

**James Bay Native
Development Corporation**

Hydraulic Study

Hydraulic study of the bridge located at the 4th kilometer of Chemin de Wemindji in the municipality of Wemindji, James Bay.

Preliminary Report



Prepared for:
James Bay Native
Development Corporation

Prepared by:
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Sign-off sheet

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1.0 INTRODUCTION

The James Bay Native Development Corporation mandated Stantec Expert-Conseil Ltée to produce a hydraulic study of the bridge located at the 4th kilometer of Chemin de Wemindji in the municipality of Wemindji, James Bay. The study will establish the requirements for the design of the future bridge if necessary. This investigation will define the flows and water levels for different return periods by modeling with HEC-RAS software. Simulations for actual and future conditions will be carried out.

This report presents the evaluation of the river flow, model inputs and simulation results necessary for the bridge design.

2.0 INFORMATION GATHERING

2.1 PROJECT INPUTS

The data used for this study are:

- IGO2's website [IGO2 - Données Québec \(gouv.qc.ca\)](http://IGO2 - Données Québec (gouv.qc.ca))
- MELCC'S website [MELCC \(gouv.qc.ca\)](http://MELCC (gouv.qc.ca))
- Forêt ouverte's website [Forêt ouverte \(gouv.qc.ca\)](http://Forêt ouverte (gouv.qc.ca))
- Stantec's bridge and field survey done on 11th of august 2022. It is presented in appendix 2

2.2 FIELD SURVEY

There was no hydraulic field survey done for this report, consequently the information used comes from structural survey, land survey as well as the satellite pictures of Google earth, Bing maps and Satellites.pro able us to make the following conclusions.

The Maquatua river, at the crossing of the bridge, is straight and stable. No evidence of beaver dams nor debris jams can be observed. No evidence of scouring on the banks. The banks are composed mainly of medium vegetation and trees further inland. A substantial bedrock is located directly under and downstream the structure.

During the field survey, the waterflow was too strong to allow bathymetry survey. Therefore, the waterbed is absent from the terrain model. In order to modelize the terrain, the lowest point, which correspond mostly of the water surface elevation of the day, was lowered by 500 mm while respecting the average slope of the bank. To ensure the validity of this assumption, simulations were done with a flow corresponding to 75% of the 2 years flood, which is close to the high watermark flow. The water surface elevation obtained from the model was compared to the high watermark elevation.

2.3 WATERSHED

2.3.1 Delimitation and average slope of the watershed

The limits of the watershed upstream of the bridge location, has been determined with ArcGIS software. The watershed of the Maquatua River, upstream of the bridge location, covers 1045 km². A map of this watershed is at the appendix 1. This watershed has an average slope of 3,2%.

2.3.2 Watershed surface occupancy

Wetland occupancy was determined using data from the Northern Quebec Ecoforestry Inventory Project (ENIP) and Natural Resources Canada. The watershed of the bridge located at the 4th kilometer of the Northern Road is occupied at approximately 11% of lakes and of wetlands.

Google Earth Pro's aerial pictures show that the territory is mostly occupied by forest. Paved surfaces are negligible.

2.4 FLOW ASSESSMENT

The peak flow of Maquatua River was first assessed using regional, basin transfer, HP33 and HP40 methods since the area of the watersheds is greater than 25 km².

The peak flows selected for modelling are the median of methods HP30, HP40 and regional methods even though the methods values obtained were outside the accepted range.

A flow increase of 15% was added to consider climate change as recommended by the Ministry of Transportation (MTQ, tome III, ch.2, 2022). These peak flows are summarized in Table 1 and the calculation details are in appendix 3.

2.4.1 Floods frequency analysis for Quebec (H.P. 33)

Analysis method H.P. 33 uses the data from 76 hydrometric stations across 12 Quebec regions to determine the daily and instant flow rates of watersheds in these regions.

This method is limited to certain Quebec regions and, for each of them, the area of the watershed has to be inside the recommended limits.

2.4.2 Estimation of daily flow of fall floods from meridional Quebec river method (H.P.40)

H.P. 40 method is another statistical method, similar to H.P. 33 previously described. H.P. 40's method is an analysis carried out from 81 hydrometric stations divided in 6 Quebec regions.

H.P. 40' method considers a more detailed application zone compared to H.P. 33's method since it compares the length of the waterway, the slope of the watershed, the importance of the forest cover, the surface of the lakes and the marsh, the altitude, and annual precipitations in addition to the area of the watersheds used for H.P. 33.

2.4.3 Comparison by watershed transfer

This method statistically analyse the maximal flows registered at a hydrometric station of Quebec gage station network. The data from the gage station are used to determine a recurrence-flow relation.

An inventory of the existing hydrometric stations in the hydrographic region studied was conducted. The stations presenting a natural or lightly influenced flow regime and sufficient hydrometric data were retained. Other parameters were considered, including the topography, the watershed elevation, the precipitation intensity and more, to select the rivers that best match the studied site.

In this analysis, one (1) stations was selected: station 81101 located on Pontax river. Then the calculation of the floods flow by transposition to the studied site was done.

It is important to note the recommended boundaries of this method: a watershed area ration between 0.5 and 2.0. This is respected for all selected stations. However, these stations are not in the same hydrometric region due to the localization of the studied site. There are zero stations in the region that present an area ration close to 0.5 or 2.0. The values obtained with this method should be used with caution.

2.4.4 Regional method

The regional method is a statistical method that uses a methematical equation based on the region (the province of Quebec is divided in three (3) regions). The necessary informations to obtain the floods flow are, the watershed area and the region of the watershed.

In the present case, the studied watershed is located in region III. This method comes from ANCTIL, François, Nicolas MARTEL et Van Diem HOANG (1998). « Analyse régionale des crues journalières de la province de Québec », Revue canadienne de génie civil, vol. 25, n° 2, p. 360-369.

2.4.5 Retained flow values

After analysis, three methods were retained for modelling, HP33, HP40 and regional method. The average and median of the three methods were analyzed on HEC RAS and the average was closest to the data received from the field survey. The average of methods HP33, HP40 and regional method was used for the model.

Table 1 - Peak flows of the Maquatua River – Area 1045 km2

RETURN PERIOD (Years)	Calculated PEAK FLOW		PEAK FLOW (Includes 15 % increase - m ³ /s)
		(m ³ /s)	
2		87.69	100.85
10		121.89	140.18
25		140.31	161.36
50		155.22	178.50
100		170.13	195.64

3.0 HYDRAULIC ANALYSIS

3.1 DESIGN CRITERIA

According to the MTQ, hydraulic criteria to be consider when modeling a bridge are the clearance of the structure above water surface, the increase of the water level compared to natural flow conditions, flow velocity as well as the flow surface width.

The table 2 presents the requirements related to each criteria as well as their applicability to this specific study.

Conception criteria are based on the 50 years flood. The annual average daily traffic (AADT) is not available for the structure. Therefore, an AADT over 200 is set so the bridge would not be considered as a low traffic road.

Table 2 - Hydraulic conception criterias of a bridge

Criteria	Requirements	Applicability
CAN/CSA S6-19 (art. 1.9.7.1)	Soffit located at least 300 mm above conception high watermark.	<input checked="" type="checkbox"/>
MTQ – Tome III Presence of ice jams or debris (Without tide)	Clearance under the bridge: 1 m above expected extreme ice or debris level.	.
Without tide and without jams	Clearance under the bridge: 1 m above conception high watermark (except low traffic road).	<input checked="" type="checkbox"/>
	Clearance under the bridge: 300 mm above centennial high watermark.	<input checked="" type="checkbox"/>
Without tide and without jams (low traffic road)	Clearance under the bridge for a low traffic road: 300 mm above conception high watermark.	.
Tides with ice jams or debris	1 m above expected extreme ice or debris level.	.
Navigable waterway for small embarkations	Soffit located at 1.5 m above high watermark	.
Road profile elevation	The elevation of the road profile is fixed as anticipating a security margin sufficient above the conception high watermark (E.H.C). The minimal clearance is 1000mm for highways and national roads, and 600mm for other roads.	<input checked="" type="checkbox"/>
Free opening (Tome III, Chapter2, page22)	The high watermarks of a return period of 2 years correspond to the yearly water level average.	<input checked="" type="checkbox"/>
	The minimal free opening between a bridge abutment has to approach the top width measured at the yearly high watermark.	<input checked="" type="checkbox"/>
Fishing and Oceans Canada	Conservation of natural flow conditions by maintaining the physical characteristics of the existing watercourse; the substrat, slope and width.	<input checked="" type="checkbox"/>
Maximum flow velocity	It is recommended to limit the increase of the flow speeds compared to natural conditions. The protections usually support velocities inferior to 3,4 m/s for the 100-year flood.	<input checked="" type="checkbox"/>

3.2 HYDRAULIC MODELISATION

The numeric model Geo HEC-RAS version 3.1.10.1274 was used to simulate the water flow regime. The use of this model allowed establishing the actual flow conditions as well as simulate the natural flow conditions.

Manning's n is considered to be 0,035 for the waterbed upstream the structure and to be 0,07 downstream the structure due to the presence of massif boulder. The banks Manning's n is considered to be 0,065.

A sketch including the localisation of the vertical cross-sections used for the modelization is available at the top of appendix 5 as well as hydraulic profiles and sections for both simulations.

The simulations results tables for both conditions are presented in appendix 6.

3.3 RESULT SIMULATION – UNDEVELOPED AREA

In this scenario, the hydraulic model simulates the watercourse from the flow data presented in table 1. This model represents water flow without any human intervention. In this case, the bridge is not modeled. The results of this section gives the reference conditions for further analysis. The table 3 presents flow characteristics in natural conditions in cross section 1180 located upstream of the studied bridge. This section was chosen since it gives the most critical water levels for the subsequent analyse. The waterbed elevation at this cross section is 15.26 meters.

Table 3 - Flow characteristics in natural conditions – cross section 1180

Recurrence									
2 years		10 years		25 years		50 years *		100 years	
Water surface elevation (m)	Velocity (m/s)								
16.64	2.11	16.93	2.40	17.07	2.52	17.18	2.63	17.29	2.70

*design recurrence

3.4 RESULT SIMULATION – ACTUAL CONDITIONS

The hydraulic model for existing conditions was modeled from the characteristics presented in table 4:

Table 4 - Characteristic of the actual structure

Characteristic	Actual bridge
Type of structure	Wood steel bridge
Bias relative to the stream (degree)	0
Total width of opening (m)	50
Pier width - upper part - perpendicular to flow (m)	2.1
Pier width - lower part - perpendicular to flow (m)	2.9
Height of the structure (approximate) (m)	6.0
Geodesic elevation of the road (m)	24.03
Geodesic elevation of the soffit upstream (m)	21.89
Geodesic elevation of the soffit downstream (m)	21.89
upstream channel elevation (m)	15.14
downstream channel elevation (m)	15.14

The actual conditions were simulated for recurrences of 2, 10, 25, 50 and 100 years. Detailed results are presented in appendix 4, 5 and 6. The figure 1 and table 5 compare the flow characteristics from natural and actual conditions.

Figure 1 - Hydraulic profiles, actual vs natural conditions

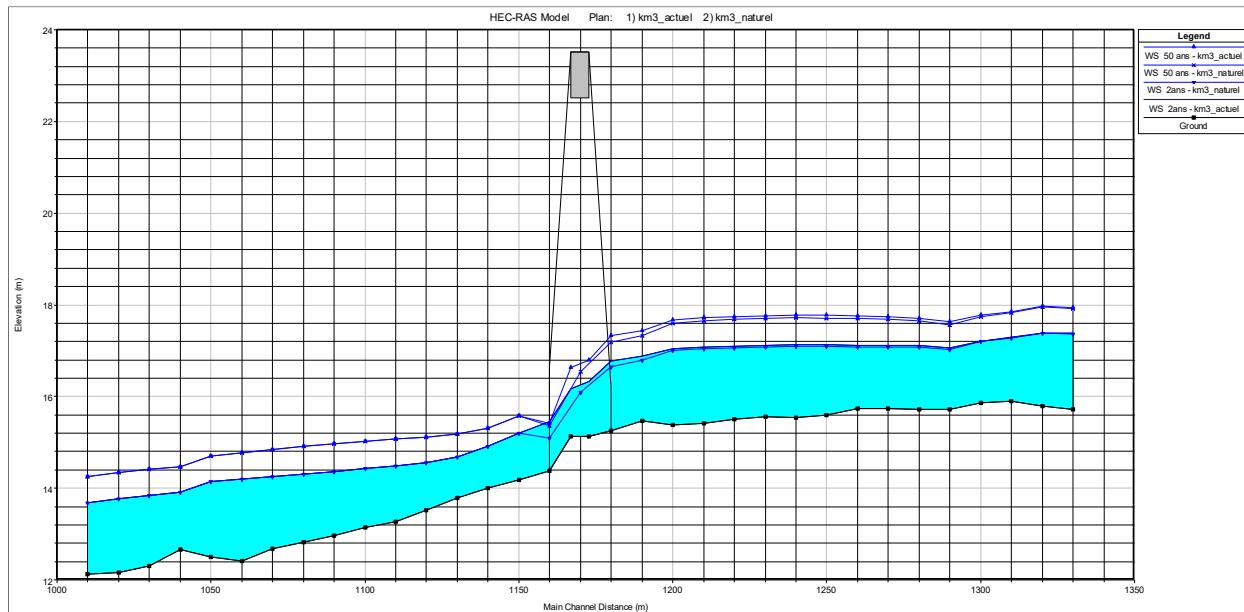


Table 5 – Flow characteristics – Cross section 1180

Recurrence – Cross section 370									
2 years		10 years		25 years		50 years (1)		100 years	
Water surface elevation (m)	Velocity (m/s)	Water surface elevation (m)	Velocity (m/s)	Water surface elevation (m)	Velocity (m/s)	Water surface elevation (m)	Velocity (m/s)	Water surface elevation (m)	Velocity (m/s)
Natural conditions									
16.64	2.11	16.93	2.40	17.07	2.52	17.18	2.63	17.29	2.70
Actual conditions									
16.77	1.92	17.07	2.19	17.22	2.31	17.33	2.40	17.45	2.48

(1) The conception is based on the 50 years flood

The hydraulic profile analysis from natural and actual conditions indicates that the bridge causes a water rise of the order of 150 mm (17.33 – 17.18) for the 50-year flood. This is under the recommended maximum value of 300 mm. Therefore, the bridge is considered non-restrictive.

The speed at the exit of the bridge for the centennial flood is 3.84 m/s¹, which is over the maximum recommended of 3.4 m/s for rock lining of caliber 300-500 (mm). The speed at the entrance of the bridge for the centennial flood is also 3.84 m/s. Those high velocities are created by the waterfall downstream of the bridge.

¹ Velocity of the simulation for the actual conditions inside the bridge downstream. The table can be found in appendix 6.

