January 2009 – Revision A

Haven Banks – Hydraulic Modelling Exercise to define Flood Zones 1, 2, 3a and 3b for the land in the Haven Banks area of Exeter.

Introduction

This modelling exercise is based on an existing hydraulic model of the River Exe near Haven Banks, Exeter, as obtained from the Environment Agency (EA). The inland extent of the Exeter Canal is situated immediately to the north of the study area. The study area's north eastern boundary follows the route of the Exeter Canal.

Fig.1, showing the catchment study area at Haven Banks, is included in Appendix A.

At Trew's Weir, which is situated to the north eastern corner of the study area, the River Exe is able to 'split' during higher flows into the Trew's Weir relief channel (over a high level weir). This relief channel diverts floodwater from Trew's Weir and causes it to flow back into the River Exe downstream of St. James' Weir.

Four flow scenarios have been considered covering the 25-year, 100-year, climate change, and 1000-year flood events.

The 25 year flow is deemed to be the equivalent of Flood Zone 3B with climate change influences added. The climate change event has been considered to be the 100-year event with an additional 20% added across the hydrograph.

Hydrology

The flows within the River Exe have been taken from the River Exe ISIS Model. The flows upstream of the radial gates and Station Road are given by the EA as 814 cumecs for a 100-year event and 1273 cumecs for a 1000-year event.

The flows provided in the ISIS results do not include a flow for the 1000-year event. Therefore, flow against the return period event graphs were used to determine an approximation for the peak 1000-year flow on the River Exe upstream of Haven Banks. These resulted in an approximation of the peak 1000-year flow as being 950 cumecs. By running the existing ISIS model from Station Road with a peak flow of 1273 cumecs the peak flow at Exe Bridges (EX63JD) is shown to be 956 cumecs therefore the estimation based upon the existing ISIS model would appear to be reasonable.

The hydrographs for the hydraulic models have been derived using the catchment characteristics from the FEH 2.0 CD by using the FEH method to provide a fit to peak design flow to match the peak flows.

The storm duration within this catchment is estimated to last for approximately 53 hours with the peak inflow occurring after 24.5 hours from the start of the storm event.

The table below shows the peak flows during each scenario that was used in the modelling:

Return Period	Peak Flow (Cumecs)
25-year	615
100-year	742
Climate Change (+20%)	890
1000-year	950

The EA design flood flow data, and the hydrographs used within the ISIS model, are included in Appendix B.

ISIS Model Make-up

The ISIS model used in this exercise is an extract from an ISIS model obtained from the EA. The upstream extent of the model extract is from the ISIS node EX63JD which is located immediately downstream of the confluence where the Exwick Flood Alleviation Channel connects back into the River Exe and extends for approximately 8km downstream.

The model takes into account the various features along the River Exe including weirs, sluices, potential overland spill routes and flood channels.

The model input is a flow against time boundary hydrograph based on the required peak flows and a hydrograph was produced using the catchment characteristics from the FEH method.

The extract of the model takes into account the overland spill routes over the right banks of the River Exe in the vicinity of Exe Bridges. The model has been constructed in such a way that spill sections simulate floodwaters overtopping the right bank of the River Exe and spilling into a reservoir node that simulates the area of land at St. Thomas between the railway embankment and the River Exe. The model suggests that floodwater will not be able to flow south of the railway embankment but will be able to spill back into the River Exe downstream of ISIS node EX52-6761. The Model does not take into account the presence of the Exeter Canal.

A plan showing the topographical survey data and the location of the ISIS nodes is included in Fig.2 in Appendix A.

ISIS Model Results

The ISIS model shows that during a 25-year event the flows remain within the designated channels past the study area. The flood water in the Trew's Weir relief channel and the River Exe will merge at the location of the allotments. Floodwater will also spill over into the lower lying land between the channels near section TF9-770. The model does not include any overland flow paths from further upstream of the River Exe which would affect the study area.

During the 25-year and the 100-year return period events floodwater does not spill into the St. Thomas reservoir node (apart from EX62SPU where a low flow of 0.271 cumecs is able to spill over the right bank).

During the climate change and the 1000-year events floodwater is able to break out over the right bank between EX63JU and up to 223m downstream of EX57. This floodwater will be able to flow into the St. Thomas reservoir node. This reservoir has been modelled to reflect the topography of St. Thomas from Exe Bridges. A flow route out of the reservoir node is located to the east downstream of EX52-6761. The model does not take into account any flow paths to the south of the railway embankment.
The model also does not take into account the presence of the Exeter Canal. Floodwater out of the St. Thomas reservoir will be able to flow over the northern side of the study area and be intercepted by the Canal. The ISIS model shows this floodwater entering into the River Exe downstream of EX52-6761.

