533 | 2.66 | 28.75 | 38.95 | 0.64 |
| 001 | 689.25* | 100 | 70.80 | 148.34 | 150.60 | 150.52 | 150.94 | 0.006629 | 2.78 | 32.76 | 40.85 | 0.65 |
| 001 | 689.25* | 100 +5% | 74.34 | 148.34 | 150.64 | 150.56 | 150.98 | 0.006662 | 2.82 | 34.11 | 41.36 | 0.66 |
| 001 | 689.25* | 100 +25% | 88.50 | 148.34 | 150.76 | 150.67 | 151.12 | 0.006736 | 2.96 | 39.34 | 43.08 | 0.67 |
| 001 | 689.25* | 100 +70% | 120.36 | 148.34 | 150.99 | 150.92 | 151.40 | 0.006919 | 3.23 | 49.83 | 46.26 | 0.69 |
| 001 | 689.25* | 1000 | 116.46 | 148.34 | 150.97 | 150.89 | 151.37 | 0.006911 | 3.20 | 48.58 | 45.91 | 0.69 |
| 001 | 679.83* | 2 | 26.58 | 148.28 | 149.81 | | 150.03 | 0.007175 | 2.09 | 12.71 | 11.21 | 0.63 |
| 001 | 679.83* | 20 | 49.78 | 148.28 | 150.30 | 149.94 | 150.60 | 0.006474 | 2.51 | 23.80 | 36.80 | 0.63 |
| 001 | 679.83* | 50 | 60.91 | 148.28 | 150.44 | 150.35 | 150.76 | 0.006529 | 2.66 | 28.94 | 39.98 | 0.64 |
| 001 | 679.83* | 100 | 70.80 | 148.28 | 150.54 | 150.47 | 150.87 | 0.006567 | 2.77 | 33.10 | 41.79 | 0.65 |
| 001 | 679.83* | 100 +5% | 74.34 | 148.28 | 150.57 | 150.50 | 150.91 | 0.006591 | 2.81 | 34.50 | 42.33 | 0.65 |
| 001 | 679.83* | 100 +25% | 88.50 | 148.28 | 150.70 | 150.61 | 151.05 | 0.006629 | 2.94 | 39.90 | 44.12 | 0.66 |
| 001 | 679.83* | 100 +70% | 120.36 | 148.28 | 150.93 | 150.84 | 151.33 | 0.006756 | 3.20 | 50.70 | 47.36 | 0.68 |
| 001 | 679.83* | 1000 | 116.46 | 148.28 | 150.91 | 150.82 | 151.29 | 0.006754 | 3.17 | 49.41 | 46.99 | 0.68 |
| 001 | 670.42* | 2 | 26.58 | 148.21 | 149.74 | | 149.97 | 0.007191 | 2.10 | 12.66 | 11.08 | 0.63 |
| 001 | 670.42* | 20 | 49.78 | 148.21 | 150.24 | 149.87 | 150.54 | 0.006501 | 2.52 | 23.81 | 37.70 | 0.63 |
| 001 | 670.42* | 50 | 60.91 | 148.21 | 150.37 | 150.30 | 150.69 | 0.006512 | 2.66 | 29.14 | 41.13 | 0.64 |
| 001 | 670.42* | 100 | 70.80 | 148.21 | 150.48 | 150.40 | 150.81 | 0.006477 | 2.76 | 33.52 | 42.82 | 0.64 |
| 001 | 670.42* | 100 +5% | 74.34 | 148.21 | 150.51 | 150.44 | 150.84 | 0.006490 | 2.79 | 34.96 | 43.35 | 0.65 |
| 001 | 670.42* | 100 +25% | 88.50 | 148.21 | 150.64 | 150.57 | 150.98 | 0.006489 | 2.92 | 40.55 | 45.24 | 0.65 |
| 001 | 670.42* | 100 +70% | 120.36 | 148.21 | 150.88 | 150.79 | 151.25 | 0.006560 | 3.16 | 51.70 | 48.55 | 0.67 |
| 001 | 670.42* | 1000 | 116.46 | 148.21 | 150.85 | 150.76 | 151.22 | 0.006565 | 3.13 | 50.36 | 48.17 | 0.67 |
| 001 | 0661 | 2 | 26.58 | 148.14 | 149.67 | | 149.90 | 0.007137 | 2.10 | 12.65 | 10.95 | 0.62 |
| 001 | 0661 | 20 | 49.78 | 148.14 | 150.18 | 149.80 | 150.48 | 0.006502 | 2.53 | 23.85 | 38.63 | 0.63 |
| 001 | 0661 | 50 | 60.91 | 148.14 | 150.31 | 150.24 | 150.63 | 0.006446 | 2.65 | 29.43 | 42.21 | 0.64 |
| 001 | 0661 | 100 | 70.80 | 148.14 | 150.42 | 150.34 | 150.74 | 0.006344 | 2.74 | 34.04 | 43.91 | 0.64 |
| 001 | 0661 | 100 +5% | 74.34 | 148.14 | 150.45 | 150.39 | 150.78 | 0.006346 | 2.77 | 35.53 | 44.44 | 0.64 |
| 001 | 0661 | 100 +25% | 88.50 | 148.14 | 150.58 | 150.52 | 150.92 | 0.006305 | 2.88 | 41.33 | 46.40 | 0.64 |
| 001 | 0661 | 100 +70% | 120.36 | 148.14 | 150.83 | 150.74 | 151.19 | 0.006257 | 3.10 | 53.09 | 49.89 | 0.65 |
| 001 | 0661 | 1000 | 116.46 | 148.14 | 150.80 | 150.71 | 151.15 | 0.006268 | 3.07 | 51.70 | 49.49 | 0.65 |
| 001 | 651.60* | 2 | 26.58 | 148.06 | 149.61 | | 149.83 | 0.007007 | 2.09 | 12.69 | 10.88 | 0.62 |
| 001 | 651.60* | 20 | 49.78 | 148.06 | 150.10 | 149.73 | 150.41 | 0.006579 | 2.55 | 23.58 | 38.22 | 0.63 |
| 001 | 651.60* | 50 | 60.91 | 148.06 | 150.24 | 150.18 | 150.56 | 0.006527 | 2.68 | 29.08 | 41.30 | 0.64 |
| 001 | 651.60* | 100 | 70.80 | 148.06 | 150.34 | 150.27 | 150.67 | 0.006454 | 2.77 | 33.57 | 42.99 | 0.64 |
| 001 | 651.60* | 100 +5% | 74.34 | 148.06 | 150.38 | 150.33 | 150.71 | 0.006472 | 2.80 | 35.00 | 43.51 | 0.65 |
| 001 | 651.60* | 100 +25% | 88.50 | 148.06 | 150.50 | 150.42 | 150.85 | 0.006482 | 2.93 | 40.61 | 45.52 | 0.65 |
| 001 | 651.60* | 100 +70% | 120.36 | 148.06 | 150.75 | 150.66 | 151.12 | 0.006488 | 3.15 | 52.08 | 49.18 | 0.67 |
| 001 | 651.60* | 1000 | 116.46 | 148.06 | 150.72 | 150.63 | 151.09 | 0.006498 | 3.13 | 50.71 | 48.77 | 0.66 |
| 001 | 642.20* | 2 | 26.58 | 147.98 | 149.54 | | 149.76 | 0.006904 | 2.09 | 12.72 | 10.83 | 0.61 |
| 001 | 642.20* | 20 | 49.78 | 147.98 | 150.03 | 149.66 | 150.34 | 0.006653 | 2.56 | 23.39 | 37.70 | 0.64 |
| 001 | 642.20* | 50 | 60.91 | 147.98 | 150.16 | 150.10 | 150.49 | 0.006624 | 2.70 | 28.79 | 40.64 | 0.64 |
| 001 | 642.20* | 100 | 70.80 | 147.98 | 150.27 | 150.20 | 150.60 | 0.006566 | 2.79 | 33.19 | 42.29 | 0.65 |
| 001 | 642.20* | 100 +5% | 74.34 | 147.98 | 150.30 | 150.23 | 150.64 | 0.006602 | 2.83 | 34.57 | 42.81 | 0.65 |
| 001 | 642.20* | 100 +25% | 88.50 | 147.98 | 150.43 | 150.38 | 150.78 | 0.006652 | 2.96 | 40.02 | 44.82 | 0.66 |
| 001 | 642.20* | 100 +70% | 120.36 | 147.98 | 150.67 | 150.57 | 151.06 | 0.006703 | 3.20 | 51.25 | 48.56 | 0.68 |
| 001 | 642.20* | 1000 | 116.46 | 147.98 | 150.64 | 150.54 | 151.02 | 0.006719 | 3.18 | 49.89 | 48.17 | 0.68 |
| 001 | 632.80* | 2 | 26.58 | 147.89 | 149.47 | | 149.70 | 0.006790 | 2.09 | 12.74 | 10.94 | 0.61 |
| 001 | 632.80* | 20 | 49.78 | 147.89 | 149.95 | 149.59 | 150.27 | 0.006740 | 2.58 | 23.25 | 37.46 | 0.64 |
| 001 | 632.80* | 50 | 60.91 | 147.89 | 150.09 | 150.03 | 150.42 | 0.006766 | 2.72 | 28.48 | 40.20 | 0.65 |
| 001 | 632.80* | 100 | 70.80 | 147.89 | 150.19 | 150.13 | 150.53 | 0.006701 | 2.81 | 32.85 | 41.85 | 0.65 |
| 001 | 632.80* | 100 +5% | 74.34 | 147.89 | 150.23 | 150.19 | 150.57 | 0.006749 | 2.86 | 34.20 | 42.33 | 0.66 |
| 001 | 632.80* | 100 +25% | 88.50 | 147.89 | 150.35 | 150.29 | 150.71 | 0.006835 | 3.00 | 39.52 | 44.39 | 0.67 |
| 001 | 632.80* | 100 +70% | 120.36 | 147.89 | 150.59 | 150.51 | 150.99 | 0.006886 | 3.24 | 50.60 | 47.96 | 0.68 |
| 001 | 632.80* | 1000 | 116.46 | 147.89 | 150.56 | 150.49 | 150.96 | 0.006902 | 3.21 | 49.25 | 47.55 | 0.68 |
| 001 | 623.40* | 2 | 26.58 | 147.81 | 149.41 | | 149.63 | 0.006704 | 2.09 | 12.76 | 11.00 | 0.61 |
| 001 | 623.40* | 20 | 49.78 | 147.81 | 149.89 | 149.52 | 150.20 | 0.006701 | 2.57 | 23.38 | 37.25 | 0.64 |
| 001 | 623.40* | 50 | 60.91 | 147.81 | 150.01 | 149.97 | 150.35 | 0.006917 | 2.74 | 28.21 | 39.80 | 0.66 |
| 001 | 623.40* | 100 | 70.80 | 147.81 | 150.12 | 150.06 | 150.47 | 0.006869 | 2.84 | 32.55 | 41.76 | 0.66 |
| 001 | 623.40* | 100 +5% | 74.34 | 147.81 | 150.15 | 150.11 | 150.50 | 0.006928 | 2.89 | 33.86 | 42.26 | 0.67 |
| 001 | 623.40* | 100 +25% | 88.50 | 147.81 | 150.27 | 150.21 | 150.64 | 0.006982 | 3.02 | 39.20 | 44.10 | 0.68 |
| 001 | 623.40* | 100 +70% | 120.36 | 147.81 | 150.51 | 150.45 | 150.92 | 0.007022 | 3.26 | 50.17 | 47.45 | 0.69 |
| 001 | 623.40* | 1000 | 116.46 | 147.81 | 150.48 | 150.42 | 150.88 | 0.007041 | 3.24 | 48.82 | 47.05 | 0.69 |
| 001 | 614.00* | 2 | 26.58 | 147.73 | 149.34 | | 149.57 | 0.006639 | 2.09 | 12.78 | 11.04 | 0.60 |
| 001 | 614.00* | 20 | 49.78 | 147.73 | 149.82 | 149.45 | 150.13 | 0.006650 | 2.56 | 23.59 | 37.36 | 0.64 |
| 001 | 614.00* | 50 | 60.91 | 147.73 | 149.94 | 149.90 | 150.28 | 0.007074 | 2.76 | 28.02 | 39.76 | 0.66 |
| 001 | 614.00* | 100 | 70.80 | 147.73 | 150.04 | 150.00 | 150.39 | 0.007023 | 2.86 | 32.37 | 41.97 | 0.67 |
| 001 | 614.00* | 100 +5% | 74.34 | 147.73 | 150.07 | 150.03 | 150.43 | 0.007076 | 2.91 | 33.69 | 42.39 | 0.67 |
| 001 | 614.00* | 100 +25% | 88.50 | 147.73 | 150.20 | 150.14 | 150.57 | 0.007061 | 3.03 | 39.10 | 43.92 | 0.68 |
| 001 | 614.00* | 100 +70% | 120.36 | 147.73 | 150.44 | 150.38 | 150.84 | 0.007091 | 3.27 | 50.00 | 47.10 | 0.69 |
| 001 | 614.00* | 1000 | 116.46 | 147.73 | 150.41 | 150.35 | 150.81 | 0.007114 | 3.25 | 48.66 | 46.71 | 0.69 |
| 001 | 604.60* | 2 | 26.58 | 147.65 | 149.28 | | 149.50 | 0.006609 | 2.09 | 12.77 | 11.04 | 0.60 |
| 001 | 604.60* | 20 | 49.78 | 147.65 | 149.75 | 149.41 | 150.06 | 0.006768 | 2.58 | 23.56 | 37.71 | 0.64 |
| 001 | 604.60* | 50 | 60.91 | 147.65 | 149.86 | 149.82 | 150.21 | 0.007289 | 2.79 | 27.84 | 40.20 | 0.67 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 604.60* | 100 | 70.80 | 147.65 | 149.97 | 149.92 | 150.32 | 0.007082 | 2.86 | 32.40 | 41.81 | 0.67 |
| 001 | 604.60* | 100 +5% | 74.34 | 147.65 | 150.01 | 149.96 | 150.36 | 0.006982 | 2.88 | 34.04 | 42.36 | 0.67 |
| 001 | 604.60* | 100 +25% | 88.50 | 147.65 | 150.14 | | 150.50 | 0.006871 | 2.99 | 39.70 | 44.05 | 0.67 |
| 001 | 604.60* | 100 +70% | 120.36 | 147.65 | 150.39 | | 150.77 | 0.006628 | 3.18 | 51.35 | 46.94 | 0.67 |
| 001 | 604.60* | 1000 | 116.46 | 147.65 | 150.37 | | 150.74 | 0.006645 | 3.15 | 50.02 | 46.65 | 0.67 |
| 001 | 595.20* | 2 | 26.58 | 147.56 | 149.21 | | 149.44 | 0.006613 | 2.10 | 12.75 | 11.07 | 0.60 |
| 001 | 595.20* | 20 | 49.78 | 147.56 | 149.68 | 149.36 | 149.99 | 0.006748 | 2.57 | 23.88 | 38.88 | 0.64 |
| 001 | 595.20* | 50 | 60.91 | 147.56 | 149.82 | 149.76 | 150.13 | 0.006574 | 2.67 | 29.46 | 40.77 | 0.64 |
| 001 | 595.20* | 100 | 70.80 | 147.56 | 149.93 | | 150.25 | 0.006416 | 2.75 | 34.05 | 42.26 | 0.64 |
| 001 | 595.20* | 100 +5% | 74.34 | 147.56 | 149.97 | 149.88 | 150.29 | 0.006326 | 2.77 | 35.71 | 42.79 | 0.63 |
| 001 | 595.20* | 100 +25% | 88.50 | 147.56 | 150.10 | | 150.43 | 0.006279 | 2.88 | 41.38 | 44.49 | 0.64 |
| 001 | 595.20* | 100 +70% | 120.36 | 147.56 | 150.36 | | 150.70 | 0.006073 | 3.06 | 53.02 | 46.46 | 0.64 |
| 001 | 595.20* | 1000 | 116.46 | 147.56 | 150.33 | | 150.67 | 0.006081 | 3.04 | 51.70 | 46.23 | 0.64 |
| 001 | 585.80* | 2 | 26.58 | 147.48 | 149.15 | | 149.37 | 0.006666 | 2.11 | 12.70 | 11.40 | 0.60 |
| 001 | 585.80* | 20 | 49.78 | 147.48 | 149.65 | 149.31 | 149.92 | 0.006064 | 2.46 | 25.55 | 39.55 | 0.60 |
| 001 | 585.80* | 50 | 60.91 | 147.48 | 149.79 | 149.68 | 150.07 | 0.005849 | 2.55 | 31.34 | 41.40 | 0.60 |
| 001 | 585.80* | 100 | 70.80 | 147.48 | 149.90 | | 150.18 | 0.005714 | 2.62 | 36.03 | 42.84 | 0.60 |
| 001 | 585.80* | 100 +5% | 74.34 | 147.48 | 149.94 | | 150.22 | 0.005622 | 2.63 | 37.75 | 43.23 | 0.60 |
| 001 | 585.80* | 100 +25% | 88.50 | 147.48 | 150.07 | | 150.36 | 0.005584 | 2.74 | 43.46 | 44.36 | 0.60 |
| 001 | 585.80* | 100 +70% | 120.36 | 147.48 | 150.32 | | 150.64 | 0.005522 | 2.94 | 54.88 | 46.02 | 0.61 |
| 001 | 585.80* | 1000 | 116.46 | 147.48 | 150.30 | | 150.61 | 0.005512 | 2.91 | 53.60 | 45.80 | 0.61 |
| 001 | 576.40* | 2 | 26.58 | 147.40 | 149.08 | | 149.31 | 0.006763 | 2.13 | 12.64 | 11.66 | 0.61 |
| 001 | 576.40* | 20 | 49.78 | 147.40 | 149.62 | | 149.86 | 0.005295 | 2.32 | 27.63 | 40.32 | 0.56 |
| 001 | 576.40* | 50 | 60.91 | 147.40 | 149.77 | | 150.00 | 0.005070 | 2.40 | 33.64 | 41.93 | 0.56 |
| 001 | 576.40* | 100 | 70.80 | 147.40 | 149.88 | | 150.12 | 0.004945 | 2.46 | 38.41 | 42.85 | 0.56 |
| 001 | 576.40* | 100 +5% | 74.34 | 147.40 | 149.92 | | 150.16 | 0.004875 | 2.48 | 40.14 | 43.16 | 0.56 |
| 001 | 576.40* | 100 +25% | 88.50 | 147.40 | 150.05 | | 150.30 | 0.004914 | 2.59 | 45.73 | 44.14 | 0.56 |
| 001 | 576.40* | 100 +70% | 120.36 | 147.40 | 150.30 | | 150.58 | 0.005000 | 2.81 | 56.91 | 45.74 | 0.58 |
| 001 | 576.40* | 1000 | 116.46 | 147.40 | 150.27 | | 150.55 | 0.004981 | 2.78 | 55.66 | 45.57 | 0.58 |
| 001 | 0567 | 2 | 26.58 | 147.31 | 149.00 | | 149.24 | 0.006997 | 2.16 | 12.50 | 11.69 | 0.61 |
| 001 | 0567 | 20 | 49.78 | 147.31 | 149.60 | | 149.80 | 0.004484 | 2.16 | 30.15 | 40.83 | 0.52 |
| 001 | 0567 | 50 | 60.91 | 147.31 | 149.75 | | 149.95 | 0.004302 | 2.23 | 36.23 | 41.95 | 0.52 |
| 001 | 0567 | 100 | 70.80 | 147.31 | 149.86 | | 150.07 | 0.004248 | 2.31 | 40.95 | 42.79 | 0.52 |
| 001 | 0567 | 100 +5% | 74.34 | 147.31 | 149.90 | | 150.11 | 0.004206 | 2.32 | 42.66 | 43.10 | 0.52 |
| 001 | 0567 | 100 +25% | 88.50 | 147.31 | 150.02 | | 150.25 | 0.004313 | 2.45 | 48.14 | 44.06 | 0.53 |
| 001 | 0567 | 100 +70% | 120.36 | 147.31 | 150.27 | | 150.53 | 0.004517 | 2.69 | 59.11 | 45.69 | 0.55 |
| 001 | 0567 | 1000 | 116.46 | 147.31 | 150.24 | | 150.50 | 0.004487 | 2.66 | 57.88 | 45.52 | 0.55 |
| 001 | 558.50* | 2 | 26.58 | 147.20 | 148.97 | | 149.18 | 0.005944 | 2.04 | 13.11 | 11.06 | 0.57 |
| 001 | 558.50* | 20 | 49.78 | 147.20 | 149.56 | | 149.76 | 0.004246 | 2.15 | 30.12 | 41.26 | 0.51 |
| 001 | 558.50* | 50 | 60.91 | 147.20 | 149.71 | | 149.91 | 0.004116 | 2.23 | 36.31 | 42.53 | 0.51 |
| 001 | 558.50* | 100 | 70.80 | 147.20 | 149.82 | | 150.03 | 0.004082 | 2.30 | 41.13 | 43.48 | 0.51 |
| 001 | 558.50* | 100 +5% | 74.34 | 147.20 | 149.86 | | 150.07 | 0.004039 | 2.32 | 42.91 | 43.83 | 0.51 |
| 001 | 558.50* | 100 +25% | 88.50 | 147.20 | 149.99 | | 150.21 | 0.004166 | 2.45 | 48.45 | 44.80 | 0.52 |
| 001 | 558.50* | 100 +70% | 120.36 | 147.20 | 150.23 | | 150.49 | 0.004421 | 2.70 | 59.47 | 46.72 | 0.55 |
| 001 | 558.50* | 1000 | 116.46 | 147.20 | 150.20 | | 150.46 | 0.004380 | 2.67 | 58.26 | 46.49 | 0.54 |
| 001 | 550.00* | 2 | 26.58 | 147.09 | 148.93 | | 149.12 | 0.005250 | 1.95 | 13.67 | 10.71 | 0.53 |
| 001 | 550.00* | 20 | 49.78 | 147.09 | 149.52 | | 149.72 | 0.004096 | 2.14 | 30.08 | 41.91 | 0.50 |
| 001 | 550.00* | 50 | 60.91 | 147.09 | 149.67 | | 149.88 | 0.003999 | 2.22 | 36.41 | 43.37 | 0.50 |
| 001 | 550.00* | 100 | 70.80 | 147.09 | 149.78 | | 149.99 | 0.003965 | 2.29 | 41.39 | 44.42 | 0.50 |
| 001 | 550.00* | 100 +5% | 74.34 | 147.09 | 149.83 | | 150.04 | 0.003907 | 2.31 | 43.28 | 44.74 | 0.50 |
| 001 | 550.00* | 100 +25% | 88.50 | 147.09 | 149.95 | | 150.18 | 0.004062 | 2.44 | 48.85 | 45.84 | 0.51 |
| 001 | 550.00* | 100 +70% | 120.36 | 147.09 | 150.19 | | 150.45 | 0.004335 | 2.69 | 60.16 | 48.27 | 0.54 |
| 001 | 550.00* | 1000 | 116.46 | 147.09 | 150.16 | | 150.42 | 0.004296 | 2.66 | 58.91 | 48.04 | 0.54 |
| 001 | 541.50* | 2 | 26.58 | 146.98 | 148.90 | | 149.08 | 0.004810 | 1.88 | 14.14 | 10.34 | 0.51 |
| 001 | 541.50* | 20 | 49.78 | 146.98 | 149.48 | | 149.69 | 0.004034 | 2.13 | 29.95 | 42.84 | 0.49 |
| 001 | 541.50* | 50 | 60.91 | 146.98 | 149.63 | | 149.84 | 0.003930 | 2.21 | 36.54 | 44.49 | 0.49 |
| 001 | 541.50* | 100 | 70.80 | 146.98 | 149.75 | | 149.96 | 0.003890 | 2.28 | 41.71 | 45.75 | 0.49 |
| 001 | 541.50* | 100 +5% | 74.34 | 146.98 | 149.79 | | 150.00 | 0.003830 | 2.29 | 43.72 | 46.30 | 0.49 |
| 001 | 541.50* | 100 +25% | 88.50 | 146.98 | 149.91 | | 150.14 | 0.003989 | 2.43 | 49.48 | 47.75 | 0.51 |
| 001 | 541.50* | 100 +70% | 120.36 | 146.98 | 150.16 | | 150.42 | 0.004231 | 2.67 | 61.35 | 50.64 | 0.53 |
| 001 | 541.50* | 1000 | 116.46 | 146.98 | 150.13 | | 150.39 | 0.004197 | 2.64 | 60.03 | 50.39 | 0.53 |
| 001 | 533.00* | 2 | 26.58 | 146.86 | 148.87 | | 149.04 | 0.004397 | 1.83 | 14.54 | 10.08 | 0.49 |
| 001 | 533.00* | 20 | 49.78 | 146.86 | 149.44 | | 149.65 | 0.004047 | 2.13 | 29.78 | 44.26 | 0.49 |
| 001 | 533.00* | 50 | 60.91 | 146.86 | 149.60 | | 149.81 | 0.003917 | 2.20 | 36.76 | 46.55 | 0.49 |
| 001 | 533.00* | 100 | 70.80 | 146.86 | 149.72 | | 149.92 | 0.003826 | 2.26 | 42.40 | 48.23 | 0.49 |
| 001 | 533.00* | 100 +5% | 74.34 | 146.86 | 149.76 | | 149.97 | 0.003743 | 2.27 | 44.60 | 48.91 | 0.48 |
| 001 | 533.00* | 100 +25% | 88.50 | 146.86 | 149.89 | | 150.11 | 0.003880 | 2.39 | 50.74 | 50.74 | 0.50 |
| 001 | 533.00* | 100 +70% | 120.36 | 146.86 | 150.13 | | 150.38 | 0.004009 | 2.60 | 63.69 | 53.74 | 0.51 |
| 001 | 533.00* | 1000 | 116.46 | 146.86 | 150.11 | | 150.35 | 0.003989 | 2.57 | 62.25 | 53.54 | 0.51 |
| 001 | 524.50* | 2 | 26.58 | 146.75 | 148.84 | | 149.00 | 0.004041 | 1.79 | 14.87 | 9.78 | 0.46 |
| 001 | 524.50* | 20 | 49.78 | 146.75 | 149.41 | | 149.62 | 0.004116 | 2.13 | 29.76 | 47.12 | 0.49 |
| 001 | 524.50* | 50 | 60.91 | 146.75 | 149.57 | | 149.77 | 0.003846 | 2.17 | 37.70 | 50.12 | 0.48 |
| 001 | 524.50* | 100 | 70.80 | 146.75 | 149.69 | | 149.89 | 0.003671 | 2.21 | 44.09 | 52.33 | 0.47 |
| 001 | 524.50* | 100 +5% | 74.34 | 146.75 | 149.74 | | 149.93 | 0.003549 | 2.20 | 46.64 | 52.99 | 0.47 |
| 001 | 524.50* | 100 +25% | 88.50 | 146.75 | 149.87 | | 150.07 | 0.003608 | 2.30 | 53.48 | 54.73 | 0.47 |
| 001 | 524.50* | 100 +70% | 120.36 | 146.75 | 150.12 | | 150.34 | 0.003651 | 2.47 | 67.66 | 57.92 | 0.48 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 524.50* | 1000 | 116.46 | 146.75 | 150.09 | | 150.31 | 0.003635 | 2.45 | 66.11 | 57.64 | 0.48 |
| 001 | 0516 | 2 | 26.58 | 146.64 | 148.81 | | 148.96 | 0.003716 | 1.75 | 15.15 | 9.35 | 0.44 |
| 001 | 0516 | 20 | 49.78 | 146.64 | 149.38 | 148.57 | 149.58 | 0.004014 | 2.08 | 31.16 | 52.90 | 0.48 |
| 001 | 0516 | 50 | 60.91 | 146.64 | 149.56 | | 149.73 | 0.003495 | 2.06 | 40.89 | 56.14 | 0.45 |
| 001 | 0516 | 100 | 70.80 | 146.64 | 149.69 | | 149.85 | 0.003242 | 2.06 | 48.26 | 58.17 | 0.44 |
| 001 | 0516 | 100 +5% | 74.34 | 146.64 | 149.74 | | 149.90 | 0.003113 | 2.05 | 51.14 | 58.95 | 0.43 |
| 001 | 0516 | 100 +25% | 88.50 | 146.64 | 149.87 | | 150.03 | 0.003121 | 2.13 | 58.87 | 60.98 | 0.44 |
| 001 | 0516 | 100 +70% | 120.36 | 146.64 | 150.12 | | 150.30 | 0.003096 | 2.26 | 74.94 | 65.01 | 0.44 |
| 001 | 0516 | 1000 | 116.46 | 146.64 | 150.09 | | 150.27 | 0.003087 | 2.25 | 73.17 | 64.58 | 0.44 |
| 001 | 507.20* | 2 | 26.58 | 146.66 | 148.76 | | 148.93 | 0.004307 | 1.84 | 14.46 | 9.51 | 0.48 |
| 001 | 507.20* | 20 | 49.78 | 146.66 | 149.25 | 148.62 | 149.53 | 0.005572 | 2.40 | 24.60 | 37.93 | 0.56 |
| 001 | 507.20* | 50 | 60.91 | 146.66 | 149.38 | 148.87 | 149.68 | 0.005950 | 2.59 | 30.13 | 48.99 | 0.59 |
| 001 | 507.20* | 100 | 70.80 | 146.66 | 149.54 | 149.42 | 149.80 | 0.005020 | 2.51 | 38.66 | 53.93 | 0.55 |
| 001 | 507.20* | 100 +5% | 74.34 | 146.66 | 149.62 | 149.45 | 149.86 | 0.004359 | 2.40 | 43.26 | 55.55 | 0.51 |
| 001 | 507.20* | 100 +25% | 88.50 | 146.66 | 149.76 | | 149.99 | 0.004271 | 2.47 | 50.93 | 58.14 | 0.51 |
| 001 | 507.20* | 100 +70% | 120.36 | 146.66 | 150.03 | | 150.26 | 0.003999 | 2.57 | 67.37 | 63.28 | 0.50 |
| 001 | 507.20* | 1000 | 116.46 | 146.66 | 150.00 | | 150.23 | 0.004001 | 2.55 | 65.61 | 62.76 | 0.50 |
| 001 | 498.40* | 2 | 26.58 | 146.68 | 148.70 | | 148.89 | 0.005021 | 1.92 | 13.81 | 9.65 | 0.51 |
| 001 | 498.40* | 20 | 49.78 | 146.68 | 149.19 | 148.65 | 149.48 | 0.005944 | 2.47 | 24.11 | 36.01 | 0.58 |
| 001 | 498.40* | 50 | 60.91 | 146.68 | 149.31 | 149.20 | 149.63 | 0.006426 | 2.68 | 28.72 | 40.30 | 0.61 |
| 001 | 498.40* | 100 | 70.80 | 146.68 | 149.41 | 149.33 | 149.75 | 0.006532 | 2.80 | 33.17 | 44.07 | 0.62 |
| 001 | 498.40* | 100 +5% | 74.34 | 146.68 | 149.45 | 149.35 | 149.79 | 0.006560 | 2.83 | 34.75 | 45.57 | 0.63 |
| 001 | 498.40* | 100 +25% | 88.50 | 146.68 | 149.58 | 149.51 | 149.94 | 0.006553 | 2.95 | 41.21 | 51.22 | 0.63 |
| 001 | 498.40* | 100 +70% | 120.36 | 146.68 | 149.90 | | 150.21 | 0.005448 | 2.94 | 58.87 | 60.12 | 0.59 |
| 001 | 498.40* | 1000 | 116.46 | 146.68 | 149.86 | | 150.18 | 0.005554 | 2.94 | 56.81 | 59.41 | 0.59 |
| 001 | 489.60* | 2 | 26.58 | 146.70 | 148.64 | | 148.84 | 0.005754 | 2.01 | 13.20 | 9.56 | 0.55 |
| 001 | 489.60* | 20 | 49.78 | 146.70 | 149.12 | 148.65 | 149.43 | 0.006316 | 2.53 | 23.86 | 35.36 | 0.60 |
| 001 | 489.60* | 50 | 60.91 | 146.70 | 149.24 | 149.16 | 149.58 | 0.006970 | 2.76 | 27.97 | 38.97 | 0.64 |
| 001 | 489.60* | 100 | 70.80 | 146.70 | 149.34 | 149.28 | 149.70 | 0.007022 | 2.87 | 32.31 | 42.07 | 0.64 |
| 001 | 489.60* | 100 +5% | 74.34 | 146.70 | 149.38 | 149.34 | 149.74 | 0.007016 | 2.91 | 33.85 | 43.02 | 0.65 |
| 001 | 489.60* | 100 +25% | 88.50 | 146.70 | 149.51 | 149.44 | 149.88 | 0.006977 | 3.02 | 39.86 | 46.80 | 0.65 |
| 001 | 489.60* | 100 +70% | 120.36 | 146.70 | 149.79 | 149.69 | 150.16 | 0.006490 | 3.16 | 54.03 | 55.26 | 0.64 |
| 001 | 489.60* | 1000 | 116.46 | 146.70 | 149.76 | 149.66 | 150.13 | 0.006564 | 3.15 | 52.25 | 54.26 | 0.64 |
| 001 | 480.80* | 2 | 26.58 | 146.72 | 148.56 | | 148.79 | 0.006704 | 2.12 | 12.55 | 9.39 | 0.58 |
| 001 | 480.80* | 20 | 49.78 | 146.72 | 149.06 | 148.63 | 149.37 | 0.006803 | 2.60 | 23.55 | 35.19 | 0.62 |
| 001 | 480.80* | 50 | 60.91 | 146.72 | 149.16 | 149.11 | 149.52 | 0.007630 | 2.85 | 27.28 | 38.14 | 0.66 |
| 001 | 480.80* | 100 | 70.80 | 146.72 | 149.27 | 149.23 | 149.64 | 0.007570 | 2.95 | 31.67 | 41.35 | 0.66 |
| 001 | 480.80* | 100 +5% | 74.34 | 146.72 | 149.30 | 149.26 | 149.68 | 0.007528 | 2.98 | 33.23 | 42.44 | 0.66 |
| 001 | 480.80* | 100 +25% | 88.50 | 146.72 | 149.45 | 149.40 | 149.82 | 0.007292 | 3.06 | 39.47 | 45.92 | 0.66 |
| 001 | 480.80* | 100 +70% | 120.36 | 146.72 | 149.73 | | 150.10 | 0.006558 | 3.16 | 53.81 | 53.35 | 0.64 |
| 001 | 480.80* | 1000 | 116.46 | 146.72 | 149.70 | | 150.06 | 0.006647 | 3.15 | 52.05 | 52.48 | 0.64 |
| 001 | 0472 | 2 | 26.58 | 146.74 | 148.46 | | 148.72 | 0.008131 | 2.25 | 11.80 | 9.15 | 0.63 |
| 001 | 0472 | 20 | 49.78 | 146.74 | 148.94 | 148.91 | 149.30 | 0.008470 | 2.80 | 21.64 | 34.07 | 0.68 |
| 001 | 0472 | 50 | 60.91 | 146.74 | 149.08 | 149.06 | 149.46 | 0.008362 | 2.93 | 26.74 | 37.90 | 0.68 |
| 001 | 0472 | 100 | 70.80 | 146.74 | 149.20 | 149.17 | 149.57 | 0.008007 | 2.99 | 31.48 | 41.14 | 0.68 |
| 001 | 0472 | 100 +5% | 74.34 | 146.74 | 149.24 | 149.21 | 149.61 | 0.007891 | 3.01 | 33.14 | 42.22 | 0.67 |
| 001 | 0472 | 100 +25% | 88.50 | 146.74 | 149.38 | 149.33 | 149.75 | 0.007475 | 3.07 | 39.66 | 46.06 | 0.66 |
| 001 | 0472 | 100 +70% | 120.36 | 146.74 | 149.69 | | 150.03 | 0.006448 | 3.11 | 54.72 | 53.40 | 0.63 |
| 001 | 0472 | 1000 | 116.46 | 146.74 | 149.65 | | 150.00 | 0.006557 | 3.10 | 52.89 | 52.54 | 0.63 |
| 001 | 463.17* | 2 | 26.58 | 146.66 | 148.40 | | 148.64 | 0.007633 | 2.21 | 12.05 | 9.35 | 0.62 |
| 001 | 463.17* | 20 | 49.78 | 146.66 | 148.87 | 148.83 | 149.22 | 0.007997 | 2.73 | 22.19 | 34.09 | 0.66 |
| 001 | 463.17* | 50 | 60.91 | 146.66 | 149.03 | 148.98 | 149.37 | 0.007478 | 2.80 | 27.99 | 38.00 | 0.65 |
| 001 | 463.17* | 100 | 70.80 | 146.66 | 149.15 | 149.09 | 149.49 | 0.007133 | 2.85 | 32.85 | 41.02 | 0.64 |
| 001 | 463.17* | 100 +5% | 74.34 | 146.66 | 149.20 | 149.13 | 149.53 | 0.007025 | 2.87 | 34.55 | 42.02 | 0.64 |
| 001 | 463.17* | 100 +25% | 88.50 | 146.66 | 149.35 | 149.24 | 149.68 | 0.006660 | 2.93 | 41.15 | 45.62 | 0.63 |
| 001 | 463.17* | 100 +70% | 120.36 | 146.66 | 149.65 | | 149.97 | 0.005804 | 2.98 | 56.24 | 52.58 | 0.60 |
| 001 | 463.17* | 1000 | 116.46 | 146.66 | 149.62 | | 149.94 | 0.005893 | 2.98 | 54.41 | 51.81 | 0.61 |
| 001 | 454.33* | 2 | 26.58 | 146.58 | 148.33 | | 148.57 | 0.007280 | 2.16 | 12.28 | 9.54 | 0.61 |
| 001 | 454.33* | 20 | 49.78 | 146.58 | 148.83 | 148.70 | 149.14 | 0.007183 | 2.60 | 23.55 | 34.99 | 0.63 |
| 001 | 454.33* | 50 | 60.91 | 146.58 | 149.00 | 148.90 | 149.30 | 0.006524 | 2.64 | 29.83 | 38.63 | 0.61 |
| 001 | 454.33* | 100 | 70.80 | 146.58 | 149.13 | | 149.42 | 0.006212 | 2.69 | 34.84 | 41.44 | 0.60 |
| 001 | 454.33* | 100 +5% | 74.34 | 146.58 | 149.17 | | 149.46 | 0.006126 | 2.70 | 36.57 | 42.37 | 0.60 |
| 001 | 454.33* | 100 +25% | 88.50 | 146.58 | 149.32 | | 149.61 | 0.005836 | 2.77 | 43.22 | 45.53 | 0.59 |
| 001 | 454.33* | 100 +70% | 120.36 | 146.58 | 149.63 | | 149.92 | 0.005180 | 2.84 | 58.18 | 51.78 | 0.57 |
| 001 | 454.33* | 1000 | 116.46 | 146.58 | 149.59 | | 149.88 | 0.005243 | 2.83 | 56.38 | 51.02 | 0.57 |
| 001 | 445.50* | 2 | 26.58 | 146.50 | 148.27 | | 148.51 | 0.007056 | 2.13 | 12.46 | 9.79 | 0.60 |
| 001 | 445.50* | 20 | 49.78 | 146.50 | 148.80 | 148.65 | 149.07 | 0.006379 | 2.45 | 25.26 | 36.00 | 0.60 |
| 001 | 445.50* | 50 | 60.91 | 146.50 | 148.98 | | 149.23 | 0.005645 | 2.47 | 32.03 | 39.57 | 0.57 |
| 001 | 445.50* | 100 | 70.80 | 146.50 | 149.10 | | 149.36 | 0.005368 | 2.51 | 37.22 | 42.15 | 0.56 |
| 001 | 445.50* | 100 +5% | 74.34 | 146.50 | 149.14 | | 149.40 | 0.005300 | 2.53 | 38.98 | 43.01 | 0.56 |
| 001 | 445.50* | 100 +25% | 88.50 | 146.50 | 149.30 | | 149.55 | 0.005072 | 2.59 | 45.73 | 45.74 | 0.56 |
| 001 | 445.50* | 100 +70% | 120.36 | 146.50 | 149.60 | | 149.86 | 0.004586 | 2.69 | 60.62 | 51.23 | 0.54 |
| 001 | 445.50* | 1000 | 116.46 | 146.50 | 149.57 | | 149.83 | 0.004629 | 2.68 | 58.85 | 50.56 | 0.54 |
| 001 | 436.67* | 2 | 26.58 | 146.41 | 148.21 | | 148.44 | 0.006973 | 2.11 | 12.59 | 10.06 | 0.60 |
| 001 | 436.67* | 20 | 49.78 | 146.41 | 148.77 | | 149.01 | 0.005583 | 2.31 | 27.19 | 37.09 | 0.56 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 436.67* | 50 | 60.91 | 146.41 | 148.96 | | 149.17 | 0.004889 | 2.30 | 34.43 | 40.55 | 0.53 |
| 001 | 436.67* | 100 | 70.80 | 146.41 | 149.08 | | 149.30 | 0.004651 | 2.34 | 39.79 | 42.98 | 0.52 |
| 001 | 436.67* | 100 +5% | 74.34 | 146.41 | 149.13 | | 149.34 | 0.004592 | 2.36 | 41.60 | 43.73 | 0.52 |
| 001 | 436.67* | 100 +25% | 88.50 | 146.41 | 149.28 | | 149.50 | 0.004417 | 2.43 | 48.44 | 46.09 | 0.52 |
| 001 | 436.67* | 100 +70% | 120.36 | 146.41 | 149.59 | | 149.82 | 0.004063 | 2.54 | 63.33 | 51.03 | 0.51 |
| 001 | 436.67* | 1000 | 116.46 | 146.41 | 149.55 | | 149.78 | 0.004092 | 2.52 | 61.58 | 50.41 | 0.51 |
| 001 | 427.83* | 2 | 26.58 | 146.33 | 148.15 | | 148.38 | 0.007066 | 2.10 | 12.69 | 12.70 | 0.60 |
| 001 | 427.83* | 20 | 49.78 | 146.33 | 148.75 | | 148.95 | 0.004820 | 2.16 | 29.33 | 38.21 | 0.52 |
| 001 | 427.83* | 50 | 60.91 | 146.33 | 148.94 | | 149.12 | 0.004250 | 2.14 | 36.96 | 41.50 | 0.49 |
| 001 | 427.83* | 100 | 70.80 | 146.33 | 149.07 | | 149.25 | 0.004044 | 2.18 | 42.49 | 43.79 | 0.49 |
| 001 | 427.83* | 100 +5% | 74.34 | 146.33 | 149.11 | | 149.30 | 0.003990 | 2.20 | 44.35 | 44.37 | 0.49 |
| 001 | 427.83* | 100 +25% | 88.50 | 146.33 | 149.26 | | 149.46 | 0.003864 | 2.27 | 51.27 | 46.50 | 0.48 |
| 001 | 427.83* | 100 +70% | 120.36 | 146.33 | 149.57 | | 149.78 | 0.003611 | 2.39 | 66.22 | 50.99 | 0.48 |
| 001 | 427.83* | 1000 | 116.46 | 146.33 | 149.54 | | 149.74 | 0.003629 | 2.37 | 64.47 | 50.42 | 0.48 |
| 001 | 0419 | 2 | 26.58 | 146.25 | 148.08 | | 148.31 | 0.007422 | 2.11 | 12.76 | 14.69 | 0.61 |
| 001 | 0419 | 20 | 49.78 | 146.25 | 148.73 | | 148.90 | 0.004189 | 2.02 | 31.65 | 39.38 | 0.48 |
| 001 | 0419 | 50 | 60.91 | 146.25 | 148.92 | | 149.08 | 0.003698 | 1.99 | 39.58 | 42.47 | 0.46 |
| 001 | 0419 | 100 | 70.80 | 146.25 | 149.05 | | 149.21 | 0.003540 | 2.03 | 45.30 | 44.46 | 0.45 |
| 001 | 0419 | 100 +5% | 74.34 | 146.25 | 149.10 | | 149.26 | 0.003498 | 2.04 | 47.19 | 45.00 | 0.45 |
| 001 | 0419 | 100 +25% | 88.50 | 146.25 | 149.25 | | 149.42 | 0.003409 | 2.11 | 54.19 | 46.96 | 0.45 |
| 001 | 0419 | 100 +70% | 120.36 | 146.25 | 149.56 | | 149.74 | 0.003233 | 2.24 | 69.22 | 51.09 | 0.45 |
| 001 | 0419 | 1000 | 116.46 | 146.25 | 149.52 | | 149.70 | 0.003243 | 2.22 | 67.48 | 50.56 | 0.45 |
| 001 | 409.75* | 2 | 26.58 | 146.22 | 148.04 | | 148.24 | 0.005835 | 1.96 | 13.59 | 10.93 | 0.55 |
| 001 | 409.75* | 20 | 49.78 | 146.22 | 148.65 | | 148.86 | 0.004416 | 2.14 | 28.79 | 36.70 | 0.51 |
| 001 | 409.75* | 50 | 60.91 | 146.22 | 148.85 | | 149.04 | 0.003913 | 2.16 | 36.34 | 40.52 | 0.48 |
| 001 | 409.75* | 100 | 70.80 | 146.22 | 148.98 | | 149.17 | 0.003778 | 2.21 | 41.79 | 42.53 | 0.48 |
| 001 | 409.75* | 100 +5% | 74.34 | 146.22 | 149.02 | | 149.22 | 0.003753 | 2.23 | 43.60 | 43.19 | 0.48 |
| 001 | 409.75* | 100 +25% | 88.50 | 146.22 | 149.17 | | 149.38 | 0.003718 | 2.32 | 50.31 | 45.56 | 0.48 |
| 001 | 409.75* | 100 +70% | 120.36 | 146.22 | 149.48 | | 149.70 | 0.003504 | 2.45 | 65.28 | 50.09 | 0.48 |
| 001 | 409.75* | 1000 | 116.46 | 146.22 | 149.45 | | 149.67 | 0.003524 | 2.43 | 63.53 | 49.62 | 0.48 |
| 001 | 400.50* | 2 | 26.58 | 146.18 | 148.02 | | 148.18 | 0.004435 | 1.79 | 14.88 | 11.69 | 0.49 |
| 001 | 400.50* | 20 | 49.78 | 146.18 | 148.61 | | 148.82 | 0.003876 | 2.13 | 28.35 | 35.80 | 0.49 |
| 001 | 400.50* | 50 | 60.91 | 146.18 | 148.80 | | 149.01 | 0.003652 | 2.20 | 35.49 | 40.37 | 0.48 |
| 001 | 400.50* | 100 | 70.80 | 146.18 | 148.93 | | 149.14 | 0.003606 | 2.27 | 40.85 | 42.52 | 0.48 |
| 001 | 400.50* | 100 +5% | 74.34 | 146.18 | 148.97 | | 149.19 | 0.003604 | 2.30 | 42.63 | 43.17 | 0.48 |
| 001 | 400.50* | 100 +25% | 88.50 | 146.18 | 149.12 | | 149.35 | 0.003603 | 2.40 | 49.30 | 45.03 | 0.49 |
| 001 | 400.50* | 100 +70% | 120.36 | 146.18 | 149.43 | | 149.67 | 0.003425 | 2.53 | 64.02 | 48.34 | 0.49 |
| 001 | 400.50* | 1000 | 116.46 | 146.18 | 149.40 | | 149.64 | 0.003440 | 2.52 | 62.33 | 47.97 | 0.49 |
| 001 | 391.25* | 2 | 26.58 | 146.14 | 148.01 | | 148.14 | 0.003148 | 1.63 | 16.89 | 14.35 | 0.42 |
| 001 | 391.25* | 20 | 49.78 | 146.14 | 148.60 | | 148.78 | 0.002923 | 1.96 | 30.95 | 36.58 | 0.43 |
| 001 | 391.25* | 50 | 60.91 | 146.14 | 148.78 | | 148.97 | 0.002886 | 2.06 | 37.89 | 40.39 | 0.44 |
| 001 | 391.25* | 100 | 70.80 | 146.14 | 148.91 | | 149.10 | 0.002916 | 2.14 | 43.12 | 41.74 | 0.44 |
| 001 | 391.25* | 100 +5% | 74.34 | 146.14 | 148.95 | | 149.15 | 0.002935 | 2.18 | 44.83 | 42.09 | 0.44 |
| 001 | 391.25* | 100 +25% | 88.50 | 146.14 | 149.10 | | 149.31 | 0.003027 | 2.30 | 51.12 | 43.36 | 0.46 |
| 001 | 391.25* | 100 +70% | 120.36 | 146.14 | 149.41 | | 149.64 | 0.003051 | 2.49 | 64.88 | 46.02 | 0.47 |
| 001 | 391.25* | 1000 | 116.46 | 146.14 | 149.37 | | 149.60 | 0.003048 | 2.47 | 63.29 | 45.73 | 0.47 |
| 001 | 0382 | 2 | 26.58 | 146.11 | 148.01 | | 148.10 | 0.001998 | 1.38 | 21.15 | 18.14 | 0.34 |
| 001 | 0382 | 20 | 49.78 | 146.11 | 148.62 | | 148.74 | 0.001990 | 1.69 | 35.64 | 37.72 | 0.36 |
| 001 | 0382 | 50 | 60.91 | 146.11 | 148.79 | | 148.93 | 0.002043 | 1.80 | 42.44 | 38.96 | 0.37 |
| 001 | 0382 | 100 | 70.80 | 146.11 | 148.92 | | 149.07 | 0.002145 | 1.91 | 47.30 | 39.82 | 0.38 |
| 001 | 0382 | 100 +5% | 74.34 | 146.11 | 148.96 | | 149.11 | 0.002185 | 1.95 | 48.88 | 40.09 | 0.39 |
| 001 | 0382 | 100 +25% | 88.50 | 146.11 | 149.10 | | 149.27 | 0.002351 | 2.10 | 54.67 | 41.09 | 0.41 |
| 001 | 0382 | 100 +70% | 120.36 | 146.11 | 149.39 | | 149.60 | 0.002563 | 2.34 | 67.13 | 43.12 | 0.43 |
| 001 | 0382 | 1000 | 116.46 | 146.11 | 149.36 | | 149.57 | 0.002529 | 2.31 | 65.80 | 42.91 | 0.43 |
| 001 | 372.33* | 2 | 26.58 | 146.05 | 147.92 | | 148.07 | 0.004375 | 1.72 | 15.65 | 14.53 | 0.49 |
| 001 | 372.33* | 20 | 49.78 | 146.05 | 148.51 | | 148.71 | 0.003642 | 2.03 | 28.59 | 35.79 | 0.48 |
| 001 | 372.33* | 50 | 60.91 | 146.05 | 148.70 | | 148.90 | 0.003462 | 2.11 | 35.67 | 39.77 | 0.47 |
| 001 | 372.33* | 100 | 70.80 | 146.05 | 148.83 | | 149.04 | 0.003432 | 2.19 | 40.86 | 40.92 | 0.47 |
| 001 | 372.33* | 100 +5% | 74.34 | 146.05 | 148.87 | | 149.08 | 0.003441 | 2.22 | 42.54 | 41.28 | 0.48 |
| 001 | 372.33* | 100 +25% | 88.50 | 146.05 | 149.02 | | 149.24 | 0.003470 | 2.33 | 48.88 | 42.55 | 0.48 |
| 001 | 372.33* | 100 +70% | 120.36 | 146.05 | 149.33 | | 149.57 | 0.003429 | 2.51 | 62.32 | 45.07 | 0.49 |
| 001 | 372.33* | 1000 | 116.46 | 146.05 | 149.30 | | 149.54 | 0.003412 | 2.49 | 60.90 | 44.82 | 0.49 |
| 001 | 362.67* | 2 | 26.58 | 146.00 | 147.81 | | 148.01 | 0.007446 | 1.99 | 13.38 | 12.53 | 0.61 |
| 001 | 362.67* | 20 | 49.78 | 146.00 | 148.41 | | 148.66 | 0.005745 | 2.25 | 24.25 | 30.74 | 0.57 |
| 001 | 362.67* | 50 | 60.91 | 146.00 | 148.60 | | 148.85 | 0.005306 | 2.33 | 30.73 | 38.09 | 0.56 |
| 001 | 362.67* | 100 | 70.80 | 146.00 | 148.73 | | 148.99 | 0.005024 | 2.38 | 36.19 | 41.31 | 0.55 |
| 001 | 362.67* | 100 +5% | 74.34 | 146.00 | 148.78 | | 149.03 | 0.004934 | 2.40 | 38.06 | 41.84 | 0.55 |
| 001 | 362.67* | 100 +25% | 88.50 | 146.00 | 148.95 | | 149.20 | 0.004558 | 2.44 | 45.47 | 43.79 | 0.54 |
| 001 | 362.67* | 100 +70% | 120.36 | 146.00 | 149.27 | | 149.53 | 0.004105 | 2.55 | 60.16 | 47.04 | 0.52 |
| 001 | 362.67* | 1000 | 116.46 | 146.00 | 149.24 | | 149.50 | 0.004110 | 2.53 | 58.65 | 46.72 | 0.52 |
| 001 | 0353 | 2 | 26.58 | 145.94 | 147.77 | | 147.94 | 0.005034 | 1.82 | 14.61 | 11.01 | 0.50 |
| 001 | 0353 | 20 | 49.78 | 145.94 | 148.36 | | 148.60 | 0.005619 | 2.23 | 24.49 | 29.97 | 0.56 |
| 001 | 0353 | 50 | 60.91 | 145.94 | 148.55 | | 148.79 | 0.005602 | 2.30 | 30.90 | 37.38 | 0.56 |
| 001 | 0353 | 100 | 70.80 | 145.94 | 148.69 | | 148.93 | 0.005371 | 2.33 | 36.38 | 40.06 | 0.56 |
| 001 | 0353 | 100 +5% | 74.34 | 145.94 | 148.73 | | 148.98 | 0.005260 | 2.34 | 38.34 | 40.86 | 0.55 |
| 001 | 0353 | 100 +25% | 88.50 | 145.94 | 148.91 | | 149.15 | 0.004897 | 2.36 | 45.87 | 43.79 | 0.54 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0353 | 100 +70% | 120.36 | 145.94 | 149.25 | | 149.49 | 0.004216 | 2.43 | 61.39 | 48.97 | 0.51 |