Table 6 - Bridge analysis

Norm	Conception criteria		Actual characteristic of the structure	Conformity
Soffit clearance above conception high watermark	Soffit minimum elevation = $E.H_{50}^2 + 0.1m$	17.33m + 1m $= 18.33m$	21.89m	Yes
Without tide and without jams	Soffit minimum elevation > $E.H_{100} + 0.3 m$	17.33m + 0.3m $= 17.63m$	21.89m	Yes
Road profile	Road profile elevation $> E.H_{50}+0.6 m$	17.33m + 0.6m $= 17.93$	24.03	Yes
Free opening	Minimum opening = 80% High watermark line average width of three sections upstream	$(39.70+42.03+47.8) /3X 80\% = 43.18 m$	50m	Yes
Velocity	Maximum velocity (m/s) – 100 years	< 3,4 m/s	3.84 ³ m/s	No

² Water surface level for the conception high watermark (50 years) for the actual conditions simulation.

³ For the 100-year flood under the bridge in actual conditions simulation.

4.0 PROTECTIVE STRUCTURE

The channel under and at both ends of the bridge is made of resurgence of rock as presented on the picture in appendix 2. There is already rip rap protecting one overbank under the bridge nevertheless considering the MTQ's norm (Tome III, chap.2, art. 2.18.2.2), a superior erosion resistance protection should be considered because the velocities at the edges of the bridge are over 3.4 m/s.

5.0 CONCLUSION

The present hydraulic study aims to analyze the impact of the existing bridge at kilometer 4 of Chemin de Wemindji crossing Maquatua's river.

The generated terrain by the software is incomplete. Thereby, if the conception of a new bridge is intended, this analysis should be done again with a complete bathymetry.

Two scenarios were analysed: natural and actual conditions. The actual conditions simulation allows us to confirm that the actual steel-wood bridge for all applicable norms except the norm concerning the velocity under the bridge.

Comparing the natural and actual condition simulations shows that the bridge is non-restrictive.

6.0 BIBLIOGRAPHICAL REFERENCES

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APPENDIX 1

Waster shed boundary

N

Légende

km3_ChWemindji_2019

km3_ChWemindji_2019

40 km

Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image Landsat / Copernicus

APPENDIX 2

Pictures of the studied site and field survey forms



































No.....
Date..... Page.....

No. Relève Structure 2022
Date... 2022-08-11 Page.....

Relève Rivière Magatua
Wemindji

2022-08-11

Francis Mathon, Arpenteur
Jacinthe Daoust, Biologiste
Alexander Christiano, Biologiste

GPS R12i, récepteur
GPS RB, base
Station totale 1203+

température: 16°C ensoleillé

No. Date Page

Hpoint

- | | |
|----------|-----------------------------------|
| I | Station permanente (clan) |
| II et VI | Station temporaire (piguet). |
| B,C,D | Mise en station (station totale). |

1011 et 1014 pas exactement au dessus du point
1010 et 1013, plus profond vers le centre
du point. Elevation bonne.

Stations:

$$\begin{aligned} B: \quad \Delta x &: 0,012 \text{ m} \\ &\Delta y : 0,013 \text{ m} \\ &\Delta z : 0,004 \text{ m} \end{aligned}$$

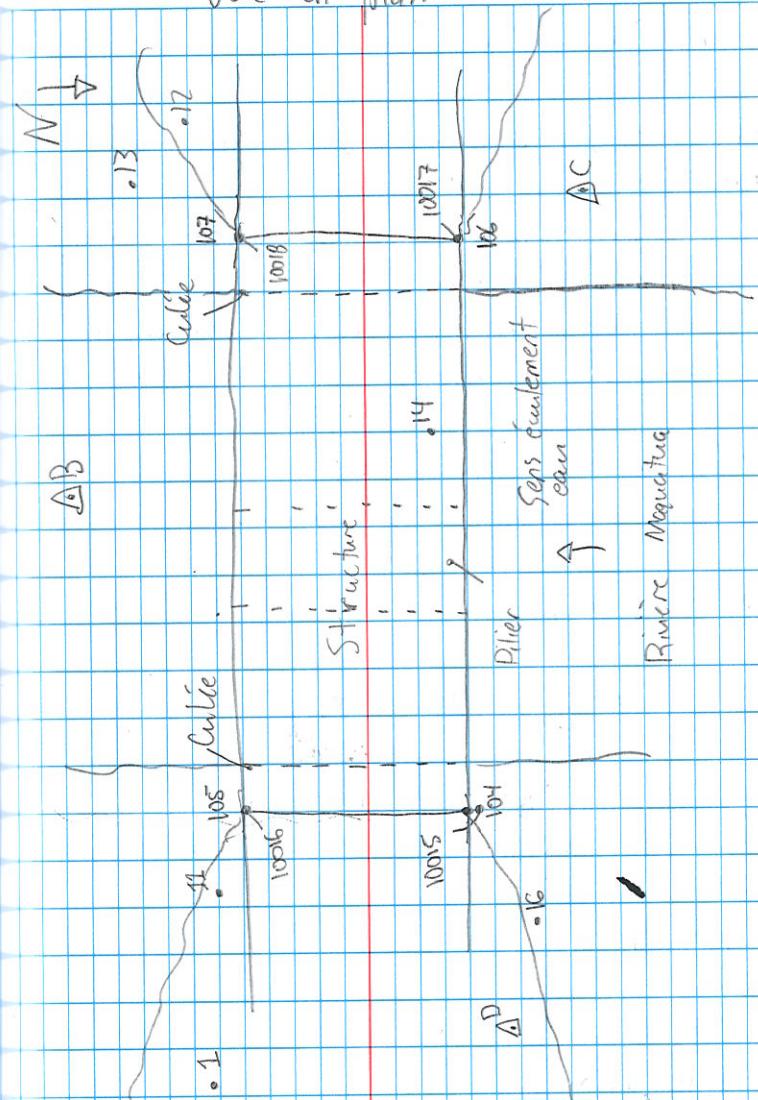
$$C: \begin{array}{l} Q_x: 0,021 \text{ m} \\ Q_y: 0,035 \text{ m} \\ Q_z: 0,004 \end{array}$$

$$\begin{aligned} \Delta x &= 0,007\text{m} \\ \Delta y &= 0,009\text{m} \\ \Delta z &= 0,007\text{m} \end{aligned}$$

No. Date. Page.

Date..... Page

Vue en plan



No.

Date.

Page

Transects de avant vers arrière

#12 rive gauche décalé, végétation très dense

#11 rive gauche, idem

#9 rive gauche manque TAB, végétation très dense, impossible même avec station totale.

#5 EAD, TAB et LHE pas pris, végétation extrêmement dense GPS ne capte pas et station totale on voit rien

#4 Idem, on a essayé longtemps et en chargeant
rive gauche de place mais, aucun signal

#1 Rive gauche, idem

10015 à Dessous du tablier

10018

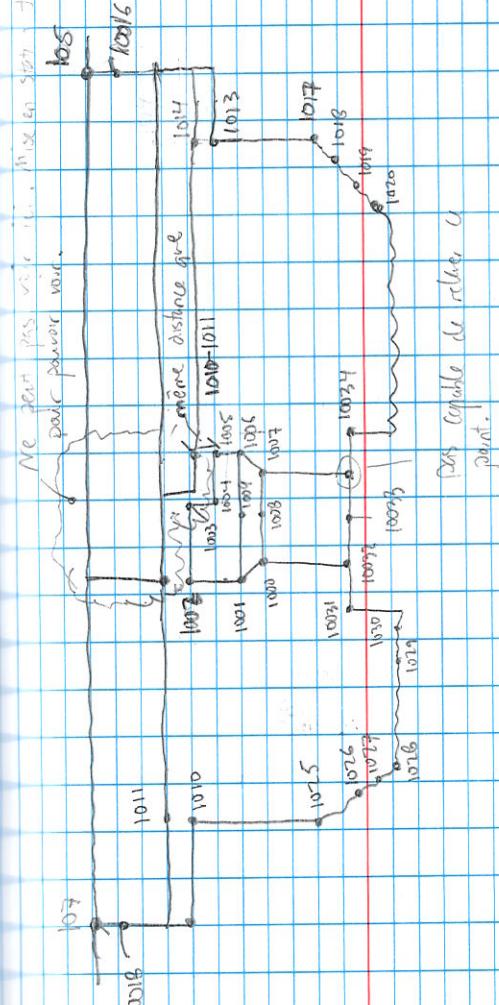
1009, 1008 faire un cercle
et 10091001, 1009 Idem
et 10061002 & 1003 Demi cercle
1004 & 1005 Idem

No.

Date.

Page

Vue en arrière



No.....

Date..... Page

. Page

10032 d form a circle

10033

1036 et Demi cercle

1037

1031 ct | Idem

1041

1036, 1035 Arc de cerde

et 1032

1039, 1034 | Idem

et 1033

~~10030, 10029~~ Idem

et 1002B

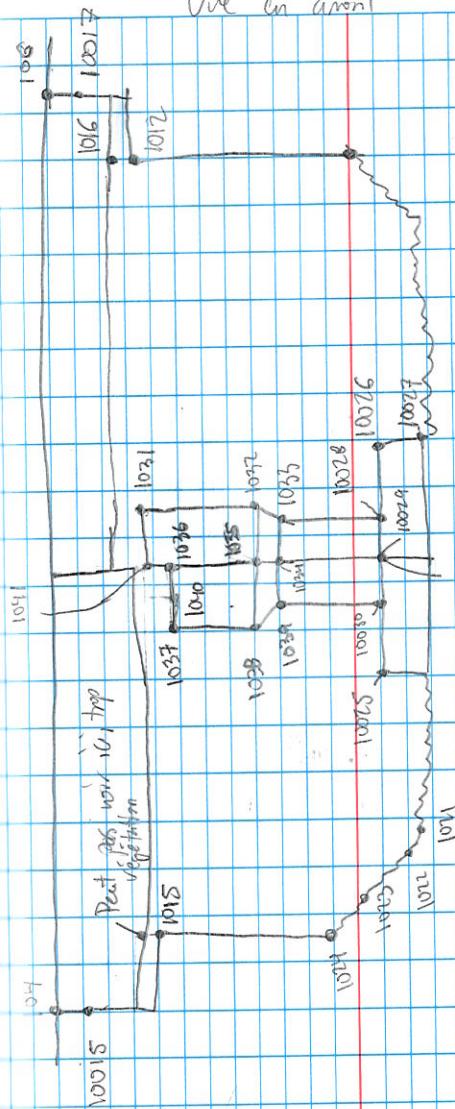
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Date..... Page.....

. Page

Vive en avont



APPENDIX 3

Flow calculation

Méthode de transfert

Station respectant presque le critère régional					
Station :	81101	Région hydrographique : Baies de Hannah et de Rupel			
St. fédérale	03BF001	Régime d'écoulement : Naturel			
Nom :	Pontax	Distance station météo la + près : Matagami A 197km			
Bassin :	5970.0 km ²	Élévation station météo la + près : ± 281 m			
Q2 :	594.0 m ³ /s	Élévation approx. de 081101 : ±98m - Google Earth			
Q10 :	911.0 m ³ /s				
Q20 :	1028.0 m ³ /s				
Q25 :	1065.0 m ³ /s				
Q50 :	1178.0 m ³ /s				
Q100 :	1290.0 m ³ /s				
Période :	1976-2018, sans 1997,	Exemple :	T : 25.00	ans	Récurrence
		QTu : 221.94	m ³ /s	0.0	Débit (m ³ /s)
		QTj : 1065.00	m ³ /s	0.0	20.0
		Au : 1045.17	km ²	0.0	214.2
		Aj : 5970.00	km ²	0.0	221.9
		n : 0.9	0.0	0.0	245.5
				50.0	268.8
				100.0	
		Au/Aj : 0.1751	NON APPLICABLE !		

Station respectant le critère régional					
Station :	92715	Région hydrographique : Baies James et d'Hudson			
St. fédérale		Régime d'écoulement : Naturel			
Nom :	De Pontois	Distance station météo la + près : Matagami A 197km			
Bassin :	13200.0 km ²	Élévation station météo la + près : ± 281 m			
Q2 :	917.0 m ³ /s	Élévation approx. de 081101 : ±98m - Google Earth			
Q10 :	1172.0 m ³ /s				
Q20 :	1252.0 m ³ /s				
Q25 :	1276.0 m ³ /s				
Q50 :	1346.0 m ³ /s				
Q100 :	1412.0 m ³ /s				
Période :	1972-1991	Exemple :	T : 25.00	ans	Récurrence
		QTu : 130.20	m ³ /s	0.0	Débit (m ³ /s)
		QTj : 1276.00	m ³ /s	0.0	20.0
		Au : 1045.17	km ²	0.0	3602.4
		Aj : 13200.00	km ²	0.0	3671.4
		n : 0.90	0.0	50.0	3872.9
				100.0	4062.8
		Au/Aj : 0.0792	NON APPLICABLE !		