During the climate change scenario 52 cumecs is predicted as being able to spill overland from the St. Thomas area back into the River Exe; this increases to 65.876 cumecs during a 1000-year event. This could result in floodwater levels up to 550mm deep in the northern part of the study area.

The topography of the northern part of the study area will allow for floodwater to flow in an easterly direction over the northern part of the site to merge into the River Exe / Exeter Canal. Floodwater will also be able to flow to the south east over the study area. This floodwater will merge into floodwaters from the Exeter Canal breaking out from the relief channel.

The Exeter Canal has not been modelled within the ISIS hydraulic model. It will provide an extra flow path for the overland flows and will provide additional flood capacity. The Canal is maintained at a depth of 3.6m (approximately 5.45m AOD). Once the depth reaches 3.9m water starts to spill over Double Locks downstream of the study area and flow continues to Turf Lock and the Exe Estuary. Should the canal water depth rise to a 4.2m (approximately 6.05m AOD) a low bank to the south of Salmonpool Swingbridge, adjacent to the incinerator, downstream of the study area, would be overtopped allowing flows into Exminster / Matford Marshes.

During both the climate change and the 1000-year scenarios floodwater from the relief channel will be able to spill overland (over the right bank) and overtop into the canal. Once the water level in the canal reaches a level of approximately 6m AOD floodwater will be able to overtop the western bank of the canal and flood parts of the middle southern parts of the study area. Floodwater originating from Exe Bridges and flowing overland will merge with this floodwater.

As a result of the railway embankments the flood extent in a 1000-year scenario is similar to the climate change scenario. However, land to the south west of the railway has not been modelled as part of this modelling exercise.

Tidal Influences

Tidal data has been obtained from the Report on Regional Extreme Tide Levels, May 2002. This states the Mean High Water Spring (MHWS) to be 2.25m AOD. When considering the affects of climate change over the next 100-years as set out by the guidance in Planning Policy Statement 25 (PPS25) a MHWS level of 3.26m AOD can be expected. The 200-year tide level is stated to be 3.82m AOD, with the affects of climate change over the next 100-years this level is predicted to increase to 4.83m AOD. The levels on the site are all shown to be above the extreme climate change tidal surge.

Initially the floodwaters will spill over the Powderham Bank extending upstream to Exminster Marshes and the A379 Bridge Road. To the north of Bridge Road the tidal inundation area is contained within the Matford Marshes and designated flood relief corrider between the River Exe, Exeter Canal and the Exeter to Newton Abbot Railway line.

The EA have previously stated that the total possible volume of tidal propagation spilling over flood defences between Powederham and Exminster is less than the volume of storage available in low lying land downstream of the A379 Bridge Road.

Summary

The flood alleviation measures on the River Exe, including the Trew's Weir Relief Channel, provide adequate capacity to contain the floodwaters up to the 1 in 100-year event. However, once the affects of climate change is taken into account (an increase of peak flows of 20%), then the right bank of the River Exe near Exe Bridges could be overtopped resulting in flooding to large parts of St. Thomas. This floodwater is able to spill back over the northern section of the study area before flowing back into the River Exe.

The Exeter Canal will provide an additional flow path for overland flows over St. Thomas. The ISIS model also makes an assumption that no flows are lost to the south west of the railway embankment.

The River Exe model is due to be revised in 2009 to incorporate 2D elements within the model to better represent the overland flow paths though Exeter. This will assist in a better understanding of the interactions and return of flows to the River Exe downstream of Station Road. Therefore once the EA have updated their River Exe model the Flood Risk and extents to Haven Banks should be much clearer. The updated model will also be able to better represent the effect that a breach to the defences will have on the site.

Conclusion

1. The hydraulic modelling exercise shows that large parts of the study area lies within Flood Zone 3a when considered against the Planning Policy Guidance 25 (PPS 25). The flood regime of the watercourses associated with the modelling are such that design flows for Flood Zone 3a and Flood Zone 2 do not greatly increase the areas at risk from fluvial flooding because the floodwaters are contained by the railway embankment along the south western boundary of the study area.

2. There is an area to the south of the study area which remains free from flooding. However this is based on the presence of an overland flow route towards the River Exe at the northern part of the study area. If this area of land were raised then flows would be diverted in a south eastwards direction across the site.

3. The ISIS model does not take into account any overland flows to the south west of the railway embankment and assumes the flows from the St. Thomas reservoir ISIS node flows back into the River Exe downstream from EX52-6761. Furthermore, the ISIS model does not take into account the presence of the Exeter Canal which will act as an additional flow path for overland flows.