| 001 | 0353 | 1000 | 116.46 | 145.94 | 149.21 | | 149.45 | 0.004266 | 2.42 | 59.62 | 48.45 | 0.51 |
| 001 | 344.60* | 2 | 26.58 | 145.91 | 147.69 | | 147.89 | 0.006033 | 1.97 | 13.50 | 10.50 | 0.55 |
| 001 | 344.60* | 20 | 49.78 | 145.91 | 148.29 | | 148.55 | 0.006282 | 2.30 | 23.89 | 30.59 | 0.59 |
| 001 | 344.60* | 50 | 60.91 | 145.91 | 148.49 | | 148.75 | 0.005667 | 2.34 | 30.59 | 36.17 | 0.57 |
| 001 | 344.60* | 100 | 70.80 | 145.91 | 148.64 | | 148.89 | 0.005335 | 2.37 | 35.94 | 38.54 | 0.56 |
| 001 | 344.60* | 100 +5% | 74.34 | 145.91 | 148.69 | | 148.94 | 0.005213 | 2.38 | 37.86 | 39.30 | 0.56 |
| 001 | 344.60* | 100 +25% | 88.50 | 145.91 | 148.86 | | 149.11 | 0.004795 | 2.42 | 45.14 | 42.16 | 0.54 |
| 001 | 344.60* | 100 +70% | 120.36 | 145.91 | 149.20 | | 149.45 | 0.004233 | 2.51 | 59.89 | 46.39 | 0.52 |
| 001 | 344.60* | 1000 | 116.46 | 145.91 | 149.16 | | 149.41 | 0.004272 | 2.50 | 58.22 | 45.96 | 0.52 |
| 001 | 336.20* | 2 | 26.58 | 145.88 | 147.60 | | 147.83 | 0.007636 | 2.12 | 12.53 | 10.76 | 0.63 |
| 001 | 336.20* | 20 | 49.78 | 145.88 | 148.23 | | 148.51 | 0.006356 | 2.37 | 23.89 | 29.79 | 0.60 |
| 001 | 336.20* | 50 | 60.91 | 145.88 | 148.44 | | 148.70 | 0.005588 | 2.38 | 30.19 | 34.47 | 0.57 |
| 001 | 336.20* | 100 | 70.80 | 145.88 | 148.59 | | 148.85 | 0.005282 | 2.43 | 35.33 | 36.75 | 0.56 |
| 001 | 336.20* | 100 +5% | 74.34 | 145.88 | 148.63 | | 148.90 | 0.005151 | 2.44 | 37.17 | 37.56 | 0.56 |
| 001 | 336.20* | 100 +25% | 88.50 | 145.88 | 148.82 | | 149.08 | 0.004758 | 2.49 | 44.19 | 40.24 | 0.55 |
| 001 | 336.20* | 100 +70% | 120.36 | 145.88 | 149.14 | | 149.42 | 0.004332 | 2.61 | 58.08 | 44.09 | 0.53 |
| 001 | 336.20* | 1000 | 116.46 | 145.88 | 149.11 | | 149.38 | 0.004364 | 2.60 | 56.49 | 43.72 | 0.53 |
| 001 | 327.80* | 2 | 26.58 | 145.85 | 147.50 | | 147.76 | 0.009115 | 2.26 | 11.78 | 10.81 | 0.69 |
| 001 | 327.80* | 20 | 49.78 | 145.85 | 148.16 | | 148.45 | 0.006541 | 2.46 | 22.65 | 28.40 | 0.62 |
| 001 | 327.80* | 50 | 60.91 | 145.85 | 148.39 | | 148.66 | 0.005581 | 2.45 | 29.59 | 32.61 | 0.58 |
| 001 | 327.80* | 100 | 70.80 | 145.85 | 148.52 | | 148.81 | 0.005343 | 2.51 | 34.29 | 34.86 | 0.57 |
| 001 | 327.80* | 100 +5% | 74.34 | 145.85 | 148.57 | | 148.86 | 0.005228 | 2.53 | 36.05 | 35.63 | 0.57 |
| 001 | 327.80* | 100 +25% | 88.50 | 145.85 | 148.76 | | 149.04 | 0.004875 | 2.59 | 42.76 | 38.11 | 0.56 |
| 001 | 327.80* | 100 +70% | 120.36 | 145.85 | 149.07 | | 149.38 | 0.004651 | 2.76 | 55.36 | 41.72 | 0.56 |
| 001 | 327.80* | 1000 | 116.46 | 145.85 | 149.04 | | 149.34 | 0.004671 | 2.74 | 53.89 | 41.34 | 0.56 |
| 001 | 319.40* | 2 | 26.58 | 145.82 | 147.40 | | 147.69 | 0.010087 | 2.39 | 11.14 | 10.23 | 0.73 |
| 001 | 319.40* | 20 | 49.78 | 145.82 | 148.06 | 147.66 | 148.40 | 0.007225 | 2.61 | 21.19 | 26.54 | 0.65 |
| 001 | 319.40* | 50 | 60.91 | 145.82 | 148.31 | 148.07 | 148.62 | 0.005801 | 2.56 | 28.44 | 30.62 | 0.59 |
| 001 | 319.40* | 100 | 70.80 | 145.82 | 148.45 | 148.21 | 148.76 | 0.005617 | 2.64 | 32.85 | 32.75 | 0.59 |
| 001 | 319.40* | 100 +5% | 74.34 | 145.82 | 148.50 | 148.25 | 148.81 | 0.005570 | 2.66 | 34.36 | 33.42 | 0.59 |
| 001 | 319.40* | 100 +25% | 88.50 | 145.82 | 148.68 | 148.41 | 149.00 | 0.005229 | 2.73 | 40.72 | 35.77 | 0.58 |
| 001 | 319.40* | 100 +70% | 120.36 | 145.82 | 148.98 | 148.70 | 149.33 | 0.005293 | 2.98 | 51.67 | 39.09 | 0.59 |
| 001 | 319.40* | 1000 | 116.46 | 145.82 | 148.94 | 148.67 | 149.29 | 0.005301 | 2.95 | 50.33 | 38.71 | 0.59 |
| 001 | 0311 | 2 | 26.58 | 145.79 | 147.18 | | 147.57 | 0.014474 | 2.76 | 9.63 | 9.18 | 0.86 |
| 001 | 0311 | 20 | 49.78 | 145.79 | 147.74 | 147.60 | 148.30 | 0.013524 | 3.31 | 15.16 | 13.00 | 0.86 |
| 001 | 0311 | 50 | 60.91 | 145.79 | 148.03 | 148.03 | 148.53 | 0.010428 | 3.22 | 21.44 | 25.62 | 0.77 |
| 001 | 0311 | 100 | 70.80 | 145.79 | 148.17 | 148.17 | 148.68 | 0.010001 | 3.32 | 25.15 | 27.59 | 0.76 |
| 001 | 0311 | 100 +5% | 74.34 | 145.79 | 148.21 | 148.21 | 148.73 | 0.009906 | 3.35 | 26.39 | 28.22 | 0.76 |
| 001 | 0311 | 100 +25% | 88.50 | 145.79 | 148.37 | 148.37 | 148.91 | 0.009750 | 3.50 | 30.97 | 30.42 | 0.77 |
| 001 | 0311 | 100 +70% | 120.36 | 145.79 | 148.67 | 148.67 | 149.25 | 0.009329 | 3.74 | 40.74 | 34.16 | 0.77 |
| 001 | 0311 | 1000 | 116.46 | 145.79 | 148.64 | 148.64 | 149.22 | 0.009299 | 3.70 | 39.72 | 33.82 | 0.77 |
| 001 | 301.67* | 2 | 26.58 | 145.58 | 147.12 | | 147.44 | 0.010533 | 2.49 | 10.69 | 9.42 | 0.74 |
| 001 | 301.67* | 20 | 49.78 | 145.58 | 147.69 | 147.42 | 148.16 | 0.010797 | 3.05 | 16.37 | 11.49 | 0.78 |
| 001 | 301.67* | 50 | 60.91 | 145.58 | 147.89 | 147.60 | 148.41 | 0.010527 | 3.23 | 20.61 | 27.68 | 0.78 |
| 001 | 301.67* | 100 | 70.80 | 145.58 | 147.99 | 148.07 | 148.57 | 0.011299 | 3.46 | 23.37 | 29.67 | 0.81 |
| 001 | 301.67* | 100 +5% | 74.34 | 145.58 | 148.02 | 148.11 | 148.62 | 0.011557 | 3.54 | 24.30 | 30.32 | 0.82 |
| 001 | 301.67* | 100 +25% | 88.50 | 145.58 | 148.16 | 148.28 | 148.80 | 0.011810 | 3.75 | 28.59 | 33.15 | 0.84 |
| 001 | 301.67* | 100 +70% | 120.36 | 145.58 | 148.39 | 148.56 | 149.14 | 0.012596 | 4.16 | 36.93 | 37.81 | 0.88 |
| 001 | 301.67* | 1000 | 116.46 | 145.58 | 148.37 | 148.53 | 149.10 | 0.012474 | 4.11 | 36.01 | 37.40 | 0.88 |
| 001 | 292.33* | 2 | 26.58 | 145.37 | 147.09 | | 147.33 | 0.007426 | 2.20 | 12.10 | 9.75 | 0.63 |
| 001 | 292.33* | 20 | 49.78 | 145.37 | 147.65 | 147.23 | 148.05 | 0.008500 | 2.78 | 17.89 | 10.76 | 0.69 |
| 001 | 292.33* | 50 | 60.91 | 145.37 | 147.85 | 147.45 | 148.30 | 0.008578 | 2.99 | 22.22 | 31.41 | 0.70 |
| 001 | 292.33* | 100 | 70.80 | 145.37 | 148.00 | 147.61 | 148.45 | 0.008279 | 3.08 | 27.04 | 36.02 | 0.70 |
| 001 | 292.33* | 100 +5% | 74.34 | 145.37 | 148.02 | 148.01 | 148.50 | 0.008620 | 3.17 | 27.91 | 36.79 | 0.71 |
| 001 | 292.33* | 100 +25% | 88.50 | 145.37 | 148.05 | 148.20 | 148.69 | 0.011220 | 3.66 | 29.23 | 37.93 | 0.81 |
| 001 | 292.33* | 100 +70% | 120.36 | 145.37 | 148.25 | 148.49 | 149.02 | 0.012899 | 4.17 | 37.31 | 43.88 | 0.89 |
| 001 | 292.33* | 1000 | 116.46 | 145.37 | 148.23 | 148.45 | 148.98 | 0.012746 | 4.12 | 36.34 | 43.25 | 0.88 |
| 001 | 0283 | 2 | 26.58 | 145.16 | 147.07 | | 147.26 | 0.005271 | 1.94 | 13.72 | 10.10 | 0.53 |
| 001 | 0283 | 20 | 49.78 | 145.16 | 147.63 | | 147.96 | 0.006622 | 2.53 | 19.74 | 14.27 | 0.61 |
| 001 | 0283 | 50 | 60.91 | 145.16 | 147.83 | 147.25 | 148.20 | 0.006796 | 2.72 | 24.60 | 35.00 | 0.62 |
| 001 | 0283 | 100 | 70.80 | 145.16 | 147.99 | 147.44 | 148.36 | 0.006340 | 2.77 | 31.20 | 45.94 | 0.61 |
| 001 | 0283 | 100 +5% | 74.34 | 145.16 | 148.04 | 147.50 | 148.40 | 0.006264 | 2.79 | 33.32 | 48.42 | 0.61 |
| 001 | 0283 | 100 +25% | 88.50 | 145.16 | 148.19 | 148.15 | 148.55 | 0.006054 | 2.87 | 41.14 | 54.19 | 0.60 |
| 001 | 0283 | 100 +70% | 120.36 | 145.16 | 148.13 | 148.36 | 148.90 | 0.012974 | 4.14 | 38.17 | 53.67 | 0.88 |
| 001 | 0283 | 1000 | 116.46 | 145.16 | 148.11 | 148.34 | 148.87 | 0.012805 | 4.08 | 37.05 | 52.50 | 0.87 |
| 001 | 274.00* | 2 | 26.58 | 145.16 | 147.03 | | 147.21 | 0.005000 | 1.89 | 14.10 | 10.64 | 0.52 |
| 001 | 274.00* | 20 | 49.78 | 145.16 | 147.59 | | 147.89 | 0.006139 | 2.45 | 20.33 | 12.38 | 0.59 |
| 001 | 274.00* | 50 | 60.91 | 145.16 | 147.78 | 147.20 | 148.14 | 0.006236 | 2.65 | 24.87 | 34.18 | 0.61 |
| 001 | 274.00* | 100 | 70.80 | 145.16 | 147.95 | 147.37 | 148.30 | 0.005857 | 2.71 | 31.61 | 47.41 | 0.60 |
| 001 | 274.00* | 100 +5% | 74.34 | 145.16 | 147.99 | 147.43 | 148.34 | 0.005789 | 2.73 | 33.83 | 50.18 | 0.60 |
| 001 | 274.00* | 100 +25% | 88.50 | 145.16 | 148.14 | 148.04 | 148.49 | 0.005625 | 2.82 | 41.81 | 55.97 | 0.59 |
| 001 | 274.00* | 100 +70% | 120.36 | 145.16 | 148.43 | 148.34 | 148.75 | 0.004932 | 2.86 | 59.45 | 61.84 | 0.57 |
| 001 | 274.00* | 1000 | 116.46 | 145.16 | 148.40 | 148.32 | 148.72 | 0.005089 | 2.87 | 57.08 | 61.77 | 0.57 |
| 001 | 265.00* | 2 | 26.58 | 145.15 | 146.99 | | 147.16 | 0.004875 | 1.85 | 14.39 | 11.18 | 0.52 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 265.00* | 20 | 49.78 | 145.15 | 147.54 | | 147.83 | 0.005676 | 2.38 | 20.98 | 13.12 | 0.58 |
| 001 | 265.00* | 50 | 60.91 | 145.15 | 147.74 | 147.15 | 148.08 | 0.005772 | 2.58 | 25.33 | 33.07 | 0.59 |
| 001 | 265.00* | 100 | 70.80 | 145.15 | 147.90 | 147.31 | 148.24 | 0.005442 | 2.64 | 32.19 | 48.64 | 0.58 |
| 001 | 265.00* | 100 +5% | 74.34 | 145.15 | 147.95 | 147.37 | 148.29 | 0.005379 | 2.66 | 34.49 | 51.71 | 0.58 |
| 001 | 265.00* | 100 +25% | 88.50 | 145.15 | 148.10 | 147.98 | 148.44 | 0.005214 | 2.75 | 42.99 | 59.07 | 0.58 |
| 001 | 265.00* | 100 +70% | 120.36 | 145.15 | 148.40 | | 148.70 | 0.004559 | 2.79 | 61.95 | 67.78 | 0.55 |
| 001 | 265.00* | 1000 | 116.46 | 145.15 | 148.36 | | 148.67 | 0.004691 | 2.80 | 59.33 | 66.66 | 0.56 |
| 001 | 256.00* | 2 | 26.58 | 145.15 | 146.95 | | 147.11 | 0.004885 | 1.82 | 14.59 | 11.71 | 0.52 |
| 001 | 256.00* | 20 | 49.78 | 145.15 | 147.50 | | 147.78 | 0.005335 | 2.31 | 21.64 | 14.59 | 0.57 |
| 001 | 256.00* | 50 | 60.91 | 145.15 | 147.70 | 147.11 | 148.02 | 0.005397 | 2.51 | 25.97 | 32.80 | 0.58 |
| 001 | 256.00* | 100 | 70.80 | 145.15 | 147.86 | 147.26 | 148.18 | 0.005084 | 2.57 | 33.03 | 50.61 | 0.57 |
| 001 | 256.00* | 100 +5% | 74.34 | 145.15 | 147.91 | 147.32 | 148.23 | 0.005004 | 2.59 | 35.47 | 53.40 | 0.57 |
| 001 | 256.00* | 100 +25% | 88.50 | 145.15 | 148.06 | 147.53 | 148.38 | 0.004884 | 2.68 | 44.32 | 63.40 | 0.57 |
| 001 | 256.00* | 100 +70% | 120.36 | 145.15 | 148.38 | | 148.65 | 0.004015 | 2.65 | 65.71 | 71.49 | 0.53 |
| 001 | 256.00* | 1000 | 116.46 | 145.15 | 148.34 | | 148.62 | 0.004157 | 2.67 | 62.81 | 70.47 | 0.54 |
| 001 | 247.00* | 2 | 26.58 | 145.14 | 146.90 | | 147.07 | 0.005059 | 1.81 | 14.68 | 12.30 | 0.53 |
| 001 | 247.00* | 20 | 49.78 | 145.14 | 147.46 | | 147.72 | 0.005096 | 2.26 | 22.35 | 16.47 | 0.56 |
| 001 | 247.00* | 50 | 60.91 | 145.14 | 147.67 | 147.07 | 147.96 | 0.005077 | 2.43 | 26.87 | 33.64 | 0.57 |
| 001 | 247.00* | 100 | 70.80 | 145.14 | 147.83 | 147.23 | 148.13 | 0.004741 | 2.49 | 34.29 | 53.21 | 0.56 |
| 001 | 247.00* | 100 +5% | 74.34 | 145.14 | 147.88 | 147.27 | 148.18 | 0.004640 | 2.50 | 36.95 | 56.14 | 0.55 |
| 001 | 247.00* | 100 +25% | 88.50 | 145.14 | 148.03 | 147.50 | 148.33 | 0.004489 | 2.58 | 46.31 | 66.61 | 0.55 |
| 001 | 247.00* | 100 +70% | 120.36 | 145.14 | 148.37 | | 148.60 | 0.003505 | 2.50 | 70.46 | 76.51 | 0.50 |
| 001 | 247.00* | 1000 | 116.46 | 145.14 | 148.32 | | 148.57 | 0.003648 | 2.52 | 67.23 | 75.52 | 0.51 |
| 001 | 0238 | 2 | 26.58 | 145.14 | 146.85 | | 147.02 | 0.005397 | 1.82 | 14.61 | 12.79 | 0.54 |
| 001 | 0238 | 20 | 49.78 | 145.14 | 147.43 | | 147.67 | 0.004919 | 2.21 | 23.30 | 19.74 | 0.55 |
| 001 | 0238 | 50 | 60.91 | 145.14 | 147.64 | | 147.91 | 0.004711 | 2.34 | 28.48 | 36.15 | 0.55 |
| 001 | 0238 | 100 | 70.80 | 145.14 | 147.81 | 147.19 | 148.08 | 0.004291 | 2.37 | 36.69 | 56.77 | 0.53 |
| 001 | 0238 | 100 +5% | 74.34 | 145.14 | 147.86 | | 148.12 | 0.004166 | 2.37 | 39.63 | 59.87 | 0.53 |
| 001 | 0238 | 100 +25% | 88.50 | 145.14 | 148.03 | | 148.28 | 0.003863 | 2.41 | 50.46 | 70.94 | 0.51 |
| 001 | 0238 | 100 +70% | 120.36 | 145.14 | 148.36 | | 148.56 | 0.002998 | 2.32 | 76.47 | 82.14 | 0.46 |
| 001 | 0238 | 1000 | 116.46 | 145.14 | 148.32 | | 148.53 | 0.003087 | 2.33 | 73.39 | 81.35 | 0.47 |
| 001 | 229.50* | 2 | 26.58 | 145.06 | 146.77 | | 146.97 | 0.006368 | 1.94 | 13.67 | 12.32 | 0.59 |
| 001 | 229.50* | 20 | 49.78 | 145.06 | 147.35 | | 147.62 | 0.005830 | 2.33 | 21.71 | 17.18 | 0.60 |
| 001 | 229.50* | 50 | 60.91 | 145.06 | 147.55 | 147.04 | 147.86 | 0.005677 | 2.50 | 25.90 | 30.62 | 0.60 |
| 001 | 229.50* | 100 | 70.80 | 145.06 | 147.72 | 147.20 | 148.03 | 0.005189 | 2.54 | 33.28 | 50.77 | 0.58 |
| 001 | 229.50* | 100 +5% | 74.34 | 145.06 | 147.77 | 147.24 | 148.08 | 0.005016 | 2.54 | 35.99 | 53.29 | 0.58 |
| 001 | 229.50* | 100 +25% | 88.50 | 145.06 | 147.94 | 147.47 | 148.24 | 0.004617 | 2.57 | 45.71 | 61.60 | 0.56 |
| 001 | 229.50* | 100 +70% | 120.36 | 145.06 | 148.28 | | 148.53 | 0.003633 | 2.52 | 69.72 | 77.33 | 0.51 |
| 001 | 229.50* | 1000 | 116.46 | 145.06 | 148.24 | | 148.49 | 0.003773 | 2.54 | 66.59 | 76.44 | 0.52 |
| 001 | 221.00* | 2 | 26.58 | 144.97 | 146.69 | | 146.91 | 0.006903 | 2.05 | 12.99 | 11.49 | 0.61 |
| 001 | 221.00* | 20 | 49.78 | 144.97 | 147.27 | | 147.57 | 0.006704 | 2.44 | 20.75 | 16.38 | 0.64 |
| 001 | 221.00* | 50 | 60.91 | 144.97 | 147.47 | 147.01 | 147.81 | 0.006488 | 2.60 | 24.53 | 26.04 | 0.64 |
| 001 | 221.00* | 100 | 70.80 | 144.97 | 147.64 | 147.18 | 147.98 | 0.005952 | 2.66 | 31.14 | 45.69 | 0.62 |
| 001 | 221.00* | 100 +5% | 74.34 | 144.97 | 147.69 | 147.23 | 148.03 | 0.005745 | 2.66 | 33.63 | 47.95 | 0.61 |
| 001 | 221.00* | 100 +25% | 88.50 | 144.97 | 147.86 | 147.71 | 148.19 | 0.005300 | 2.70 | 42.39 | 55.18 | 0.60 |
| 001 | 221.00* | 100 +70% | 120.36 | 144.97 | 148.20 | | 148.49 | 0.004344 | 2.70 | 63.56 | 71.66 | 0.55 |
| 001 | 221.00* | 1000 | 116.46 | 144.97 | 148.16 | | 148.45 | 0.004466 | 2.71 | 60.75 | 69.54 | 0.56 |
| 001 | 212.50* | 2 | 26.58 | 144.89 | 146.62 | | 146.84 | 0.007389 | 2.10 | 12.64 | 11.30 | 0.63 |
| 001 | 212.50* | 20 | 49.78 | 144.89 | 147.18 | | 147.51 | 0.007254 | 2.52 | 20.13 | 16.54 | 0.66 |
| 001 | 212.50* | 50 | 60.91 | 144.89 | 147.39 | 146.97 | 147.75 | 0.007216 | 2.68 | 23.82 | 23.60 | 0.67 |
| 001 | 212.50* | 100 | 70.80 | 144.89 | 147.56 | 147.15 | 147.92 | 0.006549 | 2.73 | 30.01 | 41.98 | 0.65 |
| 001 | 212.50* | 100 +5% | 74.34 | 144.89 | 147.61 | 147.22 | 147.97 | 0.006303 | 2.73 | 32.35 | 44.31 | 0.64 |
| 001 | 212.50* | 100 +25% | 88.50 | 144.89 | 147.79 | 147.65 | 148.13 | 0.005792 | 2.78 | 40.48 | 50.28 | 0.62 |
| 001 | 212.50* | 100 +70% | 120.36 | 144.89 | 148.13 | | 148.44 | 0.004714 | 2.78 | 60.02 | 64.04 | 0.57 |
| 001 | 212.50* | 1000 | 116.46 | 144.89 | 148.09 | | 148.41 | 0.004828 | 2.78 | 57.53 | 62.20 | 0.58 |
| 001 | 204.00* | 2 | 26.58 | 144.80 | 146.55 | | 146.78 | 0.007704 | 2.13 | 12.50 | 11.36 | 0.65 |
| 001 | 204.00* | 20 | 49.78 | 144.80 | 147.11 | | 147.44 | 0.007446 | 2.56 | 19.93 | 16.88 | 0.67 |
| 001 | 204.00* | 50 | 60.91 | 144.80 | 147.32 | 146.91 | 147.68 | 0.007310 | 2.71 | 23.80 | 22.34 | 0.67 |
| 001 | 204.00* | 100 | 70.80 | 144.80 | 147.49 | 147.10 | 147.86 | 0.006810 | 2.75 | 29.83 | 39.58 | 0.65 |
| 001 | 204.00* | 100 +5% | 74.34 | 144.80 | 147.56 | 147.18 | 147.91 | 0.006301 | 2.71 | 32.71 | 42.40 | 0.63 |
| 001 | 204.00* | 100 +25% | 88.50 | 144.80 | 147.76 | | 148.08 | 0.005473 | 2.70 | 41.58 | 48.17 | 0.60 |
| 001 | 204.00* | 100 +70% | 120.36 | 144.80 | 148.10 | | 148.40 | 0.004605 | 2.74 | 59.66 | 59.19 | 0.56 |
| 001 | 204.00* | 1000 | 116.46 | 144.80 | 148.06 | | 148.37 | 0.004687 | 2.74 | 57.43 | 57.70 | 0.57 |
| 001 | 195.50* | 2 | 26.58 | 144.72 | 146.48 | | 146.71 | 0.007717 | 2.12 | 12.55 | 11.47 | 0.65 |
| 001 | 195.50* | 20 | 49.78 | 144.72 | 147.06 | | 147.38 | 0.006901 | 2.52 | 20.47 | 17.43 | 0.64 |
| 001 | 195.50* | 50 | 60.91 | 144.72 | 147.27 | 146.83 | 147.62 | 0.006824 | 2.66 | 24.60 | 24.61 | 0.65 |
| 001 | 195.50* | 100 | 70.80 | 144.72 | 147.46 | 147.02 | 147.80 | 0.006284 | 2.68 | 31.03 | 38.72 | 0.63 |
| 001 | 195.50* | 100 +5% | 74.34 | 144.72 | 147.53 | | 147.85 | 0.005835 | 2.63 | 34.07 | 41.45 | 0.61 |
| 001 | 195.50* | 100 +25% | 88.50 | 144.72 | 147.73 | | 148.03 | 0.005072 | 2.61 | 42.98 | 46.53 | 0.57 |
| 001 | 195.50* | 100 +70% | 120.36 | 144.72 | 148.08 | | 148.36 | 0.004334 | 2.67 | 60.40 | 55.79 | 0.54 |
| 001 | 195.50* | 1000 | 116.46 | 144.72 | 148.04 | | 148.32 | 0.004389 | 2.66 | 58.35 | 54.57 | 0.55 |
| 001 | 0187 | 2 | 26.58 | 144.63 | 146.42 | | 146.64 | 0.007339 | 2.07 | 12.85 | 11.66 | 0.63 |
| 001 | 0187 | 20 | 49.78 | 144.63 | 147.02 | | 147.31 | 0.006267 | 2.42 | 21.54 | 18.68 | 0.61 |
| 001 | 0187 | 50 | 60.91 | 144.63 | 147.23 | 146.76 | 147.55 | 0.006164 | 2.57 | 25.88 | 29.43 | 0.61 |
| 001 | 0187 | 100 | 70.80 | 144.63 | 147.43 | | 147.74 | 0.005470 | 2.55 | 33.01 | 38.55 | 0.58 |
| 001 | 0187 | 100 +5% | 74.34 | 144.63 | 147.51 | | 147.80 | 0.005071 | 2.51 | 36.14 | 40.84 | 0.56 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0187 | 100 +25% | 88.50 | 144.63 | 147.72 | | 147.98 | 0.004548 | 2.49 | 44.96 | 45.32 | 0.54 |
| 001 | 0187 | 100 +70% | 120.36 | 144.63 | 148.06 | | 148.32 | 0.004004 | 2.58 | 61.68 | 53.13 | 0.52 |
| 001 | 0187 | 1000 | 116.46 | 144.63 | 148.02 | | 148.28 | 0.004037 | 2.56 | 59.74 | 52.05 | 0.52 |
| 001 | 177.00* | 2 | 26.58 | 144.51 | 146.34 | | 146.57 | 0.007593 | 2.12 | 12.54 | 11.23 | 0.64 |
| 001 | 177.00* | 20 | 49.78 | 144.51 | 146.93 | | 147.25 | 0.006616 | 2.50 | 20.83 | 17.46 | 0.62 |
| 001 | 177.00* | 50 | 60.91 | 144.51 | 147.15 | 146.70 | 147.49 | 0.006533 | 2.63 | 24.92 | 22.60 | 0.63 |
| 001 | 177.00* | 100 | 70.80 | 144.51 | 147.32 | 146.89 | 147.67 | 0.006423 | 2.72 | 30.17 | 34.61 | 0.63 |
| 001 | 177.00* | 100 +5% | 74.34 | 144.51 | 147.41 | 146.98 | 147.74 | 0.005786 | 2.65 | 33.47 | 37.42 | 0.60 |
| 001 | 177.00* | 100 +25% | 88.50 | 144.51 | 147.64 | | 147.93 | 0.004828 | 2.60 | 42.67 | 42.78 | 0.56 |
| 001 | 177.00* | 100 +70% | 120.36 | 144.51 | 147.98 | | 148.28 | 0.004263 | 2.70 | 58.76 | 50.37 | 0.54 |
| 001 | 177.00* | 1000 | 116.46 | 144.51 | 147.95 | | 148.24 | 0.004293 | 2.68 | 56.92 | 49.34 | 0.54 |
| 001 | 167.00* | 2 | 26.58 | 144.39 | 146.25 | | 146.49 | 0.007867 | 2.17 | 12.24 | 10.79 | 0.65 |
| 001 | 167.00* | 20 | 49.78 | 144.39 | 146.83 | | 147.17 | 0.007321 | 2.59 | 19.98 | 16.57 | 0.66 |
| 001 | 167.00* | 50 | 60.91 | 144.39 | 147.05 | | 147.42 | 0.007204 | 2.73 | 23.82 | 19.44 | 0.66 |
| 001 | 167.00* | 100 | 70.80 | 144.39 | 147.19 | 146.84 | 147.60 | 0.007446 | 2.91 | 27.39 | 30.72 | 0.68 |
| 001 | 167.00* | 100 +5% | 74.34 | 144.39 | 147.29 | 146.92 | 147.67 | 0.006546 | 2.82 | 30.61 | 33.70 | 0.64 |
| 001 | 167.00* | 100 +25% | 88.50 | 144.39 | 147.53 | | 147.87 | 0.005381 | 2.77 | 39.62 | 39.87 | 0.60 |
| 001 | 167.00* | 100 +70% | 120.36 | 144.39 | 147.90 | | 148.23 | 0.004586 | 2.83 | 55.75 | 47.73 | 0.56 |
| 001 | 167.00* | 1000 | 116.46 | 144.39 | 147.86 | | 148.19 | 0.004620 | 2.81 | 53.99 | 46.79 | 0.56 |
| 001 | 157.00* | 2 | 26.58 | 144.27 | 146.16 | | 146.41 | 0.008130 | 2.22 | 11.95 | 10.38 | 0.66 |
| 001 | 157.00* | 20 | 49.78 | 144.27 | 146.73 | | 147.09 | 0.008050 | 2.67 | 19.24 | 15.82 | 0.69 |
| 001 | 157.00* | 50 | 60.91 | 144.27 | 146.93 | | 147.33 | 0.007762 | 2.83 | 22.72 | 18.13 | 0.69 |
| 001 | 157.00* | 100 | 70.80 | 144.27 | 147.06 | 146.78 | 147.52 | 0.008155 | 3.05 | 25.26 | 26.80 | 0.71 |
| 001 | 157.00* | 100 +5% | 74.34 | 144.27 | 147.16 | 146.85 | 147.60 | 0.007405 | 3.00 | 28.03 | 30.36 | 0.69 |
| 001 | 157.00* | 100 +25% | 88.50 | 144.27 | 147.41 | | 147.81 | 0.006077 | 2.95 | 36.53 | 36.73 | 0.63 |
| 001 | 157.00* | 100 +70% | 120.36 | 144.27 | 147.79 | | 148.17 | 0.005172 | 3.02 | 51.93 | 45.37 | 0.60 |
| 001 | 157.00* | 1000 | 116.46 | 144.27 | 147.75 | | 148.13 | 0.005219 | 3.01 | 50.23 | 44.42 | 0.60 |
| 001 | 147.00* | 2 | 26.58 | 144.15 | 146.05 | | 146.32 | 0.008494 | 2.29 | 11.63 | 9.97 | 0.68 |
| 001 | 147.00* | 20 | 49.78 | 144.15 | 146.62 | | 147.00 | 0.008503 | 2.75 | 18.59 | 15.02 | 0.71 |
| 001 | 147.00* | 50 | 60.91 | 144.15 | 146.82 | | 147.25 | 0.008171 | 2.93 | 21.87 | 17.31 | 0.71 |
| 001 | 147.00* | 100 | 70.80 | 144.15 | 146.97 | 146.68 | 147.44 | 0.008192 | 3.10 | 24.61 | 19.75 | 0.72 |
| 001 | 147.00* | 100 +5% | 74.34 | 144.15 | 147.01 | 146.75 | 147.52 | 0.008458 | 3.20 | 25.60 | 26.41 | 0.73 |
| 001 | 147.00* | 100 +25% | 88.50 | 144.15 | 147.28 | 146.86 | 147.74 | 0.006819 | 3.13 | 33.76 | 33.82 | 0.67 |
| 001 | 147.00* | 100 +70% | 120.36 | 144.15 | 147.67 | 147.50 | 148.11 | 0.005817 | 3.22 | 48.70 | 44.23 | 0.64 |
| 001 | 147.00* | 1000 | 116.46 | 144.15 | 147.63 | 147.46 | 148.07 | 0.005883 | 3.21 | 46.99 | 43.23 | 0.64 |
| 001 | 137.00* | 2 | 26.58 | 144.03 | 145.95 | | 146.23 | 0.009167 | 2.32 | 11.44 | 10.17 | 0.70 |
| 001 | 137.00* | 20 | 49.78 | 144.03 | 146.51 | | 146.91 | 0.008532 | 2.80 | 18.28 | 14.81 | 0.71 |
| 001 | 137.00* | 50 | 60.91 | 144.03 | 146.71 | | 147.16 | 0.008249 | 2.99 | 21.54 | 16.88 | 0.71 |
| 001 | 137.00* | 100 | 70.80 | 144.03 | 146.88 | 146.60 | 147.36 | 0.008079 | 3.13 | 24.40 | 18.75 | 0.72 |
| 001 | 137.00* | 100 +5% | 74.34 | 144.03 | 146.93 | 146.67 | 147.43 | 0.008107 | 3.19 | 25.42 | 20.52 | 0.72 |
| 001 | 137.00* | 100 +25% | 88.50 | 144.03 | 147.16 | 146.82 | 147.67 | 0.007415 | 3.29 | 31.73 | 31.13 | 0.70 |
| 001 | 137.00* | 100 +70% | 120.36 | 144.03 | 147.57 | 147.47 | 148.04 | 0.006037 | 3.32 | 47.93 | 45.66 | 0.65 |
| 001 | 137.00* | 1000 | 116.46 | 144.03 | 147.51 | 147.42 | 148.00 | 0.006400 | 3.36 | 45.20 | 44.49 | 0.67 |
| 001 | 127.00* | 2 | 26.58 | 143.90 | 145.87 | | 146.13 | 0.008836 | 2.28 | 11.66 | 10.36 | 0.69 |
| 001 | 127.00* | 20 | 49.78 | 143.90 | 146.44 | | 146.82 | 0.007726 | 2.75 | 18.84 | 15.19 | 0.68 |
| 001 | 127.00* | 50 | 60.91 | 143.90 | 146.65 | | 147.08 | 0.007458 | 2.93 | 22.20 | 16.62 | 0.68 |
| 001 | 127.00* | 100 | 70.80 | 143.90 | 146.81 | | 147.28 | 0.007536 | 3.10 | 24.88 | 18.78 | 0.70 |
| 001 | 127.00* | 100 +5% | 74.34 | 143.90 | 146.86 | 146.57 | 147.35 | 0.007582 | 3.17 | 25.90 | 20.76 | 0.70 |
| 001 | 127.00* | 100 +25% | 88.50 | 143.90 | 147.04 | 146.73 | 147.59 | 0.007852 | 3.40 | 30.96 | 33.92 | 0.72 |
| 001 | 127.00* | 100 +70% | 120.36 | 143.90 | 147.58 | | 147.96 | 0.004715 | 3.05 | 53.89 | 47.71 | 0.58 |
| 001 | 127.00* | 1000 | 116.46 | 143.90 | 147.52 | | 147.91 | 0.004969 | 3.08 | 51.11 | 46.61 | 0.59 |
| 001 | 117.00* | 2 | 26.58 | 143.78 | 145.80 | | 146.05 | 0.007520 | 2.18 | 12.19 | 10.55 | 0.64 |
| 001 | 117.00* | 20 | 49.78 | 143.78 | 146.40 | | 146.74 | 0.006548 | 2.64 | 19.99 | 15.20 | 0.63 |
| 001 | 117.00* | 50 | 60.91 | 143.78 | 146.61 | 146.21 | 147.00 | 0.006495 | 2.83 | 23.44 | 18.73 | 0.64 |
| 001 | 117.00* | 100 | 70.80 | 143.78 | 146.75 | 146.37 | 147.20 | 0.006825 | 3.04 | 26.94 | 29.23 | 0.66 |
| 001 | 117.00* | 100 +5% | 74.34 | 143.78 | 146.82 | 146.42 | 147.26 | 0.006599 | 3.05 | 28.91 | 31.29 | 0.66 |
| 001 | 117.00* | 100 +25% | 88.50 | 143.78 | 147.09 | 146.58 | 147.47 | 0.005254 | 2.94 | 38.94 | 40.39 | 0.60 |
| 001 | 117.00* | 100 +70% | 120.36 | 143.78 | 147.61 | | 147.89 | 0.003376 | 2.68 | 62.69 | 50.50 | 0.49 |
| 001 | 117.00* | 1000 | 116.46 | 143.78 | 147.56 | | 147.84 | 0.003520 | 2.70 | 59.88 | 49.50 | 0.50 |
| 001 | 107.00* | 2 | 26.58 | 143.66 | 145.76 | | 145.97 | 0.005926 | 2.04 | 13.23 | 11.97 | 0.57 |
| 001 | 107.00* | 20 | 49.78 | 143.66 | 146.37 | | 146.67 | 0.005333 | 2.48 | 22.16 | 24.69 | 0.57 |
| 001 | 107.00* | 50 | 60.91 | 143.66 | 146.62 | | 146.91 | 0.004758 | 2.54 | 29.25 | 30.68 | 0.55 |
| 001 | 107.00* | 100 | 70.80 | 143.66 | 146.82 | | 147.10 | 0.004168 | 2.52 | 35.94 | 37.04 | 0.52 |
| 001 | 107.00* | 100 +5% | 74.34 | 143.66 | 146.89 | | 147.16 | 0.003944 | 2.50 | 38.63 | 39.03 | 0.51 |
| 001 | 107.00* | 100 +25% | 88.50 | 143.66 | 147.15 | | 147.38 | 0.003221 | 2.42 | 49.54 | 44.63 | 0.47 |
| 001 | 107.00* | 100 +70% | 120.36 | 143.66 | 147.64 | | 147.83 | 0.002311 | 2.29 | 73.52 | 52.74 | 0.41 |
| 001 | 107.00* | 1000 | 116.46 | 143.66 | 147.59 | | 147.78 | 0.002382 | 2.30 | 70.71 | 51.86 | 0.41 |
| 001 | 97.00* | 2 | 26.58 | 143.54 | 145.74 | | 145.91 | 0.004356 | 1.85 | 15.01 | 12.42 | 0.48 |
| 001 | 97.00* | 20 | 49.78 | 143.54 | 146.41 | | 146.59 | 0.003345 | 2.07 | 30.36 | 32.36 | 0.45 |
| 001 | 97.00* | 50 | 60.91 | 143.54 | 146.67 | | 146.84 | 0.002724 | 2.01 | 39.34 | 36.01 | 0.41 |
| 001 | 97.00* | 100 | 70.80 | 143.54 | 146.87 | | 147.03 | 0.002400 | 1.99 | 47.27 | 42.03 | 0.39 |
| 001 | 97.00* | 100 +5% | 74.34 | 143.54 | 146.94 | | 147.09 | 0.002297 | 1.98 | 50.15 | 43.26 | 0.39 |
| 001 | 97.00* | 100 +25% | 88.50 | 143.54 | 147.19 | | 147.33 | 0.001978 | 1.95 | 61.51 | 47.63 | 0.36 |
| 001 | 97.00* | 100 +70% | 120.36 | 143.54 | 147.67 | | 147.79 | 0.001573 | 1.92 | 85.79 | 54.53 | 0.33 |
| 001 | 97.00* | 1000 | 116.46 | 143.54 | 147.61 | | 147.74 | 0.001606 | 1.92 | 82.95 | 53.76 | 0.33 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0087 | 2 | 26.58 | 143.42 | 145.74 | | 145.86 | 0.003014 | 1.61 | 18.59 | 23.73 | 0.39 |
| 001 | 0087 | 20 | 49.78 | 143.42 | 146.44 | | 146.54 | 0.001820 | 1.57 | 41.30 | 36.73 | 0.32 |
| 001 | 0087 | 50 | 60.91 | 143.42 | 146.70 | | 146.79 | 0.001557 | 1.56 | 51.26 | 41.29 | 0.30 |
| 001 | 0087 | 100 | 70.80 | 143.42 | 146.90 | | 146.99 | 0.001412 | 1.55 | 59.89 | 45.21 | 0.29 |
| 001 | 0087 | 100 +5% | 74.34 | 143.42 | 146.97 | | 147.06 | 0.001372 | 1.56 | 62.90 | 46.26 | 0.29 |
| 001 | 0087 | 100 +25% | 88.50 | 143.42 | 147.21 | | 147.30 | 0.001244 | 1.56 | 74.68 | 49.87 | 0.28 |
| 001 | 0087 | 100 +70% | 120.36 | 143.42 | 147.68 | | 147.77 | 0.001078 | 1.59 | 99.47 | 55.93 | 0.27 |
| 001 | 0087 | 1000 | 116.46 | 143.42 | 147.63 | | 147.72 | 0.001092 | 1.59 | 96.58 | 55.26 | 0.27 |
| 001 | 77.333* | 2 | 26.58 | 143.39 | 145.73 | | 145.83 | 0.002118 | 1.43 | 20.50 | 24.19 | 0.35 |
| 001 | 77.333* | 20 | 49.78 | 143.39 | 146.43 | | 146.52 | 0.001415 | 1.47 | 43.47 | 37.26 | 0.31 |
| 001 | 77.333* | 50 | 60.91 | 143.39 | 146.69 | | 146.78 | 0.001244 | 1.48 | 53.85 | 43.27 | 0.29 |
| 001 | 77.333* | 100 | 70.80 | 143.39 | 146.89 | | 146.98 | 0.001144 | 1.49 | 62.78 | 46.52 | 0.28 |
| 001 | 77.333* | 100 +5% | 74.34 | 143.39 | 146.96 | | 147.04 | 0.001116 | 1.50 | 65.88 | 47.60 | 0.28 |
| 001 | 77.333* | 100 +25% | 88.50 | 143.39 | 147.20 | | 147.29 | 0.001028 | 1.51 | 78.00 | 51.09 | 0.27 |
| 001 | 77.333* | 100 +70% | 120.36 | 143.39 | 147.67 | | 147.76 | 0.000912 | 1.57 | 103.45 | 57.35 | 0.26 |
| 001 | 77.333* | 1000 | 116.46 | 143.39 | 147.62 | | 147.71 | 0.000921 | 1.56 | 100.49 | 56.66 | 0.26 |
| 001 | 67.667* | 2 | 26.58 | 143.36 | 145.72 | | 145.80 | 0.001585 | 1.26 | 22.75 | 25.14 | 0.31 |
| 001 | 67.667* | 20 | 49.78 | 143.36 | 146.43 | | 146.51 | 0.001147 | 1.36 | 46.11 | 38.80 | 0.28 |
| 001 | 67.667* | 50 | 60.91 | 143.36 | 146.69 | | 146.76 | 0.001025 | 1.38 | 57.00 | 44.68 | 0.27 |
| 001 | 67.667* | 100 | 70.80 | 143.36 | 146.89 | | 146.96 | 0.000955 | 1.40 | 66.22 | 48.01 | 0.27 |
| 001 | 67.667* | 100 +5% | 74.34 | 143.36 | 146.95 | | 147.03 | 0.000936 | 1.40 | 69.42 | 49.09 | 0.26 |
| 001 | 67.667* | 100 +25% | 88.50 | 143.36 | 147.20 | | 147.28 | 0.000873 | 1.43 | 81.88 | 52.48 | 0.26 |
| 001 | 67.667* | 100 +70% | 120.36 | 143.36 | 147.67 | | 147.75 | 0.000790 | 1.49 | 108.06 | 58.94 | 0.25 |
| 001 | 67.667* | 1000 | 116.46 | 143.36 | 147.62 | | 147.70 | 0.000797 | 1.49 | 105.01 | 58.24 | 0.25 |
| 001 | 58.000* | 2 | 26.58 | 143.33 | 145.72 | | 145.78 | 0.001216 | 1.12 | 25.27 | 26.29 | 0.28 |
| 001 | 58.000* | 20 | 49.78 | 143.33 | 146.42 | | 146.49 | 0.000942 | 1.25 | 49.20 | 40.84 | 0.26 |
| 001 | 58.000* | 50 | 60.91 | 143.33 | 146.68 | | 146.75 | 0.000854 | 1.27 | 60.59 | 46.21 | 0.25 |
| 001 | 58.000* | 100 | 70.80 | 143.33 | 146.88 | | 146.95 | 0.000806 | 1.30 | 70.12 | 49.55 | 0.25 |
| 001 | 58.000* | 100 +5% | 74.34 | 143.33 | 146.95 | | 147.02 | 0.000792 | 1.31 | 73.42 | 50.50 | 0.25 |
| 001 | 58.000* | 100 +25% | 88.50 | 143.33 | 147.19 | | 147.26 | 0.000748 | 1.34 | 86.25 | 54.03 | 0.24 |
| 001 | 58.000* | 100 +70% | 120.36 | 143.33 | 147.66 | | 147.74 | 0.000689 | 1.41 | 113.21 | 60.59 | 0.24 |
| 001 | 58.000* | 1000 | 116.46 | 143.33 | 147.61 | | 147.69 | 0.000694 | 1.40 | 110.07 | 59.92 | 0.24 |
| 001 | 48.333* | 2 | 26.58 | 143.30 | 145.72 | | 145.77 | 0.000948 | 1.00 | 28.06 | 28.12 | 0.25 |
| 001 | 48.333* | 20 | 49.78 | 143.30 | 146.42 | | 146.48 | 0.000777 | 1.14 | 52.74 | 43.23 | 0.24 |
| 001 | 48.333* | 50 | 60.91 | 143.30 | 146.68 | | 146.74 | 0.000715 | 1.18 | 64.59 | 47.86 | 0.23 |
| 001 | 48.333* | 100 | 70.80 | 143.30 | 146.88 | | 146.94 | 0.000682 | 1.20 | 74.45 | 51.08 | 0.23 |
| 001 | 48.333* | 100 +5% | 74.34 | 143.30 | 146.95 | | 147.01 | 0.000673 | 1.22 | 77.85 | 52.08 | 0.23 |
| 001 | 48.333* | 100 +25% | 88.50 | 143.30 | 147.19 | | 147.26 | 0.000643 | 1.25 | 91.11 | 55.77 | 0.22 |
| 001 | 48.333* | 100 +70% | 120.36 | 143.30 | 147.66 | | 147.73 | 0.000601 | 1.33 | 118.92 | 62.32 | 0.22 |
| 001 | 48.333* | 1000 | 116.46 | 143.30 | 147.61 | | 147.68 | 0.000605 | 1.32 | 115.69 | 61.65 | 0.22 |
| 001 | 38.667* | 2 | 26.58 | 143.27 | 145.72 | | 145.76 | 0.000743 | 0.90 | 31.14 | 30.21 | 0.22 |
| 001 | 38.667* | 20 | 49.78 | 143.27 | 146.42 | | 146.47 | 0.000641 | 1.05 | 56.72 | 44.94 | 0.22 |
| 001 | 38.667* | 50 | 60.91 | 143.27 | 146.68 | | 146.73 | 0.000599 | 1.08 | 69.03 | 49.64 | 0.21 |
| 001 | 38.667* | 100 | 70.80 | 143.27 | 146.88 | | 146.93 | 0.000578 | 1.12 | 79.22 | 52.79 | 0.21 |
| 001 | 38.667* | 100 +5% | 74.34 | 143.27 | 146.95 | | 147.00 | 0.000572 | 1.13 | 82.74 | 53.83 | 0.21 |
| 001 | 38.667* | 100 +25% | 88.50 | 143.27 | 147.19 | | 147.25 | 0.000553 | 1.17 | 96.45 | 57.70 | 0.21 |
| 001 | 38.667* | 100 +70% | 120.36 | 143.27 | 147.66 | | 147.72 | 0.000525 | 1.25 | 125.14 | 64.13 | 0.21 |
| 001 | 38.667* | 1000 | 116.46 | 143.27 | 147.61 | | 147.67 | 0.000527 | 1.24 | 121.82 | 63.45 | 0.21 |
| 001 | 29.000* | 2 | 26.58 | 143.25 | 145.71 | | 145.75 | 0.000586 | 0.81 | 34.50 | 31.53 | 0.19 |
| 001 | 29.000* | 20 | 49.78 | 143.25 | 146.42 | | 146.46 | 0.000529 | 0.96 | 61.09 | 46.71 | 0.20 |
| 001 | 29.000* | 50 | 60.91 | 143.25 | 146.68 | | 146.73 | 0.000503 | 1.00 | 73.88 | 51.38 | 0.19 |
| 001 | 29.000* | 100 | 70.80 | 143.25 | 146.88 | | 146.93 | 0.000490 | 1.04 | 84.43 | 54.68 | 0.19 |
| 001 | 29.000* | 100 +5% | 74.34 | 143.25 | 146.95 | | 146.99 | 0.000487 | 1.05 | 88.07 | 55.78 | 0.19 |
| 001 | 29.000* | 100 +25% | 88.50 | 143.25 | 147.19 | | 147.24 | 0.000475 | 1.09 | 102.28 | 59.86 | 0.19 |
| 001 | 29.000* | 100 +70% | 120.36 | 143.25 | 147.66 | | 147.72 | 0.000458 | 1.17 | 131.89 | 66.02 | 0.20 |
| 001 | 29.000* | 1000 | 116.46 | 143.25 | 147.61 | | 147.66 | 0.000459 | 1.16 | 128.46 | 65.34 | 0.19 |
| 001 | 19.333* | 2 | 26.58 | 143.22 | 145.71 | | 145.74 | 0.000465 | 0.73 | 38.10 | 32.19 | 0.17 |
| 001 | 19.333* | 20 | 49.78 | 143.22 | 146.42 | | 146.46 | 0.000439 | 0.88 | 65.88 | 48.60 | 0.18 |
| 001 | 19.333* | 50 | 60.91 | 143.22 | 146.68 | | 146.72 | 0.000422 | 0.93 | 79.16 | 53.31 | 0.18 |
| 001 | 19.333* | 100 | 70.80 | 143.22 | 146.88 | | 146.92 | 0.000416 | 0.96 | 90.11 | 56.81 | 0.18 |
| 001 | 19.333* | 100 +5% | 74.34 | 143.22 | 146.95 | | 146.99 | 0.000414 | 0.97 | 93.89 | 57.97 | 0.18 |
| 001 | 19.333* | 100 +25% | 88.50 | 143.22 | 147.19 | | 147.24 | 0.000408 | 1.02 | 108.66 | 61.83 | 0.18 |
| 001 | 19.333* | 100 +70% | 120.36 | 143.22 | 147.66 | | 147.71 | 0.000399 | 1.10 | 139.17 | 67.98 | 0.18 |
| 001 | 19.333* | 1000 | 116.46 | 143.22 | 147.61 | | 147.66 | 0.000399 | 1.09 | 135.65 | 67.30 | 0.18 |
| 001 | 9.667* | 2 | 26.58 | 143.19 | 145.71 | | 145.73 | 0.000372 | 0.66 | 41.92 | 33.33 | 0.16 |
| 001 | 9.667* | 20 | 49.78 | 143.19 | 146.42 | | 146.45 | 0.000360 | 0.81 | 71.09 | 50.31 | 0.16 |
| 001 | 9.667* | 50 | 60.91 | 143.19 | 146.68 | | 146.71 | 0.000356 | 0.86 | 84.88 | 55.48 | 0.16 |
| 001 | 9.667* | 100 | 70.80 | 143.19 | 146.88 | | 146.91 | 0.000353 | 0.89 | 96.28 | 59.20 | 0.17 |
| 001 | 9.667* | 100 +5% | 74.34 | 143.19 | 146.95 | | 146.98 | 0.000353 | 0.91 | 100.23 | 60.44 | 0.17 |
| 001 | 9.667* | 100 +25% | 88.50 | 143.19 | 147.19 | | 147.23 | 0.000350 | 0.95 | 115.53 | 63.83 | 0.17 |
| 001 | 9.667* | 100 +70% | 120.36 | 143.19 | 147.66 | | 147.71 | 0.000346 | 1.03 | 146.99 | 69.48 | 0.17 |
| 001 | 9.667* | 1000 | 116.46 | 143.19 | 147.61 | | 147.65 | 0.000347 | 1.02 | 143.37 | 69.32 | 0.17 |
| 001 | 0000 | 2 | 26.58 | 143.16 | 145.71 | 144.23 | 145.73 | 0.000300 | 0.60 | 46.01 | 35.06 | 0.14 |
| 001 | 0000 | 20 | 49.78 | 143.16 | 146.42 | 144.55 | 146.45 | 0.000300 | 0.74 | 76.72 | 52.19 | 0.15 |
| 001 | 0000 | 50 | 60.91 | 143.16 | 146.68 | 144.67 | 146.71 | 0.000300 | 0.79 | 91.08 | 57.93 | 0.15 |
| 001 | 0000 | 100 | 70.80 | 143.16 | 146.88 | 144.77 | 146.91 | 0.000300 | 0.83 | 103.00 | 61.78 | 0.15 |