Station respectant le critère Au/Aj					
Station :	023401	Région hydrographique : St-Laurent sud-est			
St. fédérale	02PJ007	Régime d'écoulement : Naturel			
Nom :	Beaurivage	Distance station météo la + près : Saint-Flavien ±28 km			
Bassin :	709.0 km ²	Élévation station météo la + près : ± 137 m			
Q2 :	189.0 m ³ /s	Élévation approx. de 023401 : ±125 m - Google Earth			
Q10 :	258.0 m ³ /s				
Q20 :	277.0 m ³ /s				
Q25 :	283.0 m ³ /s				
Q50 :	302.0 m ³ /s				
Q100 :	320.0 m ³ /s				
Période :	1970-2011 sans 2005 et 2007	Exemple :	T : 25.00	ans	Récurrence
		QTu : 401.30	m ³ /s	0.0	Débit (m ³ /s)
		QTj : 283.00	m ³ /s	0.0	20.0
		Au : 1045.17	km ²	0.0	392.8
		Aj : 709.00	km ²	0.0	401.3
		n : 0.90	0.0	50.0	428.2
				100.0	453.8
		Au/Aj : 1.4741	OK		

Méthode HP40

Récurrence	Constante	Q journalier	Q instantanné
-	Région 6	m ³ /s	m ³ /s
2.33	1.03	70.481	88.528
5	1.22	83.482	104.859
10	1.36	93.062	116.892
20	1.5	102.642	128.925
25	1.54	105.379	132.363
50	1.66	113.591	142.677
100	1.8	123.171	154.710

Méthode régionale

RÉCURRENCES

	III
2	203.58
5	252.63
10	281.70
20	307.28
25	314.95
50	337.33
100	357.80

Méthode HP33

Référence (ans)	Débit (m³/s)
2	87.694
5	106.109
10	121.894
20	136.802
25	140.310
50	155.218
100	170.126

Moyenne HP33, HP40 et Régionale (15% inclus)

Référence	Débit (m³/s)
2	134.84
5	169.52
10	190.38
20	209.58
25	214.91
50	232.35
100	249.59

Médiane HP33, HP40 et régionale (15% inclus)

Référence	Débit (m³/s)
2	100.847842
5	122.026
10	140.179
20	157.323
25	161.357
50	178.501
100	195.645

Identification du projet

Date : 2022-12-19

Client : Société de développement autochtone de la Baie-James (SODAB) Réf. Client : _____
Projet : **La Grande Alliance - Feasibility Study Phase 1** N./Réf.: **158100425**
Route : Rue Spruce Chaînage : km4 Municipalité : Gouvernement régional d'Eeyou Istchee Baie-James
N° bassin versant : **1** Cours d'eau : **Rivière Maquata** Analyste : _____ -

$$Q_{2,33} = 0,3048^3 K_2 \left(\frac{A}{2,59}\right)^{K_1}$$

1

km4

Hydrologie_ selon la méthode HP33

Carte ou plan de référence : Carte des BV (LiDAR) Échelle : 1 : 10000 Méthode de calcul du BV : CDAO
Superficie totale du bassin (A) : **104 517.00** ha Mesurée par : Catégorie de bassin : **Grand bassin**

Choix de la région

Selon la figure 1 du Guide de préparation des projets routiers (annexe Hydraulique)

Choix de la région : **M**


Figure 1 – Délimitation des régions où s'applique la méthode H.P.-33

Coefficient K₂ : **18.1**

Coefficient k₁ : **0.857**

(ha): **99 710**

Limite BV sup.. (A₂) : **5 749 770**

(Version 2)

Détermination des débits

Débit moy. annuel (Q_{2,33}) :

87.694 m³/s

Récurrence (ans)	Débit (m ³ /s)
2	87.694
5	106.109
10	121.894
20	136.802
25	140.310
50	155.218
100	170.126

Débit de conception 50 ans

155.218 m³/s

Notes

Dossier :
N.Réf. : 158100425

Projet : 158100425

Estimation des débits journaliers de crue printanière des rivières du Québec méridional (H.P.-40)

La méthode de transfert des sonnées est tirée de l'annexe HYD du Guide de préparation des projets routiers du MTQ.
L'équation tirée de la section 2.3.2 de la page 1.9 est la suivante :

$$Q_1 = 0,3048^3 e^K \left(\frac{A}{2,59} \right)^a \quad (\text{éq. 4b})$$

où : Q_1 : débit journalier annuel – 1 jour (m^3/s)

e : constante népérienne (2,718)

A : superficie du bassin versant (km^2)

K, a : constantes régionales données au tableau 3

Tableau 3 – Coefficients et intervalles de récurrence pour la méthode H.P.-40

Région	K	a	Intervalle de récurrence (ans)						
			2,33	5	10	20	25	50	100
I	3,48	0,90	1,07	1,33	1,51	1,68	1,73	1,90	2,06
II	3,18	0,95	1,08	1,33	1,50	1,63	1,68	1,82	1,94
III	3,77	0,76	1,05	1,30	1,49	1,67	1,73	1,90	2,07
IV	3,60	0,92	1,05	1,32	1,54	1,76	1,83	2,05	2,29
V	4,01	0,81	1,05	1,27	1,42	1,57	1,62	1,76	1,91
VI	1,85	0,99	1,03	1,22	1,36	1,50	1,54	1,66	1,80

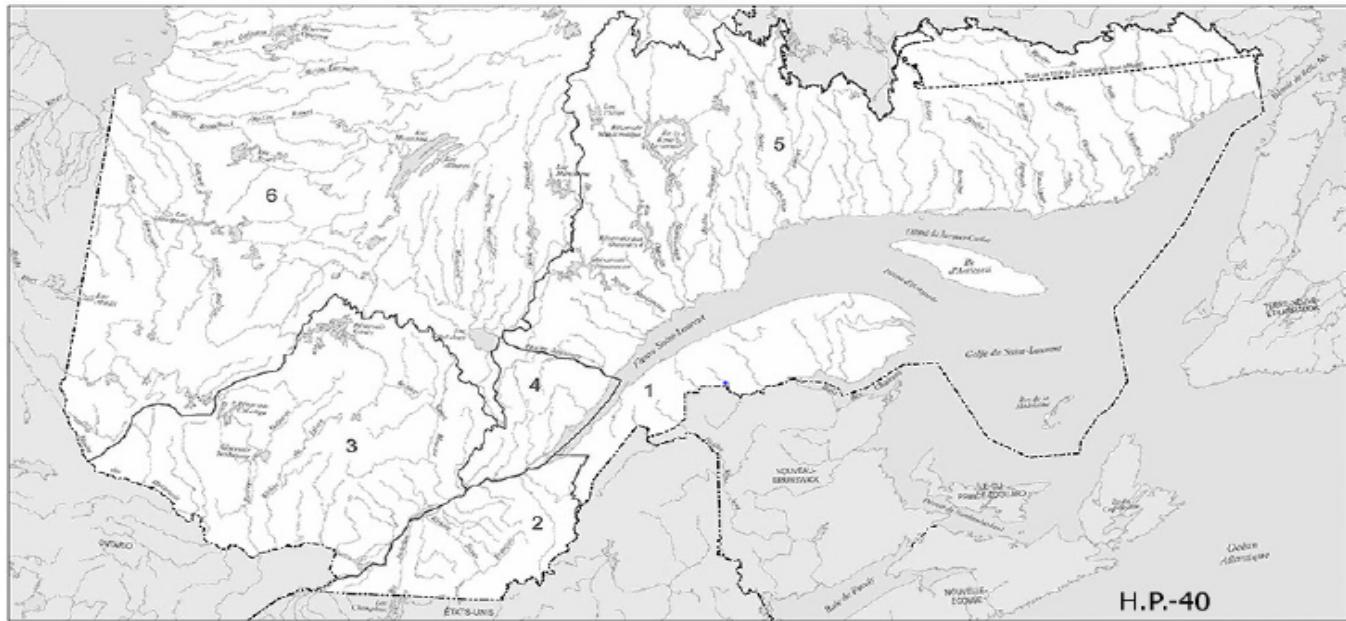


Figure 2 – Délimitation des régions où s'applique la méthode H.P.-40

Basssin versant de la Rivière Maquata

$$A = 1045.17 \text{ km}^2 \quad Q(1 \text{ jour}) = 68.428 \text{ m}^3/\text{s}$$

$$K = 1.85$$

$$a = 0.99$$

Calcul du débit pour différentes récurrences

Référence	Constante Région 6	Q journalier m³/s	Q instantané m³/s
2.33	1.03	70.481	88.528
5	1.22	83.482	104.859
10	1.36	93.062	116.892
20	1.5	102.642	128.925
25	1.54	105.379	132.363
50	1.66	113.591	142.677
100	1.8	123.171	154.710

Limites de la méthode HP-40

Tableau 4 – Limites de la méthode H.P.-40

Caractéristique	Limite inférieure	Limite supérieure
Superficie (km²)	150,7	56 980
Pente (%)	0,02	0,95
Longueur (km)	18,5	482,8
Couvert forestier (%)	18	100
Lac et marécage (%)	Trace	36
Élevation (m)	73,2	725,4
Précipitation annuelle (mm)	711,2	1 422,4

Bassin versant à l'étude :

			Conforme
Superficie	km²	1045.17	VRAI
Pente moy.	%	4,1	FAUX
Longueur	km	15.051	FAUX
Couvert forestier	%		FAUX
Lacs et marécage	%		FAUX
Élevation	m		
Précipitations annuelles	mm		FAUX

ANALYSE PAR LA MÉTHODE RÉGIONALE

Tableau des paramètres

Région	epsilon	alpha	kapa	Calcul Qmoyen	Superficie	km ²
I	0.8397	0.2819	0.0086			
II	0.8659	0.2754	0.0993			
III	0.891	0.2308	0.1173	1045.17	209.05	m ³ /s

$$\text{Équation 8.6} \quad Q = Q_r / Q_{\text{moyen}}$$

$$\text{Équation 8.7}$$

$$\text{Équation 8.8} \quad Q_{\text{moyen}} = 1,61 A^{0.7}$$

RÉCURRENCES	Calcul Q normalisé				Calcul Qr du site			$\text{m}^3/\text{s}/\text{km}^2$
	I	II	III		I	II	III	
2	0.94285733	0.965022941	0.973798592		197.11	201.74	203.58	0.19
5	1.259817607	1.249692423	1.20844185		263.37	261.25	252.63	0.25
10	1.467979345	1.421288056	1.347488069		306.89	297.12	281.70	0.29
20	1.666394679	1.57429655	1.469842192		348.37	329.11	307.28	0.33
25	1.729078487	1.620592048	1.506545305		361.47	338.79	314.95	0.35
50	1.921405782	1.756784105	1.613624547		401.68	367.26	337.33	0.38
100	2.111165831	1.882882392	1.711524787		441.35	393.62	357.80	0.42

Note: La rivière Bleue est située dans la zone I

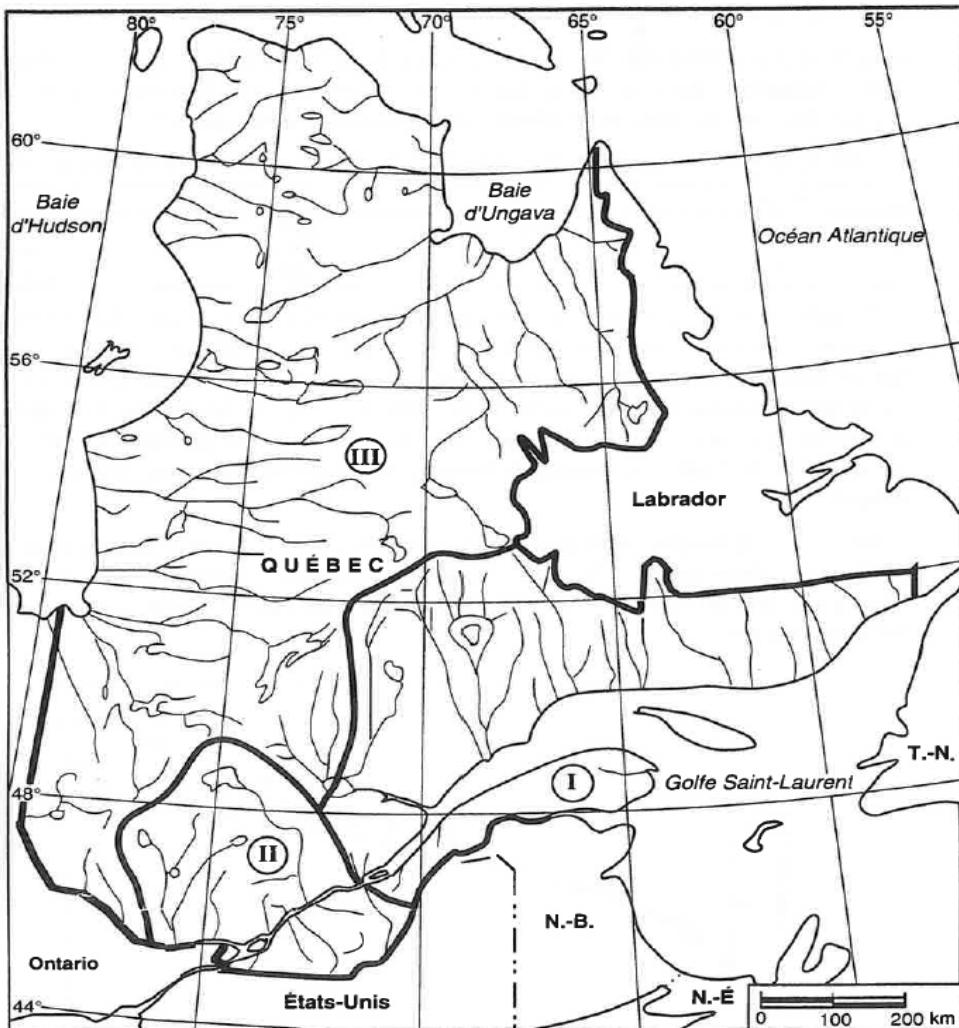


FIGURE 8.3 - Localisation des régions homogènes pour le Québec et des stations de jaugeages retenues et éliminées (Anctil et al., 1998)

APPENDIX 4

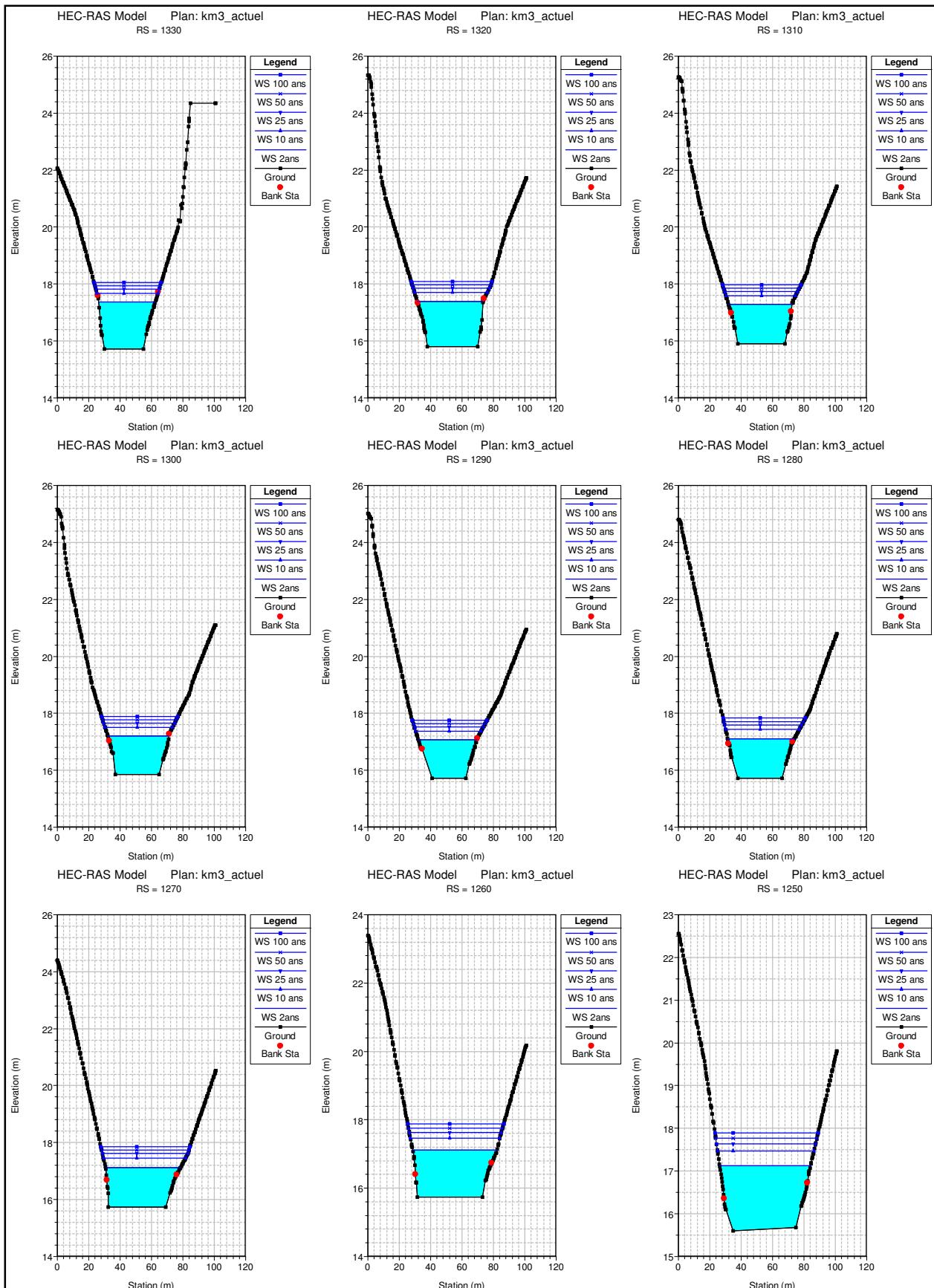
Hydraulic profiles

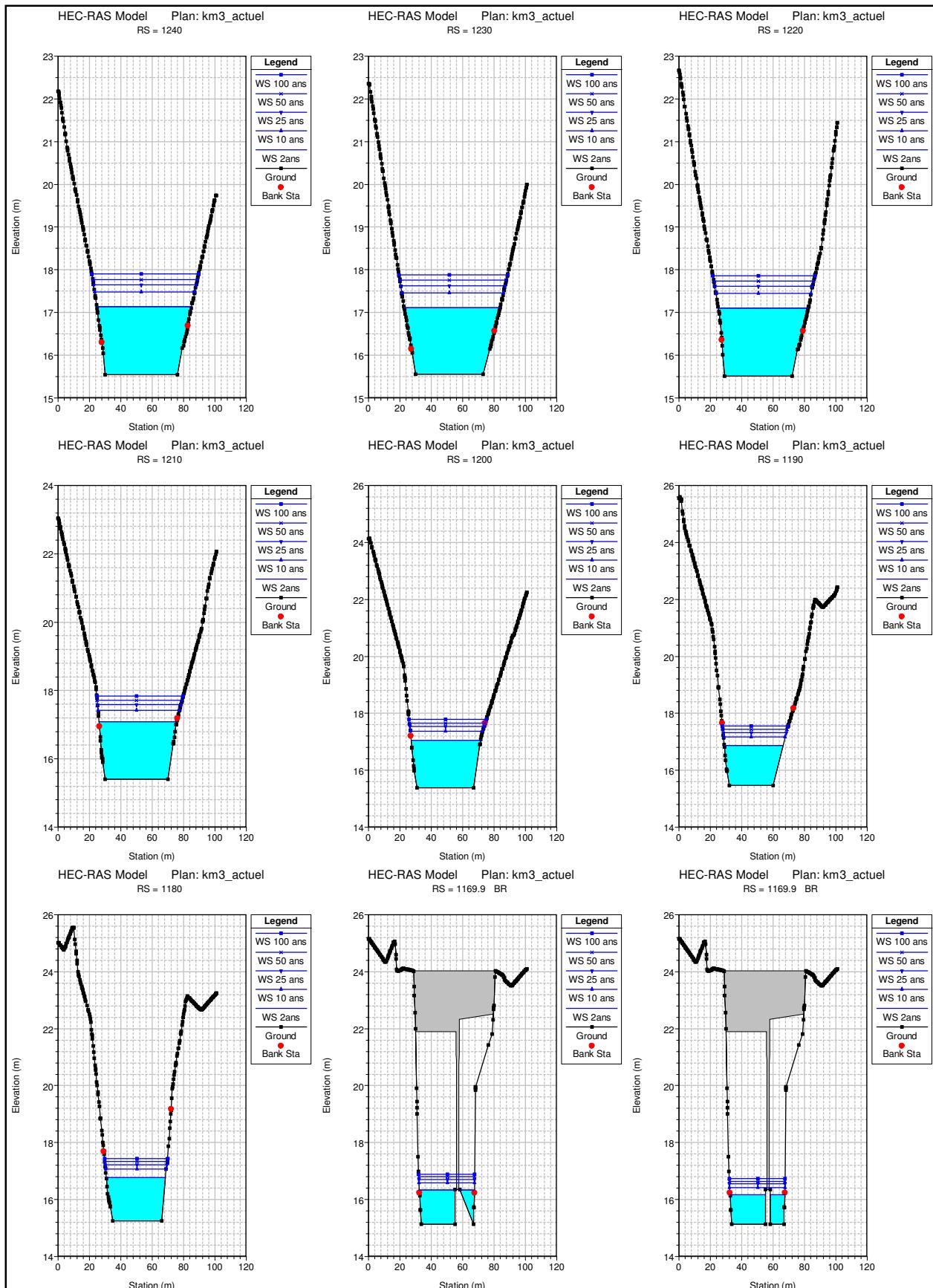
100 m

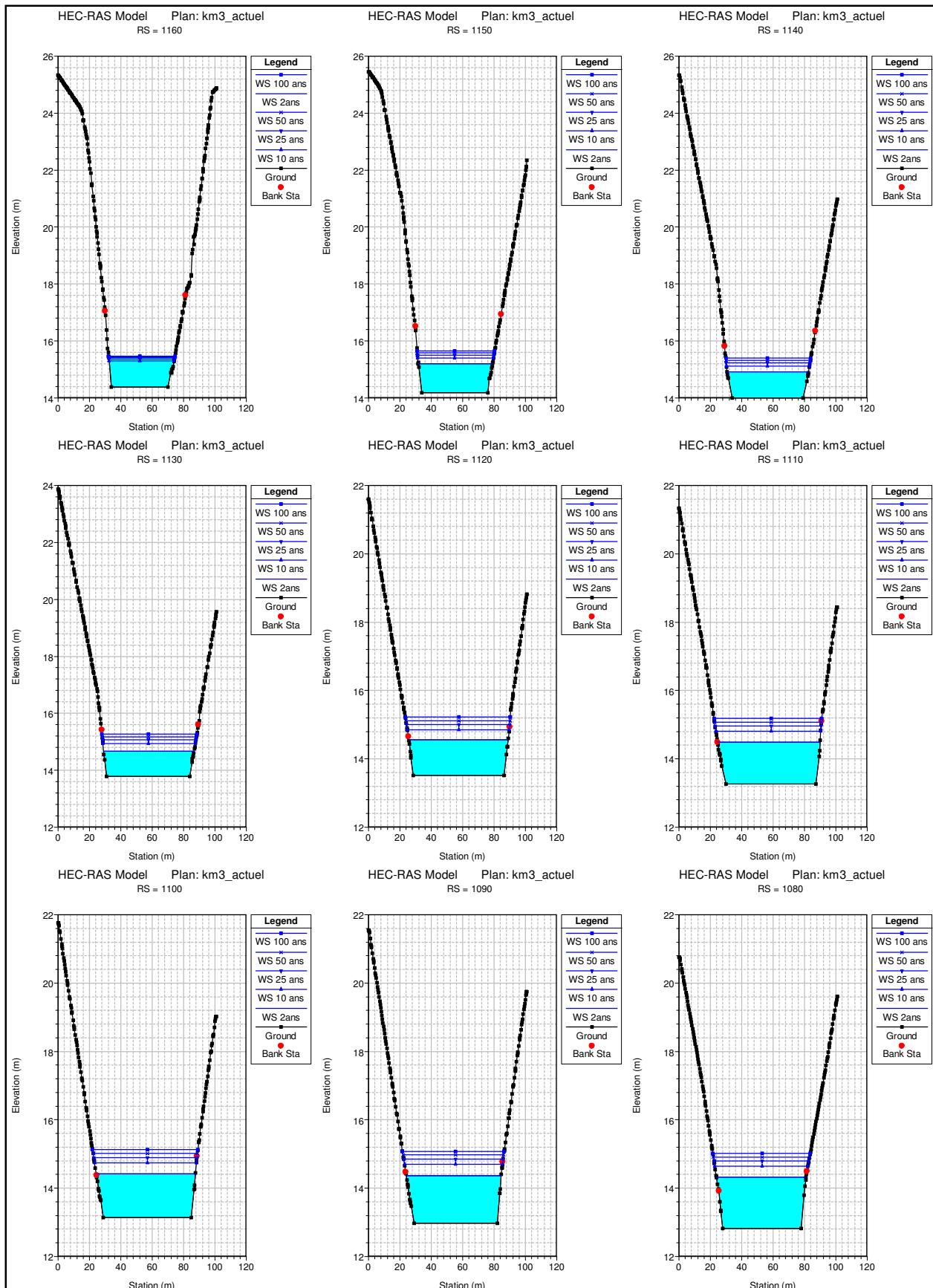


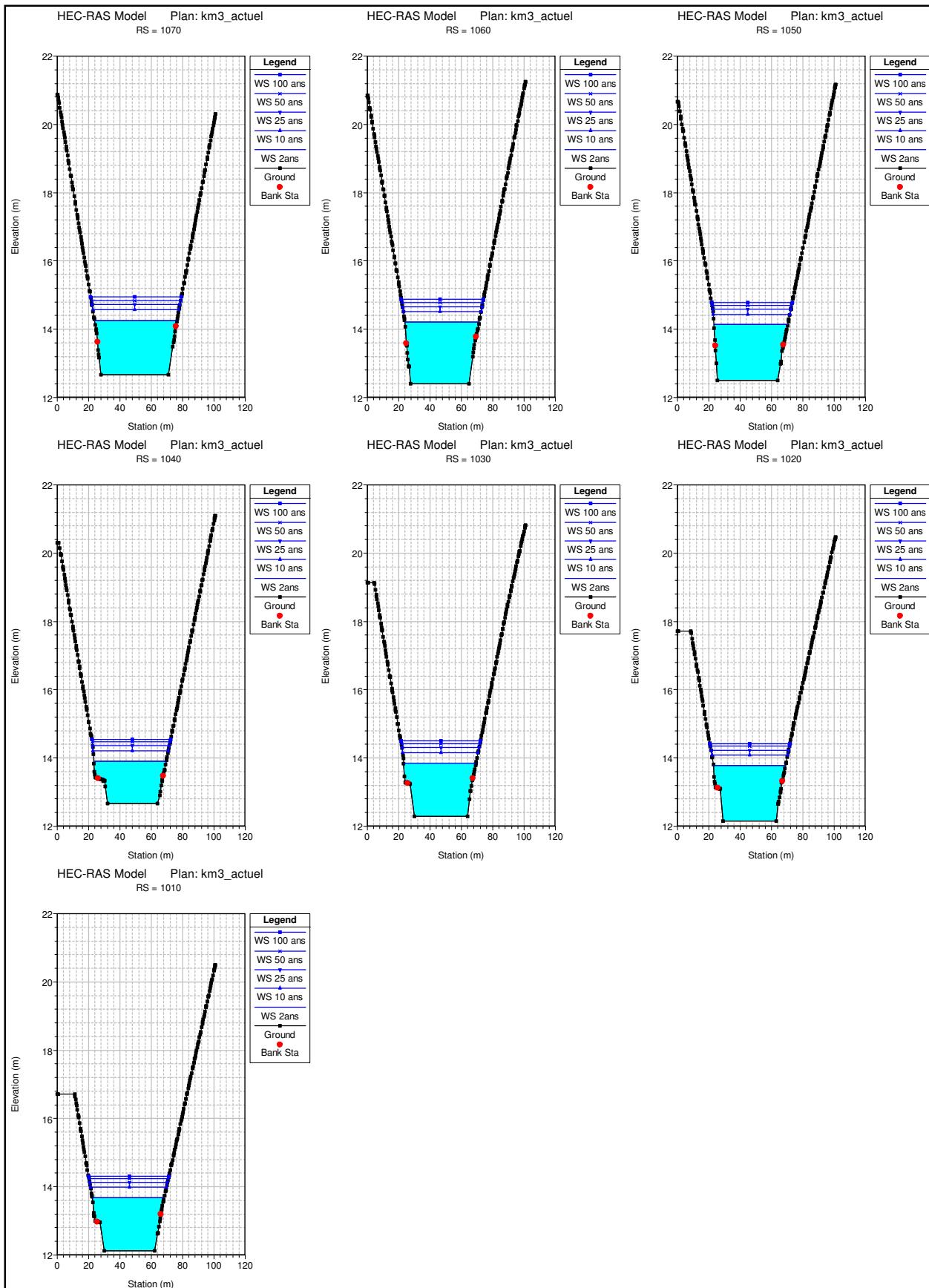
APPENDIX 5

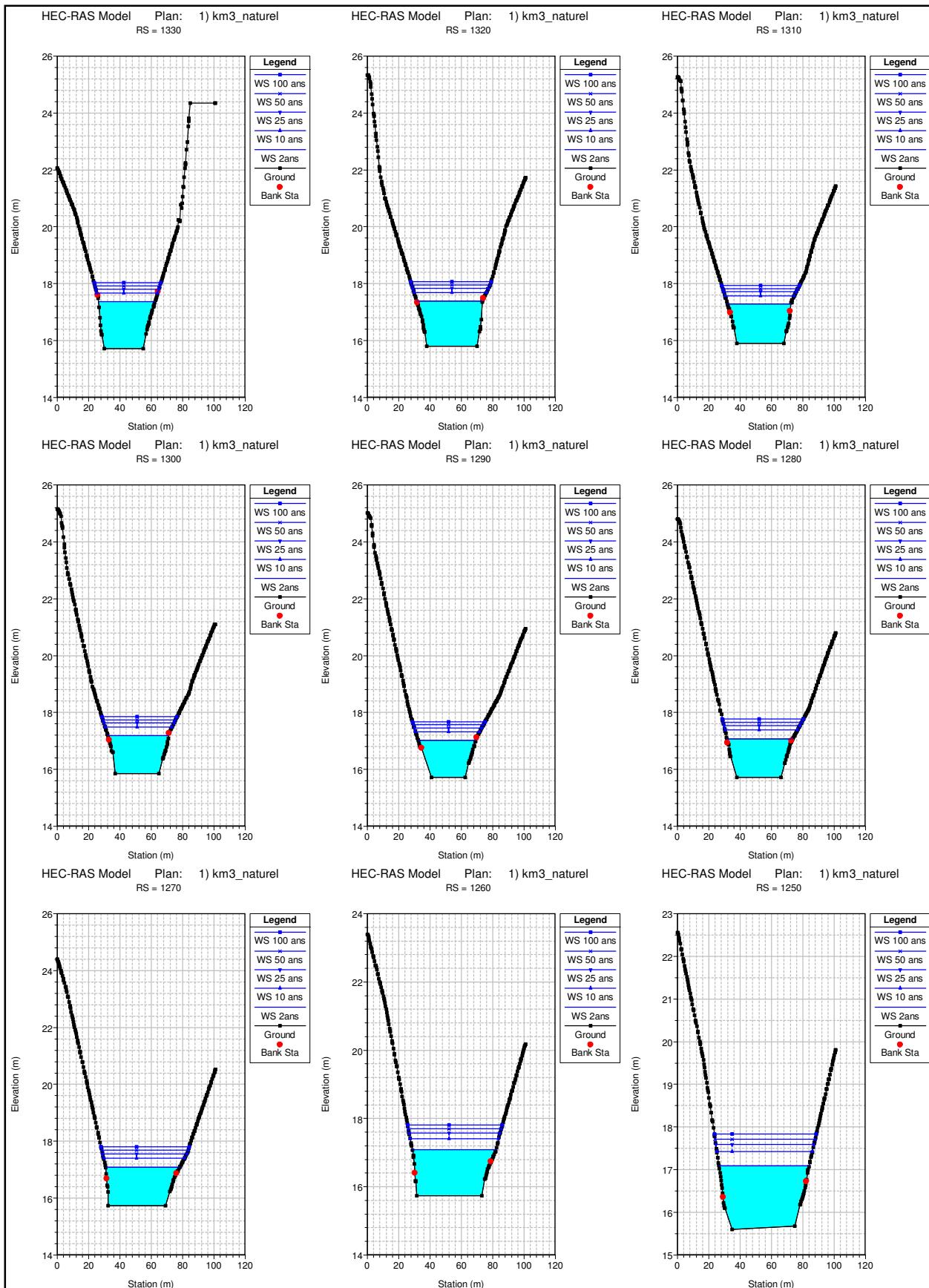
Cross-sections

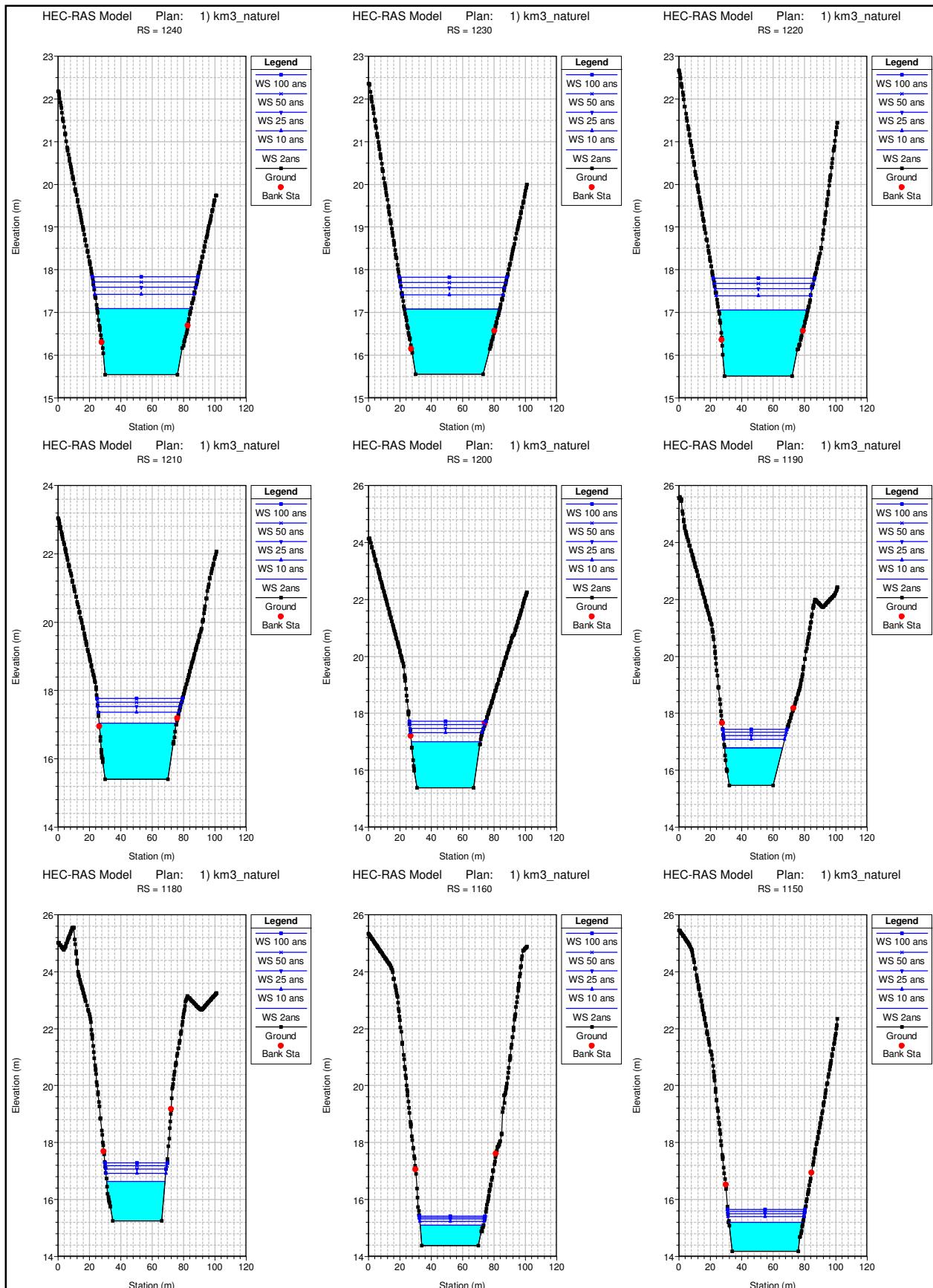


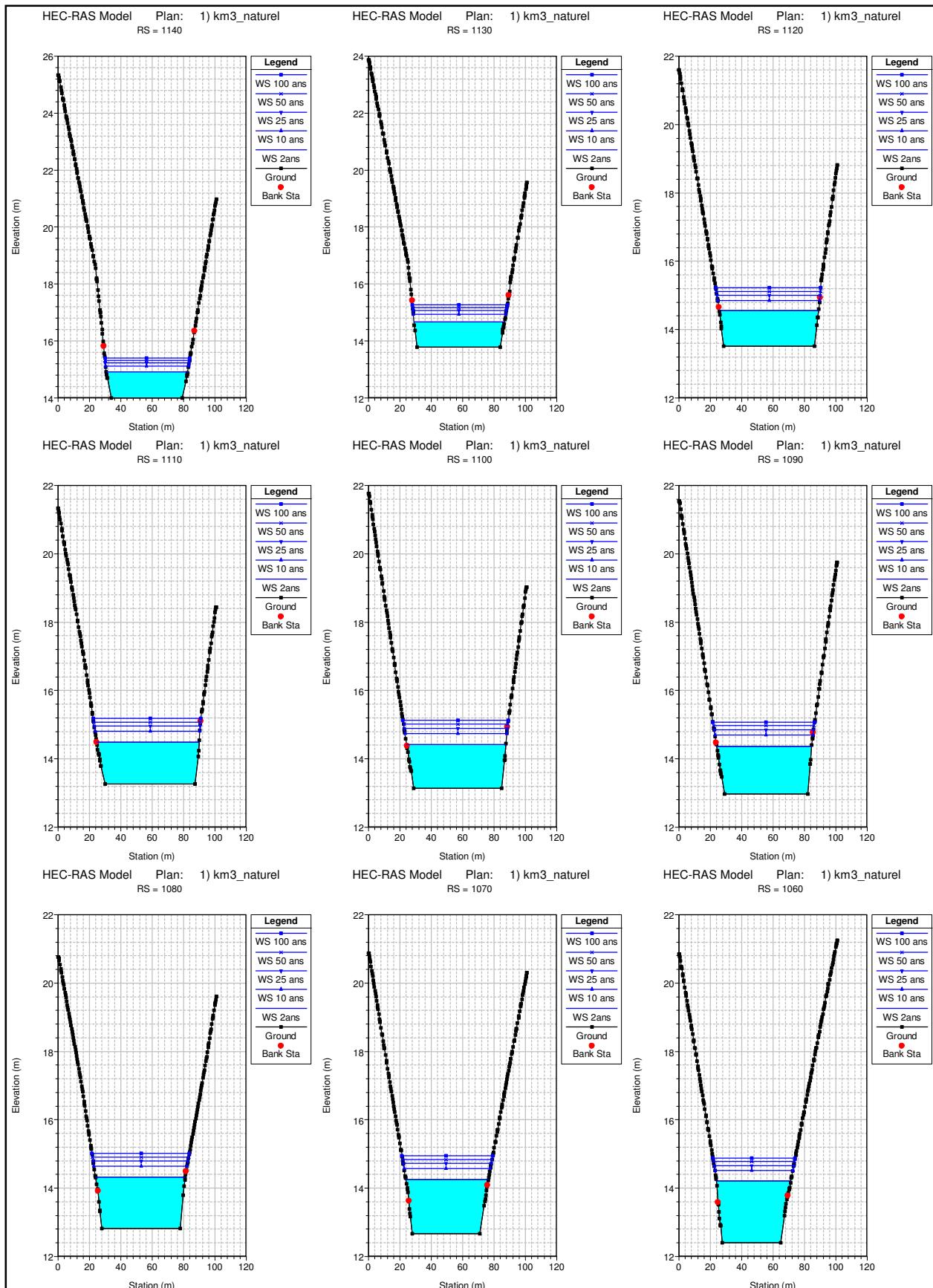


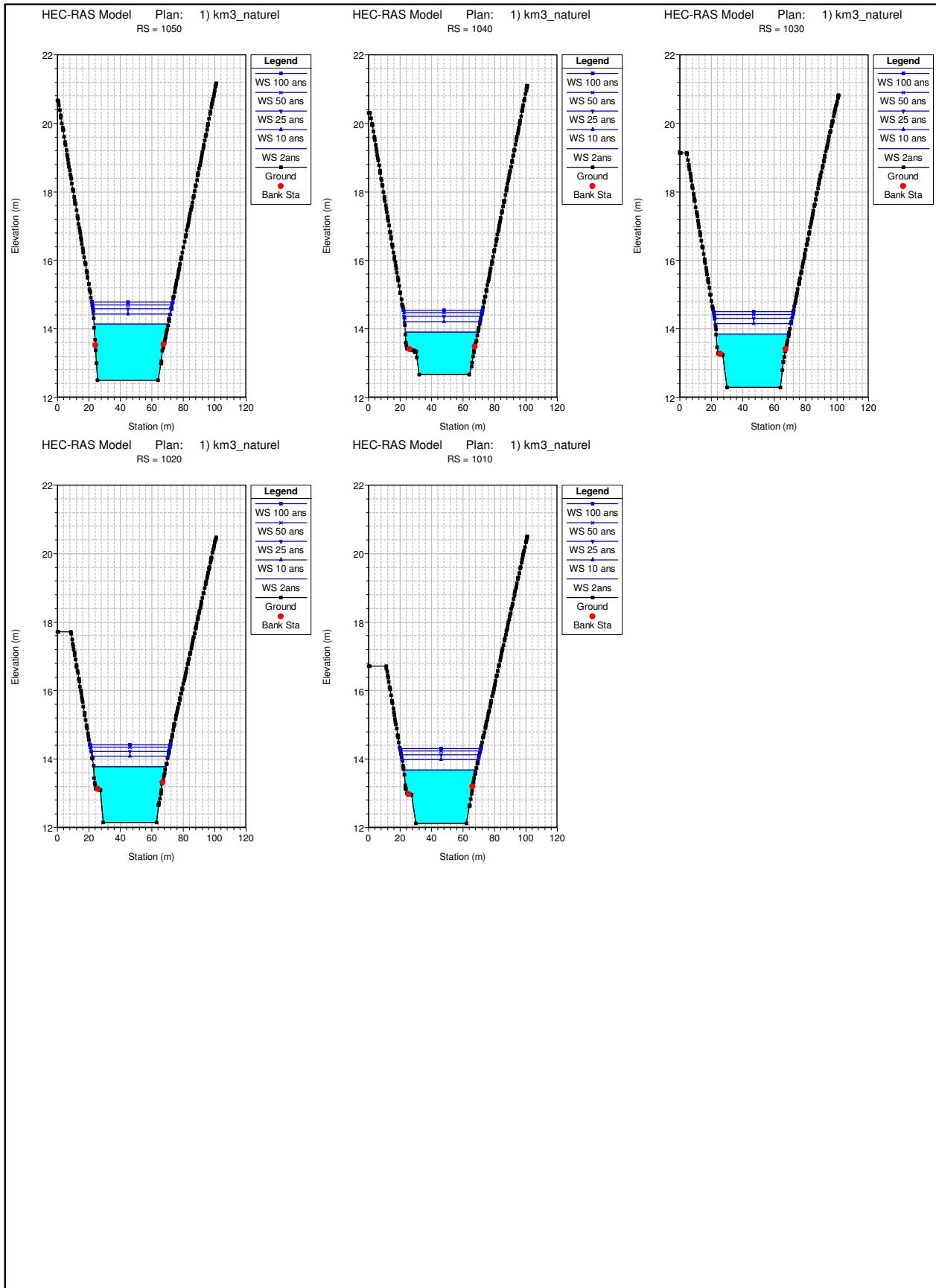












APPENDIX 6

Hydraulic Tables

HEC-RAS Plan: km3_actuel River: Maquatua Reach: KM3

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
KM3	1330	2ans	100.85	15.71	17.38	16.83	17.58	0.002631	1.99	50.76	36.09	0.53
KM3	1330	10 ans	140.18	15.71	17.68	17.09	17.94	0.002830	2.26	62.07	38.89	0.57
KM3	1330	25 ans	161.36	15.71	17.83	17.22	18.12	0.002813	2.38	67.99	40.45	0.57
KM3	1330	50 ans	178.50	15.71	17.94	17.31	18.25	0.002783	2.47	72.71	41.66	0.58
KM3	1330	100 ans	195.64	15.71	18.05	17.41	18.39	0.002756	2.55	77.39	42.81	0.58
KM3	1320	2ans	100.85	15.80	17.39		17.54	0.001966	1.72	58.62	41.98	0.46
KM3	1320	10 ans	140.18	15.80	17.70		17.90	0.001962	1.95	72.46	46.39	0.48
KM3	1320	25 ans	161.36	15.80	17.86		18.07	0.001938	2.05	79.80	48.64	0.48
KM3	1320	50 ans	178.50	15.80	17.98		18.21	0.001920	2.13	85.72	50.40	0.48
KM3	1320	100 ans	195.64	15.80	18.09		18.34	0.001901	2.20	91.60	51.62	0.49
KM3	1310	2ans	100.85	15.90	17.29		17.51	0.003203	2.07	49.09	40.43	0.58
KM3	1310	10 ans	140.18	15.90	17.59		17.86	0.003038	2.32	61.80	44.45	0.59
KM3	1310	25 ans	161.36	15.90	17.74		18.04	0.002963	2.43	68.58	46.62	0.59
KM3	1310	50 ans	178.50	15.90	17.86		18.17	0.002907	2.51	74.06	48.31	0.59
KM3	1310	100 ans	195.64	15.90	17.97		18.31	0.002853	2.59	79.54	49.93	0.59
KM3	1300	2ans	100.85	15.86	17.21		17.47	0.004271	2.26	44.74	38.98	0.67
KM3	1300	10 ans	140.18	15.86	17.51		17.83	0.003833	2.49	57.13	43.02	0.65
KM3	1300	25 ans	161.36	15.86	17.66		18.00	0.003658	2.59	63.76	45.22	0.65
KM3	1300	50 ans	178.50	15.86	17.78		18.14	0.003538	2.67	69.12	46.92	0.65
KM3	1300	100 ans	195.64	15.86	17.89		18.27	0.003431	2.74	74.49	48.57	0.64
KM3	1290	2ans	100.85	15.72	17.06		17.41	0.006078	2.60	39.15	37.20	0.79
KM3	1290	10 ans	140.18	15.72	17.37		17.77	0.005220	2.82	51.13	41.62	0.76
KM3	1290	25 ans	161.36	15.72	17.52		17.95	0.004894	2.92	57.57	43.97	0.75
KM3	1290	50 ans	178.50	15.72	17.64		18.09	0.004677	3.00	62.80	45.78	0.74
KM3	1290	100 ans	195.64	15.72	17.75		18.22	0.004487	3.07	68.07	47.54	0.73
KM3	1280	2ans	100.85	15.71	17.11		17.33	0.003477	2.06	48.96	42.57	0.60
KM3	1280	10 ans	140.18	15.71	17.43		17.69	0.003000	2.25	63.46	47.10	0.58
KM3	1280	25 ans	161.36	15.71	17.59		17.87	0.002838	2.34	71.09	49.14	0.58
KM3	1280	50 ans	178.50	15.71	17.71		18.01	0.002733	2.40	77.20	50.99	0.57
KM3	1280	100 ans	195.64	15.71	17.83		18.14	0.002642	2.47	83.30	52.56	0.57
KM3	1270	2ans	100.85	15.73	17.12		17.28	0.002344	1.77	57.42	47.79	0.50
KM3	1270	10 ans	140.18	15.73	17.45		17.64	0.002078	1.94	74.10	52.38	0.49
KM3	1270	25 ans	161.36	15.73	17.62		17.82	0.001987	2.03	82.79	54.48	0.49
KM3	1270	50 ans	178.50	15.73	17.74		17.96	0.001926	2.09	89.69	55.69	0.48
KM3	1270	100 ans	195.64	15.73	17.86		18.09	0.001874	2.15	96.46	56.77	0.48
KM3	1260	2ans	100.85	15.73	17.12		17.25	0.001814	1.58	64.69	53.86	0.44
KM3	1260	10 ans	140.18	15.73	17.46		17.61	0.001603	1.74	83.53	56.86	0.43
KM3	1260	25 ans	161.36	15.73	17.63		17.79	0.001535	1.81	93.08	58.59	0.43