HEC-RAS Plan: Mannings n +20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0000 | 100 +5% | 74.34 | 143.16 | 146.95 | 144.81 | 146.98 | 0.000300 | 0.84 | 107.10 | 62.65 | 0.15 |
| 001 | 0000 | 100 +25% | 88.50 | 143.16 | 147.19 | 144.94 | 147.23 | 0.000300 | 0.89 | 122.92 | 65.89 | 0.15 |
| 001 | 0000 | 100 +70% | 120.36 | 143.16 | 147.66 | 145.22 | 147.70 | 0.000300 | 0.97 | 155.24 | 70.32 | 0.16 |
| 001 | 0000 | 1000 | 116.46 | 143.16 | 147.61 | 145.18 | 147.65 | 0.000300 | 0.96 | 151.57 | 70.20 | 0.16 |

APPENDIX 10 – HEC-RAS Model Results: Manning's n -20%

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0874 | 2 | 26.58 | 149.52 | 150.79 | 150.68 | 151.10 | 0.005084 | 2.53 | 11.38 | 13.53 | 0.78 |
| 001 | 0874 | 20 | 49.78 | 149.52 | 151.21 | 151.12 | 151.67 | 0.005109 | 3.17 | 17.66 | 16.74 | 0.83 |
| 001 | 0874 | 50 | 60.91 | 149.52 | 151.36 | 151.31 | 151.89 | 0.005248 | 3.42 | 20.43 | 20.33 | 0.85 |
| 001 | 0874 | 100 | 70.80 | 149.52 | 151.49 | 151.48 | 152.06 | 0.005263 | 3.60 | 23.11 | 22.49 | 0.87 |
| 001 | 0874 | 100 +5% | 74.34 | 149.52 | 151.54 | 151.53 | 152.11 | 0.005141 | 3.63 | 24.30 | 23.28 | 0.86 |
| 001 | 0874 | 100 +25% | 88.50 | 149.52 | 151.62 | 151.73 | 152.33 | 0.006001 | 4.04 | 26.34 | 24.58 | 0.94 |
| 001 | 0874 | 100 +70% | 120.36 | 149.52 | 151.91 | 152.04 | 152.72 | 0.006001 | 4.43 | 33.69 | 26.91 | 0.96 |
| 001 | 0874 | 1000 | 116.46 | 149.52 | 151.87 | 152.00 | 152.67 | 0.006001 | 4.39 | 32.85 | 26.75 | 0.96 |
| 001 | 864.00* | 2 | 26.58 | 149.47 | 150.73 | | 151.05 | 0.005216 | 2.54 | 11.25 | 13.76 | 0.79 |
| 001 | 864.00* | 20 | 49.78 | 149.47 | 151.16 | 151.07 | 151.61 | 0.005028 | 3.14 | 17.79 | 17.21 | 0.82 |
| 001 | 864.00* | 50 | 60.91 | 149.47 | 151.31 | 151.26 | 151.83 | 0.005133 | 3.38 | 20.61 | 20.74 | 0.85 |
| 001 | 864.00* | 100 | 70.80 | 149.47 | 151.44 | 151.43 | 152.00 | 0.005115 | 3.55 | 23.39 | 23.07 | 0.86 |
| 001 | 864.00* | 100 +5% | 74.34 | 149.47 | 151.48 | 151.47 | 152.05 | 0.005091 | 3.60 | 24.41 | 23.76 | 0.86 |
| 001 | 864.00* | 100 +25% | 88.50 | 149.47 | 151.58 | 151.68 | 152.26 | 0.005783 | 3.97 | 26.77 | 25.31 | 0.92 |
| 001 | 864.00* | 100 +70% | 120.36 | 149.47 | 151.86 | 151.97 | 152.64 | 0.005736 | 4.34 | 34.29 | 27.36 | 0.94 |
| 001 | 864.00* | 1000 | 116.46 | 149.47 | 151.83 | 151.96 | 152.60 | 0.005732 | 4.30 | 33.45 | 27.19 | 0.94 |
| 001 | 854.00* | 2 | 26.58 | 149.41 | 150.67 | | 150.99 | 0.005395 | 2.56 | 11.07 | 13.92 | 0.81 |
| 001 | 854.00* | 20 | 49.78 | 149.41 | 151.11 | 151.03 | 151.56 | 0.004973 | 3.11 | 17.89 | 17.68 | 0.82 |
| 001 | 854.00* | 50 | 60.91 | 149.41 | 151.26 | 151.21 | 151.77 | 0.005036 | 3.34 | 20.79 | 21.15 | 0.84 |
| 001 | 854.00* | 100 | 70.80 | 149.41 | 151.38 | 151.37 | 151.94 | 0.005044 | 3.51 | 23.55 | 23.60 | 0.85 |
| 001 | 854.00* | 100 +5% | 74.34 | 149.41 | 151.42 | 151.41 | 151.99 | 0.005042 | 3.57 | 24.54 | 24.30 | 0.85 |
| 001 | 854.00* | 100 +25% | 88.50 | 149.41 | 151.52 | 151.62 | 152.20 | 0.005742 | 3.94 | 26.89 | 25.91 | 0.92 |
| 001 | 854.00* | 100 +70% | 120.36 | 149.41 | 151.80 | 151.91 | 152.57 | 0.005652 | 4.29 | 34.53 | 27.77 | 0.93 |
| 001 | 854.00* | 1000 | 116.46 | 149.41 | 151.77 | 151.87 | 152.53 | 0.005651 | 4.25 | 33.68 | 27.60 | 0.93 |
| 001 | 844.00* | 2 | 26.58 | 149.35 | 150.61 | 150.52 | 150.94 | 0.005600 | 2.57 | 10.87 | 13.99 | 0.82 |
| 001 | 844.00* | 20 | 49.78 | 149.35 | 151.06 | 150.98 | 151.50 | 0.004935 | 3.08 | 17.97 | 18.15 | 0.82 |
| 001 | 844.00* | 50 | 60.91 | 149.35 | 151.21 | 151.16 | 151.71 | 0.004950 | 3.30 | 20.96 | 21.54 | 0.83 |
| 001 | 844.00* | 100 | 70.80 | 149.35 | 151.34 | 151.32 | 151.88 | 0.004928 | 3.47 | 23.82 | 24.25 | 0.84 |
| 001 | 844.00* | 100 +5% | 74.34 | 149.35 | 151.38 | 151.37 | 151.93 | 0.004915 | 3.52 | 24.85 | 25.02 | 0.84 |
| 001 | 844.00* | 100 +25% | 88.50 | 149.35 | 151.46 | 151.57 | 152.14 | 0.005727 | 3.91 | 27.02 | 26.38 | 0.92 |
| 001 | 844.00* | 100 +70% | 120.36 | 149.35 | 151.75 | 151.85 | 152.50 | 0.005580 | 4.25 | 34.78 | 28.21 | 0.93 |
| 001 | 844.00* | 1000 | 116.46 | 149.35 | 151.71 | 151.82 | 152.46 | 0.005580 | 4.21 | 33.91 | 28.03 | 0.93 |
| 001 | 834.00* | 2 | 26.58 | 149.29 | 150.55 | 150.46 | 150.88 | 0.005771 | 2.58 | 10.67 | 13.54 | 0.83 |
| 001 | 834.00* | 20 | 49.78 | 149.29 | 151.00 | 150.93 | 151.45 | 0.004930 | 3.07 | 17.99 | 18.60 | 0.82 |
| 001 | 834.00* | 50 | 60.91 | 149.29 | 151.16 | 151.11 | 151.66 | 0.004893 | 3.27 | 21.09 | 21.85 | 0.83 |
| 001 | 834.00* | 100 | 70.80 | 149.29 | 151.29 | 151.26 | 151.82 | 0.004833 | 3.42 | 24.06 | 24.96 | 0.83 |
| 001 | 834.00* | 100 +5% | 74.34 | 149.29 | 151.34 | 151.32 | 151.87 | 0.004743 | 3.45 | 25.28 | 25.94 | 0.83 |
| 001 | 834.00* | 100 +25% | 88.50 | 149.29 | 151.40 | 151.50 | 152.08 | 0.005714 | 3.89 | 27.11 | 26.80 | 0.92 |
| 001 | 834.00* | 100 +70% | 120.36 | 149.29 | 151.69 | 151.79 | 152.44 | 0.005517 | 4.20 | 35.04 | 28.71 | 0.92 |
| 001 | 834.00* | 1000 | 116.46 | 149.29 | 151.66 | 151.76 | 152.40 | 0.005521 | 4.17 | 34.15 | 28.52 | 0.92 |
| 001 | 824.00* | 2 | 26.58 | 149.23 | 150.49 | 150.39 | 150.83 | 0.005980 | 2.58 | 10.49 | 13.09 | 0.84 |
| 001 | 824.00* | 20 | 49.78 | 149.23 | 150.95 | 150.89 | 151.40 | 0.004941 | 3.05 | 17.99 | 19.05 | 0.82 |
| 001 | 824.00* | 50 | 60.91 | 149.23 | 151.11 | 151.06 | 151.60 | 0.004847 | 3.24 | 21.20 | 22.14 | 0.82 |
| 001 | 824.00* | 100 | 70.80 | 149.23 | 151.24 | 151.21 | 151.76 | 0.004685 | 3.36 | 24.44 | 25.88 | 0.82 |
| 001 | 824.00* | 100 +5% | 74.34 | 149.23 | 151.28 | 151.27 | 151.82 | 0.004709 | 3.43 | 25.49 | 26.67 | 0.83 |
| 001 | 824.00* | 100 +25% | 88.50 | 149.23 | 151.35 | 151.45 | 152.02 | 0.005717 | 3.86 | 27.18 | 27.27 | 0.91 |
| 001 | 824.00* | 100 +70% | 120.36 | 149.23 | 151.63 | 151.73 | 152.37 | 0.005462 | 4.16 | 35.30 | 29.29 | 0.92 |
| 001 | 824.00* | 1000 | 116.46 | 149.23 | 151.60 | 151.69 | 152.33 | 0.005470 | 4.13 | 34.40 | 29.08 | 0.91 |
| 001 | 814.00* | 2 | 26.58 | 149.18 | 150.43 | 150.31 | 150.76 | 0.006074 | 2.57 | 10.38 | 12.44 | 0.84 |
| 001 | 814.00* | 20 | 49.78 | 149.18 | 150.90 | 150.84 | 151.34 | 0.004965 | 3.03 | 17.94 | 19.50 | 0.82 |
| 001 | 814.00* | 50 | 60.91 | 149.18 | 151.06 | 151.02 | 151.55 | 0.004812 | 3.21 | 21.29 | 22.26 | 0.82 |
| 001 | 814.00* | 100 | 70.80 | 149.18 | 151.19 | 151.15 | 151.71 | 0.004703 | 3.35 | 24.53 | 26.71 | 0.82 |
| 001 | 814.00* | 100 +5% | 74.34 | 149.18 | 151.24 | 151.24 | 151.76 | 0.004529 | 3.36 | 25.98 | 27.31 | 0.81 |
| 001 | 814.00* | 100 +25% | 88.50 | 149.18 | 151.29 | 151.39 | 151.96 | 0.005736 | 3.84 | 27.22 | 27.80 | 0.91 |
| 001 | 814.00* | 100 +70% | 120.36 | 149.18 | 151.58 | 151.67 | 152.31 | 0.005422 | 4.13 | 35.58 | 30.09 | 0.91 |
| 001 | 814.00* | 1000 | 116.46 | 149.18 | 151.55 | 151.64 | 152.27 | 0.005429 | 4.09 | 34.65 | 29.77 | 0.91 |
| 001 | 804.00* | 2 | 26.58 | 149.12 | 150.37 | | 150.70 | 0.005928 | 2.53 | 10.49 | 11.16 | 0.83 |
| 001 | 804.00* | 20 | 49.78 | 149.12 | 150.84 | 150.79 | 151.29 | 0.004998 | 3.02 | 17.87 | 19.93 | 0.82 |
| 001 | 804.00* | 50 | 60.91 | 149.12 | 151.01 | 150.96 | 151.49 | 0.004788 | 3.19 | 21.36 | 22.11 | 0.82 |
| 001 | 804.00* | 100 | 70.80 | 149.12 | 151.15 | 151.15 | 151.66 | 0.004555 | 3.29 | 24.93 | 27.36 | 0.81 |
| 001 | 804.00* | 100 +5% | 74.34 | 149.12 | 151.19 | 151.20 | 151.70 | 0.004492 | 3.33 | 26.15 | 27.98 | 0.80 |
| 001 | 804.00* | 100 +25% | 88.50 | 149.12 | 151.23 | 151.34 | 151.90 | 0.005769 | 3.82 | 27.25 | 28.34 | 0.92 |
| 001 | 804.00* | 100 +70% | 120.36 | 149.12 | 151.52 | 151.62 | 152.25 | 0.005386 | 4.09 | 35.92 | 31.22 | 0.91 |
| 001 | 804.00* | 1000 | 116.46 | 149.12 | 151.49 | 151.58 | 152.21 | 0.005402 | 4.05 | 34.96 | 30.93 | 0.91 |
| 001 | 794.00* | 2 | 26.58 | 149.06 | 150.32 | | 150.64 | 0.005729 | 2.49 | 10.66 | 11.33 | 0.82 |
| 001 | 794.00* | 20 | 49.78 | 149.06 | 150.79 | 150.73 | 151.24 | 0.005001 | 3.00 | 17.81 | 20.39 | 0.82 |
| 001 | 794.00* | 50 | 60.91 | 149.06 | 150.96 | 150.91 | 151.44 | 0.004749 | 3.16 | 21.45 | 22.73 | 0.81 |
| 001 | 794.00* | 100 | 70.80 | 149.06 | 151.10 | 151.10 | 151.60 | 0.004539 | 3.27 | 25.03 | 28.18 | 0.80 |
| 001 | 794.00* | 100 +5% | 74.34 | 149.06 | 151.13 | 151.14 | 151.65 | 0.004607 | 3.33 | 25.94 | 28.55 | 0.81 |
| 001 | 794.00* | 100 +25% | 88.50 | 149.06 | 151.18 | 151.29 | 151.85 | 0.005810 | 3.81 | 27.26 | 29.07 | 0.92 |
| 001 | 794.00* | 100 +70% | 120.36 | 149.06 | 151.47 | 151.58 | 152.18 | 0.005345 | 4.05 | 36.38 | 32.81 | 0.90 |
| 001 | 794.00* | 1000 | 116.46 | 149.06 | 151.44 | 151.54 | 152.15 | 0.005368 | 4.02 | 35.36 | 32.44 | 0.90 |
| 001 | 784.00* | 2 | 26.58 | 149.00 | 150.27 | | 150.58 | 0.005515 | 2.45 | 10.84 | 11.49 | 0.81 |
| 001 | 784.00* | 20 | 49.78 | 149.00 | 150.74 | 150.63 | 151.18 | 0.004990 | 2.97 | 17.74 | 20.87 | 0.81 |
| 001 | 784.00* | 50 | 60.91 | 149.00 | 150.91 | 150.85 | 151.39 | 0.004725 | 3.13 | 21.51 | 23.51 | 0.81 |
| 001 | 784.00* | 100 | 70.80 | 149.00 | 151.06 | 151.05 | 151.54 | 0.004394 | 3.21 | 25.46 | 29.36 | 0.79 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 784.00* | 100 +5% | 74.34 | 149.00 | 151.08 | 151.10 | 151.59 | 0.004520 | 3.29 | 26.26 | 29.86 | 0.80 |
| 001 | 784.00* | 100 +25% | 88.50 | 149.00 | 151.12 | 151.25 | 151.79 | 0.005883 | 3.80 | 27.28 | 30.60 | 0.92 |
| 001 | 784.00* | 100 +70% | 120.36 | 149.00 | 151.45 | 151.51 | 152.11 | 0.004910 | 3.90 | 38.08 | 34.87 | 0.86 |
| 001 | 784.00* | 1000 | 116.46 | 149.00 | 151.41 | 151.47 | 152.07 | 0.005040 | 3.90 | 36.67 | 34.26 | 0.87 |
| 001 | 0774 | 2 | 26.58 | 148.95 | 150.22 | | 150.52 | 0.005266 | 2.41 | 11.05 | 11.64 | 0.79 |
| 001 | 0774 | 20 | 49.78 | 148.95 | 150.69 | 150.52 | 151.12 | 0.004923 | 2.93 | 17.71 | 21.39 | 0.81 |
| 001 | 0774 | 50 | 60.91 | 148.95 | 150.86 | 150.81 | 151.33 | 0.004681 | 3.09 | 21.58 | 24.47 | 0.80 |
| 001 | 0774 | 100 | 70.80 | 148.95 | 151.01 | 151.01 | 151.49 | 0.004295 | 3.16 | 25.90 | 31.51 | 0.78 |
| 001 | 0774 | 100 +5% | 74.34 | 148.95 | 151.05 | 151.06 | 151.53 | 0.004337 | 3.22 | 26.96 | 31.96 | 0.79 |
| 001 | 0774 | 100 +25% | 88.50 | 148.95 | 151.06 | 151.17 | 151.73 | 0.005921 | 3.78 | 27.41 | 32.15 | 0.92 |
| 001 | 0774 | 100 +70% | 120.36 | 148.95 | 151.43 | 151.49 | 152.03 | 0.004484 | 3.74 | 40.73 | 41.30 | 0.83 |
| 001 | 0774 | 1000 | 116.46 | 148.95 | 151.36 | 151.45 | 152.01 | 0.004993 | 3.86 | 37.71 | 39.21 | 0.87 |
| 001 | 764.58* | 2 | 26.58 | 148.88 | 150.16 | | 150.46 | 0.005523 | 2.45 | 10.86 | 11.60 | 0.81 |
| 001 | 764.58* | 20 | 49.78 | 148.88 | 150.63 | 150.47 | 151.07 | 0.005095 | 2.98 | 17.46 | 22.01 | 0.82 |
| 001 | 764.58* | 50 | 60.91 | 148.88 | 150.80 | 150.76 | 151.28 | 0.004734 | 3.11 | 21.62 | 25.55 | 0.81 |
| 001 | 764.58* | 100 | 70.80 | 148.88 | 150.85 | 150.96 | 151.44 | 0.005629 | 3.47 | 22.89 | 26.83 | 0.88 |
| 001 | 764.58* | 100 +5% | 74.34 | 148.88 | 150.95 | 151.00 | 151.48 | 0.004854 | 3.35 | 25.81 | 32.08 | 0.83 |
| 001 | 764.58* | 100 +25% | 88.50 | 148.88 | 151.00 | 151.13 | 151.67 | 0.005893 | 3.78 | 27.69 | 32.87 | 0.92 |
| 001 | 764.58* | 100 +70% | 120.36 | 148.88 | 151.29 | 151.41 | 151.98 | 0.005340 | 3.98 | 37.71 | 37.89 | 0.90 |
| 001 | 764.58* | 1000 | 116.46 | 148.88 | 151.37 | 151.38 | 151.93 | 0.004135 | 3.60 | 40.93 | 39.96 | 0.79 |
| 001 | 755.17* | 2 | 26.58 | 148.81 | 150.09 | | 150.41 | 0.005773 | 2.49 | 10.68 | 11.53 | 0.83 |
| 001 | 755.17* | 20 | 49.78 | 148.81 | 150.56 | 150.43 | 151.02 | 0.005274 | 3.02 | 17.19 | 22.58 | 0.83 |
| 001 | 755.17* | 50 | 60.91 | 148.81 | 150.75 | 150.72 | 151.22 | 0.004768 | 3.13 | 21.69 | 26.67 | 0.81 |
| 001 | 755.17* | 100 | 70.80 | 148.81 | 150.81 | 150.91 | 151.38 | 0.005488 | 3.45 | 23.35 | 30.35 | 0.87 |
| 001 | 755.17* | 100 +5% | 74.34 | 148.81 | 150.92 | 150.95 | 151.42 | 0.004477 | 3.26 | 26.99 | 33.21 | 0.80 |
| 001 | 755.17* | 100 +25% | 88.50 | 148.81 | 150.95 | 151.08 | 151.61 | 0.005849 | 3.77 | 27.99 | 33.62 | 0.92 |
| 001 | 755.17* | 100 +70% | 120.36 | 148.81 | 151.31 | 151.34 | 151.89 | 0.004354 | 3.70 | 41.29 | 39.60 | 0.82 |
| 001 | 755.17* | 1000 | 116.46 | 148.81 | 151.20 | 151.31 | 151.87 | 0.005348 | 3.94 | 36.83 | 37.27 | 0.90 |
| 001 | 745.75* | 2 | 26.58 | 148.74 | 150.02 | | 150.35 | 0.006021 | 2.53 | 10.50 | 11.43 | 0.84 |
| 001 | 745.75* | 20 | 49.78 | 148.74 | 150.49 | 150.37 | 150.97 | 0.005467 | 3.07 | 16.90 | 23.09 | 0.85 |
| 001 | 745.75* | 50 | 60.91 | 148.74 | 150.69 | 150.68 | 151.17 | 0.004787 | 3.14 | 21.79 | 27.84 | 0.81 |
| 001 | 745.75* | 100 | 70.80 | 148.74 | 150.75 | 150.86 | 151.32 | 0.005445 | 3.45 | 23.68 | 31.41 | 0.87 |
| 001 | 745.75* | 100 +5% | 74.34 | 148.74 | 150.79 | 150.89 | 151.37 | 0.005417 | 3.49 | 24.88 | 32.46 | 0.87 |
| 001 | 745.75* | 100 +25% | 88.50 | 148.74 | 150.89 | 151.04 | 151.54 | 0.005787 | 3.76 | 28.34 | 34.43 | 0.91 |
| 001 | 745.75* | 100 +70% | 120.36 | 148.74 | 151.16 | 151.28 | 151.84 | 0.005424 | 4.00 | 37.89 | 38.08 | 0.90 |
| 001 | 745.75* | 1000 | 116.46 | 148.74 | 151.21 | 151.25 | 151.79 | 0.004436 | 3.68 | 40.09 | 39.20 | 0.82 |
| 001 | 736.33* | 2 | 26.58 | 148.68 | 149.95 | | 150.29 | 0.006267 | 2.57 | 10.33 | 11.33 | 0.86 |
| 001 | 736.33* | 20 | 49.78 | 148.68 | 150.43 | 150.31 | 150.92 | 0.005670 | 3.11 | 16.58 | 23.48 | 0.86 |
| 001 | 736.33* | 50 | 60.91 | 148.68 | 150.65 | 150.64 | 151.11 | 0.004531 | 3.09 | 22.51 | 29.72 | 0.79 |
| 001 | 736.33* | 100 | 70.80 | 148.68 | 150.70 | 150.80 | 151.26 | 0.005340 | 3.43 | 24.08 | 32.36 | 0.86 |
| 001 | 736.33* | 100 +5% | 74.34 | 148.68 | 150.74 | 150.84 | 151.30 | 0.005229 | 3.45 | 25.47 | 33.42 | 0.86 |
| 001 | 736.33* | 100 +25% | 88.50 | 148.68 | 150.84 | 150.98 | 151.48 | 0.005706 | 3.74 | 28.73 | 35.30 | 0.91 |
| 001 | 736.33* | 100 +70% | 120.36 | 148.68 | 151.18 | 151.22 | 151.75 | 0.004379 | 3.70 | 41.70 | 40.30 | 0.82 |
| 001 | 736.33* | 1000 | 116.46 | 148.68 | 151.07 | 151.19 | 151.74 | 0.005435 | 3.96 | 37.13 | 38.45 | 0.90 |
| 001 | 726.92* | 2 | 26.58 | 148.61 | 149.89 | | 150.23 | 0.006501 | 2.61 | 10.18 | 11.21 | 0.88 |
| 001 | 726.92* | 20 | 49.78 | 148.61 | 150.36 | 150.23 | 150.86 | 0.005851 | 3.16 | 16.30 | 22.42 | 0.88 |
| 001 | 726.92* | 50 | 60.91 | 148.61 | 150.61 | 150.61 | 151.06 | 0.004272 | 3.03 | 23.33 | 32.07 | 0.77 |
| 001 | 726.92* | 100 | 70.80 | 148.61 | 150.65 | 150.75 | 151.20 | 0.005209 | 3.40 | 24.53 | 33.35 | 0.86 |
| 001 | 726.92* | 100 +5% | 74.34 | 148.61 | 150.72 | 150.79 | 151.24 | 0.004764 | 3.34 | 26.79 | 34.89 | 0.82 |
| 001 | 726.92* | 100 +25% | 88.50 | 148.61 | 150.78 | 150.92 | 151.41 | 0.005599 | 3.72 | 29.19 | 36.21 | 0.90 |
| 001 | 726.92* | 100 +70% | 120.36 | 148.61 | 151.03 | 151.15 | 151.70 | 0.005414 | 3.99 | 38.51 | 39.62 | 0.90 |
| 001 | 726.92* | 1000 | 116.46 | 148.61 | 151.10 | 151.12 | 151.64 | 0.004230 | 3.61 | 41.45 | 40.61 | 0.80 |
| 001 | 717.50* | 2 | 26.58 | 148.54 | 149.82 | | 150.17 | 0.006721 | 2.65 | 10.03 | 11.09 | 0.89 |
| 001 | 717.50* | 20 | 49.78 | 148.54 | 150.29 | 150.19 | 150.81 | 0.006020 | 3.19 | 16.04 | 21.69 | 0.89 |
| 001 | 717.50* | 50 | 60.91 | 148.54 | 150.47 | 150.57 | 151.00 | 0.005434 | 3.31 | 20.80 | 29.83 | 0.86 |
| 001 | 717.50* | 100 | 70.80 | 148.54 | 150.62 | 150.69 | 151.13 | 0.004733 | 3.29 | 25.84 | 34.91 | 0.82 |
| 001 | 717.50* | 100 +5% | 74.34 | 148.54 | 150.72 | 150.73 | 151.16 | 0.004033 | 3.15 | 29.13 | 36.92 | 0.76 |
| 001 | 717.50* | 100 +25% | 88.50 | 148.54 | 150.82 | 150.86 | 151.32 | 0.004345 | 3.39 | 32.88 | 38.45 | 0.80 |
| 001 | 717.50* | 100 +70% | 120.36 | 148.54 | 151.08 | 151.10 | 151.61 | 0.004083 | 3.60 | 43.51 | 42.02 | 0.79 |
| 001 | 717.50* | 1000 | 116.46 | 148.54 | 150.95 | 151.07 | 151.60 | 0.005279 | 3.92 | 38.16 | 40.26 | 0.89 |
| 001 | 708.08* | 2 | 26.58 | 148.48 | 149.74 | 149.68 | 150.11 | 0.006927 | 2.69 | 9.90 | 10.97 | 0.90 |
| 001 | 708.08* | 20 | 49.78 | 148.48 | 150.22 | 150.13 | 150.75 | 0.006186 | 3.23 | 15.79 | 21.07 | 0.90 |
| 001 | 708.08* | 50 | 60.91 | 148.48 | 150.42 | 150.52 | 150.94 | 0.005220 | 3.27 | 21.31 | 31.59 | 0.85 |
| 001 | 708.08* | 100 | 70.80 | 148.48 | 150.62 | 150.64 | 151.06 | 0.003986 | 3.10 | 28.18 | 37.02 | 0.75 |
| 001 | 708.08* | 100 +5% | 74.34 | 148.48 | 150.57 | 150.68 | 151.12 | 0.005127 | 3.44 | 26.22 | 35.86 | 0.85 |
| 001 | 708.08* | 100 +25% | 88.50 | 148.48 | 150.70 | 150.81 | 151.27 | 0.005066 | 3.59 | 30.97 | 38.54 | 0.86 |
| 001 | 708.08* | 100 +70% | 120.36 | 148.48 | 150.91 | 151.04 | 151.56 | 0.005258 | 3.95 | 39.58 | 41.50 | 0.89 |
| 001 | 708.08* | 1000 | 116.46 | 148.48 | 150.99 | 151.01 | 151.50 | 0.004005 | 3.54 | 43.04 | 42.61 | 0.78 |
| 001 | 698.67* | 2 | 26.58 | 148.41 | 149.67 | 149.61 | 150.05 | 0.007099 | 2.72 | 9.78 | 10.85 | 0.91 |
| 001 | 698.67* | 20 | 49.78 | 148.41 | 150.15 | 150.07 | 150.69 | 0.006325 | 3.26 | 15.58 | 20.58 | 0.91 |
| 001 | 698.67* | 50 | 60.91 | 148.41 | 150.37 | 150.46 | 150.88 | 0.005066 | 3.24 | 21.73 | 33.44 | 0.83 |
| 001 | 698.67* | 100 | 70.80 | 148.41 | 150.48 | 150.58 | 151.01 | 0.005063 | 3.38 | 25.31 | 36.06 | 0.84 |
| 001 | 698.67* | 100 +5% | 74.34 | 148.41 | 150.58 | 150.62 | 151.04 | 0.004160 | 3.19 | 29.10 | 38.30 | 0.77 |
| 001 | 698.67* | 100 +25% | 88.50 | 148.41 | 150.73 | 150.74 | 151.18 | 0.003816 | 3.24 | 35.27 | 40.90 | 0.75 |
| 001 | 698.67* | 100 +70% | 120.36 | 148.41 | 150.96 | 150.98 | 151.46 | 0.003922 | 3.54 | 44.91 | 44.00 | 0.77 |
| 001 | 698.67* | 1000 | 116.46 | 148.41 | 150.83 | 150.95 | 151.45 | 0.005117 | 3.87 | 39.25 | 42.21 | 0.88 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 689.25* | 2 | 26.58 | 148.34 | 149.60 | 149.54 | 149.98 | 0.007251 | 2.75 | 9.68 | 10.72 | 0.92 |
| 001 | 689.25* | 20 | 49.78 | 148.34 | 150.08 | 150.01 | 150.63 | 0.006432 | 3.29 | 15.41 | 20.11 | 0.91 |
| 001 | 689.25* | 50 | 60.91 | 148.34 | 150.35 | 150.40 | 150.82 | 0.004542 | 3.13 | 23.08 | 35.42 | 0.79 |
| 001 | 689.25* | 100 | 70.80 | 148.34 | 150.49 | 150.52 | 150.93 | 0.004079 | 3.13 | 28.23 | 38.65 | 0.76 |
| 001 | 689.25* | 100 +5% | 74.34 | 148.34 | 150.45 | 150.56 | 150.99 | 0.005013 | 3.42 | 26.81 | 37.83 | 0.84 |
| 001 | 689.25* | 100 +25% | 88.50 | 148.34 | 150.58 | 150.67 | 151.13 | 0.004897 | 3.55 | 31.87 | 40.48 | 0.84 |
| 001 | 689.25* | 100 +70% | 120.36 | 148.34 | 150.79 | 150.92 | 151.41 | 0.005097 | 3.90 | 40.70 | 43.51 | 0.87 |
| 001 | 689.25* | 1000 | 116.46 | 148.34 | 150.88 | 150.89 | 151.36 | 0.003780 | 3.46 | 44.74 | 44.77 | 0.76 |
| 001 | 679.83* | 2 | 26.58 | 148.28 | 149.53 | 149.48 | 149.92 | 0.007329 | 2.76 | 9.61 | 10.59 | 0.93 |
| 001 | 679.83* | 20 | 49.78 | 148.28 | 150.02 | 149.94 | 150.57 | 0.006482 | 3.31 | 15.29 | 18.88 | 0.92 |
| 001 | 679.83* | 50 | 60.91 | 148.28 | 150.34 | 150.35 | 150.75 | 0.003825 | 2.94 | 25.29 | 37.76 | 0.73 |
| 001 | 679.83* | 100 | 70.80 | 148.28 | 150.36 | 150.47 | 150.89 | 0.004951 | 3.37 | 25.83 | 38.11 | 0.83 |
| 001 | 679.83* | 100 +5% | 74.34 | 148.28 | 150.48 | 150.50 | 150.91 | 0.003862 | 3.11 | 30.50 | 40.76 | 0.74 |
| 001 | 679.83* | 100 +25% | 88.50 | 148.28 | 150.48 | 150.61 | 151.08 | 0.005365 | 3.68 | 30.77 | 40.87 | 0.88 |
| 001 | 679.83* | 100 +70% | 120.36 | 148.28 | 150.85 | 150.85 | 151.32 | 0.003727 | 3.47 | 46.55 | 46.18 | 0.75 |
| 001 | 679.83* | 1000 | 116.46 | 148.28 | 150.70 | 150.82 | 151.31 | 0.005035 | 3.85 | 40.11 | 44.19 | 0.87 |
| 001 | 670.42* | 2 | 26.58 | 148.21 | 149.46 | 149.41 | 149.85 | 0.007296 | 2.77 | 9.60 | 10.48 | 0.92 |
| 001 | 670.42* | 20 | 49.78 | 148.21 | 149.95 | 149.87 | 150.51 | 0.006487 | 3.31 | 15.24 | 18.02 | 0.92 |
| 001 | 670.42* | 50 | 60.91 | 148.21 | 150.20 | 150.30 | 150.70 | 0.004893 | 3.23 | 22.28 | 36.62 | 0.82 |
| 001 | 670.42* | 100 | 70.80 | 148.21 | 150.39 | 150.40 | 150.80 | 0.003789 | 3.06 | 29.58 | 41.30 | 0.73 |
| 001 | 670.42* | 100 +5% | 74.34 | 148.21 | 150.33 | 150.44 | 150.86 | 0.004930 | 3.41 | 27.30 | 39.98 | 0.83 |
| 001 | 670.42* | 100 +25% | 88.50 | 148.21 | 150.40 | 150.57 | 151.03 | 0.005727 | 3.77 | 30.04 | 41.48 | 0.90 |
| 001 | 670.42* | 100 +70% | 120.36 | 148.21 | 150.66 | 150.78 | 151.27 | 0.005034 | 3.88 | 41.53 | 45.54 | 0.87 |
| 001 | 670.42* | 1000 | 116.46 | 148.21 | 150.76 | 150.76 | 151.21 | 0.003663 | 3.41 | 46.01 | 46.91 | 0.74 |
| 001 | 0661 | 2 | 26.58 | 148.14 | 149.39 | 149.33 | 149.78 | 0.007129 | 2.76 | 9.64 | 10.36 | 0.91 |
| 001 | 0661 | 20 | 49.78 | 148.14 | 149.89 | 149.80 | 150.45 | 0.006420 | 3.31 | 15.27 | 17.85 | 0.91 |
| 001 | 0661 | 50 | 60.91 | 148.14 | 150.20 | 150.24 | 150.62 | 0.003956 | 2.99 | 25.02 | 39.46 | 0.74 |
| 001 | 0661 | 100 | 70.80 | 148.14 | 150.23 | 150.34 | 150.76 | 0.004898 | 3.37 | 26.17 | 40.27 | 0.83 |
| 001 | 0661 | 100 +5% | 74.34 | 148.14 | 150.38 | 150.39 | 150.77 | 0.003532 | 3.02 | 32.14 | 43.22 | 0.71 |
| 001 | 0661 | 100 +25% | 88.50 | 148.14 | 150.31 | 150.52 | 150.98 | 0.006075 | 3.86 | 29.37 | 42.19 | 0.93 |
| 001 | 0661 | 100 +70% | 120.36 | 148.14 | 150.55 | 150.71 | 151.22 | 0.005653 | 4.05 | 39.86 | 45.95 | 0.91 |
| 001 | 0661 | 1000 | 116.46 | 148.14 | 150.57 | 150.69 | 151.16 | 0.004974 | 3.83 | 40.91 | 46.27 | 0.86 |
| 001 | 651.60* | 2 | 26.58 | 148.06 | 149.32 | 149.25 | 149.71 | 0.006898 | 2.74 | 9.70 | 10.27 | 0.90 |
| 001 | 651.60* | 20 | 49.78 | 148.06 | 149.82 | 149.73 | 150.38 | 0.006313 | 3.30 | 15.27 | 17.42 | 0.90 |
| 001 | 651.60* | 50 | 60.91 | 148.06 | 150.07 | 150.18 | 150.57 | 0.004737 | 3.21 | 22.58 | 37.41 | 0.81 |
| 001 | 651.60* | 100 | 70.80 | 148.06 | 150.13 | 150.27 | 150.71 | 0.005400 | 3.50 | 24.76 | 39.09 | 0.86 |
| 001 | 651.60* | 100 +5% | 74.34 | 148.06 | 150.20 | 150.33 | 150.73 | 0.004777 | 3.39 | 27.70 | 40.77 | 0.82 |
| 001 | 651.60* | 100 +25% | 88.50 | 148.06 | 150.23 | 150.42 | 150.92 | 0.006325 | 3.94 | 28.63 | 41.13 | 0.94 |
| 001 | 651.60* | 100 +70% | 120.36 | 148.06 | 150.47 | 150.65 | 151.16 | 0.005841 | 4.12 | 39.07 | 44.97 | 0.93 |
| 001 | 651.60* | 1000 | 116.46 | 148.06 | 150.60 | 150.63 | 151.08 | 0.003888 | 3.50 | 45.01 | 47.01 | 0.76 |
| 001 | 642.20* | 2 | 26.58 | 147.98 | 149.26 | 149.18 | 149.64 | 0.006699 | 2.72 | 9.77 | 10.19 | 0.89 |
| 001 | 642.20* | 20 | 49.78 | 147.98 | 149.75 | 149.66 | 150.31 | 0.006352 | 3.32 | 15.17 | 15.84 | 0.91 |
| 001 | 642.20* | 50 | 60.91 | 147.98 | 149.95 | 150.10 | 150.52 | 0.005588 | 3.41 | 20.50 | 34.60 | 0.87 |
| 001 | 642.20* | 100 | 70.80 | 147.98 | 150.05 | 150.20 | 150.64 | 0.005547 | 3.55 | 24.37 | 38.69 | 0.88 |