KM3	1260	50 ans	178.50	15.73	17.75		17.93	0.001491	1.87	100.60	59.88	0.43
KM3	1260	100 ans	195.64	15.73	17.88		18.06	0.001453	1.92	107.99	61.13	0.43
KM3	1250	2ans	100.85	15.60	17.13		17.22	0.001251	1.37	74.72	57.86	0.37
KM3	1250	10 ans	140.18	15.60	17.47		17.59	0.001142	1.52	95.24	61.38	0.37
KM3	1250	25 ans	161.36	15.60	17.64		17.77	0.001106	1.59	105.65	63.09	0.37
KM3	1250	50 ans	178.50	15.60	17.77		17.90	0.001082	1.64	113.84	64.40	0.37
KM3	1250	100 ans	195.64	15.60	17.89		18.04	0.001062	1.69	121.87	65.67	0.37
KM3	1240	2ans	100.85	15.54	17.13		17.21	0.000897	1.22	83.97	60.37	0.32
KM3	1240	10 ans	140.18	15.54	17.48		17.57	0.000859	1.37	105.46	63.79	0.32
KM3	1240	25 ans	161.36	15.54	17.65		17.75	0.000847	1.45	116.31	65.44	0.33
KM3	1240	50 ans	178.50	15.54	17.77		17.89	0.000839	1.50	124.84	66.73	0.33
KM3	1240	100 ans	195.64	15.54	17.90		18.02	0.000832	1.55	133.19	67.99	0.33
KM3	1230	2ans	100.85	15.55	17.12		17.20	0.001001	1.28	81.31	61.15	0.34
KM3	1230	10 ans	140.18	15.55	17.46		17.56	0.000945	1.43	103.12	64.84	0.34
KM3	1230	25 ans	161.36	15.55	17.63		17.74	0.000926	1.50	114.16	66.52	0.34
KM3	1230	50 ans	178.50	15.55	17.76		17.88	0.000914	1.56	122.83	67.97	0.34
KM3	1230	100 ans	195.64	15.55	17.88		18.01	0.000903	1.61	131.34	69.23	0.34
KM3	1220	2ans	100.85	15.51	17.10		17.19	0.001002	1.29	79.32	57.34	0.34
KM3	1220	10 ans	140.18	15.51	17.45		17.55	0.000966	1.46	99.61	60.70	0.34
KM3	1220	25 ans	161.36	15.51	17.61		17.73	0.000953	1.53	109.87	62.18	0.34
KM3	1220	50 ans	178.50	15.51	17.74		17.87	0.000945	1.59	117.95	63.76	0.35
KM3	1220	100 ans	195.64	15.51	17.86		18.00	0.000938	1.64	125.88	65.07	0.35
KM3	1210	2ans	100.85	15.41	17.09		17.18	0.001057	1.34	75.38	49.48	0.35
KM3	1210	10 ans	140.18	15.41	17.42		17.54	0.001056	1.52	92.52	51.91	0.36
KM3	1210	25 ans	161.36	15.41	17.59		17.72	0.001054	1.61	101.16	53.16	0.36
KM3	1210	50 ans	178.50	15.41	17.71		17.86	0.001052	1.67	107.91	54.11	0.36
KM3	1210	100 ans	195.64	15.41	17.84		17.99	0.001051	1.73	114.51	55.02	0.37

HEC-RAS Plan: km3_actuel River: Maquatua Reach: KM3 (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
KM3	1200	2ans	100.85	15.38	17.05		17.16	0.001356	1.50	67.06	44.21	0.39
KM3	1200	10 ans	140.18	15.38	17.38		17.53	0.001415	1.71	81.95	46.20	0.41
KM3	1200	25 ans	161.36	15.38	17.54		17.71	0.001439	1.81	89.49	47.41	0.42
KM3	1200	50 ans	178.50	15.38	17.66		17.84	0.001451	1.87	95.41	48.32	0.42
KM3	1200	100 ans	195.64	15.38	17.78		17.97	0.001438	1.94	101.21	49.23	0.42
KM3	1190	2ans	100.85	15.47	16.88		17.12	0.017936	2.18	46.21	37.47	0.63
KM3	1190	10 ans	140.18	15.47	17.18		17.48	0.017545	2.42	57.87	39.37	0.64
KM3	1190	25 ans	161.36	15.47	17.33		17.65	0.017312	2.53	63.85	40.32	0.64
KM3	1190	50 ans	178.50	15.47	17.44		17.79	0.017130	2.60	68.57	41.05	0.64
KM3	1190	100 ans	195.64	15.47	17.56		17.92	0.016982	2.67	73.26	41.92	0.65
KM3	1180	2ans	100.85	15.26	16.77	16.25	16.96	0.011964	1.92	52.43	37.62	0.52
KM3	1180	10 ans	140.18	15.26	17.07	16.48	17.32	0.012426	2.19	63.95	38.66	0.54
KM3	1180	25 ans	161.36	15.26	17.22	16.60	17.49	0.012656	2.31	69.75	39.39	0.56
KM3	1180	50 ans	178.50	15.26	17.33	16.69	17.63	0.012782	2.40	74.30	39.92	0.56
KM3	1180	100 ans	195.64	15.26	17.45	16.77	17.76	0.012792	2.48	78.81	40.28	0.57
KM3	1169.9	Bridge										
KM3	1160	2ans	100.85	14.38	15.45		15.75	0.030013	2.43	41.48	42.02	0.78
KM3	1160	10 ans	140.18	14.38	15.30	15.50	16.10	0.095580	3.95	35.45	41.33	1.36