| 001 | 642.20* | 100 +5% | 74.34 | 147.98 | 150.10 | 150.23 | 150.68 | 0.005325 | 3.54 | 26.18 | 39.66 | 0.86 |
| 001 | 642.20* | 100 +25% | 88.50 | 147.98 | 150.16 | 150.38 | 150.86 | 0.006372 | 3.95 | 28.45 | 40.51 | 0.95 |
| 001 | 642.20* | 100 +70% | 120.36 | 147.98 | 150.39 | 150.57 | 151.11 | 0.006056 | 4.19 | 38.33 | 44.20 | 0.94 |
| 001 | 642.20* | 1000 | 116.46 | 147.98 | 150.44 | 150.54 | 151.04 | 0.004893 | 3.83 | 40.79 | 45.09 | 0.85 |
| 001 | 632.80* | 2 | 26.58 | 147.89 | 149.19 | 149.10 | 149.57 | 0.006537 | 2.71 | 9.82 | 10.10 | 0.88 |
| 001 | 632.80* | 20 | 49.78 | 147.89 | 149.69 | 149.59 | 150.24 | 0.006194 | 3.30 | 15.31 | 15.55 | 0.90 |
| 001 | 632.80* | 50 | 60.91 | 147.89 | 150.00 | 150.03 | 150.42 | 0.003909 | 3.00 | 25.00 | 38.44 | 0.74 |
| 001 | 632.80* | 100 | 70.80 | 147.89 | 149.96 | 150.13 | 150.59 | 0.005890 | 3.63 | 23.61 | 37.67 | 0.90 |
| 001 | 632.80* | 100 +5% | 74.34 | 147.89 | 150.19 | 150.19 | 150.57 | 0.003361 | 2.98 | 32.51 | 41.72 | 0.69 |
| 001 | 632.80* | 100 +25% | 88.50 | 147.89 | 150.08 | 150.29 | 150.79 | 0.006450 | 3.98 | 28.26 | 40.11 | 0.95 |
| 001 | 632.80* | 100 +70% | 120.36 | 147.89 | 150.31 | 150.51 | 151.05 | 0.006277 | 4.25 | 37.71 | 43.70 | 0.96 |
| 001 | 632.80* | 1000 | 116.46 | 147.89 | 150.48 | 150.49 | 150.95 | 0.003725 | 3.46 | 45.57 | 46.41 | 0.75 |
| 001 | 623.40* | 2 | 26.58 | 147.81 | 149.13 | 149.03 | 149.50 | 0.006413 | 2.70 | 9.86 | 10.02 | 0.87 |
| 001 | 623.40* | 20 | 49.78 | 147.81 | 149.62 | 149.52 | 150.18 | 0.006165 | 3.30 | 15.36 | 13.90 | 0.89 |
| 001 | 623.40* | 50 | 60.91 | 147.81 | 149.86 | 149.97 | 150.36 | 0.004789 | 3.23 | 22.50 | 36.76 | 0.81 |
| 001 | 623.40* | 100 | 70.80 | 147.81 | 149.87 | 150.06 | 150.53 | 0.006283 | 3.71 | 22.86 | 36.96 | 0.93 |
| 001 | 623.40* | 100 +5% | 74.34 | 147.81 | 149.99 | 150.11 | 150.52 | 0.004951 | 3.45 | 27.16 | 39.26 | 0.83 |
| 001 | 623.40* | 100 +25% | 88.50 | 147.81 | 150.01 | 150.21 | 150.73 | 0.006553 | 4.00 | 28.08 | 39.74 | 0.96 |
| 001 | 623.40* | 100 +70% | 120.36 | 147.81 | 150.23 | 150.45 | 150.99 | 0.006506 | 4.31 | 37.19 | 43.48 | 0.97 |
| 001 | 623.40* | 1000 | 116.46 | 147.81 | 150.30 | 150.42 | 150.90 | 0.004957 | 3.85 | 40.54 | 44.52 | 0.86 |
| 001 | 614.00* | 2 | 26.58 | 147.73 | 149.07 | 148.96 | 149.43 | 0.006315 | 2.69 | 9.89 | 9.93 | 0.86 |
| 001 | 614.00* | 20 | 49.78 | 147.73 | 149.57 | 149.45 | 150.11 | 0.006033 | 3.28 | 15.52 | 14.03 | 0.88 |
| 001 | 614.00* | 50 | 60.91 | 147.73 | 149.74 | 149.90 | 150.31 | 0.005676 | 3.43 | 20.55 | 35.62 | 0.87 |
| 001 | 614.00* | 100 | 70.80 | 147.73 | 149.80 | 150.00 | 150.46 | 0.006436 | 3.74 | 22.68 | 36.85 | 0.94 |
| 001 | 614.00* | 100 +5% | 74.34 | 147.73 | 149.88 | 150.03 | 150.47 | 0.005561 | 3.60 | 25.75 | 38.55 | 0.88 |
| 001 | 614.00* | 100 +25% | 88.50 | 147.73 | 149.94 | 150.14 | 150.66 | 0.006586 | 4.00 | 28.13 | 39.81 | 0.96 |
| 001 | 614.00* | 100 +70% | 120.36 | 147.73 | 150.15 | 150.35 | 150.93 | 0.006700 | 4.35 | 36.83 | 43.31 | 0.99 |
| 001 | 614.00* | 1000 | 116.46 | 147.73 | 150.19 | 150.34 | 150.85 | 0.005571 | 4.02 | 38.70 | 43.81 | 0.90 |
| 001 | 604.60* | 2 | 26.58 | 147.65 | 149.01 | 149.01 | 149.37 | 0.006158 | 2.67 | 9.96 | 9.85 | 0.85 |
| 001 | 604.60* | 20 | 49.78 | 147.65 | 149.51 | 149.41 | 150.05 | 0.005944 | 3.26 | 15.66 | 14.21 | 0.88 |
| 001 | 604.60* | 50 | 60.91 | 147.65 | 149.65 | 149.82 | 150.25 | 0.006081 | 3.51 | 19.90 | 35.43 | 0.90 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 604.60* | 100 | 70.80 | 147.65 | 149.72 | 149.92 | 150.39 | 0.006526 | 3.76 | 22.69 | 37.18 | 0.94 |
| 001 | 604.60* | 100 +5% | 74.34 | 147.65 | 149.79 | 149.96 | 150.41 | 0.005981 | 3.69 | 25.01 | 38.57 | 0.91 |
| 001 | 604.60* | 100 +25% | 88.50 | 147.65 | 149.87 | 150.08 | 150.59 | 0.006658 | 4.01 | 28.20 | 40.36 | 0.96 |
| 001 | 604.60* | 100 +70% | 120.36 | 147.65 | 150.06 | 150.29 | 150.86 | 0.006930 | 4.39 | 36.46 | 43.13 | 1.00 |
| 001 | 604.60* | 1000 | 116.46 | 147.65 | 150.09 | 150.27 | 150.79 | 0.006101 | 4.15 | 37.42 | 43.42 | 0.94 |
| 001 | 595.20* | 2 | 26.58 | 147.56 | 148.94 | | 149.31 | 0.006151 | 2.67 | 9.95 | 9.76 | 0.84 |
| 001 | 595.20* | 20 | 49.78 | 147.56 | 149.45 | 149.36 | 149.98 | 0.005862 | 3.25 | 15.87 | 20.26 | 0.87 |
| 001 | 595.20* | 50 | 60.91 | 147.56 | 149.56 | 149.76 | 150.19 | 0.006401 | 3.57 | 19.52 | 35.76 | 0.92 |
| 001 | 595.20* | 100 | 70.80 | 147.56 | 149.65 | 149.85 | 150.33 | 0.006653 | 3.78 | 22.72 | 38.07 | 0.95 |
| 001 | 595.20* | 100 +5% | 74.34 | 147.56 | 149.70 | 149.88 | 150.35 | 0.006255 | 3.74 | 24.73 | 39.17 | 0.92 |
| 001 | 595.20* | 100 +25% | 88.50 | 147.56 | 149.78 | 150.00 | 150.52 | 0.006948 | 4.06 | 27.87 | 40.24 | 0.98 |
| 001 | 595.20* | 100 +70% | 120.36 | 147.56 | 149.98 | 150.22 | 150.79 | 0.007199 | 4.44 | 36.07 | 42.90 | 1.01 |
| 001 | 595.20* | 1000 | 116.46 | 147.56 | 149.99 | 150.20 | 150.73 | 0.006522 | 4.24 | 36.57 | 43.06 | 0.97 |
| 001 | 585.80* | 2 | 26.58 | 147.48 | 148.87 | | 149.24 | 0.006209 | 2.68 | 9.90 | 9.68 | 0.85 |
| 001 | 585.80* | 20 | 49.78 | 147.48 | 149.41 | 149.31 | 149.92 | 0.005578 | 3.19 | 16.67 | 27.97 | 0.85 |
| 001 | 585.80* | 50 | 60.91 | 147.48 | 149.49 | 149.68 | 150.12 | 0.006510 | 3.58 | 19.67 | 37.39 | 0.92 |
| 001 | 585.80* | 100 | 70.80 | 147.48 | 149.57 | 149.78 | 150.26 | 0.006966 | 3.83 | 22.51 | 38.54 | 0.96 |
| 001 | 585.80* | 100 +5% | 74.34 | 147.48 | 149.62 | 149.81 | 150.28 | 0.006582 | 3.79 | 24.41 | 39.17 | 0.94 |
| 001 | 585.80* | 100 +25% | 88.50 | 147.48 | 149.70 | 149.92 | 150.45 | 0.007257 | 4.11 | 27.60 | 40.21 | 1.00 |
| 001 | 585.80* | 100 +70% | 120.36 | 147.48 | 149.89 | 150.14 | 150.72 | 0.007509 | 4.49 | 35.68 | 42.74 | 1.03 |
| 001 | 585.80* | 1000 | 116.46 | 147.48 | 149.90 | 150.12 | 150.66 | 0.006830 | 4.30 | 36.12 | 42.87 | 0.98 |
| 001 | 576.40* | 2 | 26.58 | 147.40 | 148.80 | 148.69 | 149.18 | 0.006427 | 2.72 | 9.76 | 9.63 | 0.86 |
| 001 | 576.40* | 20 | 49.78 | 147.40 | 149.48 | 149.48 | 149.83 | 0.003687 | 2.74 | 22.10 | 38.55 | 0.70 |
| 001 | 576.40* | 50 | 60.91 | 147.40 | 149.41 | 149.61 | 150.05 | 0.006829 | 3.63 | 19.56 | 37.68 | 0.94 |
| 001 | 576.40* | 100 | 70.80 | 147.40 | 149.49 | 149.70 | 150.19 | 0.007308 | 3.87 | 22.34 | 38.63 | 0.98 |
| 001 | 576.40* | 100 +5% | 74.34 | 147.40 | 149.53 | 149.73 | 150.21 | 0.006951 | 3.85 | 24.13 | 39.20 | 0.96 |
| 001 | 576.40* | 100 +25% | 88.50 | 147.40 | 149.61 | 149.85 | 150.38 | 0.007596 | 4.16 | 27.37 | 40.23 | 1.01 |
| 001 | 576.40* | 100 +70% | 120.36 | 147.40 | 149.80 | 150.05 | 150.64 | 0.007863 | 4.54 | 35.25 | 42.25 | 1.05 |
| 001 | 576.40* | 1000 | 116.46 | 147.40 | 149.81 | 150.03 | 150.58 | 0.007184 | 4.35 | 35.60 | 42.31 | 1.00 |
| 001 | 0567 | 2 | 26.58 | 147.31 | 148.62 | 148.62 | 149.10 | 0.009163 | 3.07 | 8.67 | 9.17 | 1.01 |
| 001 | 0567 | 20 | 49.78 | 147.31 | 149.26 | 149.41 | 149.77 | 0.005967 | 3.24 | 17.03 | 28.45 | 0.87 |
| 001 | 0567 | 50 | 60.91 | 147.31 | 149.33 | 149.56 | 149.98 | 0.007136 | 3.66 | 19.50 | 37.44 | 0.96 |
| 001 | 0567 | 100 | 70.80 | 147.31 | 149.41 | 149.64 | 150.11 | 0.007517 | 3.89 | 22.47 | 38.84 | 0.99 |
| 001 | 0567 | 100 +5% | 74.34 | 147.31 | 149.45 | 149.67 | 150.14 | 0.007353 | 3.91 | 23.89 | 39.29 | 0.98 |
| 001 | 0567 | 100 +25% | 88.50 | 147.31 | 149.53 | 149.77 | 150.29 | 0.007820 | 4.17 | 27.40 | 40.31 | 1.02 |
| 001 | 0567 | 100 +70% | 120.36 | 147.31 | 149.72 | 149.96 | 150.56 | 0.008079 | 4.55 | 35.10 | 41.74 | 1.06 |
| 001 | 0567 | 1000 | 116.46 | 147.31 | 149.72 | 149.94 | 150.51 | 0.007582 | 4.41 | 35.07 | 41.73 | 1.03 |
| 001 | 558.50* | 2 | 26.58 | 147.20 | 148.43 | 148.52 | 149.01 | 0.012010 | 3.38 | 7.87 | 8.98 | 1.15 |
| 001 | 558.50* | 20 | 49.78 | 147.20 | 149.22 | 149.03 | 149.71 | 0.005217 | 3.12 | 17.20 | 27.15 | 0.82 |
| 001 | 558.50* | 50 | 60.91 | 147.20 | 149.27 | 149.49 | 149.93 | 0.006806 | 3.64 | 18.76 | 33.82 | 0.94 |
| 001 | 558.50* | 100 | 70.80 | 147.20 | 149.38 | 149.58 | 150.05 | 0.006565 | 3.75 | 23.04 | 39.36 | 0.93 |
| 001 | 558.50* | 100 +5% | 74.34 | 147.20 | 149.42 | 149.61 | 150.08 | 0.006405 | 3.76 | 24.60 | 39.94 | 0.92 |
| 001 | 558.50* | 100 +25% | 88.50 | 147.20 | 149.54 | 149.71 | 150.21 | 0.006318 | 3.91 | 29.35 | 41.10 | 0.93 |
| 001 | 558.50* | 100 +70% | 120.36 | 147.20 | 150.01 | 149.92 | 150.41 | 0.003205 | 3.25 | 49.66 | 44.98 | 0.69 |
| 001 | 558.50* | 1000 | 116.46 | 147.20 | 149.99 | 149.90 | 150.38 | 0.003143 | 3.20 | 48.81 | 44.85 | 0.68 |
| 001 | 550.00* | 2 | 26.58 | 147.09 | 148.60 | 148.41 | 148.93 | 0.005235 | 2.56 | 10.38 | 9.46 | 0.78 |
| 001 | 550.00* | 20 | 49.78 | 147.09 | 149.21 | 148.94 | 149.65 | 0.004444 | 2.96 | 17.99 | 28.18 | 0.76 |
| 001 | 550.00* | 50 | 60.91 | 147.09 | 149.21 | 149.45 | 149.87 | 0.006647 | 3.62 | 18.00 | 28.27 | 0.92 |
| 001 | 550.00* | 100 | 70.80 | 147.09 | 149.35 | 149.56 | 150.00 | 0.006085 | 3.67 | 23.18 | 39.96 | 0.90 |
| 001 | 550.00* | 100 +5% | 74.34 | 147.09 | 149.39 | 149.58 | 150.03 | 0.005932 | 3.68 | 24.84 | 40.55 | 0.89 |
| 001 | 550.00* | 100 +25% | 88.50 | 147.09 | 149.78 | 149.71 | 150.11 | 0.002760 | 2.87 | 41.35 | 44.41 | 0.63 |
| 001 | 550.00* | 100 +70% | 120.36 | 147.09 | 149.99 | | 150.38 | 0.002991 | 3.18 | 50.97 | 46.32 | 0.66 |
| 001 | 550.00* | 1000 | 116.46 | 147.09 | 149.98 | | 150.35 | 0.002917 | 3.13 | 50.17 | 46.14 | 0.65 |
| 001 | 541.50* | 2 | 26.58 | 146.98 | 148.59 | | 148.88 | 0.004127 | 2.38 | 11.16 | 9.33 | 0.70 |
| 001 | 541.50* | 20 | 49.78 | 146.98 | 149.20 | 148.84 | 149.61 | 0.003950 | 2.84 | 18.58 | 27.78 | 0.71 |
| 001 | 541.50* | 50 | 60.91 | 146.98 | 149.48 | 149.40 | 149.79 | 0.002675 | 2.60 | 30.00 | 42.86 | 0.60 |
| 001 | 541.50* | 100 | 70.80 | 146.98 | 149.61 | 149.52 | 149.91 | 0.002521 | 2.64 | 35.49 | 44.27 | 0.59 |
| 001 | 541.50* | 100 +5% | 74.34 | 146.98 | 149.64 | 149.55 | 149.94 | 0.002530 | 2.67 | 36.99 | 44.58 | 0.59 |
| 001 | 541.50* | 100 +25% | 88.50 | 146.98 | 149.77 | | 150.08 | 0.002541 | 2.79 | 42.79 | 46.05 | 0.60 |
| 001 | 541.50* | 100 +70% | 120.36 | 146.98 | 149.99 | | 150.35 | 0.002752 | 3.09 | 53.00 | 48.62 | 0.63 |
| 001 | 541.50* | 1000 | 116.46 | 146.98 | 149.97 | | 150.32 | 0.002685 | 3.03 | 52.16 | 48.41 | 0.63 |
| 001 | 533.00* | 2 | 26.58 | 146.86 | 148.59 | | 148.84 | 0.003365 | 2.24 | 11.85 | 9.11 | 0.63 |
| 001 | 533.00* | 20 | 49.78 | 146.86 | 149.19 | 148.75 | 149.57 | 0.003627 | 2.75 | 19.11 | 29.20 | 0.68 |
| 001 | 533.00* | 50 | 60.91 | 146.86 | 149.48 | 148.96 | 149.76 | 0.002458 | 2.52 | 31.18 | 44.64 | 0.57 |
| 001 | 533.00* | 100 | 70.80 | 146.86 | 149.60 | | 149.88 | 0.002323 | 2.55 | 36.96 | 46.61 | 0.56 |
| 001 | 533.00* | 100 +5% | 74.34 | 146.86 | 149.64 | | 149.92 | 0.002329 | 2.58 | 38.57 | 47.10 | 0.57 |
| 001 | 533.00* | 100 +25% | 88.50 | 146.86 | 149.77 | | 150.06 | 0.002310 | 2.68 | 44.98 | 49.02 | 0.57 |
| 001 | 533.00* | 100 +70% | 120.36 | 146.86 | 150.00 | | 150.32 | 0.002448 | 2.94 | 56.40 | 52.36 | 0.59 |
| 001 | 533.00* | 1000 | 116.46 | 146.86 | 149.98 | | 150.29 | 0.002395 | 2.89 | 55.42 | 52.09 | 0.59 |
| 001 | 524.50* | 2 | 26.58 | 146.75 | 148.58 | | 148.81 | 0.002862 | 2.13 | 12.46 | 8.96 | 0.58 |
| 001 | 524.50* | 20 | 49.78 | 146.75 | 149.17 | 148.65 | 149.54 | 0.003499 | 2.70 | 19.35 | 31.40 | 0.66 |
| 001 | 524.50* | 50 | 60.91 | 146.75 | 149.48 | | 149.73 | 0.002242 | 2.41 | 33.05 | 48.36 | 0.54 |
| 001 | 524.50* | 100 | 70.80 | 146.75 | 149.61 | | 149.85 | 0.002070 | 2.42 | 39.66 | 50.84 | 0.53 |
| 001 | 524.50* | 100 +5% | 74.34 | 146.75 | 149.64 | | 149.89 | 0.002065 | 2.44 | 41.50 | 51.51 | 0.53 |
| 001 | 524.50* | 100 +25% | 88.50 | 146.75 | 149.79 | | 150.03 | 0.001995 | 2.50 | 48.91 | 53.58 | 0.52 |
| 001 | 524.50* | 100 +70% | 120.36 | 146.75 | 150.01 | | 150.28 | 0.002088 | 2.73 | 61.45 | 56.70 | 0.55 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 524.50* | 1000 | 116.46 | 146.75 | 149.99 | | 150.26 | 0.002049 | 2.69 | 60.33 | 56.42 | 0.54 |
| 001 | 0516 | 2 | 26.58 | 146.64 | 148.57 | | 148.78 | 0.002517 | 2.05 | 12.99 | 8.79 | 0.54 |
| 001 | 0516 | 20 | 49.78 | 146.64 | 149.14 | 148.57 | 149.50 | 0.003498 | 2.67 | 19.65 | 35.48 | 0.65 |
| 001 | 0516 | 50 | 60.91 | 146.64 | 149.50 | 148.82 | 149.71 | 0.001869 | 2.22 | 37.47 | 55.16 | 0.49 |
| 001 | 0516 | 100 | 70.80 | 146.64 | 149.63 | 149.42 | 149.82 | 0.001692 | 2.20 | 45.03 | 57.29 | 0.47 |
| 001 | 0516 | 100 +5% | 74.34 | 146.64 | 149.67 | 149.47 | 149.86 | 0.001681 | 2.21 | 47.10 | 57.86 | 0.47 |
| 001 | 0516 | 100 +25% | 88.50 | 146.64 | 149.81 | | 150.00 | 0.001614 | 2.26 | 55.40 | 60.08 | 0.47 |
| 001 | 0516 | 100 +70% | 120.36 | 146.64 | 150.04 | | 150.25 | 0.001662 | 2.44 | 69.74 | 63.73 | 0.48 |
| 001 | 0516 | 1000 | 116.46 | 146.64 | 150.02 | | 150.22 | 0.001636 | 2.41 | 68.42 | 63.40 | 0.48 |
| 001 | 507.20* | 2 | 26.58 | 146.66 | 148.52 | | 148.76 | 0.003021 | 2.17 | 12.26 | 8.96 | 0.59 |
| 001 | 507.20* | 20 | 49.78 | 146.66 | 149.07 | 148.62 | 149.47 | 0.003909 | 2.81 | 18.61 | 26.81 | 0.69 |
| 001 | 507.20* | 50 | 60.91 | 146.66 | 149.23 | 148.87 | 149.66 | 0.003921 | 2.99 | 23.80 | 36.93 | 0.71 |
| 001 | 507.20* | 100 | 70.80 | 146.66 | 149.43 | 149.42 | 149.79 | 0.003092 | 2.85 | 32.71 | 51.72 | 0.64 |
| 001 | 507.20* | 100 +5% | 74.34 | 146.66 | 149.46 | 149.45 | 149.82 | 0.003123 | 2.89 | 34.28 | 52.35 | 0.64 |
| 001 | 507.20* | 100 +25% | 88.50 | 146.66 | 149.71 | 149.58 | 149.97 | 0.002193 | 2.61 | 47.84 | 57.11 | 0.55 |
| 001 | 507.20* | 100 +70% | 120.36 | 146.66 | 149.95 | | 150.22 | 0.002173 | 2.78 | 62.16 | 61.74 | 0.55 |
| 001 | 507.20* | 1000 | 116.46 | 146.66 | 149.93 | 149.75 | 150.20 | 0.002121 | 2.73 | 61.12 | 61.41 | 0.55 |
| 001 | 498.40* | 2 | 26.58 | 146.68 | 148.46 | | 148.73 | 0.003463 | 2.28 | 11.66 | 8.82 | 0.63 |
| 001 | 498.40* | 20 | 49.78 | 146.68 | 149.01 | 148.65 | 149.43 | 0.004188 | 2.90 | 18.39 | 27.63 | 0.72 |
| 001 | 498.40* | 50 | 60.91 | 146.68 | 149.20 | 149.20 | 149.62 | 0.003849 | 2.99 | 24.48 | 36.45 | 0.70 |
| 001 | 498.40* | 100 | 70.80 | 146.68 | 149.33 | 149.33 | 149.75 | 0.003609 | 3.03 | 29.72 | 41.04 | 0.69 |
| 001 | 498.40* | 100 +5% | 74.34 | 146.68 | 149.35 | 149.35 | 149.79 | 0.003775 | 3.12 | 30.52 | 41.62 | 0.71 |
| 001 | 498.40* | 100 +25% | 88.50 | 146.68 | 149.51 | 149.51 | 149.93 | 0.003561 | 3.19 | 37.40 | 48.08 | 0.69 |
| 001 | 498.40* | 100 +70% | 120.36 | 146.68 | 149.77 | 149.76 | 150.19 | 0.003295 | 3.32 | 51.65 | 57.59 | 0.68 |
| 001 | 498.40* | 1000 | 116.46 | 146.68 | 149.74 | 149.74 | 150.16 | 0.003370 | 3.32 | 49.69 | 56.88 | 0.69 |
| 001 | 489.60* | 2 | 26.58 | 146.70 | 148.40 | | 148.69 | 0.004092 | 2.41 | 11.01 | 8.63 | 0.68 |
| 001 | 489.60* | 20 | 49.78 | 146.70 | 148.97 | 148.65 | 149.40 | 0.004321 | 2.95 | 18.68 | 29.72 | 0.73 |
| 001 | 489.60* | 50 | 60.91 | 146.70 | 149.08 | 149.16 | 149.58 | 0.004736 | 3.23 | 22.36 | 33.82 | 0.78 |
| 001 | 489.60* | 100 | 70.80 | 146.70 | 149.21 | 149.28 | 149.70 | 0.004513 | 3.30 | 26.91 | 38.08 | 0.77 |
| 001 | 489.60* | 100 +5% | 74.34 | 146.70 | 149.24 | 149.34 | 149.75 | 0.004557 | 3.36 | 28.14 | 39.12 | 0.77 |
| 001 | 489.60* | 100 +25% | 88.50 | 146.70 | 149.36 | 149.44 | 149.89 | 0.004657 | 3.53 | 33.02 | 42.51 | 0.79 |
| 001 | 489.60* | 100 +70% | 120.36 | 146.70 | 149.69 | 149.69 | 150.15 | 0.003670 | 3.46 | 48.65 | 52.19 | 0.72 |
| 001 | 489.60* | 1000 | 116.46 | 146.70 | 149.60 | 149.66 | 150.12 | 0.004301 | 3.65 | 44.05 | 49.42 | 0.77 |
| 001 | 480.80* | 2 | 26.58 | 146.72 | 148.32 | | 148.65 | 0.004993 | 2.55 | 10.41 | 8.69 | 0.75 |
| 001 | 480.80* | 20 | 49.78 | 146.72 | 148.93 | 148.63 | 149.36 | 0.004282 | 2.95 | 19.45 | 31.47 | 0.73 |
| 001 | 480.80* | 50 | 60.91 | 146.72 | 149.10 | 149.11 | 149.52 | 0.003956 | 3.02 | 25.25 | 36.56 | 0.71 |
| 001 | 480.80* | 100 | 70.80 | 146.72 | 149.12 | 149.23 | 149.66 | 0.005128 | 3.46 | 25.78 | 36.98 | 0.81 |
| 001 | 480.80* | 100 +5% | 74.34 | 146.72 | 149.26 | 149.26 | 149.68 | 0.003774 | 3.12 | 31.41 | 41.17 | 0.70 |
| 001 | 480.80* | 100 +25% | 88.50 | 146.72 | 149.38 | 149.40 | 149.82 | 0.003860 | 3.28 | 36.51 | 44.30 | 0.72 |
| 001 | 480.80* | 100 +70% | 120.36 | 146.72 | 149.51 | 149.62 | 150.10 | 0.005064 | 3.90 | 42.50 | 47.51 | 0.83 |
| 001 | 480.80* | 1000 | 116.46 | 146.72 | 149.47 | 149.60 | 150.08 | 0.005214 | 3.92 | 40.77 | 46.61 | 0.84 |
| 001 | 0472 | 2 | 26.58 | 146.74 | 148.12 | 148.04 | 148.58 | 0.007985 | 3.00 | 8.86 | 8.14 | 0.92 |
| 001 | 0472 | 20 | 49.78 | 146.74 | 148.91 | 148.91 | 149.30 | 0.004003 | 2.86 | 20.94 | 33.50 | 0.70 |
| 001 | 0472 | 50 | 60.91 | 146.74 | 148.96 | 149.06 | 149.47 | 0.005160 | 3.32 | 22.67 | 34.88 | 0.80 |
| 001 | 0472 | 100 | 70.80 | 146.74 | 149.15 | 149.17 | 149.57 | 0.004022 | 3.13 | 29.73 | 39.98 | 0.72 |
| 001 | 0472 | 100 +5% | 74.34 | 146.74 | 149.11 | 149.21 | 149.63 | 0.005091 | 3.47 | 27.85 | 38.68 | 0.80 |
| 001 | 0472 | 100 +25% | 88.50 | 146.74 | 149.22 | 149.33 | 149.77 | 0.005204 | 3.64 | 32.45 | 41.78 | 0.82 |
| 001 | 0472 | 100 +70% | 120.36 | 146.74 | 149.41 | 149.55 | 150.05 | 0.005749 | 4.07 | 40.82 | 46.66 | 0.87 |
| 001 | 0472 | 1000 | 116.46 | 146.74 | 149.38 | 149.52 | 150.02 | 0.005756 | 4.04 | 39.66 | 46.06 | 0.87 |
| 001 | 463.17* | 2 | 26.58 | 146.66 | 148.07 | 148.00 | 148.50 | 0.007643 | 2.91 | 9.13 | 8.73 | 0.91 |
| 001 | 463.17* | 20 | 49.78 | 146.66 | 148.61 | 148.83 | 149.24 | 0.007341 | 3.51 | 14.69 | 21.20 | 0.93 |
| 001 | 463.17* | 50 | 60.91 | 146.66 | 148.82 | 148.98 | 149.41 | 0.006134 | 3.52 | 20.58 | 33.02 | 0.87 |
| 001 | 463.17* | 100 | 70.80 | 146.66 | 148.95 | 149.09 | 149.52 | 0.005704 | 3.56 | 24.94 | 35.99 | 0.85 |
| 001 | 463.17* | 100 +5% | 74.34 | 146.66 | 148.97 | 149.13 | 149.57 | 0.005912 | 3.65 | 25.71 | 36.50 | 0.86 |
| 001 | 463.17* | 100 +25% | 88.50 | 146.66 | 149.10 | 149.24 | 149.71 | 0.005781 | 3.78 | 30.62 | 39.66 | 0.87 |
| 001 | 463.17* | 100 +70% | 120.36 | 146.66 | 149.30 | 149.46 | 149.99 | 0.006175 | 4.17 | 39.08 | 44.56 | 0.91 |
| 001 | 463.17* | 1000 | 116.46 | 146.66 | 149.27 | 149.45 | 149.97 | 0.006352 | 4.19 | 37.52 | 43.72 | 0.92 |
| 001 | 454.33* | 2 | 26.58 | 146.58 | 148.03 | | 148.43 | 0.007114 | 2.82 | 9.41 | 9.03 | 0.88 |
| 001 | 454.33* | 20 | 49.78 | 146.58 | 148.61 | 148.70 | 149.14 | 0.005935 | 3.26 | 16.68 | 25.91 | 0.84 |
| 001 | 454.33* | 50 | 60.91 | 146.58 | 148.71 | 148.90 | 149.34 | 0.006815 | 3.62 | 19.51 | 31.03 | 0.91 |
| 001 | 454.33* | 100 | 70.80 | 146.58 | 148.82 | 149.01 | 149.46 | 0.006579 | 3.72 | 23.34 | 34.86 | 0.91 |
| 001 | 454.33* | 100 +5% | 74.34 | 146.58 | 148.85 | 149.04 | 149.51 | 0.006698 | 3.79 | 24.27 | 35.42 | 0.92 |
| 001 | 454.33* | 100 +25% | 88.50 | 146.58 | 148.98 | 149.15 | 149.65 | 0.006535 | 3.93 | 28.95 | 38.12 | 0.92 |
| 001 | 454.33* | 100 +70% | 120.36 | 146.58 | 149.18 | 149.37 | 149.93 | 0.006841 | 4.31 | 37.24 | 42.73 | 0.96 |
| 001 | 454.33* | 1000 | 116.46 | 146.58 | 149.15 | 149.35 | 149.90 | 0.006902 | 4.29 | 36.06 | 42.10 | 0.96 |
| 001 | 445.50* | 2 | 26.58 | 146.50 | 147.99 | | 148.37 | 0.006625 | 2.74 | 9.71 | 9.31 | 0.86 |
| 001 | 445.50* | 20 | 49.78 | 146.50 | 148.65 | 148.65 | 149.05 | 0.004274 | 2.88 | 20.35 | 32.76 | 0.72 |
| 001 | 445.50* | 50 | 60.91 | 146.50 | 148.59 | 148.82 | 149.28 | 0.007544 | 3.75 | 18.44 | 28.92 | 0.96 |
| 001 | 445.50* | 100 | 70.80 | 146.50 | 148.72 | 148.94 | 149.40 | 0.007231 | 3.81 | 22.50 | 34.49 | 0.95 |
| 001 | 445.50* | 100 +5% | 74.34 | 146.50 | 148.75 | 148.96 | 149.44 | 0.007365 | 3.88 | 23.46 | 35.00 | 0.96 |
| 001 | 445.50* | 100 +25% | 88.50 | 146.50 | 148.88 | 149.08 | 149.58 | 0.007086 | 4.00 | 28.15 | 37.57 | 0.95 |
| 001 | 445.50* | 100 +70% | 120.36 | 146.50 | 149.08 | 149.30 | 149.86 | 0.007416 | 4.39 | 36.10 | 41.58 | 0.99 |
| 001 | 445.50* | 1000 | 116.46 | 146.50 | 149.05 | 149.28 | 149.83 | 0.007500 | 4.37 | 34.93 | 41.01 | 0.99 |
| 001 | 436.67* | 2 | 26.58 | 146.41 | 147.95 | | 148.31 | 0.006269 | 2.66 | 9.98 | 9.56 | 0.83 |
| 001 | 436.67* | 20 | 49.78 | 146.41 | 148.35 | 148.57 | 148.99 | 0.007784 | 3.55 | 14.60 | 19.03 | 0.96 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 436.67* | 50 | 60.91 | 146.41 | 148.51 | 148.76 | 149.20 | 0.007816 | 3.77 | 18.26 | 28.35 | 0.97 |
| 001 | 436.67* | 100 | 70.80 | 146.41 | 148.63 | 148.85 | 149.33 | 0.007577 | 3.87 | 22.08 | 34.61 | 0.97 |
| 001 | 436.67* | 100 +5% | 74.34 | 146.41 | 148.66 | 148.88 | 149.37 | 0.007619 | 3.92 | 23.17 | 35.13 | 0.97 |
| 001 | 436.67* | 100 +25% | 88.50 | 146.41 | 148.77 | 148.99 | 149.51 | 0.007802 | 4.10 | 27.25 | 37.12 | 0.99 |
| 001 | 436.67* | 100 +70% | 120.36 | 146.41 | 148.98 | 149.22 | 149.78 | 0.007885 | 4.42 | 35.49 | 41.04 | 1.01 |
| 001 | 436.67* | 1000 | 116.46 | 146.41 | 148.95 | 149.19 | 149.76 | 0.007986 | 4.41 | 34.35 | 40.51 | 1.02 |
| 001 | 427.83* | 2 | 26.58 | 146.33 | 147.88 | | 148.25 | 0.006529 | 2.67 | 9.96 | 9.77 | 0.84 |
| 001 | 427.83* | 20 | 49.78 | 146.33 | 148.30 | 148.53 | 148.91 | 0.007522 | 3.47 | 15.21 | 20.64 | 0.94 |
| 001 | 427.83* | 50 | 60.91 | 146.33 | 148.42 | 148.66 | 149.13 | 0.008291 | 3.81 | 17.98 | 27.27 | 1.00 |
| 001 | 427.83* | 100 | 70.80 | 146.33 | 148.54 | 148.78 | 149.26 | 0.007905 | 3.90 | 21.91 | 34.96 | 0.98 |
| 001 | 427.83* | 100 +5% | 74.34 | 146.33 | 148.57 | 148.81 | 149.30 | 0.007991 | 3.96 | 22.92 | 35.42 | 0.99 |
| 001 | 427.83* | 100 +25% | 88.50 | 146.33 | 149.07 | 148.91 | 149.36 | 0.002794 | 2.72 | 42.58 | 43.82 | 0.61 |
| 001 | 427.83* | 100 +70% | 120.36 | 146.33 | 149.34 | 149.14 | 149.65 | 0.002658 | 2.88 | 54.83 | 47.57 | 0.60 |
| 001 | 427.83* | 1000 | 116.46 | 146.33 | 149.31 | 149.11 | 149.61 | 0.002676 | 2.87 | 53.35 | 47.13 | 0.61 |
| 001 | 0419 | 2 | 26.58 | 146.25 | 147.80 | 147.72 | 148.18 | 0.007425 | 2.74 | 9.70 | 9.96 | 0.89 |
| 001 | 0419 | 20 | 49.78 | 146.25 | 148.23 | 148.39 | 148.83 | 0.007770 | 3.46 | 15.43 | 21.39 | 0.95 |
| 001 | 0419 | 50 | 60.91 | 146.25 | 148.35 | 148.61 | 149.05 | 0.008552 | 3.80 | 18.17 | 27.28 | 1.00 |
| 001 | 0419 | 100 | 70.80 | 146.25 | 148.90 | 148.71 | 149.12 | 0.002387 | 2.39 | 38.41 | 42.01 | 0.55 |
| 001 | 0419 | 100 +5% | 74.34 | 146.25 | 148.94 | 148.72 | 149.17 | 0.002330 | 2.38 | 40.40 | 42.78 | 0.55 |
| 001 | 0419 | 100 +25% | 88.50 | 146.25 | 149.09 | | 149.32 | 0.002248 | 2.45 | 46.84 | 44.90 | 0.54 |
| 001 | 0419 | 100 +70% | 120.36 | 146.25 | 149.35 | | 149.61 | 0.002203 | 2.63 | 59.19 | 48.33 | 0.55 |