KM3	1160	25 ans	161.36	14.38	15.37	15.61	16.28	0.100555	4.23	38.11	41.64	1.41
KM3	1160	50 ans	178.50	14.38	15.42	15.69	16.42	0.103466	4.44	40.25	41.88	1.44
KM3	1160	100 ans	195.64	14.38	15.47	15.77	16.56	0.106477	4.63	42.30	42.22	1.48
KM3	1150	2ans	100.85	14.18	15.21		15.46	0.025191	2.21	45.69	47.14	0.72
KM3	1150	10 ans	140.18	14.18	15.40	15.20	15.73	0.027086	2.54	55.11	48.43	0.76
KM3	1150	25 ans	161.36	14.18	15.50	15.30	15.87	0.027645	2.70	59.84	48.89	0.78
KM3	1150	50 ans	178.50	14.18	15.58	15.38	15.98	0.027939	2.81	63.56	49.21	0.79
KM3	1150	100 ans	195.64	14.18	15.65	15.45	16.08	0.028181	2.91	67.17	49.52	0.80
KM3	1140	2ans	100.85	14.00	14.92		15.18	0.030546	2.25	44.79	52.06	0.78
KM3	1140	10 ans	140.18	14.00	15.12		15.45	0.029942	2.53	55.32	52.95	0.79
KM3	1140	25 ans	161.36	14.00	15.23		15.59	0.029082	2.65	60.95	53.40	0.79
KM3	1140	50 ans	178.50	14.00	15.31		15.69	0.028137	2.72	65.61	53.78	0.79
KM3	1140	100 ans	195.64	14.00	15.40		15.80	0.027377	2.79	70.10	54.14	0.78
KM3	1130	2ans	100.85	13.78	14.67		14.89	0.025415	2.04	49.35	57.67	0.71
KM3	1130	10 ans	140.18	13.78	14.93		15.18	0.020754	2.17	64.47	58.86	0.66
KM3	1130	25 ans	161.36	13.78	15.07		15.32	0.018937	2.23	72.43	59.47	0.64
KM3	1130	50 ans	178.50	13.78	15.18		15.44	0.017735	2.27	78.78	60.01	0.63
KM3	1130	100 ans	195.64	13.78	15.27		15.55	0.016949	2.31	84.67	60.49	0.62
KM3	1120	2ans	100.85	13.52	14.56		14.69	0.012560	1.59	63.29	63.33	0.51
KM3	1120	10 ans	140.18	13.52	14.86		15.00	0.010334	1.70	82.38	65.09	0.48
KM3	1120	25 ans	161.36	13.52	15.01		15.16	0.009524	1.76	92.08	65.87	0.47
KM3	1120	50 ans	178.50	13.52	15.12		15.28	0.008984	1.80	99.69	66.45	0.46
KM3	1120	100 ans	195.64	13.52	15.22		15.40	0.008671	1.84	106.62	66.97	0.46
KM3	1110	2ans	100.85	13.27	14.49		14.58	0.007304	1.34	75.40	65.35	0.40
KM3	1110	10 ans	140.18	13.27	14.80		14.91	0.006409	1.46	95.97	66.75	0.39
KM3	1110	25 ans	161.36	13.27	14.96		15.08	0.006110	1.52	106.24	67.46	0.38
KM3	1110	50 ans	178.50	13.27	15.08		15.20	0.005923	1.57	114.27	68.11	0.38
KM3	1110	100 ans	195.64	13.27	15.18		15.31	0.005829	1.62	121.52	68.75	0.38
KM3	1100	2ans	100.85	13.14	14.43		14.51	0.006622	1.32	76.64	63.25	0.38
KM3	1100	10 ans	140.18	13.14	14.74		14.85	0.005936	1.45	97.06	64.86	0.37
KM3	1100	25 ans	161.36	13.14	14.90		15.02	0.005714	1.51	107.20	65.65	0.37
KM3	1100	50 ans	178.50	13.14	15.02		15.14	0.005553	1.56	115.12	66.40	0.37
KM3	1100	100 ans	195.64	13.14	15.13		15.26	0.005492	1.61	122.23	67.06	0.37
KM3	1090	2ans	100.85	12.97	14.37		14.45	0.005522	1.27	79.61	60.48	0.35
KM3	1090	10 ans	140.18	12.97	14.69		14.79	0.005246	1.41	99.44	62.45	0.36
KM3	1090	25 ans	161.36	12.97	14.85		14.96	0.005119	1.48	109.30	63.44	0.36
KM3	1090	50 ans	178.50	12.97	14.97		15.09	0.005014	1.53	117.02	64.20	0.36
KM3	1090	100 ans	195.64	12.97	15.08		15.20	0.005007	1.59	123.89	64.88	0.36
KM3	1080	2ans	100.85	12.83	14.32		14.40	0.005035	1.27	79.47	57.18	0.34
KM3	1080	10 ans	140.18	12.83	14.64		14.74	0.004948	1.44	98.17	59.35	0.35
KM3	1080	25 ans	161.36	12.83	14.79		14.91	0.004896	1.51	107.52	60.49	0.35
KM3	1080	50 ans	178.50	12.83	14.91		15.04	0.004856	1.57	114.86	61.36	0.35
KM3	1080	100 ans	195.64	12.83	15.02		15.15	0.004904	1.63	121.34	62.13	0.36
KM3	1070	2ans	100.85	12.67	14.25		14.35	0.005231	1.34	75.46	52.59	0.35
KM3	1070	10 ans	140.18	12.67	14.57		14.69	0.005285	1.53	92.45	54.99	0.36