| 001 | 0419 | 1000 | 116.46 | 146.25 | 149.32 | | 149.57 | 0.002211 | 2.61 | 57.70 | 47.92 | 0.55 |
| 001 | 409.75* | 2 | 26.58 | 146.22 | 147.81 | | 148.10 | 0.004812 | 2.39 | 11.11 | 10.25 | 0.73 |
| 001 | 409.75* | 20 | 49.78 | 146.22 | 148.35 | 148.08 | 148.77 | 0.004466 | 2.89 | 18.78 | 27.16 | 0.74 |
| 001 | 409.75* | 50 | 60.91 | 146.22 | 148.27 | 148.52 | 148.99 | 0.008032 | 3.77 | 16.91 | 20.85 | 0.99 |
| 001 | 409.75* | 100 | 70.80 | 146.22 | 148.78 | | 149.09 | 0.002788 | 2.67 | 33.74 | 39.30 | 0.61 |
| 001 | 409.75* | 100 +5% | 74.34 | 146.22 | 148.83 | | 149.13 | 0.002673 | 2.66 | 35.85 | 40.29 | 0.60 |
| 001 | 409.75* | 100 +25% | 88.50 | 146.22 | 148.98 | | 149.29 | 0.002630 | 2.76 | 41.75 | 42.52 | 0.60 |
| 001 | 409.75* | 100 +70% | 120.36 | 146.22 | 149.23 | | 149.58 | 0.002642 | 2.99 | 53.27 | 46.57 | 0.61 |
| 001 | 409.75* | 1000 | 116.46 | 146.22 | 149.20 | | 149.54 | 0.002658 | 2.97 | 51.79 | 46.07 | 0.62 |
| 001 | 400.50* | 2 | 26.58 | 146.18 | 147.82 | | 148.04 | 0.003311 | 2.10 | 12.63 | 10.85 | 0.62 |
| 001 | 400.50* | 20 | 49.78 | 146.18 | 148.37 | 147.94 | 148.71 | 0.003121 | 2.63 | 20.54 | 29.22 | 0.64 |
| 001 | 400.50* | 50 | 60.91 | 146.18 | 148.59 | 148.13 | 148.92 | 0.002679 | 2.64 | 27.80 | 35.36 | 0.61 |
| 001 | 400.50* | 100 | 70.80 | 146.18 | 148.74 | 148.56 | 149.06 | 0.002509 | 2.69 | 33.32 | 39.19 | 0.59 |
| 001 | 400.50* | 100 +5% | 74.34 | 146.18 | 148.79 | | 149.11 | 0.002433 | 2.69 | 35.39 | 40.32 | 0.59 |
| 001 | 400.50* | 100 +25% | 88.50 | 146.18 | 148.93 | | 149.27 | 0.002468 | 2.82 | 41.11 | 42.61 | 0.60 |
| 001 | 400.50* | 100 +70% | 120.36 | 146.18 | 149.18 | | 149.56 | 0.002571 | 3.09 | 52.19 | 45.70 | 0.62 |
| 001 | 400.50* | 1000 | 116.46 | 146.18 | 149.15 | | 149.52 | 0.002588 | 3.07 | 50.69 | 45.35 | 0.62 |
| 001 | 391.25* | 2 | 26.58 | 146.14 | 147.83 | | 148.01 | 0.002162 | 1.86 | 14.53 | 12.66 | 0.52 |
| 001 | 391.25* | 20 | 49.78 | 146.14 | 148.41 | | 148.66 | 0.002028 | 2.30 | 24.45 | 29.68 | 0.53 |
| 001 | 391.25* | 50 | 60.91 | 146.14 | 148.63 | | 148.88 | 0.001847 | 2.35 | 31.77 | 37.14 | 0.52 |
| 001 | 391.25* | 100 | 70.80 | 146.14 | 148.77 | | 149.02 | 0.001796 | 2.42 | 37.26 | 40.07 | 0.52 |
| 001 | 391.25* | 100 +5% | 74.34 | 146.14 | 148.82 | | 149.07 | 0.001770 | 2.44 | 39.26 | 40.95 | 0.51 |
| 001 | 391.25* | 100 +25% | 88.50 | 146.14 | 148.95 | | 149.23 | 0.001848 | 2.59 | 44.84 | 42.09 | 0.53 |
| 001 | 391.25* | 100 +70% | 120.36 | 146.14 | 149.19 | | 149.52 | 0.002061 | 2.91 | 55.13 | 44.16 | 0.57 |
| 001 | 391.25* | 1000 | 116.46 | 146.14 | 149.16 | | 149.49 | 0.002054 | 2.88 | 53.77 | 43.89 | 0.57 |
| 001 | 0382 | 2 | 26.58 | 146.11 | 147.85 | | 147.97 | 0.001322 | 1.57 | 18.33 | 17.13 | 0.41 |
| 001 | 0382 | 20 | 49.78 | 146.11 | 148.46 | | 148.62 | 0.001222 | 1.90 | 30.09 | 27.70 | 0.42 |
| 001 | 0382 | 50 | 60.91 | 146.11 | 148.67 | | 148.84 | 0.001185 | 1.99 | 37.60 | 38.08 | 0.42 |
| 001 | 0382 | 100 | 70.80 | 146.11 | 148.81 | | 148.99 | 0.001195 | 2.08 | 42.94 | 39.04 | 0.43 |
| 001 | 0382 | 100 +5% | 74.34 | 146.11 | 148.85 | | 149.04 | 0.001196 | 2.10 | 44.78 | 39.37 | 0.43 |
| 001 | 0382 | 100 +25% | 88.50 | 146.11 | 148.98 | | 149.19 | 0.001304 | 2.27 | 49.99 | 40.28 | 0.45 |
| 001 | 0382 | 100 +70% | 120.36 | 146.11 | 149.22 | | 149.49 | 0.001557 | 2.63 | 59.53 | 41.90 | 0.50 |
| 001 | 0382 | 1000 | 116.46 | 146.11 | 149.19 | | 149.45 | 0.001538 | 2.60 | 58.29 | 41.70 | 0.49 |
| 001 | 372.33* | 2 | 26.58 | 146.05 | 147.73 | | 147.94 | 0.003290 | 2.03 | 13.14 | 13.05 | 0.62 |
| 001 | 372.33* | 20 | 49.78 | 146.05 | 148.32 | | 148.59 | 0.002521 | 2.36 | 22.90 | 22.09 | 0.58 |
| 001 | 372.33* | 50 | 60.91 | 146.05 | 148.53 | | 148.81 | 0.002349 | 2.46 | 29.05 | 36.24 | 0.57 |
| 001 | 372.33* | 100 | 70.80 | 146.05 | 148.68 | 148.24 | 148.96 | 0.002165 | 2.49 | 35.01 | 39.63 | 0.56 |
| 001 | 372.33* | 100 +5% | 74.34 | 146.05 | 148.74 | 148.29 | 149.01 | 0.002072 | 2.48 | 37.32 | 40.14 | 0.55 |
| 001 | 372.33* | 100 +25% | 88.50 | 146.05 | 148.87 | | 149.17 | 0.002147 | 2.63 | 42.71 | 41.31 | 0.56 |
| 001 | 372.33* | 100 +70% | 120.36 | 146.05 | 149.10 | | 149.46 | 0.002410 | 2.98 | 52.26 | 43.20 | 0.61 |
| 001 | 372.33* | 1000 | 116.46 | 146.05 | 149.07 | | 149.42 | 0.002419 | 2.96 | 50.84 | 42.93 | 0.61 |
| 001 | 362.67* | 2 | 26.58 | 146.00 | 147.57 | | 147.89 | 0.005694 | 2.50 | 10.63 | 10.44 | 0.79 |
| 001 | 362.67* | 20 | 49.78 | 146.00 | 148.18 | | 148.55 | 0.004521 | 2.71 | 18.76 | 17.80 | 0.75 |
| 001 | 362.67* | 50 | 60.91 | 146.00 | 148.32 | 148.12 | 148.76 | 0.004834 | 2.98 | 21.65 | 26.23 | 0.78 |
| 001 | 362.67* | 100 | 70.80 | 146.00 | 148.46 | 148.38 | 148.92 | 0.004503 | 3.06 | 25.97 | 33.48 | 0.77 |
| 001 | 362.67* | 100 +5% | 74.34 | 146.00 | 148.51 | 148.48 | 148.97 | 0.004430 | 3.09 | 27.48 | 35.18 | 0.76 |
| 001 | 362.67* | 100 +25% | 88.50 | 146.00 | 148.68 | 148.67 | 149.13 | 0.003976 | 3.13 | 34.13 | 40.50 | 0.74 |
| 001 | 362.67* | 100 +70% | 120.36 | 146.00 | 149.03 | | 149.43 | 0.003074 | 3.09 | 49.20 | 44.64 | 0.67 |
| 001 | 362.67* | 1000 | 116.46 | 146.00 | 148.99 | 148.90 | 149.40 | 0.003179 | 3.10 | 47.30 | 44.21 | 0.67 |
| 001 | 0353 | 2 | 26.58 | 145.94 | 147.60 | | 147.82 | 0.003261 | 2.08 | 12.75 | 10.43 | 0.60 |
| 001 | 0353 | 20 | 49.78 | 145.94 | 148.16 | | 148.50 | 0.003639 | 2.59 | 19.53 | 18.01 | 0.66 |
| 001 | 0353 | 50 | 60.91 | 145.94 | 148.30 | 147.91 | 148.71 | 0.004193 | 2.86 | 22.83 | 27.82 | 0.72 |
| 001 | 0353 | 100 | 70.80 | 145.94 | 148.45 | 148.22 | 148.86 | 0.004114 | 2.91 | 27.64 | 34.10 | 0.72 |
| 001 | 0353 | 100 +5% | 74.34 | 145.94 | 148.50 | 148.40 | 148.91 | 0.004083 | 2.92 | 29.32 | 35.82 | 0.72 |
| 001 | 0353 | 100 +25% | 88.50 | 145.94 | 148.69 | 148.60 | 149.07 | 0.003678 | 2.90 | 36.61 | 40.15 | 0.69 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0353 | 100 +70% | 120.36 | 145.94 | 149.04 | | 149.39 | 0.002944 | 2.86 | 51.75 | 45.79 | 0.63 |
| 001 | 0353 | 1000 | 116.46 | 145.94 | 149.00 | | 149.35 | 0.003047 | 2.87 | 49.82 | 45.11 | 0.64 |
| 001 | 344.60* | 2 | 26.58 | 145.91 | 147.53 | | 147.78 | 0.003832 | 2.25 | 11.81 | 9.80 | 0.66 |
| 001 | 344.60* | 20 | 49.78 | 145.91 | 148.07 | | 148.46 | 0.004603 | 2.78 | 18.08 | 17.36 | 0.75 |
| 001 | 344.60* | 50 | 60.91 | 145.91 | 148.25 | 147.95 | 148.68 | 0.004664 | 2.93 | 22.59 | 29.30 | 0.76 |
| 001 | 344.60* | 100 | 70.80 | 145.91 | 148.42 | 148.34 | 148.82 | 0.004063 | 2.90 | 28.13 | 34.35 | 0.72 |
| 001 | 344.60* | 100 +5% | 74.34 | 145.91 | 148.47 | 148.39 | 148.87 | 0.003948 | 2.91 | 29.87 | 35.65 | 0.72 |
| 001 | 344.60* | 100 +25% | 88.50 | 145.91 | 148.67 | 148.56 | 149.04 | 0.003454 | 2.89 | 37.04 | 38.98 | 0.68 |
| 001 | 344.60* | 100 +70% | 120.36 | 145.91 | 149.01 | | 149.36 | 0.002799 | 2.90 | 51.51 | 44.10 | 0.63 |
| 001 | 344.60* | 1000 | 116.46 | 145.91 | 148.97 | | 149.32 | 0.002884 | 2.91 | 49.65 | 43.54 | 0.63 |
| 001 | 336.20* | 2 | 26.58 | 145.88 | 147.43 | | 147.74 | 0.005076 | 2.48 | 10.72 | 9.79 | 0.76 |
| 001 | 336.20* | 20 | 49.78 | 145.88 | 148.01 | 147.76 | 148.43 | 0.004930 | 2.86 | 17.59 | 17.71 | 0.78 |
| 001 | 336.20* | 50 | 60.91 | 145.88 | 148.21 | 148.13 | 148.64 | 0.004421 | 2.94 | 22.92 | 29.39 | 0.75 |
| 001 | 336.20* | 100 | 70.80 | 145.88 | 148.40 | 148.30 | 148.79 | 0.003751 | 2.89 | 28.67 | 33.50 | 0.70 |
| 001 | 336.20* | 100 +5% | 74.34 | 145.88 | 148.45 | 148.35 | 148.83 | 0.003652 | 2.90 | 30.37 | 34.58 | 0.70 |
| 001 | 336.20* | 100 +25% | 88.50 | 145.88 | 148.64 | | 149.01 | 0.003223 | 2.89 | 37.27 | 37.60 | 0.66 |
| 001 | 336.20* | 100 +70% | 120.36 | 145.88 | 148.98 | | 149.34 | 0.002711 | 2.96 | 50.96 | 42.23 | 0.63 |
| 001 | 336.20* | 1000 | 116.46 | 145.88 | 148.94 | | 149.30 | 0.002781 | 2.96 | 49.20 | 41.72 | 0.63 |
| 001 | 327.80* | 2 | 26.58 | 145.85 | 147.32 | 147.19 | 147.69 | 0.006364 | 2.69 | 9.89 | 9.74 | 0.85 |
| 001 | 327.80* | 20 | 49.78 | 145.85 | 147.96 | 147.72 | 148.39 | 0.004742 | 2.91 | 17.48 | 21.11 | 0.78 |
| 001 | 327.80* | 50 | 60.91 | 145.85 | 148.18 | 148.10 | 148.60 | 0.004118 | 2.95 | 23.28 | 28.82 | 0.73 |
| 001 | 327.80* | 100 | 70.80 | 145.85 | 148.37 | 148.26 | 148.75 | 0.003491 | 2.89 | 29.05 | 32.30 | 0.68 |
| 001 | 327.80* | 100 +5% | 74.34 | 145.85 | 148.42 | 148.30 | 148.80 | 0.003401 | 2.90 | 30.68 | 33.23 | 0.68 |
| 001 | 327.80* | 100 +25% | 88.50 | 145.85 | 148.61 | | 148.98 | 0.003054 | 2.93 | 37.20 | 36.11 | 0.65 |
| 001 | 327.80* | 100 +70% | 120.36 | 145.85 | 148.94 | | 149.32 | 0.002681 | 3.04 | 50.07 | 40.28 | 0.63 |
| 001 | 327.80* | 1000 | 116.46 | 145.85 | 148.90 | | 149.28 | 0.002738 | 3.03 | 48.41 | 39.80 | 0.63 |
| 001 | 319.40* | 2 | 26.58 | 145.82 | 147.16 | 147.15 | 147.62 | 0.008862 | 3.02 | 8.79 | 9.50 | 1.00 |
| 001 | 319.40* | 20 | 49.78 | 145.82 | 147.90 | 147.66 | 148.36 | 0.004708 | 2.99 | 17.20 | 21.42 | 0.78 |
| 001 | 319.40* | 50 | 60.91 | 145.82 | 148.14 | 148.07 | 148.57 | 0.003921 | 2.97 | 23.46 | 27.86 | 0.72 |
| 001 | 319.40* | 100 | 70.80 | 145.82 | 148.34 | 148.21 | 148.73 | 0.003297 | 2.91 | 29.14 | 30.99 | 0.67 |
| 001 | 319.40* | 100 +5% | 74.34 | 145.82 | 148.39 | 148.25 | 148.77 | 0.003226 | 2.93 | 30.69 | 31.77 | 0.67 |
| 001 | 319.40* | 100 +25% | 88.50 | 145.82 | 148.57 | 148.41 | 148.96 | 0.002975 | 2.99 | 36.82 | 34.42 | 0.65 |
| 001 | 319.40* | 100 +70% | 120.36 | 145.82 | 148.90 | 148.70 | 149.30 | 0.002749 | 3.15 | 48.63 | 38.21 | 0.64 |
| 001 | 319.40* | 1000 | 116.46 | 145.82 | 148.86 | 148.67 | 149.26 | 0.002767 | 3.13 | 47.26 | 37.81 | 0.64 |
| 001 | 0311 | 2 | 26.58 | 145.79 | 147.07 | 147.07 | 147.56 | 0.008859 | 3.08 | 8.64 | 8.99 | 1.00 |
| 001 | 0311 | 20 | 49.78 | 145.79 | 147.60 | 147.60 | 148.28 | 0.008255 | 3.66 | 13.60 | 10.33 | 1.00 |
| 001 | 0311 | 50 | 60.91 | 145.79 | 148.03 | 148.03 | 148.53 | 0.004635 | 3.22 | 21.44 | 25.62 | 0.77 |
| 001 | 0311 | 100 | 70.80 | 145.79 | 148.17 | 148.17 | 148.68 | 0.004445 | 3.32 | 25.15 | 27.59 | 0.76 |
| 001 | 0311 | 100 +5% | 74.34 | 145.79 | 148.21 | 148.21 | 148.73 | 0.004402 | 3.35 | 26.39 | 28.22 | 0.76 |
| 001 | 0311 | 100 +25% | 88.50 | 145.79 | 148.37 | 148.37 | 148.91 | 0.004333 | 3.50 | 30.97 | 30.42 | 0.77 |
| 001 | 0311 | 100 +70% | 120.36 | 145.79 | 148.67 | 148.67 | 149.25 | 0.004146 | 3.74 | 40.74 | 34.16 | 0.77 |
| 001 | 0311 | 1000 | 116.46 | 145.79 | 148.64 | 148.64 | 149.22 | 0.004133 | 3.70 | 39.72 | 33.82 | 0.77 |
| 001 | 301.67* | 2 | 26.58 | 145.58 | 146.75 | 146.90 | 147.43 | 0.015217 | 3.67 | 7.24 | 8.96 | 1.30 |
| 001 | 301.67* | 20 | 49.78 | 145.58 | 147.21 | 147.42 | 148.16 | 0.013177 | 4.32 | 11.53 | 9.56 | 1.26 |
| 001 | 301.67* | 50 | 60.91 | 145.58 | 147.45 | 147.60 | 148.43 | 0.011544 | 4.38 | 13.90 | 10.05 | 1.19 |
| 001 | 301.67* | 100 | 70.80 | 145.58 | 147.85 | 148.07 | 148.61 | 0.006959 | 3.88 | 19.44 | 26.82 | 0.94 |
| 001 | 301.67* | 100 +5% | 74.34 | 145.58 | 147.91 | 148.11 | 148.66 | 0.006746 | 3.89 | 21.00 | 27.96 | 0.93 |
| 001 | 301.67* | 100 +25% | 88.50 | 145.58 | 148.06 | 148.28 | 148.85 | 0.006579 | 4.06 | 25.58 | 31.19 | 0.93 |
| 001 | 301.67* | 100 +70% | 120.36 | 145.58 | 148.32 | 148.56 | 149.18 | 0.006565 | 4.41 | 34.37 | 36.61 | 0.95 |
| 001 | 301.67* | 1000 | 116.46 | 145.58 | 148.29 | 148.53 | 149.14 | 0.006535 | 4.37 | 33.42 | 36.06 | 0.95 |
| 001 | 292.33* | 2 | 26.58 | 145.37 | 146.55 | 146.73 | 147.28 | 0.017260 | 3.80 | 7.00 | 9.08 | 1.38 |
| 001 | 292.33* | 20 | 49.78 | 145.37 | 146.97 | 147.23 | 148.02 | 0.015437 | 4.53 | 10.99 | 9.64 | 1.35 |
| 001 | 292.33* | 50 | 60.91 | 145.37 | 147.18 | 147.45 | 148.30 | 0.014008 | 4.69 | 12.99 | 9.83 | 1.30 |
| 001 | 292.33* | 100 | 70.80 | 145.37 | 147.41 | 147.61 | 148.50 | 0.011775 | 4.60 | 15.38 | 10.34 | 1.21 |
| 001 | 292.33* | 100 +5% | 74.34 | 145.37 | 147.54 | 148.01 | 148.55 | 0.010249 | 4.45 | 16.70 | 10.56 | 1.13 |
| 001 | 292.33* | 100 +25% | 88.50 | 145.37 | 147.88 | 148.20 | 148.77 | 0.007481 | 4.23 | 23.23 | 32.43 | 0.98 |
| 001 | 292.33* | 100 +70% | 120.36 | 145.37 | 148.15 | 148.49 | 149.11 | 0.007358 | 4.58 | 32.93 | 40.95 | 1.00 |
| 001 | 292.33* | 1000 | 116.46 | 145.37 | 148.12 | 148.45 | 149.07 | 0.007310 | 4.53 | 31.93 | 40.15 | 0.99 |
| 001 | 0283 | 2 | 26.58 | 145.16 | 146.80 | 146.57 | 147.09 | 0.004517 | 2.41 | 11.04 | 9.89 | 0.73 |
| 001 | 0283 | 20 | 49.78 | 145.16 | 146.77 | 147.05 | 147.86 | 0.017064 | 4.62 | 10.77 | 9.87 | 1.41 |
| 001 | 0283 | 50 | 60.91 | 145.16 | 146.95 | 147.26 | 148.15 | 0.016159 | 4.86 | 12.53 | 10.01 | 1.39 |
| 001 | 0283 | 100 | 70.80 | 145.16 | 147.14 | 147.43 | 148.36 | 0.014266 | 4.90 | 14.44 | 10.15 | 1.31 |
| 001 | 0283 | 100 +5% | 74.34 | 145.16 | 147.23 | 147.48 | 148.42 | 0.013066 | 4.84 | 15.37 | 10.22 | 1.26 |
| 001 | 0283 | 100 +25% | 88.50 | 145.16 | 147.60 | 148.15 | 148.67 | 0.009786 | 4.58 | 19.33 | 12.08 | 1.10 |
| 001 | 0283 | 100 +70% | 120.36 | 145.16 | 148.00 | 148.36 | 149.04 | 0.007962 | 4.67 | 31.63 | 46.46 | 1.02 |
| 001 | 0283 | 1000 | 116.46 | 145.16 | 147.98 | 148.34 | 149.00 | 0.007898 | 4.62 | 30.53 | 45.14 | 1.02 |
| 001 | 274.00* | 2 | 26.58 | 145.16 | 146.77 | | 147.05 | 0.004246 | 2.33 | 11.38 | 10.40 | 0.71 |
| 001 | 274.00* | 20 | 49.78 | 145.16 | 147.27 | 147.00 | 147.72 | 0.004778 | 2.98 | 16.72 | 11.09 | 0.77 |
| 001 | 274.00* | 50 | 60.91 | 145.16 | 147.43 | 147.20 | 147.98 | 0.005326 | 3.29 | 18.53 | 11.40 | 0.82 |
| 001 | 274.00* | 100 | 70.80 | 145.16 | 147.56 | 147.37 | 148.20 | 0.005787 | 3.54 | 19.99 | 11.62 | 0.86 |
| 001 | 274.00* | 100 +5% | 74.34 | 145.16 | 147.25 | 147.43 | 148.29 | 0.011077 | 4.51 | 16.48 | 11.03 | 1.18 |
| 001 | 274.00* | 100 +25% | 88.50 | 145.16 | 147.60 | 148.04 | 148.55 | 0.008475 | 4.33 | 20.46 | 13.64 | 1.04 |
| 001 | 274.00* | 100 +70% | 120.36 | 145.16 | 147.95 | 148.34 | 148.96 | 0.007516 | 4.60 | 31.63 | 47.43 | 1.01 |
| 001 | 274.00* | 1000 | 116.46 | 145.16 | 147.91 | 148.32 | 148.93 | 0.007617 | 4.58 | 30.08 | 45.40 | 1.02 |
| 001 | 265.00* | 2 | 26.58 | 145.15 | 146.74 | | 147.00 | 0.004118 | 2.28 | 11.65 | 10.89 | 0.70 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 265.00* | 20 | 49.78 | 145.15 | 147.25 | | 147.67 | 0.004411 | 2.86 | 17.39 | 11.76 | 0.75 |
| 001 | 265.00* | 50 | 60.91 | 145.15 | 147.42 | | 147.92 | 0.004792 | 3.13 | 19.43 | 12.09 | 0.79 |
| 001 | 265.00* | 100 | 70.80 | 145.15 | 147.55 | 147.31 | 148.13 | 0.005017 | 3.36 | 21.09 | 13.22 | 0.82 |
| 001 | 265.00* | 100 +5% | 74.34 | 145.15 | 147.60 | 147.37 | 148.20 | 0.005065 | 3.44 | 21.77 | 17.37 | 0.82 |
| 001 | 265.00* | 100 +25% | 88.50 | 145.15 | 147.59 | 147.98 | 148.45 | 0.007269 | 4.11 | 21.65 | 16.64 | 0.99 |
| 001 | 265.00* | 100 +70% | 120.36 | 145.15 | 147.88 | 148.25 | 148.90 | 0.007410 | 4.59 | 31.01 | 47.18 | 1.02 |
| 001 | 265.00* | 1000 | 116.46 | 145.15 | 147.84 | 148.23 | 148.87 | 0.007539 | 4.57 | 29.37 | 45.08 | 1.03 |
| 001 | 256.00* | 2 | 26.58 | 145.15 | 146.70 | | 146.96 | 0.004116 | 2.25 | 11.81 | 11.35 | 0.70 |
| 001 | 256.00* | 20 | 49.78 | 145.15 | 147.23 | | 147.62 | 0.004157 | 2.77 | 18.00 | 12.43 | 0.73 |
| 001 | 256.00* | 50 | 60.91 | 145.15 | 147.40 | | 147.86 | 0.004380 | 3.02 | 20.21 | 13.37 | 0.76 |
| 001 | 256.00* | 100 | 70.80 | 145.15 | 147.55 | 147.26 | 148.07 | 0.004398 | 3.21 | 22.30 | 15.39 | 0.78 |
| 001 | 256.00* | 100 +5% | 74.34 | 145.15 | 147.60 | 147.32 | 148.14 | 0.004392 | 3.27 | 23.20 | 20.96 | 0.78 |
| 001 | 256.00* | 100 +25% | 88.50 | 145.15 | 147.42 | 147.53 | 148.38 | 0.008921 | 4.34 | 20.44 | 13.56 | 1.09 |
| 001 | 256.00* | 100 +70% | 120.36 | 145.15 | 147.81 | 148.22 | 148.84 | 0.007392 | 4.57 | 30.46 | 47.49 | 1.03 |
| 001 | 256.00* | 1000 | 116.46 | 145.15 | 147.78 | 148.19 | 148.80 | 0.007465 | 4.54 | 28.88 | 43.92 | 1.03 |
| 001 | 247.00* | 2 | 26.58 | 145.14 | 146.67 | | 146.92 | 0.004218 | 2.24 | 11.88 | 11.72 | 0.71 |
| 001 | 247.00* | 20 | 49.78 | 145.14 | 147.20 | | 147.57 | 0.004023 | 2.69 | 18.50 | 13.20 | 0.72 |
| 001 | 247.00* | 50 | 60.91 | 145.14 | 147.38 | | 147.81 | 0.004028 | 2.91 | 21.05 | 15.17 | 0.74 |
| 001 | 247.00* | 100 | 70.80 | 145.14 | 147.54 | 147.23 | 148.02 | 0.003893 | 3.06 | 23.73 | 17.95 | 0.74 |
| 001 | 247.00* | 100 +5% | 74.34 | 145.14 | 147.60 | 147.27 | 148.09 | 0.003832 | 3.10 | 24.96 | 25.73 | 0.74 |
| 001 | 247.00* | 100 +25% | 88.50 | 145.14 | 147.82 | 147.50 | 148.30 | 0.003379 | 3.14 | 33.73 | 52.55 | 0.70 |
| 001 | 247.00* | 100 +70% | 120.36 | 145.14 | 147.74 | 148.16 | 148.77 | 0.007514 | 4.56 | 29.73 | 43.27 | 1.04 |
| 001 | 247.00* | 1000 | 116.46 | 145.14 | 147.70 | 148.12 | 148.73 | 0.007653 | 4.54 | 28.14 | 38.11 | 1.05 |
| 001 | 0238 | 2 | 26.58 | 145.14 | 146.63 | | 146.88 | 0.004418 | 2.25 | 11.82 | 11.94 | 0.72 |
| 001 | 0238 | 20 | 49.78 | 145.14 | 147.18 | | 147.53 | 0.003878 | 2.63 | 19.00 | 14.96 | 0.71 |
| 001 | 0238 | 50 | 60.91 | 145.14 | 147.37 | | 147.77 | 0.003755 | 2.82 | 22.11 | 18.24 | 0.72 |
| 001 | 0238 | 100 | 70.80 | 145.14 | 147.55 | 147.19 | 147.97 | 0.003392 | 2.88 | 25.90 | 23.99 | 0.69 |
| 001 | 0238 | 100 +5% | 74.34 | 145.14 | 147.62 | 147.25 | 148.03 | 0.003254 | 2.89 | 27.79 | 33.73 | 0.68 |
| 001 | 0238 | 100 +25% | 88.50 | 145.14 | 147.88 | 147.47 | 148.23 | 0.002509 | 2.78 | 40.70 | 60.94 | 0.61 |
| 001 | 0238 | 100 +70% | 120.36 | 145.14 | 147.65 | 148.08 | 148.69 | 0.008000 | 4.59 | 28.84 | 37.37 | 1.07 |
| 001 | 0238 | 1000 | 116.46 | 145.14 | 147.60 | 148.04 | 148.65 | 0.008368 | 4.60 | 27.09 | 30.53 | 1.09 |
| 001 | 229.50* | 2 | 26.58 | 145.06 | 146.54 | | 146.84 | 0.005083 | 2.44 | 10.91 | 10.87 | 0.78 |
| 001 | 229.50* | 20 | 49.78 | 145.06 | 147.09 | | 147.49 | 0.004687 | 2.81 | 17.74 | 13.90 | 0.78 |
| 001 | 229.50* | 50 | 60.91 | 145.06 | 147.27 | | 147.73 | 0.004604 | 3.01 | 20.45 | 15.83 | 0.79 |
| 001 | 229.50* | 100 | 70.80 | 145.06 | 147.42 | 147.20 | 147.93 | 0.004483 | 3.16 | 22.99 | 18.51 | 0.79 |
| 001 | 229.50* | 100 +5% | 74.34 | 145.06 | 147.47 | 147.24 | 147.99 | 0.004438 | 3.21 | 23.95 | 19.59 | 0.79 |
| 001 | 229.50* | 100 +25% | 88.50 | 145.06 | 147.79 | 147.47 | 148.21 | 0.003041 | 2.98 | 36.79 | 54.02 | 0.67 |
| 001 | 229.50* | 100 +70% | 120.36 | 145.06 | 147.81 | 148.03 | 148.55 | 0.005276 | 3.96 | 38.16 | 55.23 | 0.89 |
| 001 | 229.50* | 1000 | 116.46 | 145.06 | 148.03 | 148.00 | 148.45 | 0.002894 | 3.13 | 50.94 | 66.32 | 0.67 |
| 001 | 221.00* | 2 | 26.58 | 144.97 | 146.46 | | 146.79 | 0.005841 | 2.57 | 10.36 | 10.67 | 0.83 |
| 001 | 221.00* | 20 | 49.78 | 144.97 | 146.96 | | 147.44 | 0.005905 | 3.06 | 16.28 | 13.22 | 0.87 |
| 001 | 221.00* | 50 | 60.91 | 144.97 | 147.16 | 147.01 | 147.69 | 0.005547 | 3.21 | 19.14 | 15.04 | 0.86 |
| 001 | 221.00* | 100 | 70.80 | 144.97 | 147.32 | 147.18 | 147.89 | 0.005392 | 3.35 | 21.62 | 17.26 | 0.86 |
| 001 | 221.00* | 100 +5% | 74.34 | 144.97 | 147.36 | 147.23 | 147.95 | 0.005404 | 3.41 | 22.38 | 18.05 | 0.86 |
| 001 | 221.00* | 100 +25% | 88.50 | 144.97 | 147.71 | 147.71 | 148.17 | 0.003449 | 3.11 | 34.55 | 48.76 | 0.71 |
| 001 | 221.00* | 100 +70% | 120.36 | 144.97 | 147.79 | 147.97 | 148.51 | 0.005266 | 3.94 | 38.37 | 51.99 | 0.89 |
| 001 | 221.00* | 1000 | 116.46 | 144.97 | 147.94 | 147.94 | 148.42 | 0.003358 | 3.31 | 46.80 | 58.40 | 0.72 |
| 001 | 212.50* | 2 | 26.58 | 144.89 | 146.37 | 146.29 | 146.74 | 0.006639 | 2.67 | 9.94 | 10.64 | 0.88 |
| 001 | 212.50* | 20 | 49.78 | 144.89 | 146.85 | 146.76 | 147.39 | 0.006696 | 3.24 | 15.38 | 12.42 | 0.92 |
| 001 | 212.50* | 50 | 60.91 | 144.89 | 147.04 | 146.97 | 147.64 | 0.006547 | 3.42 | 17.95 | 14.48 | 0.93 |
| 001 | 212.50* | 100 | 70.80 | 144.89 | 147.20 | 147.15 | 147.84 | 0.006338 | 3.55 | 20.36 | 16.76 | 0.92 |
| 001 | 212.50* | 100 +5% | 74.34 | 144.89 | 147.27 | 147.22 | 147.90 | 0.006042 | 3.55 | 21.57 | 17.84 | 0.91 |
| 001 | 212.50* | 100 +25% | 88.50 | 144.89 | 147.58 | 147.65 | 148.13 | 0.004357 | 3.36 | 30.74 | 42.76 | 0.79 |
| 001 | 212.50* | 100 +70% | 120.36 | 144.89 | 147.74 | 147.91 | 148.45 | 0.005314 | 3.93 | 38.31 | 48.75 | 0.89 |
| 001 | 212.50* | 1000 | 116.46 | 144.89 | 147.82 | 147.89 | 148.38 | 0.004113 | 3.55 | 42.12 | 51.41 | 0.79 |
| 001 | 204.00* | 2 | 26.58 | 144.80 | 146.29 | 146.23 | 146.67 | 0.007256 | 2.75 | 9.67 | 10.66 | 0.92 |
| 001 | 204.00* | 20 | 49.78 | 144.80 | 146.77 | 146.71 | 147.32 | 0.006969 | 3.29 | 15.14 | 12.30 | 0.94 |
| 001 | 204.00* | 50 | 60.91 | 144.80 | 146.96 | 146.91 | 147.58 | 0.006692 | 3.49 | 17.62 | 14.32 | 0.94 |
| 001 | 204.00* | 100 | 70.80 | 144.80 | 147.11 | 147.10 | 147.78 | 0.006612 | 3.63 | 20.03 | 16.98 | 0.94 |
| 001 | 204.00* | 100 +5% | 74.34 | 144.80 | 147.19 | 147.18 | 147.85 | 0.006234 | 3.61 | 21.35 | 18.06 | 0.92 |
| 001 | 204.00* | 100 +25% | 88.50 | 144.80 | 147.45 | 147.58 | 148.08 | 0.005256 | 3.58 | 28.08 | 37.78 | 0.86 |
| 001 | 204.00* | 100 +70% | 120.36 | 144.80 | 147.67 | 147.85 | 148.40 | 0.005647 | 4.00 | 37.28 | 45.49 | 0.91 |
| 001 | 204.00* | 1000 | 116.46 | 144.80 | 147.72 | 147.83 | 148.33 | 0.004667 | 3.69 | 39.60 | 46.96 | 0.83 |
| 001 | 195.50* | 2 | 26.58 | 144.72 | 146.21 | 146.16 | 146.60 | 0.007504 | 2.77 | 9.59 | 10.72 | 0.94 |
| 001 | 195.50* | 20 | 49.78 | 144.72 | 146.74 | 146.64 | 147.26 | 0.006360 | 3.18 | 15.67 | 12.93 | 0.90 |
| 001 | 195.50* | 50 | 60.91 | 144.72 | 146.95 | 146.83 | 147.51 | 0.005765 | 3.32 | 18.73 | 16.02 | 0.87 |
| 001 | 195.50* | 100 | 70.80 | 144.72 | 147.12 | 147.02 | 147.71 | 0.005455 | 3.42 | 21.64 | 18.61 | 0.86 |
| 001 | 195.50* | 100 +5% | 74.34 | 144.72 | 147.18 | 147.09 | 147.77 | 0.005402 | 3.46 | 22.68 | 19.61 | 0.86 |
| 001 | 195.50* | 100 +25% | 88.50 | 144.72 | 147.54 | 147.51 | 147.99 | 0.003631 | 3.12 | 34.29 | 41.61 | 0.72 |
| 001 | 195.50* | 100 +70% | 120.36 | 144.72 | 147.58 | 147.78 | 148.35 | 0.006120 | 4.09 | 35.98 | 42.60 | 0.93 |
| 001 | 195.50* | 1000 | 116.46 | 144.72 | 147.60 | 147.75 | 148.28 | 0.005393 | 3.87 | 37.04 | 43.22 | 0.88 |
| 001 | 0187 | 2 | 26.58 | 144.63 | 146.18 | 146.09 | 146.53 | 0.006418 | 2.62 | 10.14 | 10.88 | 0.87 |
| 001 | 0187 | 20 | 49.78 | 144.63 | 146.73 | 146.56 | 147.19 | 0.005400 | 3.00 | 16.69 | 14.49 | 0.83 |
| 001 | 0187 | 50 | 60.91 | 144.63 | 146.96 | 146.76 | 147.44 | 0.004703 | 3.09 | 20.52 | 17.96 | 0.79 |
| 001 | 0187 | 100 | 70.80 | 144.63 | 147.15 | 146.95 | 147.64 | 0.004298 | 3.15 | 24.04 | 20.34 | 0.76 |
| 001 | 0187 | 100 +5% | 74.34 | 144.63 | 147.21 | 147.01 | 147.70 | 0.004206 | 3.17 | 25.31 | 24.39 | 0.76 |

HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0187 | 100 +25% | 88.50 | 144.63 | 147.58 | 147.15 | 147.93 | 0.002740 | 2.81 | 39.00 | 42.35 | 0.62 |
| 001 | 0187 | 100 +70% | 120.36 | 144.63 | 147.86 | 147.71 | 148.24 | 0.002676 | 3.00 | 51.90 | 48.52 | 0.63 |
| 001 | 0187 | 1000 | 116.46 | 144.63 | 147.82 | 147.68 | 148.20 | 0.002740 | 3.00 | 49.96 | 47.64 | 0.63 |
| 001 | 177.00* | 2 | 26.58 | 144.51 | 146.08 | 146.01 | 146.46 | 0.006998 | 2.73 | 9.73 | 10.45 | 0.90 |
| 001 | 177.00* | 20 | 49.78 | 144.51 | 146.66 | 146.49 | 147.13 | 0.005404 | 3.05 | 16.49 | 14.09 | 0.83 |
| 001 | 177.00* | 50 | 60.91 | 144.51 | 146.87 | 146.70 | 147.38 | 0.005078 | 3.21 | 19.66 | 16.64 | 0.82 |
| 001 | 177.00* | 100 | 70.80 | 144.51 | 147.04 | 146.89 | 147.58 | 0.004823 | 3.30 | 22.77 | 18.96 | 0.81 |
| 001 | 177.00* | 100 +5% | 74.34 | 144.51 | 147.10 | 146.98 | 147.65 | 0.004715 | 3.31 | 23.99 | 19.89 | 0.80 |
| 001 | 177.00* | 100 +25% | 88.50 | 144.51 | 147.56 | 147.08 | 147.90 | 0.002579 | 2.78 | 39.30 | 41.02 | 0.61 |
| 001 | 177.00* | 100 +70% | 120.36 | 144.51 | 147.80 | 147.65 | 148.21 | 0.002756 | 3.10 | 50.04 | 46.24 | 0.64 |
| 001 | 177.00* | 1000 | 116.46 | 144.51 | 147.76 | 147.62 | 148.17 | 0.002821 | 3.09 | 48.15 | 45.39 | 0.65 |
| 001 | 167.00* | 2 | 26.58 | 144.39 | 146.01 | 145.92 | 146.39 | 0.006763 | 2.73 | 9.72 | 10.09 | 0.89 |
| 001 | 167.00* | 20 | 49.78 | 144.39 | 146.55 | 146.42 | 147.07 | 0.005870 | 3.17 | 15.82 | 13.24 | 0.86 |
| 001 | 167.00* | 50 | 60.91 | 144.39 | 146.75 | 146.64 | 147.32 | 0.005785 | 3.37 | 18.61 | 15.55 | 0.87 |
| 001 | 167.00* | 100 | 70.80 | 144.39 | 146.93 | 146.84 | 147.52 | 0.005498 | 3.45 | 21.54 | 17.66 | 0.86 |
| 001 | 167.00* | 100 +5% | 74.34 | 144.39 | 146.99 | 146.92 | 147.59 | 0.005371 | 3.47 | 22.68 | 18.58 | 0.85 |
| 001 | 167.00* | 100 +25% | 88.50 | 144.39 | 147.17 | 147.04 | 147.84 | 0.005372 | 3.68 | 26.88 | 30.22 | 0.87 |
| 001 | 167.00* | 100 +70% | 120.36 | 144.39 | 147.74 | 147.60 | 148.17 | 0.002834 | 3.20 | 48.31 | 44.14 | 0.66 |
| 001 | 167.00* | 1000 | 116.46 | 144.39 | 147.70 | 147.57 | 148.14 | 0.002894 | 3.19 | 46.51 | 43.26 | 0.66 |
| 001 | 157.00* | 2 | 26.58 | 144.27 | 145.90 | 145.84 | 146.31 | 0.007162 | 2.82 | 9.42 | 9.70 | 0.91 |
| 001 | 157.00* | 20 | 49.78 | 144.27 | 146.43 | 146.35 | 147.00 | 0.006649 | 3.32 | 15.06 | 12.61 | 0.92 |
| 001 | 157.00* | 50 | 60.91 | 144.27 | 146.63 | 146.59 | 147.25 | 0.006631 | 3.52 | 17.68 | 14.73 | 0.93 |
| 001 | 157.00* | 100 | 70.80 | 144.27 | 146.81 | 146.78 | 147.45 | 0.006146 | 3.60 | 20.49 | 16.52 | 0.91 |
| 001 | 157.00* | 100 +5% | 74.34 | 144.27 | 146.87 | 146.85 | 147.52 | 0.005901 | 3.61 | 21.57 | 17.19 | 0.89 |
| 001 | 157.00* | 100 +25% | 88.50 | 144.27 | 147.05 | 146.95 | 147.77 | 0.005805 | 3.84 | 24.91 | 22.33 | 0.90 |
| 001 | 157.00* | 100 +70% | 120.36 | 144.27 | 147.62 | 147.55 | 148.13 | 0.003193 | 3.41 | 44.84 | 41.35 | 0.70 |
| 001 | 157.00* | 1000 | 116.46 | 144.27 | 147.58 | 147.52 | 148.09 | 0.003261 | 3.41 | 43.12 | 40.47 | 0.71 |
| 001 | 147.00* | 2 | 26.58 | 144.15 | 145.79 | 145.75 | 146.22 | 0.007728 | 2.93 | 9.08 | 9.32 | 0.95 |
| 001 | 147.00* | 20 | 49.78 | 144.15 | 146.31 | 146.29 | 146.92 | 0.007556 | 3.46 | 14.45 | 12.34 | 0.97 |
| 001 | 147.00* | 50 | 60.91 | 144.15 | 146.50 | 146.50 | 147.18 | 0.007309 | 3.65 | 16.98 | 13.94 | 0.97 |
| 001 | 147.00* | 100 | 70.80 | 144.15 | 146.68 | 146.68 | 147.38 | 0.006558 | 3.73 | 19.64 | 15.73 | 0.94 |
| 001 | 147.00* | 100 +5% | 74.34 | 144.15 | 146.75 | 146.75 | 147.45 | 0.006272 | 3.75 | 20.69 | 16.41 | 0.93 |
| 001 | 147.00* | 100 +25% | 88.50 | 144.15 | 146.93 | 146.86 | 147.71 | 0.006118 | 3.96 | 23.89 | 19.05 | 0.93 |
| 001 | 147.00* | 100 +70% | 120.36 | 144.15 | 147.50 | 147.50 | 148.09 | 0.003605 | 3.64 | 41.69 | 39.97 | 0.75 |
| 001 | 147.00* | 1000 | 116.46 | 144.15 | 147.46 | 147.46 | 148.05 | 0.003673 | 3.63 | 40.05 | 38.41 | 0.75 |
| 001 | 137.00* | 2 | 26.58 | 144.03 | 145.67 | 145.65 | 146.14 | 0.008253 | 3.03 | 8.78 | 8.97 | 0.98 |
| 001 | 137.00* | 20 | 49.78 | 144.03 | 146.20 | 146.20 | 146.83 | 0.008015 | 3.53 | 14.13 | 12.02 | 1.00 |
| 001 | 137.00* | 50 | 60.91 | 144.03 | 146.39 | 146.42 | 147.10 | 0.007440 | 3.73 | 16.62 | 13.60 | 0.99 |
| 001 | 137.00* | 100 | 70.80 | 144.03 | 146.58 | 146.60 | 147.31 | 0.006603 | 3.80 | 19.33 | 15.75 | 0.95 |
| 001 | 137.00* | 100 +5% | 74.34 | 144.03 | 146.61 | 146.67 | 147.38 | 0.006805 | 3.91 | 19.82 | 16.08 | 0.96 |
| 001 | 137.00* | 100 +25% | 88.50 | 144.03 | 146.82 | 146.82 | 147.63 | 0.006293 | 4.06 | 23.32 | 17.86 | 0.95 |
| 001 | 137.00* | 100 +70% | 120.36 | 144.03 | 147.37 | 147.47 | 148.04 | 0.004024 | 3.86 | 39.32 | 39.67 | 0.79 |
| 001 | 137.00* | 1000 | 116.46 | 144.03 | 147.34 | 147.42 | 148.00 | 0.004035 | 3.82 | 37.99 | 38.57 | 0.79 |
| 001 | 127.00* | 2 | 26.58 | 143.90 | 145.56 | 145.56 | 146.04 | 0.008796 | 3.09 | 8.61 | 8.95 | 1.00 |
| 001 | 127.00* | 20 | 49.78 | 143.90 | 146.04 | 146.09 | 146.74 | 0.009066 | 3.71 | 13.43 | 10.94 | 1.06 |
| 001 | 127.00* | 50 | 60.91 | 143.90 | 146.21 | 146.32 | 147.01 | 0.008833 | 3.99 | 15.48 | 12.89 | 1.07 |
| 001 | 127.00* | 100 | 70.80 | 143.90 | 146.37 | 146.50 | 147.23 | 0.008188 | 4.12 | 17.73 | 14.69 | 1.05 |
| 001 | 127.00* | 100 +5% | 74.34 | 143.90 | 146.44 | 146.57 | 147.29 | 0.007748 | 4.13 | 18.76 | 15.15 | 1.02 |
| 001 | 127.00* | 100 +25% | 88.50 | 143.90 | 146.63 | 146.73 | 147.55 | 0.007389 | 4.33 | 21.75 | 16.44 | 1.02 |
| 001 | 127.00* | 100 +70% | 120.36 | 143.90 | 147.18 | 147.39 | 147.98 | 0.004832 | 4.17 | 36.25 | 39.77 | 0.86 |
| 001 | 127.00* | 1000 | 116.46 | 143.90 | 147.15 | 147.36 | 147.94 | 0.004804 | 4.13 | 35.13 | 39.08 | 0.86 |
| 001 | 117.00* | 2 | 26.58 | 143.78 | 145.38 | 145.46 | 145.94 | 0.011403 | 3.32 | 8.00 | 9.05 | 1.13 |
| 001 | 117.00* | 20 | 49.78 | 143.78 | 145.86 | 145.97 | 146.64 | 0.010043 | 3.89 | 12.84 | 10.87 | 1.11 |
| 001 | 117.00* | 50 | 60.91 | 143.78 | 146.05 | 146.21 | 146.92 | 0.009652 | 4.14 | 14.97 | 13.29 | 1.11 |
| 001 | 117.00* | 100 | 70.80 | 143.78 | 146.20 | 146.38 | 147.13 | 0.008986 | 4.29 | 17.13 | 14.12 | 1.09 |
| 001 | 117.00* | 100 +5% | 74.34 | 143.78 | 146.26 | 146.45 | 147.20 | 0.008707 | 4.32 | 17.95 | 14.42 | 1.08 |
| 001 | 117.00* | 100 +25% | 88.50 | 143.78 | 146.44 | 146.58 | 147.47 | 0.008448 | 4.56 | 20.62 | 15.45 | 1.08 |
| 001 | 117.00* | 100 +70% | 120.36 | 143.78 | 146.92 | 147.24 | 147.90 | 0.006309 | 4.61 | 32.22 | 36.37 | 0.97 |
| 001 | 117.00* | 1000 | 116.46 | 143.78 | 146.88 | 147.20 | 147.86 | 0.006332 | 4.57 | 31.07 | 35.40 | 0.97 |
| 001 | 107.00* | 2 | 26.58 | 143.66 | 145.22 | 145.31 | 145.81 | 0.012660 | 3.39 | 7.83 | 9.20 | 1.17 |
| 001 | 107.00* | 20 | 49.78 | 143.66 | 145.68 | 145.86 | 146.53 | 0.011324 | 4.09 | 12.29 | 10.82 | 1.16 |
| 001 | 107.00* | 50 | 60.91 | 143.66 | 145.86 | 146.08 | 146.80 | 0.010861 | 4.33 | 14.46 | 12.42 | 1.16 |
| 001 | 107.00* | 100 | 70.80 | 143.66 | 146.01 | 146.22 | 147.01 | 0.010129 | 4.48 | 16.50 | 13.58 | 1.14 |
| 001 | 107.00* | 100 +5% | 74.34 | 143.66 | 146.05 | 146.27 | 147.10 | 0.010323 | 4.58 | 16.97 | 13.73 | 1.15 |
| 001 | 107.00* | 100 +25% | 88.50 | 143.66 | 146.23 | 146.66 | 147.37 | 0.009818 | 4.81 | 19.58 | 15.14 | 1.15 |
| 001 | 107.00* | 100 +70% | 120.36 | 143.66 | 146.60 | 147.03 | 147.80 | 0.008677 | 5.11 | 28.58 | 30.46 | 1.11 |
| 001 | 107.00* | 1000 | 116.46 | 143.66 | 146.57 | 147.01 | 147.76 | 0.008696 | 5.07 | 27.67 | 30.16 | 1.11 |
| 001 | 97.00* | 2 | 26.58 | 143.54 | 145.04 | 145.16 | 145.67 | 0.014252 | 3.52 | 7.56 | 8.98 | 1.22 |
| 001 | 97.00* | 20 | 49.78 | 143.54 | 145.49 | 145.70 | 146.40 | 0.012527 | 4.24 | 12.00 | 11.78 | 1.20 |
| 001 | 97.00* | 50 | 60.91 | 143.54 | 145.66 | 145.96 | 146.68 | 0.012356 | 4.52 | 13.99 | 12.23 | 1.21 |
| 001 | 97.00* | 100 | 70.80 | 143.54 | 145.80 | 146.23 | 146.89 | 0.011785 | 4.68 | 15.85 | 13.08 | 1.20 |
| 001 | 97.00* | 100 +5% | 74.34 | 143.54 | 145.83 | 146.34 | 146.98 | 0.012124 | 4.81 | 16.24 | 13.20 | 1.22 |
| 001 | 97.00* | 100 +25% | 88.50 | 143.54 | 146.01 | 146.49 | 147.25 | 0.011717 | 5.06 | 18.96 | 22.68 | 1.22 |
| 001 | 97.00* | 100 +70% | 120.36 | 143.54 | 146.30 | 146.76 | 147.68 | 0.011357 | 5.52 | 26.90 | 31.29 | 1.23 |
| 001 | 97.00* | 1000 | 116.46 | 143.54 | 146.27 | 146.71 | 147.64 | 0.011279 | 5.46 | 26.17 | 31.06 | 1.22 |