HEC-RAS Plan: km3_actuel River: Maquatua Reach: KM3 (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
KM3	1070	25 ans	161.36	12.67	14.72		14.86	0.005305	1.62	100.98	56.17	0.37
KM3	1070	50 ans	178.50	12.67	14.84		14.99	0.005309	1.69	107.70	57.08	0.37
KM3	1070	100 ans	195.64	12.67	14.94		15.10	0.005411	1.76	113.56	57.85	0.38
KM3	1060	2ans	100.85	12.41	14.21		14.30	0.004414	1.34	75.85	47.39	0.33
KM3	1060	10 ans	140.18	12.41	14.51		14.64	0.004846	1.57	90.74	49.65	0.35
KM3	1060	25 ans	161.36	12.41	14.66		14.80	0.005021	1.67	98.22	50.79	0.36
KM3	1060	50 ans	178.50	12.41	14.78		14.93	0.005134	1.75	104.13	51.68	0.37
KM3	1060	100 ans	195.64	12.41	14.88		15.04	0.005332	1.84	109.19	52.43	0.38
KM3	1050	2ans	100.85	12.49	14.14		14.25	0.005728	1.46	69.95	47.13	0.37
KM3	1050	10 ans	140.18	12.49	14.44		14.58	0.006134	1.69	84.30	48.86	0.39
KM3	1050	25 ans	161.36	12.49	14.58		14.75	0.006297	1.80	91.47	49.83	0.40
KM3	1050	50 ans	178.50	12.49	14.69		14.87	0.006404	1.88	97.10	50.75	0.41
KM3	1050	100 ans	195.64	12.49	14.79		14.98	0.006639	1.97	101.85	51.48	0.42
KM3	1040	2ans	100.85	12.67	13.91		14.14	0.018923	2.12	48.43	46.40	0.64
KM3	1040	10 ans	140.18	12.67	14.21		14.48	0.016195	2.29	62.62	48.12	0.61
KM3	1040	25 ans	161.36	12.67	14.36		14.64	0.015337	2.38	69.67	48.97	0.61
KM3	1040	50 ans	178.50	12.67	14.47		14.77	0.014777	2.45	75.19	49.64	0.60
KM3	1040	100 ans	195.64	12.67	14.55		14.87	0.015047	2.55	79.27	50.14	0.61
KM3	1030	2ans	100.85	12.30	13.85		13.99	0.008524	1.67	61.32	46.19	0.44
KM3	1030	10 ans	140.18	12.30	14.16		14.34	0.008471	1.90	75.78	48.11	0.46
KM3	1030	25 ans	161.36	12.30	14.30		14.50	0.008475	2.00	82.95	49.09	0.46
KM3	1030	50 ans	178.50	12.30	14.42		14.63	0.008476	2.08	88.57	49.99	0.47
KM3	1030	100 ans	195.64	12.30	14.50		14.73	0.008890	2.19	92.59	50.67	0.48
KM3	1020	2ans	100.85	12.16	13.78		13.91	0.007405	1.60	63.91	46.00	0.42
KM3	1020	10 ans	140.18	12.16	14.08		14.25	0.007577	1.84	78.33	48.30	0.44
KM3	1020	25 ans	161.36	12.16	14.23		14.42	0.007659	1.94	85.52	49.45	0.44
KM3	1020	50 ans	178.50	12.16	14.34		14.55	0.007710	2.03	91.18	50.52	0.45
KM3	1020	100 ans	195.64	12.16	14.42		14.65	0.008174	2.14	95.01	51.16	0.47
KM3	1010	2ans	100.85	12.12	13.68	13.09	13.83	0.008683	1.69	60.71	45.95	0.45
KM3	1010	10 ans	140.18	12.12	13.99	13.31	14.17	0.008677	1.92	75.05	48.46	0.46
KM3	1010	25 ans	161.36	12.12	14.13	13.41	14.34	0.008690	2.03	82.22	49.69	0.47
KM3	1010	50 ans	178.50	12.12	14.24	13.49	14.46	0.008685	2.11	87.89	50.75	0.48
KM3	1010	100 ans	195.64	12.12	14.31	13.57	14.56	0.009310	2.23	91.26	51.38	0.49

HEC-RAS Plan: km3_naturel River: Maquatua Reach: KM3

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
KM3	1330	2ans	100.85	15.71	17.37	16.83	17.57	0.002662	1.99	50.56	36.04	0.54
KM3	1330	10 ans	140.18	15.71	17.67	17.09	17.93	0.002899	2.28	61.57	38.75	0.57
KM3	1330	25 ans	161.36	15.71	17.81	17.22	18.11	0.002904	2.40	67.32	40.27	0.58
KM3	1330	50 ans	178.50	15.71	17.92	17.32	18.24	0.002883	2.50	71.90	41.45	0.59
KM3	1330	100 ans	195.64	15.71	18.03	17.41	18.37	0.002867	2.58	76.41	42.57	0.59
KM3	1320	2ans	100.85	15.80	17.38		17.54	0.001993	1.73	58.38	41.95	0.47
KM3	1320	10 ans	140.18	15.80	17.69		17.89	0.002012	1.96	71.87	46.20	0.48
KM3	1320	25 ans	161.36	15.80	17.84		18.06	0.001997	2.07	79.02	48.41	0.49
KM3	1320	50 ans	178.50	15.80	17.96		18.19	0.001984	2.15	84.77	50.20	0.49
KM3	1320	100 ans	195.64	15.80	18.07		18.32	0.001972	2.23	90.45	51.39	0.49
KM3	1310	2ans	100.85	15.90	17.28		17.50	0.003268	2.08	48.78	40.37	0.59
KM3	1310	10 ans	140.18	15.90	17.57		17.85	0.003151	2.34	61.05	44.20	0.60
KM3	1310	25 ans	161.36	15.90	17.72		18.03	0.003093	2.46	67.57	46.30	0.60
KM3	1310	50 ans	178.50	15.90	17.83		18.16	0.003047	2.55	72.84	47.94	0.60
KM3	1310	100 ans	195.64	15.90	17.94		18.29	0.003007	2.63	78.07	49.50	0.61
KM3	1300	2ans	100.85	15.86	17.20		17.46	0.004407	2.28	44.30	38.90	0.67
KM3	1300	10 ans	140.18	15.86	17.49		17.81	0.004042	2.53	56.14	42.69	0.67
KM3	1300	25 ans	161.36	15.86	17.63		17.99	0.003887	2.64	62.46	44.80	0.67
KM3	1300	50 ans	178.50	15.86	17.74		18.12	0.003776	2.72	67.58	46.44	0.67
KM3	1300	100 ans	195.64	15.86	17.85		18.25	0.003684	2.80	72.65	48.01	0.66
KM3	1290	2ans	100.85	15.72	17.02		17.40	0.006809	2.70	37.69	36.78	0.83
KM3	1290	10 ans	140.18	15.72	17.31	17.14	17.75	0.005989	2.94	48.82	40.77	0.81
KM3	1290	25 ans	161.36	15.72	17.46	17.26	17.93	0.005634	3.05	54.83	43.00	0.80
KM3	1290	50 ans	178.50	15.72	17.57	17.35	18.06	0.005385	3.13	59.75	44.73	0.79
KM3	1290	100 ans	195.64	15.72	17.68	17.44	18.19	0.005190	3.21	64.60	46.39	0.78
KM3	1280	2ans	100.85	15.71	17.07		17.30	0.003854	2.13	47.43	42.00	0.63
KM3	1280	10 ans	140.18	15.71	17.38		17.66	0.003352	2.33	61.17	46.37	0.61
KM3	1280	25 ans	161.36	15.71	17.54		17.83	0.003176	2.42	68.43	48.44	0.61
KM3	1280	50 ans	178.50	15.71	17.65		17.97	0.003056	2.49	74.28	50.10	0.60
KM3	1280	100 ans	195.64	15.71	17.77		18.10	0.002964	2.55	80.01	51.74	0.60
KM3	1270	2ans	100.85	15.73	17.08		17.25	0.002580	1.82	55.70	47.30	0.52
KM3	1270	10 ans	140.18	15.73	17.41		17.61	0.002302	2.01	71.61	51.72	0.51
KM3	1270	25 ans	161.36	15.73	17.56		17.78	0.002203	2.09	79.93	53.84	0.51
KM3	1270	50 ans	178.50	15.73	17.68		17.92	0.002134	2.15	86.58	55.17	0.51
KM3	1270	100 ans	195.64	15.73	17.80		18.05	0.002081	2.22	93.02	56.23	0.51
KM3	1260	2ans	100.85	15.73	17.08		17.22	0.001998	1.63	62.70	53.48	0.46
KM3	1260	10 ans	140.18	15.73	17.41		17.58	0.001773	1.79	80.80	56.44	0.45
KM3	1260	25 ans	161.36	15.73	17.57		17.75	0.001698	1.87	89.99	58.05	0.45
KM3	1260	50 ans	178.50	15.73	17.70		17.88	0.001647	1.93	97.28	59.31	0.45
KM3	1260	100 ans	195.64	15.73	17.82		18.01	0.001603	1.98	104.45	60.54	0.45
KM3	1250	2ans	100.85	15.60	17.09		17.19	0.001370	1.41	72.59	57.49	0.39
KM3	1250	10 ans	140.18	15.60	17.43		17.55	0.001255	1.56	92.33	60.89	0.38
KM3	1250	25 ans	161.36	15.60	17.59		17.72	0.001216	1.63	102.38	62.55	0.38
KM3	1250	50 ans	178.50	15.60	17.71		17.86	0.001188	1.69	110.32	63.84	0.38
KM3	1250	100 ans	195.64	15.60	17.84		17.99	0.001165	1.74	118.13	65.09	0.38
KM3	1240	2ans	100.85	15.54	17.09		17.17	0.000975	1.25	81.76	60.00	0.33
KM3	1240	10 ans	140.18	15.54	17.43		17.53	0.000939	1.41	102.44	63.32	0.34
KM3	1240	25 ans	161.36	15.54	17.59		17.71	0.000926	1.49	112.93	64.93	0.34
KM3	1240	50 ans	178.50	15.54	17.72		17.84	0.000916	1.54	121.22	66.19	0.34
KM3	1240	100 ans	195.64	15.54	17.84		17.97	0.000907	1.59	129.35	67.40	0.34
KM3	1230	2ans	100.85	15.55	17.08		17.16	0.001094	1.32	78.97	60.73	0.35
KM3	1230	10 ans	140.18	15.55	17.41		17.52	0.001037	1.47	99.96	64.37	0.35
KM3	1230	25 ans	161.36	15.55	17.58		17.70	0.001017	1.55	110.62	65.94	0.35
KM3	1230	50 ans	178.50	15.55	17.70		17.83	0.001002	1.60	119.04	67.30	0.36
KM3	1230	100 ans	195.64	15.55	17.82		17.96	0.000989	1.65	127.32	68.64	0.36
KM3	1220	2ans	100.85	15.51	17.06		17.15	0.001099	1.33	76.99	56.89	0.35
KM3	1220	10 ans	140.18	15.51	17.40		17.51	0.001061	1.50	96.57	60.28	0.36
KM3	1220	25 ans	161.36	15.51	17.56		17.68	0.001047	1.58	106.48	61.67	0.36
KM3	1220	50 ans	178.50	15.51	17.68		17.82	0.001037	1.64	114.30	63.25	0.36
KM3	1220	100 ans	195.64	15.51	17.80		17.95	0.001027	1.69	122.02	64.37	0.36
KM3	1210	2ans	100.85	15.41	17.04		17.14	0.001156	1.38	73.29	49.28	0.36
KM3	1210	10 ans	140.18	15.41	17.37		17.50	0.001161	1.56	89.83	51.52	0.37
KM3	1210	25 ans	161.36	15.41	17.53		17.67	0.001159	1.65	98.16	52.73	0.38
KM3	1210	50 ans	178.50	15.41	17.66		17.81	0.001156	1.72	104.72	53.66	0.38
KM3	1210	100 ans	195.64	15.41	17.77		17.94	0.001154	1.78	111.13	54.55	0.38

HEC-RAS Plan: km3_naturel River: Maquatua Reach: KM3 (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
KM3	1200	2ans	100.85	15.38	17.00		17.12	0.001491	1.55	65.05	44.02	0.41
KM3	1200	10 ans	140.18	15.38	17.32		17.48	0.001559	1.77	79.36	45.77	0.43
KM3	1200	25 ans	161.36	15.38	17.48		17.65	0.001588	1.86	86.59	46.95	0.44
KM3	1200	50 ans	178.50	15.38	17.60		17.79	0.001606	1.94	92.30	47.85	0.44
KM3	1200	100 ans	195.64	15.38	17.71		17.92	0.001601	2.00	97.92	48.73	0.45
KM3	1190	2ans	100.85	15.47	16.80		17.07	0.021961	2.33	43.24	36.94	0.69
KM3	1190	10 ans	140.18	15.47	17.08		17.42	0.021578	2.59	54.03	38.75	0.70
KM3	1190	25 ans	161.36	15.47	17.22		17.60	0.021306	2.71	59.58	39.65	0.71
KM3	1190	50 ans	178.50	15.47	17.33		17.73	0.021027	2.79	64.01	40.35	0.71
KM3	1190	100 ans	195.64	15.47	17.44		17.86	0.020680	2.86	68.45	41.04	0.71
KM3	1180	2ans	100.85	15.26	16.64		16.87	0.016048	2.11	47.77	37.22	0.60
KM3	1180	10 ans	140.18	15.26	16.93		17.22	0.016429	2.40	58.49	38.21	0.62
KM3	1180	25 ans	161.36	15.26	17.07		17.39	0.016482	2.52	63.93	38.66	0.63
KM3	1180	50 ans	178.50	15.26	17.18		17.53	0.016554	2.62	68.23	39.20	0.63
KM3	1180	100 ans	195.64	15.26	17.29		17.66	0.016508	2.70	72.56	39.73	0.64
KM3	1170	2ans	100.85	15.14	16.10	16.10	16.58	0.052056	3.07	32.90	34.82	1.01
KM3	1170	10 ans	140.18	15.14	16.34	16.34	16.93	0.048531	3.41	41.16	35.27	1.01
KM3	1170	25 ans	161.36	15.14	16.45	16.45	17.10	0.046943	3.57	45.25	35.35	1.00
KM3	1170	50 ans	178.50	15.14	16.54	16.54	17.24	0.045633	3.68	48.50	35.42	1.00
KM3	1170	100 ans	195.64	15.14	16.63	16.63	17.37	0.044941	3.80	51.50	35.48	1.00
KM3	1160	2ans	100.85	14.38	15.09	15.29	15.81	0.118798	3.74	26.97	40.33	1.46
KM3	1160	10 ans	140.18	14.38	15.24	15.50	16.16	0.120991	4.26	32.93	41.04	1.52
KM3	1160	25 ans	161.36	14.38	15.31	15.61	16.34	0.121932	4.50	35.87	41.38	1.54
KM3	1160	50 ans	178.50	14.38	15.37	15.69	16.48	0.122440	4.68	38.17	41.64	1.56
KM3	1160	100 ans	195.64	14.38	15.42	15.77	16.61	0.122609	4.84	40.42	41.90	1.57
KM3	1150	2ans	100.85	14.18	15.21	15.00	15.46	0.025191	2.21	45.69	47.14	0.72
KM3	1150	10 ans	140.18	14.18	15.40	15.20	15.73	0.027086	2.54	55.11	48.43	0.76
KM3	1150	25 ans	161.36	14.18	15.50	15.30	15.87	0.027645	2.70	59.84	48.89	0.78
KM3	1150	50 ans	178.50	14.18	15.58	15.38	15.98	0.027939	2.81	63.56	49.21	0.79
KM3	1150	100 ans	195.64	14.18	15.65	15.45	16.08	0.028181	2.91	67.17	49.52	0.80
KM3	1140	2ans	100.85	14.00	14.92		15.18	0.030546	2.25	44.79	52.06	0.78
KM3	1140	10 ans	140.18	14.00	15.12		15.45	0.029941	2.53	55.32	52.95	0.79
KM3	1140	25 ans	161.36	14.00	15.23		15.59	0.029082	2.65	60.95	53.40	0.79
KM3	1140	50 ans	178.50	14.00	15.31		15.69	0.028136	2.72	65.61	53.78	0.79
KM3	1140	100 ans	195.64	14.00	15.40		15.80	0.027376	2.79	70.10	54.14	0.78
KM3	1130	2ans	100.85	13.78	14.67		14.89	0.025415	2.04	49.35	57.67	0.71
KM3	1130	10 ans	140.18	13.78	14.93		15.18	0.020754	2.17	64.47	58.86	0.66
KM3	1130	25 ans	161.36	13.78	15.07		15.32	0.018937	2.23	72.43	59.47	0.64
KM3	1130	50 ans	178.50	13.78	15.18		15.44	0.017735	2.27	78.78	60.01	0.63
KM3	1130	100 ans	195.64	13.78	15.27		15.55	0.016949	2.31	84.67	60.49	0.62
KM3	1120	2ans	100.85	13.52	14.56		14.69	0.012560	1.59	63.29	63.33	0.51
KM3	1120	10 ans	140.18	13.52	14.86		15.00	0.010333	1.70	82.38	65.09	0.48
KM3	1120	25 ans	161.36	13.52	15.01		15.16	0.009523	1.76	92.08	65.87	0.47
KM3	1120	50 ans	178.50	13.52	15.12		15.28	0.008984	1.80	99.69	66.45	0.46
KM3	1120	100 ans	195.64	13.52	15.22		15.40	0.008671	1.84	106.62	66.97	0.46
KM3	1110	2ans	100.85	13.27	14.49		14.58	0.007304	1.34	75.40	65.35	0.40
KM3	1110	10 ans	140.18	13.27	14.80		14.91	0.006409	1.46	95.97	66.75	0.39
KM3	1110	25 ans	161.36	13.27	14.96		15.08	0.006110	1.52	106.24	67.46	0.38
KM3	1110	50 ans	178.50	13.27	15.08		15.20	0.005923	1.57	114.27	68.11	0.38
KM3	1110	100 ans	195.64	13.27	15.18		15.31	0.005829	1.62	121.52	68.75	0.38
KM3	1100	2ans	100.85	13.14	14.43		14.51	0.006622	1.32	76.64	63.25	0.38
KM3	1100	10 ans	140.18	13.14	14.74		14.85	0.005936	1.45	97.07	64.86	0.37
KM3	1100	25 ans	161.36	13.14	14.90		15.02	0.005714	1.51	107.20	65.65	0.37
KM3	1100	50 ans	178.50	13.14	15.02		15.14	0.005553	1.56	115.12	66.40	0.37
KM3	1100	100 ans	195.64	13.14	15.13		15.26	0.005492	1.61	122.23	67.06	0.37
KM3	1090	2ans	100.85	12.97	14.37		14.45	0.005522	1.27	79.61	60.48	0.35
KM3	1090	10 ans	140.18	12.97	14.69		14.79	0.005246	1.41	99.44	62.45	0.36
KM3	1090	25 ans	161.36	12.97	14.85		14.96	0.005118	1.48	109.30	63.44	0.36
KM3	1090	50 ans	178.50	12.97	14.97		15.09	0.005014	1.53	117.02	64.20	0.36
KM3	1090	100 ans	195.64	12.97	15.08		15.20	0.005007	1.59	123.89	64.88	0.36
KM3	1080	2ans	100.85	12.83	14.32		14.40	0.005035	1.27	79.47	57.18	0.34
KM3	1080	10 ans	140.18	12.83	14.64		14.74	0.004948	1.44	98.17	59.35	0.35
KM3	1080	25 ans	161.36	12.83	14.79		14.91	0.004896	1.51	107.52	60.49	0.35
KM3	1080	50 ans	178.50	12.83	14.91		15.04	0.004856	1.57	114.86	61.36	0.35