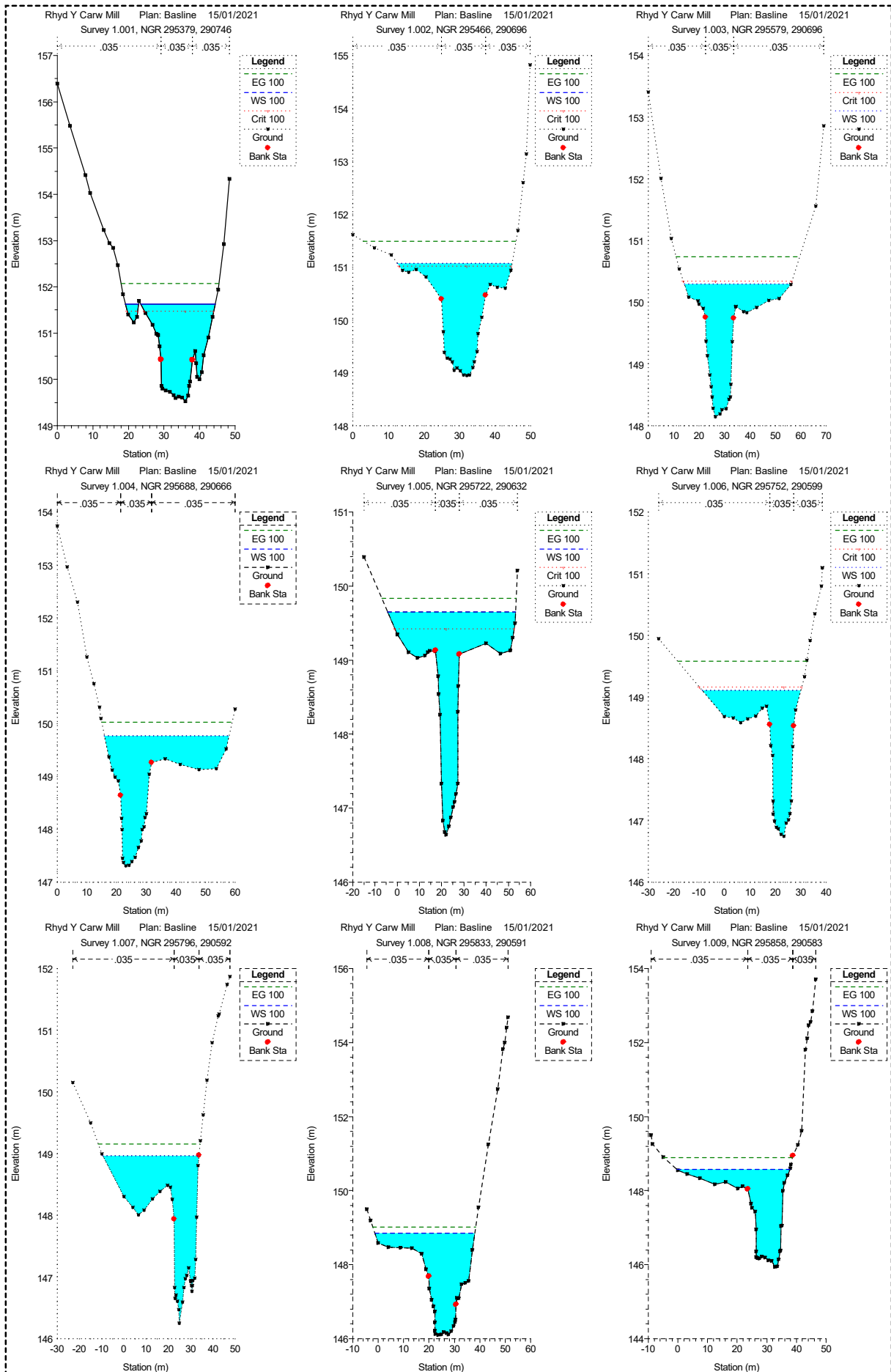
HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

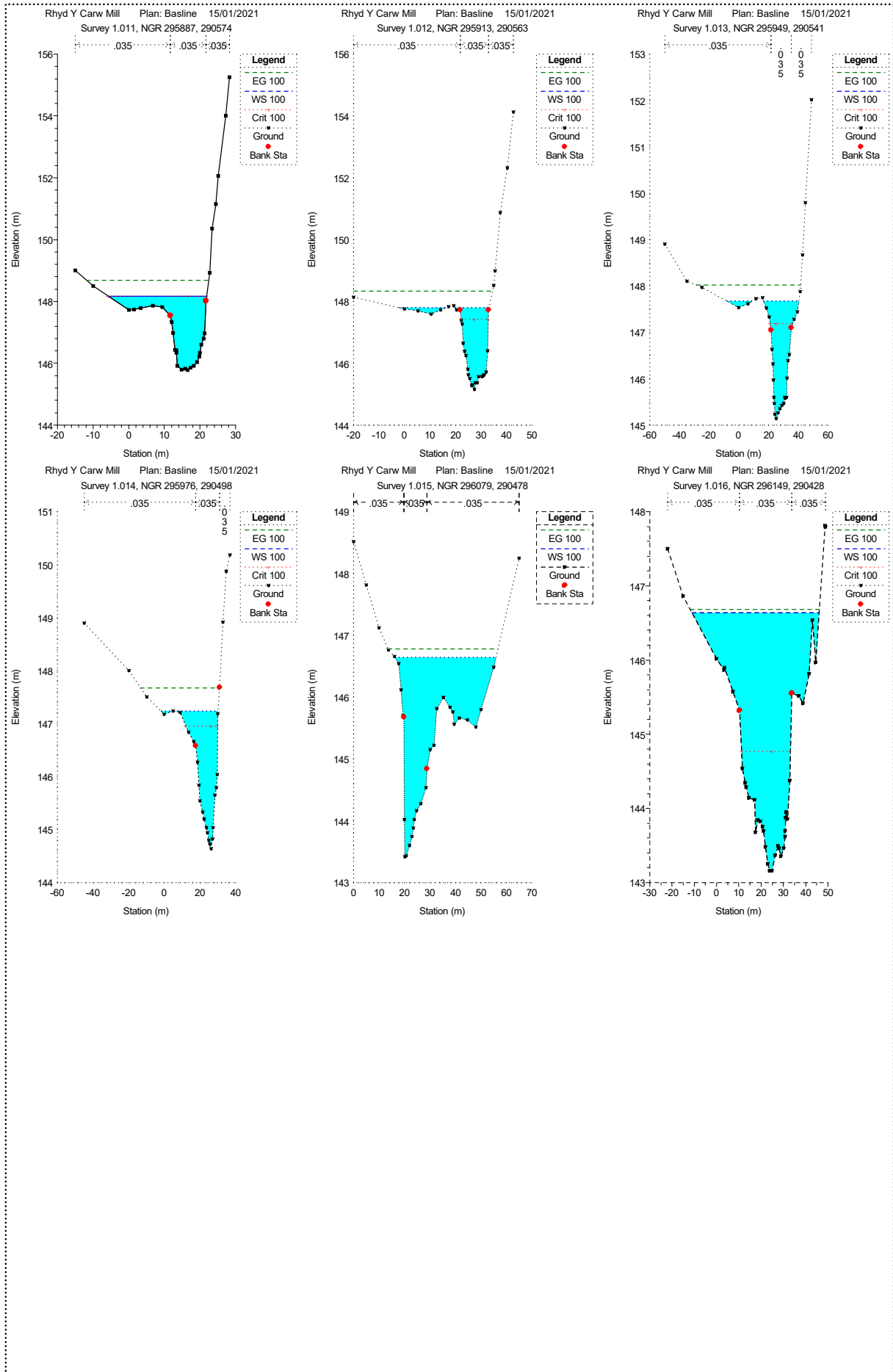
| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0087 | 2 | 26.58 | 143.42 | 145.24 | 144.99 | 145.54 | 0.004646 | 2.44 | 11.19 | 11.77 | 0.71 |
| 001 | 0087 | 20 | 49.78 | 143.42 | 145.27 | 145.54 | 146.26 | 0.014819 | 4.43 | 11.59 | 11.83 | 1.27 |
| 001 | 0087 | 50 | 60.91 | 143.42 | 145.44 | 145.80 | 146.53 | 0.014270 | 4.68 | 13.62 | 12.15 | 1.26 |
| 001 | 0087 | 100 | 70.80 | 143.42 | 145.57 | 146.09 | 146.75 | 0.014167 | 4.91 | 15.25 | 14.48 | 1.26 |
| 001 | 0087 | 100 +5% | 74.34 | 143.42 | 145.59 | 146.12 | 146.84 | 0.014738 | 5.05 | 15.64 | 16.07 | 1.29 |
| 001 | 0087 | 100 +25% | 88.50 | 143.42 | 145.73 | 146.25 | 147.10 | 0.015127 | 5.38 | 18.42 | 23.63 | 1.32 |
| 001 | 0087 | 100 +70% | 120.36 | 143.42 | 147.02 | 146.47 | 147.23 | 0.001460 | 2.43 | 65.13 | 47.02 | 0.45 |
| 001 | 0087 | 1000 | 116.46 | 143.42 | 146.97 | 146.45 | 147.18 | 0.001493 | 2.43 | 62.96 | 46.28 | 0.45 |
| 001 | 77.333* | 2 | 26.58 | 143.39 | 145.26 | | 145.48 | 0.002916 | 2.08 | 13.06 | 13.00 | 0.60 |
| 001 | 77.333* | 20 | 49.78 | 143.39 | 145.86 | 145.40 | 146.13 | 0.002416 | 2.41 | 24.00 | 28.58 | 0.57 |
| 001 | 77.333* | 50 | 60.91 | 143.39 | 146.10 | 145.69 | 146.35 | 0.002031 | 2.40 | 31.62 | 33.55 | 0.53 |
| 001 | 77.333* | 100 | 70.80 | 143.39 | 146.29 | 145.87 | 146.53 | 0.001744 | 2.36 | 38.28 | 35.79 | 0.50 |
| 001 | 77.333* | 100 +5% | 74.34 | 143.39 | 146.35 | 146.01 | 146.58 | 0.001672 | 2.35 | 40.54 | 36.51 | 0.49 |
| 001 | 77.333* | 100 +25% | 88.50 | 143.39 | 146.59 | 146.13 | 146.80 | 0.001441 | 2.33 | 49.44 | 40.47 | 0.47 |
| 001 | 77.333* | 100 +70% | 120.36 | 143.39 | 147.01 | | 147.21 | 0.001188 | 2.34 | 68.29 | 48.42 | 0.43 |
| 001 | 77.333* | 1000 | 116.46 | 143.39 | 146.96 | | 147.17 | 0.001210 | 2.34 | 66.06 | 47.66 | 0.44 |
| 001 | 67.667* | 2 | 26.58 | 143.36 | 145.28 | | 145.44 | 0.002026 | 1.78 | 15.08 | 14.01 | 0.51 |
| 001 | 67.667* | 20 | 49.78 | 143.36 | 145.89 | | 146.10 | 0.001709 | 2.09 | 27.32 | 31.26 | 0.49 |
| 001 | 67.667* | 50 | 60.91 | 143.36 | 146.12 | | 146.32 | 0.001477 | 2.11 | 34.96 | 33.85 | 0.47 |
| 001 | 67.667* | 100 | 70.80 | 143.36 | 146.30 | | 146.50 | 0.001340 | 2.13 | 41.42 | 36.69 | 0.45 |
| 001 | 67.667* | 100 +5% | 74.34 | 143.36 | 146.36 | | 146.56 | 0.001298 | 2.13 | 43.68 | 37.57 | 0.45 |
| 001 | 67.667* | 100 +25% | 88.50 | 143.36 | 146.59 | | 146.78 | 0.001155 | 2.14 | 52.89 | 43.09 | 0.43 |
| 001 | 67.667* | 100 +70% | 120.36 | 143.36 | 147.01 | | 147.20 | 0.000983 | 2.19 | 72.35 | 49.91 | 0.41 |
| 001 | 67.667* | 1000 | 116.46 | 143.36 | 146.97 | | 147.15 | 0.000998 | 2.18 | 70.05 | 49.26 | 0.41 |
| 001 | 58.000* | 2 | 26.58 | 143.33 | 145.29 | | 145.41 | 0.001472 | 1.55 | 17.27 | 14.76 | 0.44 |
| 001 | 58.000* | 20 | 49.78 | 143.33 | 145.91 | | 146.07 | 0.001253 | 1.83 | 30.82 | 31.87 | 0.43 |
| 001 | 58.000* | 50 | 60.91 | 143.33 | 146.14 | | 146.30 | 0.001119 | 1.87 | 38.40 | 33.84 | 0.41 |
| 001 | 58.000* | 100 | 70.80 | 143.33 | 146.31 | | 146.48 | 0.001058 | 1.92 | 44.85 | 38.35 | 0.41 |
| 001 | 58.000* | 100 +5% | 74.34 | 143.33 | 146.37 | | 146.54 | 0.001032 | 1.93 | 47.19 | 39.45 | 0.40 |
| 001 | 58.000* | 100 +25% | 88.50 | 143.33 | 146.60 | | 146.76 | 0.000935 | 1.96 | 56.87 | 44.80 | 0.39 |
| 001 | 58.000* | 100 +70% | 120.36 | 143.33 | 147.02 | | 147.18 | 0.000822 | 2.03 | 76.91 | 51.49 | 0.38 |
| 001 | 58.000* | 1000 | 116.46 | 143.33 | 146.97 | | 147.13 | 0.000832 | 2.02 | 74.55 | 50.82 | 0.38 |
| 001 | 48.333* | 2 | 26.58 | 143.30 | 145.30 | | 145.39 | 0.001097 | 1.36 | 19.64 | 15.98 | 0.38 |
| 001 | 48.333* | 20 | 49.78 | 143.30 | 145.92 | | 146.05 | 0.000947 | 1.62 | 34.35 | 32.38 | 0.38 |
| 001 | 48.333* | 50 | 60.91 | 143.30 | 146.15 | | 146.28 | 0.000874 | 1.68 | 41.95 | 34.46 | 0.37 |
| 001 | 48.333* | 100 | 70.80 | 143.30 | 146.32 | | 146.46 | 0.000845 | 1.74 | 48.62 | 40.54 | 0.37 |
| 001 | 48.333* | 100 +5% | 74.34 | 143.30 | 146.38 | | 146.52 | 0.000830 | 1.75 | 51.09 | 42.18 | 0.36 |
| 001 | 48.333* | 100 +25% | 88.50 | 143.30 | 146.61 | | 146.75 | 0.000764 | 1.79 | 61.22 | 46.60 | 0.36 |
| 001 | 48.333* | 100 +70% | 120.36 | 143.30 | 147.02 | | 147.17 | 0.000691 | 1.88 | 81.91 | 53.23 | 0.35 |
| 001 | 48.333* | 1000 | 116.46 | 143.30 | 146.98 | | 147.12 | 0.000697 | 1.87 | 79.48 | 52.54 | 0.35 |
| 001 | 38.667* | 2 | 26.58 | 143.27 | 145.30 | | 145.37 | 0.000831 | 1.20 | 22.20 | 17.24 | 0.33 |
| 001 | 38.667* | 20 | 49.78 | 143.27 | 145.93 | | 146.03 | 0.000732 | 1.44 | 37.98 | 33.01 | 0.33 |
| 001 | 38.667* | 50 | 60.91 | 143.27 | 146.16 | | 146.26 | 0.000694 | 1.51 | 45.76 | 36.01 | 0.33 |
| 001 | 38.667* | 100 | 70.80 | 143.27 | 146.33 | | 146.45 | 0.000682 | 1.58 | 52.80 | 43.22 | 0.33 |
| 001 | 38.667* | 100 +5% | 74.34 | 143.27 | 146.39 | | 146.51 | 0.000671 | 1.60 | 55.41 | 44.41 | 0.33 |
| 001 | 38.667* | 100 +25% | 88.50 | 143.27 | 146.62 | | 146.74 | 0.000628 | 1.64 | 65.94 | 48.50 | 0.32 |
| 001 | 38.667* | 100 +70% | 120.36 | 143.27 | 147.03 | | 147.16 | 0.000582 | 1.74 | 87.34 | 55.16 | 0.32 |
| 001 | 38.667* | 1000 | 116.46 | 143.27 | 146.98 | | 147.11 | 0.000586 | 1.73 | 84.82 | 54.43 | 0.32 |
| 001 | 29.000* | 2 | 26.58 | 143.25 | 145.30 | | 145.36 | 0.000637 | 1.06 | 24.96 | 18.44 | 0.29 |
| 001 | 29.000* | 20 | 49.78 | 143.25 | 145.94 | | 146.02 | 0.000576 | 1.30 | 41.77 | 33.91 | 0.30 |
| 001 | 29.000* | 50 | 60.91 | 143.25 | 146.16 | | 146.25 | 0.000558 | 1.37 | 49.90 | 38.90 | 0.30 |
| 001 | 29.000* | 100 | 70.80 | 143.25 | 146.34 | | 146.44 | 0.000552 | 1.44 | 57.37 | 45.20 | 0.30 |
| 001 | 29.000* | 100 +5% | 74.34 | 143.25 | 146.40 | | 146.50 | 0.000546 | 1.45 | 60.09 | 46.31 | 0.30 |
| 001 | 29.000* | 100 +25% | 88.50 | 143.25 | 146.63 | | 146.73 | 0.000519 | 1.51 | 71.02 | 50.45 | 0.29 |
| 001 | 29.000* | 100 +70% | 120.36 | 143.25 | 147.04 | | 147.15 | 0.000493 | 1.61 | 93.20 | 57.28 | 0.29 |
| 001 | 29.000* | 1000 | 116.46 | 143.25 | 146.99 | | 147.10 | 0.000495 | 1.60 | 90.59 | 56.52 | 0.29 |
| 001 | 19.333* | 2 | 26.58 | 143.22 | 145.31 | | 145.35 | 0.000491 | 0.95 | 27.92 | 20.06 | 0.26 |
| 001 | 19.333* | 20 | 49.78 | 143.22 | 145.94 | | 146.01 | 0.000460 | 1.18 | 45.82 | 35.57 | 0.26 |
| 001 | 19.333* | 50 | 60.91 | 143.22 | 146.17 | | 146.24 | 0.000451 | 1.25 | 54.47 | 41.71 | 0.27 |
| 001 | 19.333* | 100 | 70.80 | 143.22 | 146.35 | | 146.43 | 0.000443 | 1.30 | 62.35 | 46.72 | 0.27 |
| 001 | 19.333* | 100 +5% | 74.34 | 143.22 | 146.41 | | 146.49 | 0.000447 | 1.33 | 65.13 | 48.30 | 0.27 |
| 001 | 19.333* | 100 +25% | 88.50 | 143.22 | 146.63 | | 146.72 | 0.000430 | 1.38 | 76.51 | 52.43 | 0.27 |
| 001 | 19.333* | 100 +70% | 120.36 | 143.22 | 147.04 | | 147.14 | 0.000417 | 1.50 | 99.56 | 59.66 | 0.27 |
| 001 | 19.333* | 1000 | 116.46 | 143.22 | 147.00 | | 147.09 | 0.000418 | 1.49 | 96.85 | 58.86 | 0.27 |
| 001 | 9.667* | 2 | 26.58 | 143.19 | 145.31 | | 145.35 | 0.000382 | 0.86 | 31.06 | 21.70 | 0.23 |
| 001 | 9.667* | 20 | 49.78 | 143.19 | 145.95 | | 146.00 | 0.000370 | 1.07 | 50.16 | 37.20 | 0.24 |
| 001 | 9.667* | 50 | 60.91 | 143.19 | 146.17 | | 146.24 | 0.000367 | 1.14 | 59.42 | 43.92 | 0.24 |
| 001 | 9.667* | 100 | 70.80 | 143.19 | 146.35 | | 146.42 | 0.000364 | 1.19 | 67.67 | 48.53 | 0.24 |
| 001 | 9.667* | 100 +5% | 74.34 | 143.19 | 146.41 | | 146.48 | 0.000363 | 1.21 | 70.59 | 50.06 | 0.24 |
| 001 | 9.667* | 100 +25% | 88.50 | 143.19 | 146.64 | | 146.71 | 0.000359 | 1.28 | 82.39 | 54.64 | 0.25 |
| 001 | 9.667* | 100 +70% | 120.36 | 143.19 | 147.05 | | 147.13 | 0.000354 | 1.39 | 106.44 | 61.93 | 0.25 |
| 001 | 9.667* | 1000 | 116.46 | 143.19 | 147.00 | | 147.08 | 0.000354 | 1.38 | 103.61 | 61.33 | 0.25 |
| 001 | 0000 | 2 | 26.58 | 143.16 | 145.31 | 144.23 | 145.34 | 0.000300 | 0.77 | 34.38 | 23.32 | 0.20 |
| 001 | 0000 | 20 | 49.78 | 143.16 | 145.95 | 144.55 | 146.00 | 0.000300 | 0.97 | 54.86 | 40.30 | 0.21 |
| 001 | 0000 | 50 | 60.91 | 143.16 | 146.18 | 144.67 | 146.23 | 0.000300 | 1.04 | 64.73 | 46.17 | 0.22 |
| 001 | 0000 | 100 | 70.80 | 143.16 | 146.36 | 144.77 | 146.41 | 0.000300 | 1.10 | 73.37 | 50.58 | 0.22 |




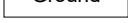
HEC-RAS Plan: Mannings n -20% River: River Trannon Reach: 001 (Continued)