HEC-RAS Plan: km3_naturel River: Maquatua Reach: KM3 (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
KM3	1080	100 ans	195.64	12.83	15.02		15.15	0.004904	1.63	121.34	62.13	0.36
KM3	1070	2ans	100.85	12.67	14.25		14.35	0.005231	1.34	75.46	52.59	0.35
KM3	1070	10 ans	140.18	12.67	14.57		14.69	0.005284	1.53	92.45	54.99	0.36
KM3	1070	25 ans	161.36	12.67	14.72		14.86	0.005305	1.62	100.98	56.17	0.37
KM3	1070	50 ans	178.50	12.67	14.84		14.99	0.005309	1.69	107.70	57.08	0.37
KM3	1070	100 ans	195.64	12.67	14.94		15.10	0.005411	1.76	113.56	57.85	0.38
KM3	1060	2ans	100.85	12.41	14.21		14.30	0.004414	1.34	75.85	47.39	0.33
KM3	1060	10 ans	140.18	12.41	14.51		14.64	0.004846	1.57	90.74	49.65	0.35
KM3	1060	25 ans	161.36	12.41	14.66		14.80	0.005021	1.67	98.22	50.79	0.36
KM3	1060	50 ans	178.50	12.41	14.78		14.93	0.005134	1.75	104.13	51.68	0.37
KM3	1060	100 ans	195.64	12.41	14.88		15.04	0.005332	1.84	109.19	52.43	0.38
KM3	1050	2ans	100.85	12.49	14.14		14.25	0.005728	1.46	69.95	47.13	0.37
KM3	1050	10 ans	140.18	12.49	14.44		14.58	0.006134	1.69	84.30	48.86	0.39
KM3	1050	25 ans	161.36	12.49	14.58		14.75	0.006297	1.80	91.47	49.83	0.40
KM3	1050	50 ans	178.50	12.49	14.69		14.87	0.006404	1.88	97.10	50.75	0.41
KM3	1050	100 ans	195.64	12.49	14.79		14.98	0.006639	1.97	101.85	51.48	0.42
KM3	1040	2ans	100.85	12.67	13.91		14.14	0.018923	2.12	48.43	46.40	0.64
KM3	1040	10 ans	140.18	12.67	14.21		14.48	0.016193	2.29	62.62	48.12	0.61
KM3	1040	25 ans	161.36	12.67	14.36		14.64	0.015336	2.38	69.67	48.97	0.61
KM3	1040	50 ans	178.50	12.67	14.47		14.77	0.014777	2.45	75.19	49.64	0.60
KM3	1040	100 ans	195.64	12.67	14.55		14.87	0.015046	2.55	79.27	50.14	0.61
KM3	1030	2ans	100.85	12.30	13.85		13.99	0.008524	1.67	61.32	46.19	0.44
KM3	1030	10 ans	140.18	12.30	14.16		14.34	0.008469	1.90	75.78	48.12	0.46
KM3	1030	25 ans	161.36	12.30	14.30		14.50	0.008474	2.00	82.95	49.09	0.46
KM3	1030	50 ans	178.50	12.30	14.42		14.63	0.008475	2.08	88.57	49.99	0.47
KM3	1030	100 ans	195.64	12.30	14.50		14.73	0.008889	2.19	92.59	50.67	0.48
KM3	1020	2ans	100.85	12.16	13.78		13.91	0.007405	1.60	63.91	46.00	0.42
KM3	1020	10 ans	140.18	12.16	14.08		14.25	0.007575	1.84	78.34	48.30	0.44
KM3	1020	25 ans	161.36	12.16	14.23		14.42	0.007659	1.94	85.52	49.45	0.44
KM3	1020	50 ans	178.50	12.16	14.34		14.55	0.007710	2.03	91.18	50.52	0.45
KM3	1020	100 ans	195.64	12.16	14.42		14.65	0.008174	2.14	95.01	51.16	0.47
KM3	1010	2ans	100.85	12.12	13.68	13.09	13.83	0.008683	1.69	60.71	45.95	0.45
KM3	1010	10 ans	140.18	12.12	13.99	13.31	14.17	0.008677	1.92	75.05	48.46	0.46
KM3	1010	25 ans	161.36	12.12	14.13	13.41	14.34	0.008690	2.03	82.22	49.69	0.47
KM3	1010	50 ans	178.50	12.12	14.24	13.49	14.46	0.008685	2.11	87.89	50.75	0.48
KM3	1010	100 ans	195.64	12.12	14.31	13.57	14.56	0.009310	2.23	91.26	51.38	0.49

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 2ans

	16.96	Element	Inside BR US	Inside BR DS
E.G. US. (m)	16.96	E.G. Elev (m)	16.83	16.67
W.S. US. (m)	16.77	W.S. Elev (m)	16.33	16.16
Q Total (m3/s)	100.85	Crit W.S. (m)	16.33	16.16
Q Bridge (m3/s)	100.85	Max Chl Dpth (m)	1.20	1.03
Q Weir (m3/s)		Vel Total (m/s)	3.14	3.14
Weir Sta Lft (m)		Flow Area (m2)	32.09	32.10
Weir Sta Rgt (m)		Froude # Chl	1.00	1.00
Weir Submerg		Specif Force (m3)	50.23	48.66
Weir Max Depth (m)				
Min El Weir Flow (m)	23.52	Hydr Depth (m)	1.00	1.00
Min El Prs (m)	22.52	W.P. Total (m)	34.94	35.43
Delta EG (m)	1.21	Conv. Total (m3/s)	434.8	429.3
Delta WS (m)	1.32	Top Width (m)	32.15	32.06
BR Open Area (m2)	250.73	Frctn Loss (m)		
BR Open Vel (m/s)	3.14	C & E Loss (m)		
BR Sluice Coef		Shear Total (N/m2)	484.48	490.29
BR Sel Method	Momentum	Power Total (N/m s)	1522.67	1540.53

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 10 ans

	17.32	Element	Inside BR US	Inside BR DS
E.G. US. (m)	17.32	E.G. Elev (m)	17.19	17.03
W.S. US. (m)	17.07	W.S. Elev (m)	16.59	16.43
Q Total (m3/s)	140.18	Crit W.S. (m)	16.59	16.43
Q Bridge (m3/s)	140.18	Max Chl Dpth (m)	1.45	1.29
Q Weir (m3/s)		Vel Total (m/s)	3.45	3.45
Weir Sta Lft (m)		Flow Area (m2)	40.66	40.64
Weir Sta Rgt (m)		Froude # Chl	0.92	0.97
Weir Submerg		Specif Force (m3)	76.47	75.16
Weir Max Depth (m)				
Min El Weir Flow (m)	23.52	Hydr Depth (m)	1.20	1.20
Min El Prs (m)	22.52	W.P. Total (m)	37.60	38.07
Delta EG (m)	1.22	Conv. Total (m3/s)	619.4	610.5
Delta WS (m)	1.77	Top Width (m)	33.96	33.84
BR Open Area (m2)	250.73	Frctn Loss (m)		
BR Open Vel (m/s)	3.45	C & E Loss (m)		
BR Sluice Coef		Shear Total (N/m2)	543.23	551.79
BR Sel Method	Momentum	Power Total (N/m s)	1872.94	1903.32

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 25 ans

	17.49	Element	Inside BR US	Inside BR DS
E.G. US. (m)	17.49	E.G. Elev (m)	17.37	17.21
W.S. US. (m)	17.22	W.S. Elev (m)	16.71	16.55
Q Total (m3/s)	161.36	Crit W.S. (m)	16.71	16.55
Q Bridge (m3/s)	161.36	Max Chl Dpth (m)	1.58	1.41
Q Weir (m3/s)		Vel Total (m/s)	3.59	3.60
Weir Sta Lft (m)		Flow Area (m2)	44.95	44.77
Weir Sta Rgt (m)		Froude # Chl	0.91	0.97
Weir Submerg		Specif Force (m3)	91.69	90.39
Weir Max Depth (m)				
Min El Weir Flow (m)	23.52	Hydr Depth (m)	1.32	1.32
Min El Prs (m)	22.52	W.P. Total (m)	38.13	38.57
Delta EG (m)	1.21	Conv. Total (m3/s)	727.9	714.0
Delta WS (m)	1.85	Top Width (m)	34.05	33.93
BR Open Area (m2)	250.73	Frctn Loss (m)		
BR Open Vel (m/s)	3.60	C & E Loss (m)		

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 25 ans (Continued)

BR Sluice Coef		Shear Total (N/m ²)	568.16	581.36
BR Sel Method	Momentum	Power Total (N/m s)	2039.77	2095.31

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 50 ans

E.G. US. (m)	17.63	Element	Inside BR US	Inside BR DS
W.S. US. (m)	17.33	E.G. Elev (m)	17.51	17.35
Q Total (m ³ /s)	178.50	W.S. Elev (m)	16.80	16.64
Q Bridge (m ³ /s)	178.50	Crit W.S. (m)	16.80	16.64
Q Weir (m ³ /s)		Max Chl Dpth (m)	1.67	1.50
Weir Sta Lft (m)		Vel Total (m/s)	3.72	3.74
Weir Sta Rgt (m)		Flow Area (m ²)	48.02	47.77
Weir Submerg		Froude # Chl	0.92	0.98
Weir Max Depth (m)		Specif Force (m ³)	104.51	103.21
Min El Weir Flow (m)	23.52	Hydr Depth (m)	1.41	1.41
Min El Prs (m)	22.52	W.P. Total (m)	38.51	38.94
Delta EG (m)	1.21	Conv. Total (m ³ /s)	809.2	792.5
Delta WS (m)	1.92	Top Width (m)	34.11	33.99
BR Open Area (m ²)	250.73	Frctn Loss (m)		
BR Open Vel (m/s)	3.74	C & E Loss (m)		
BR Sluice Coef		Shear Total (N/m ²)	594.95	610.26
BR Sel Method	Momentum	Power Total (N/m s)	2211.69	2280.25

Plan: km3_actuel Maquatua KM3 RS: 1169.9 Profile: 100 ans

E.G. US. (m)	17.76	Element	Inside BR US	Inside BR DS
W.S. US. (m)	17.45	E.G. Elev (m)	17.64	17.48
Q Total (m ³ /s)	195.64	W.S. Elev (m)	16.89	16.73
Q Bridge (m ³ /s)	195.64	Crit W.S. (m)	16.89	16.73
Q Weir (m ³ /s)		Max Chl Dpth (m)	1.76	1.59
Weir Sta Lft (m)		Vel Total (m/s)	3.82	3.84
Weir Sta Rgt (m)		Flow Area (m ²)	51.15	50.95
Weir Submerg		Froude # Chl	0.92	0.97
Weir Max Depth (m)		Specif Force (m ³)	117.73	116.44
Min El Weir Flow (m)	23.52	Hydr Depth (m)	1.50	1.50
Min El Prs (m)	22.52	W.P. Total (m)	38.89	39.32
Delta EG (m)	1.20	Conv. Total (m ³ /s)	895.6	879.0
Delta WS (m)	1.98	Top Width (m)	34.18	34.06
BR Open Area (m ²)	250.73	Frctn Loss (m)		
BR Open Vel (m/s)	3.84	C & E Loss (m)		
BR Sluice Coef		Shear Total (N/m ²)	615.62	629.52
BR Sel Method	Momentum	Power Total (N/m s)	2354.45	2417.28