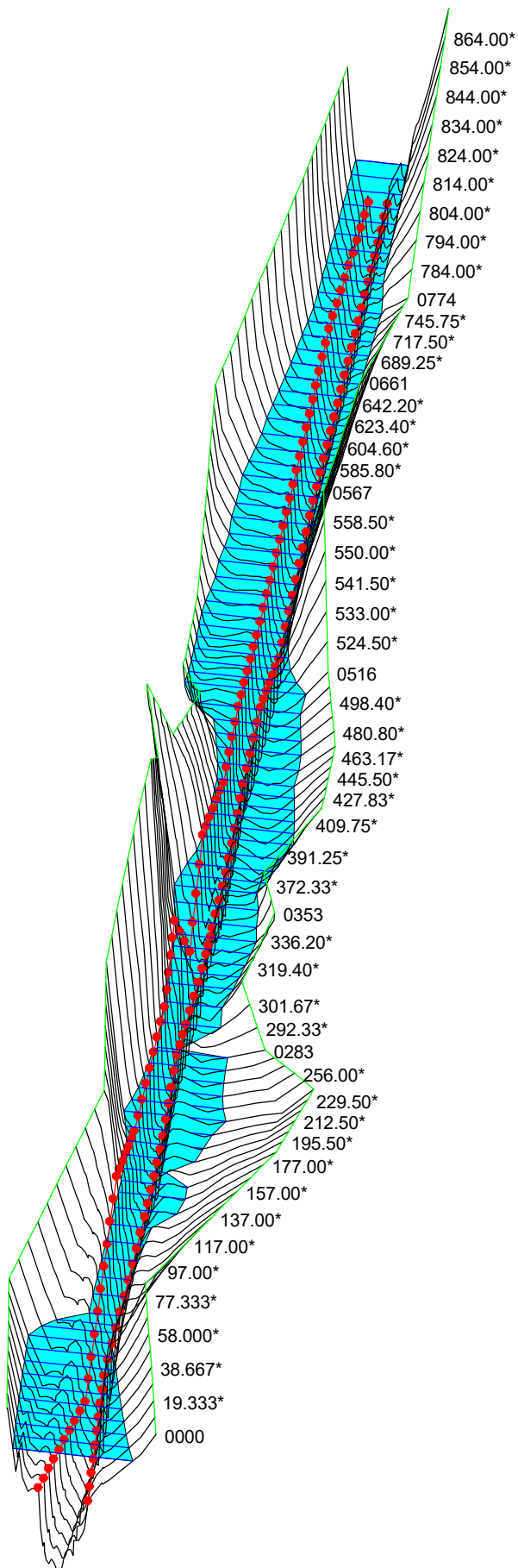
| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------|-----------|----------|-------------------|------------------|------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| 001 | 0000 | 100 +5% | 74.34 | 143.16 | 146.41 | 144.81 | 146.47 | 0.000301 | 1.11 | 76.42 | 52.04 | 0.22 |
| 001 | 0000 | 100 +25% | 88.50 | 143.16 | 146.64 | 144.94 | 146.70 | 0.000300 | 1.18 | 88.72 | 57.11 | 0.23 |
| 001 | 0000 | 100 +70% | 120.36 | 143.16 | 147.05 | 145.22 | 147.12 | 0.000300 | 1.29 | 113.81 | 64.04 | 0.23 |
| 001 | 0000 | 1000 | 116.46 | 143.16 | 147.01 | 145.18 | 147.08 | 0.000300 | 1.28 | 110.88 | 63.44 | 0.23 |

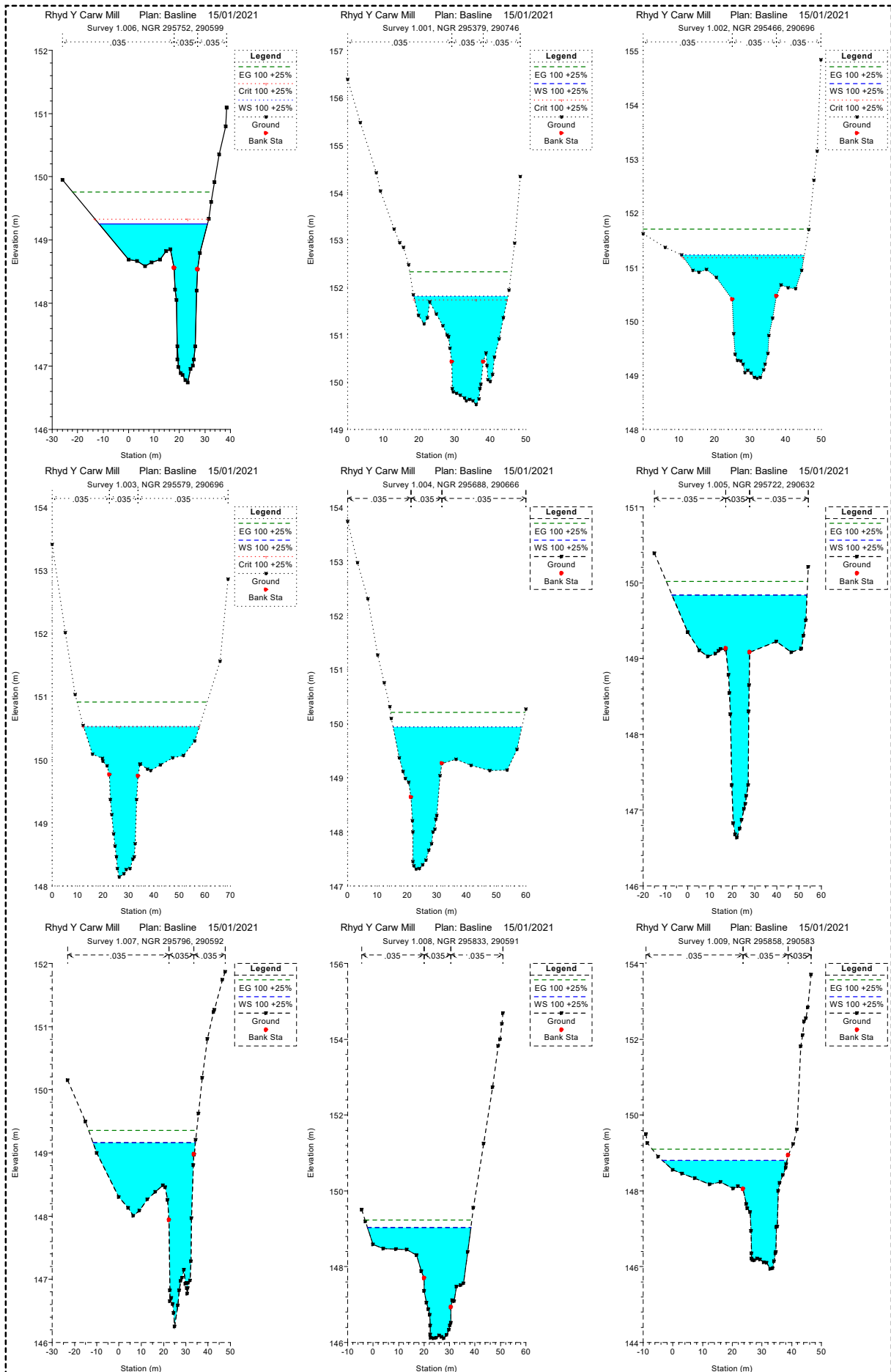
APPENDIX 11 – HEC-RAS Model Result Cross Sections & Long Sections

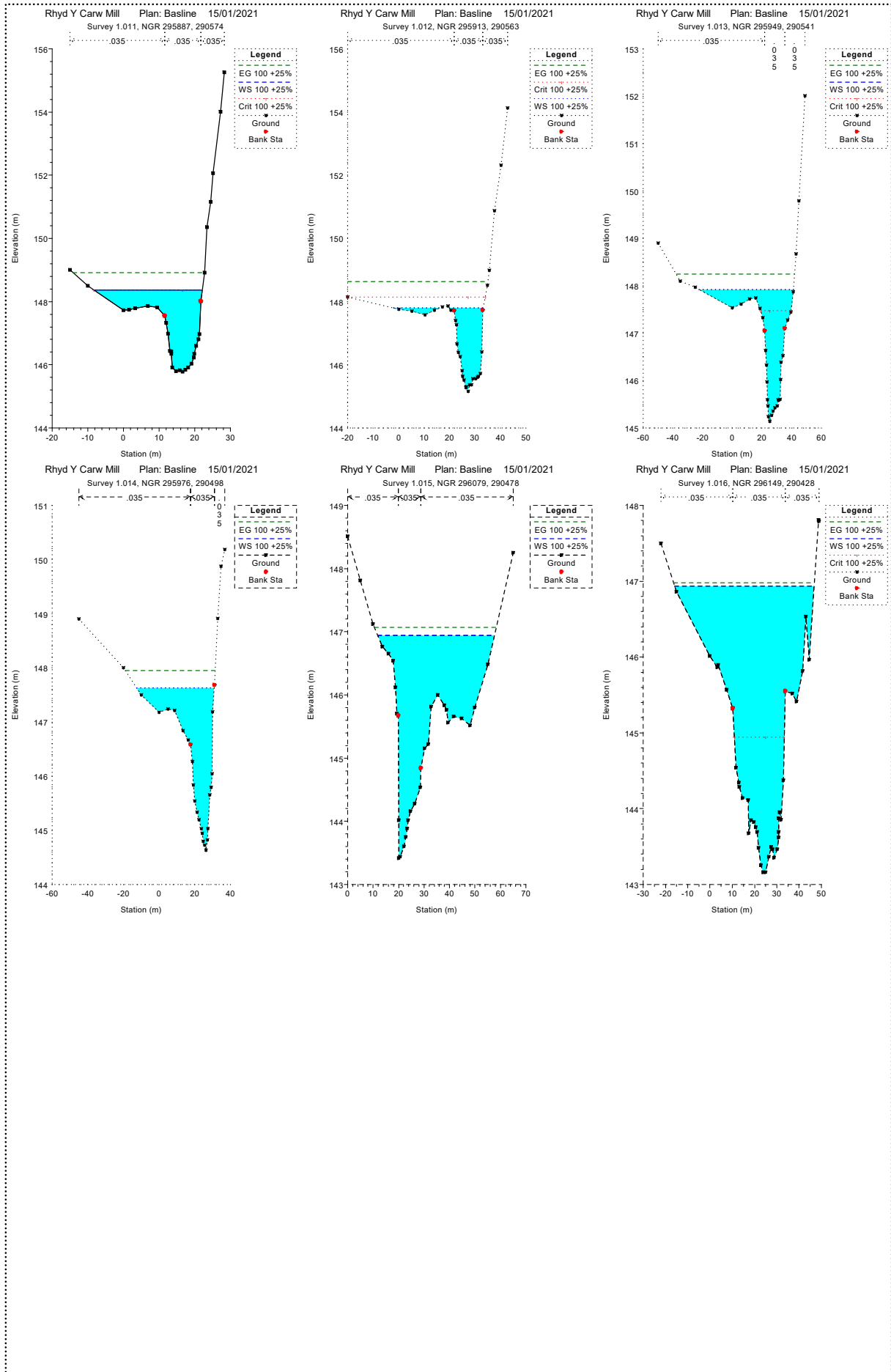




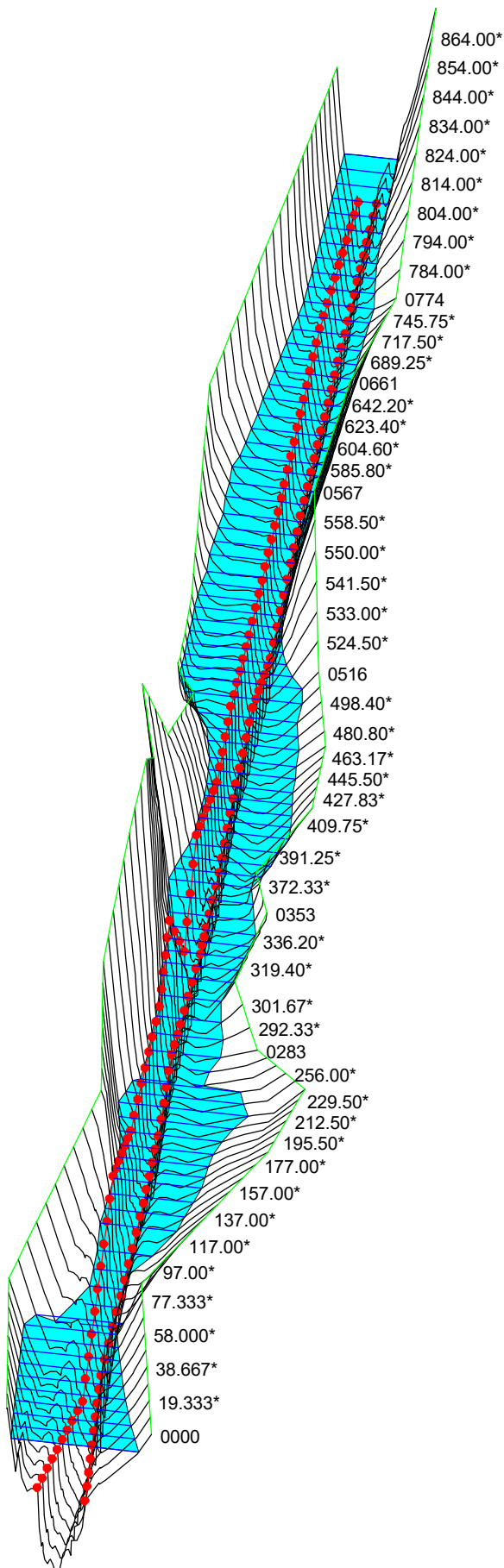
| Legend | |
|---|----------|
|  | WS 100 |
|  | Ground |
|  | Bank Sta |
|  | Ground |

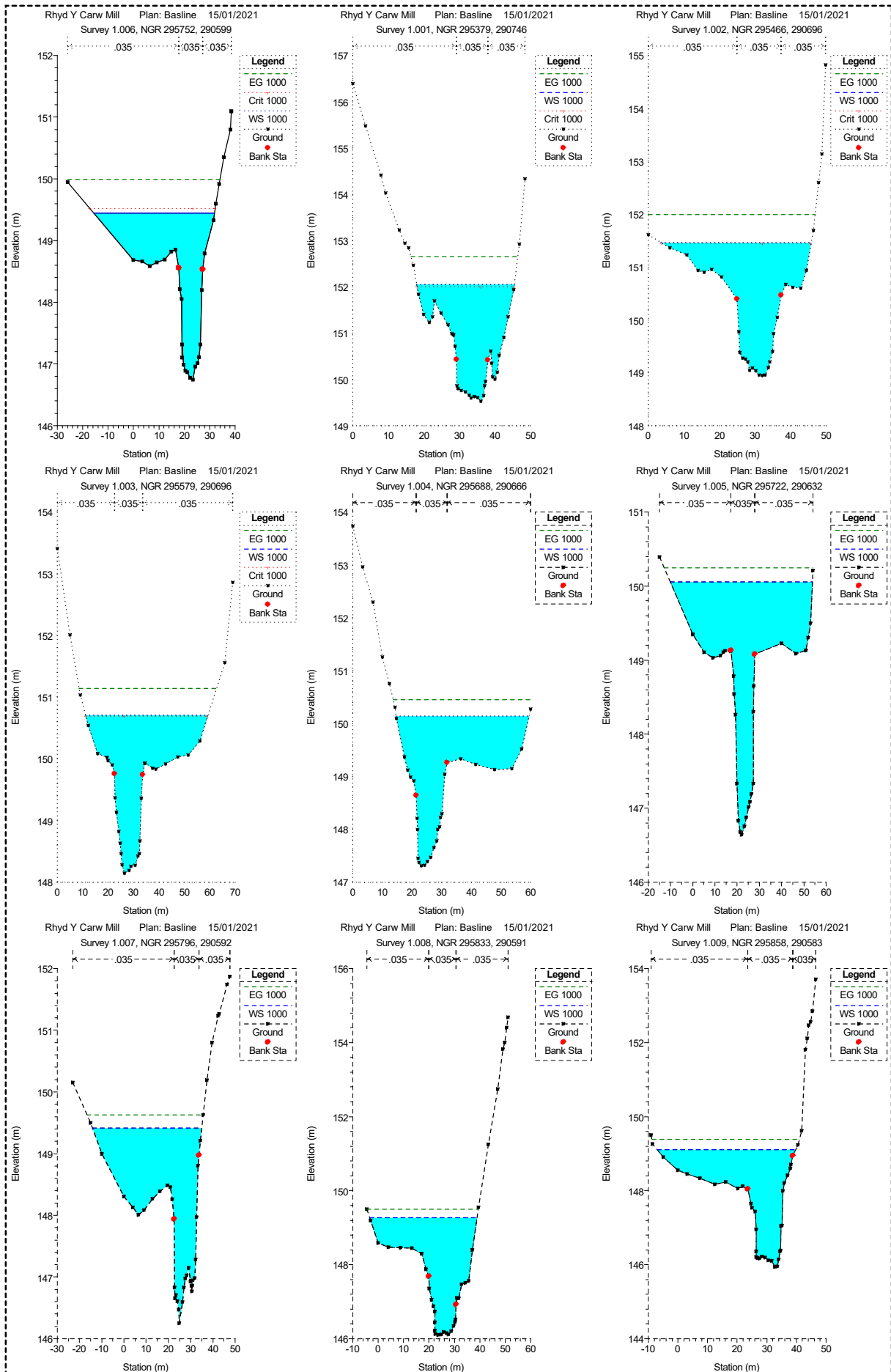


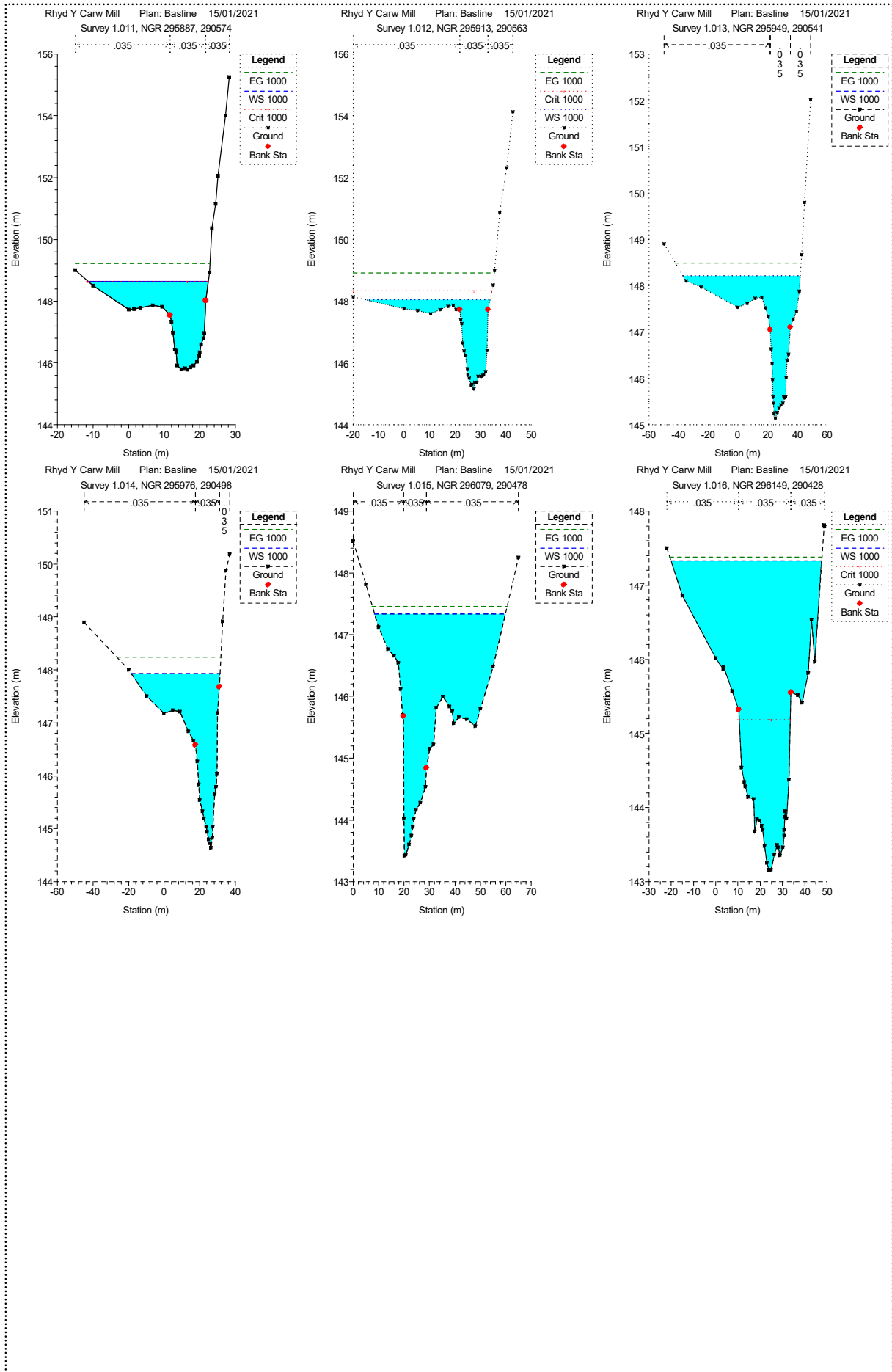


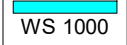


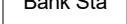


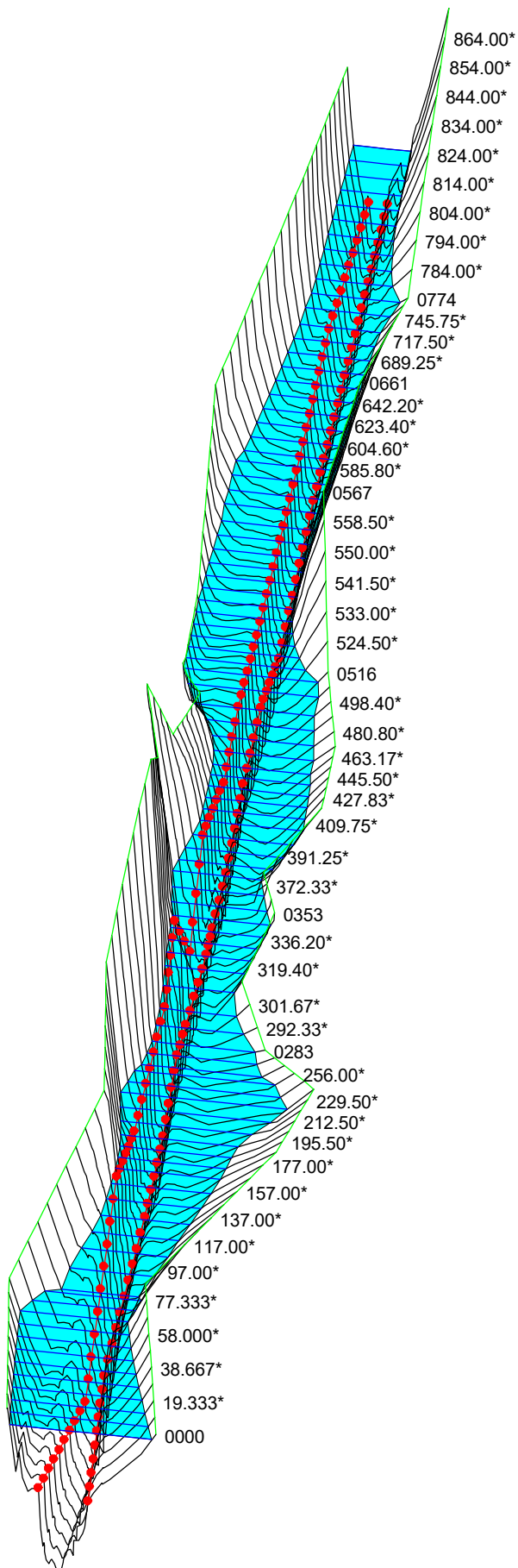
| Legend | |
|--------|-------------|
| | WS 100 +25% |
| | Ground |
| | Bank Sta |
| | Ground |



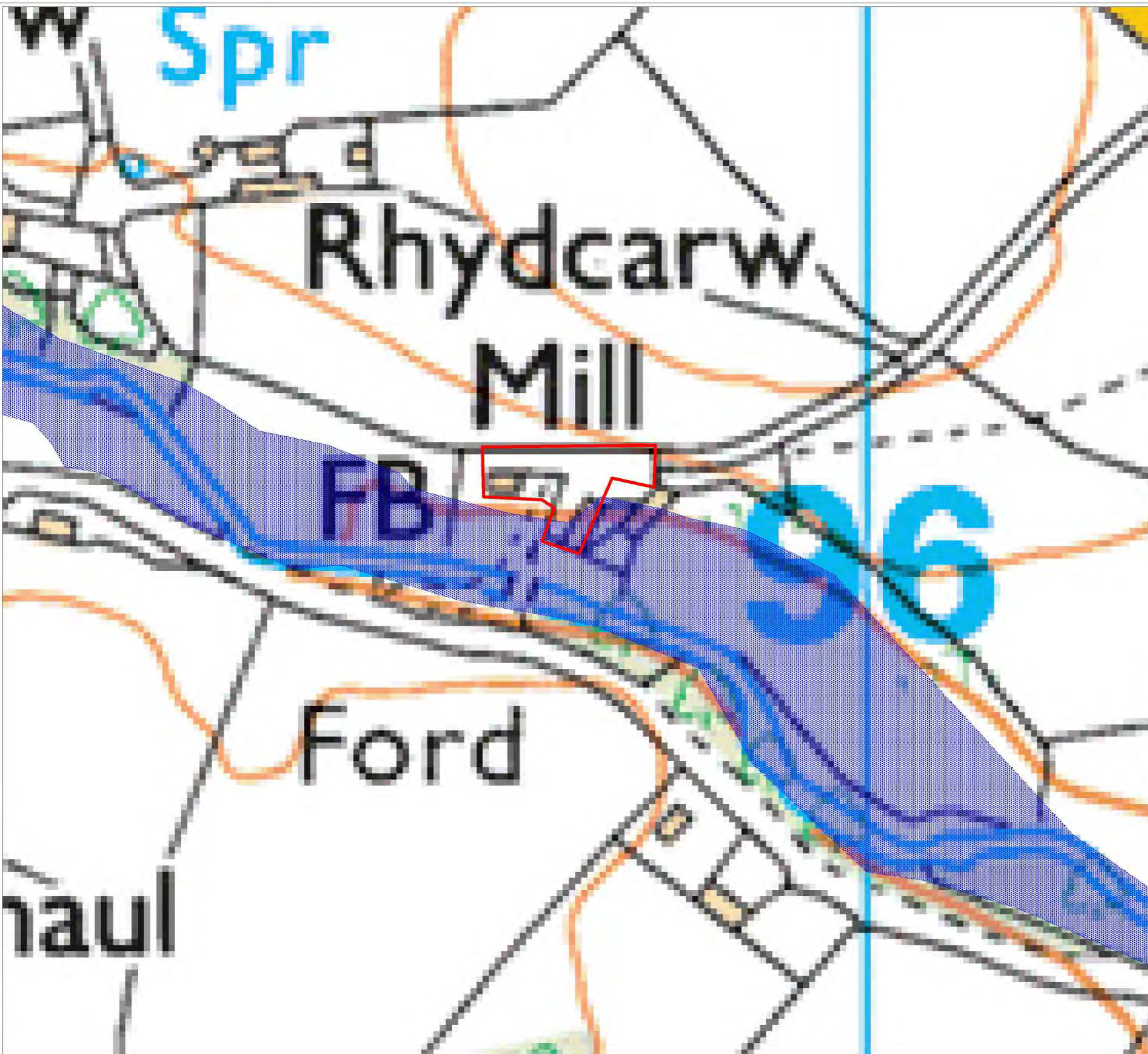




| Legend | |
|---|----------|
|  | WS 1000 |
|  | Ground |
|  | Bank Sta |
|  | Ground |



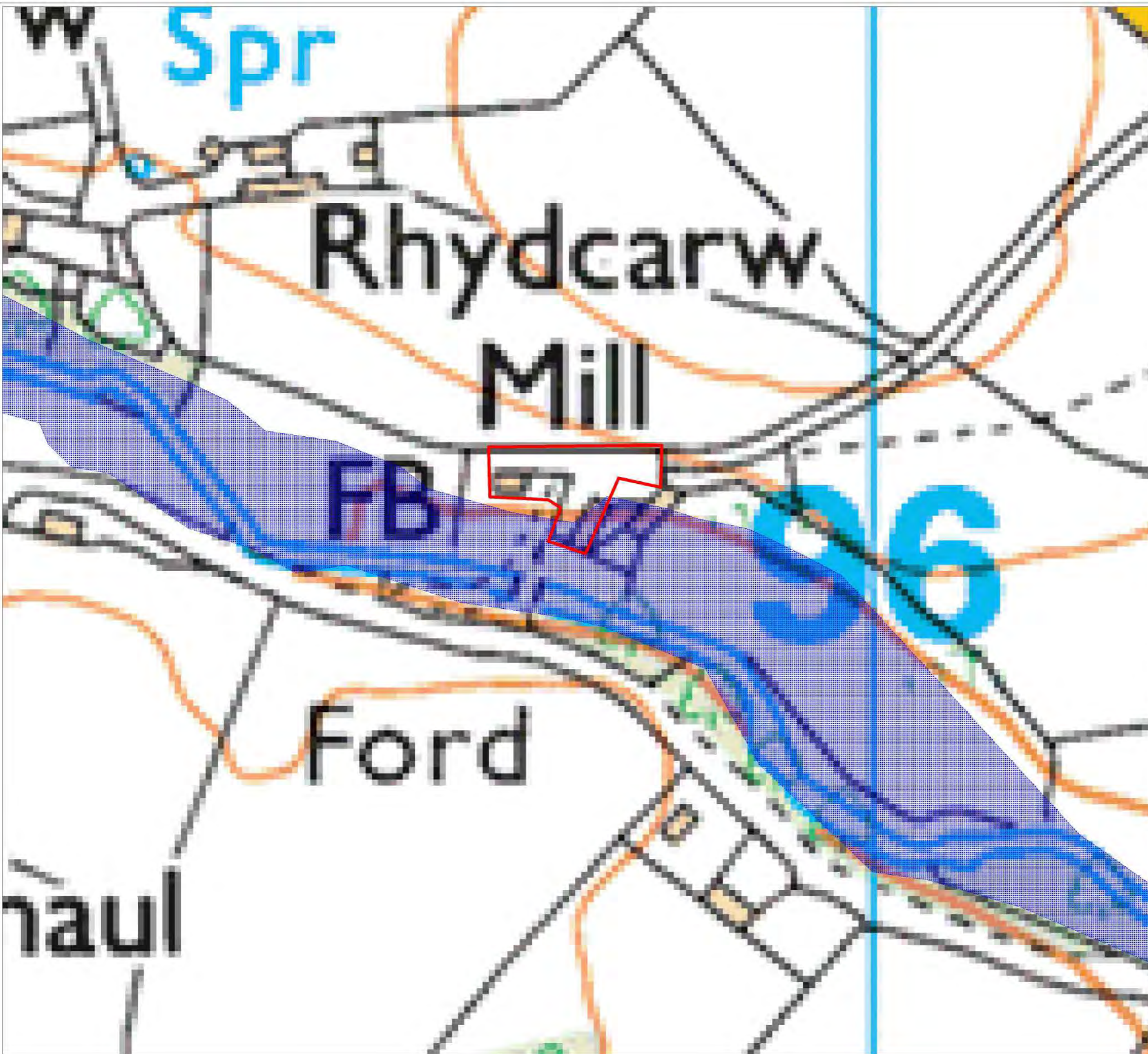
APPENDIX 12 – Modelled Flood Outlines



- KEY
- Site Boundary
 - 1 in 100 Year Flood Outline



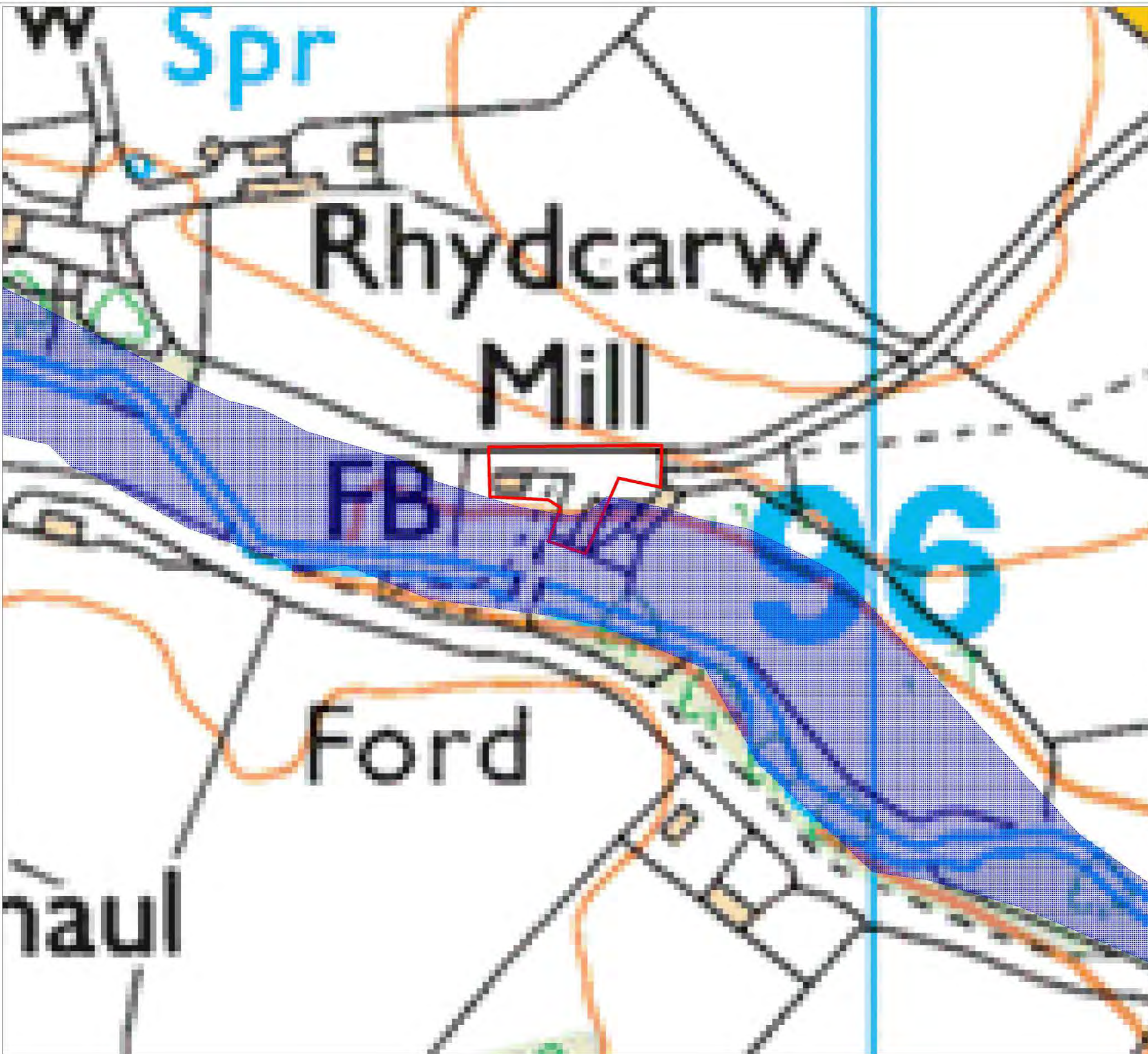
| | |
|---|-------------|
| Rhyd Y Carw Mill, Trefeglwys, Caersws SY17 5PU | PROJECT |
| Straightforward Properties Ltd | CLIENT |
| 1 in 100 Year Modelled Flood Outline | TITLE |
| KRS.0507.001 | PROJECT REF |
| 1 | DRAWING NO |
| 1:1,500@A3 | SCALE |
| January 2021 | DATE |





KEY
 Site Boundary
 1 in 100 Year (+25%) Flood Outline



| | |
|--|-------------|
| Rhyd Y Carw Mill, Trefglwys, Caersws SY17 5PU | PROJECT |
| Straightforward Properties Ltd | CLIENT |
| 1 in 100 Year (+25%) Modelled Flood Outline | TITLE |
| KRS.0507.001 | PROJECT REF |
| 2 | DRAWING NO |
| 1:1,500@A3 | SCALE |
| January 2021 | DATE |



| KEY | |
|---|------------------------------|
|  | Site Boundary |
|  | 1 in 1000 Year Flood Outline |



| | |
|---|-------------|
| Rhyd Y Carw Mill, Trefeglwys, Caersws SY17 5PU | PROJECT |
| Straightforward Properties Ltd | CLIENT |
| 1 in 1000 Year Modelled Flood Outline | TITLE |
| KRS.0507.001 | PROJECT REF |
| 3 | DRAWING NO |
| 1:1,500@A3 | SCALE |
| January 2021 | DATE |



KRS Environmental Ltd

Mob: 07857 264 376

Tel: 01686 668957

Tel: 01484 437420

Email: keelan@krsenvironmental.com

Web: www.krsenvironmental.com