4. This report is based upon the data that is currently available. The Environment Agency is due to update the River Exe Model during 2009 to provide a better understanding of the overland flows during times of flood. Once the model has been updated a revised assessment of flood risk to the Haven Banks area should be undertaken.

Appendix A

Drawings

HB/Fig. 01	Site Location Plan
HB/Fig. 02	Flood Extents
HB/Fig. 03	Site Topography Plan

Rev.	Detail	By	Date
A	Original Issue	NAS	21.08.08

Revisions

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Client
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Project
Exeter City Council SFRA
Haven Banks

Drawing Title
Haven Banks
Study Area Plan

Reinforcement schedules nos.

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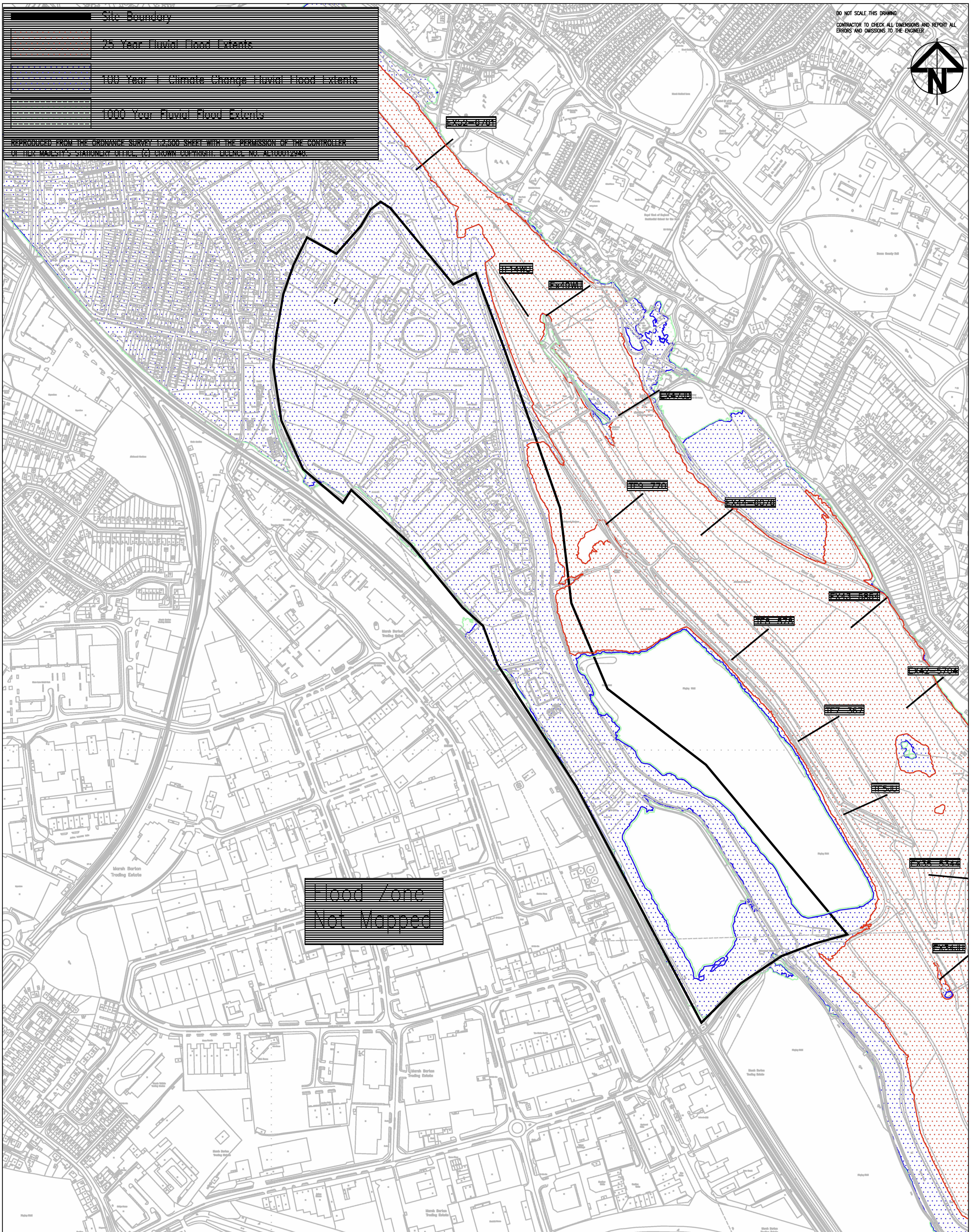

Rev	Detail	By	Chk	Date

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Project: Exeter City SFRA Haven Banks

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Drawing Title: Flood Extents Plan

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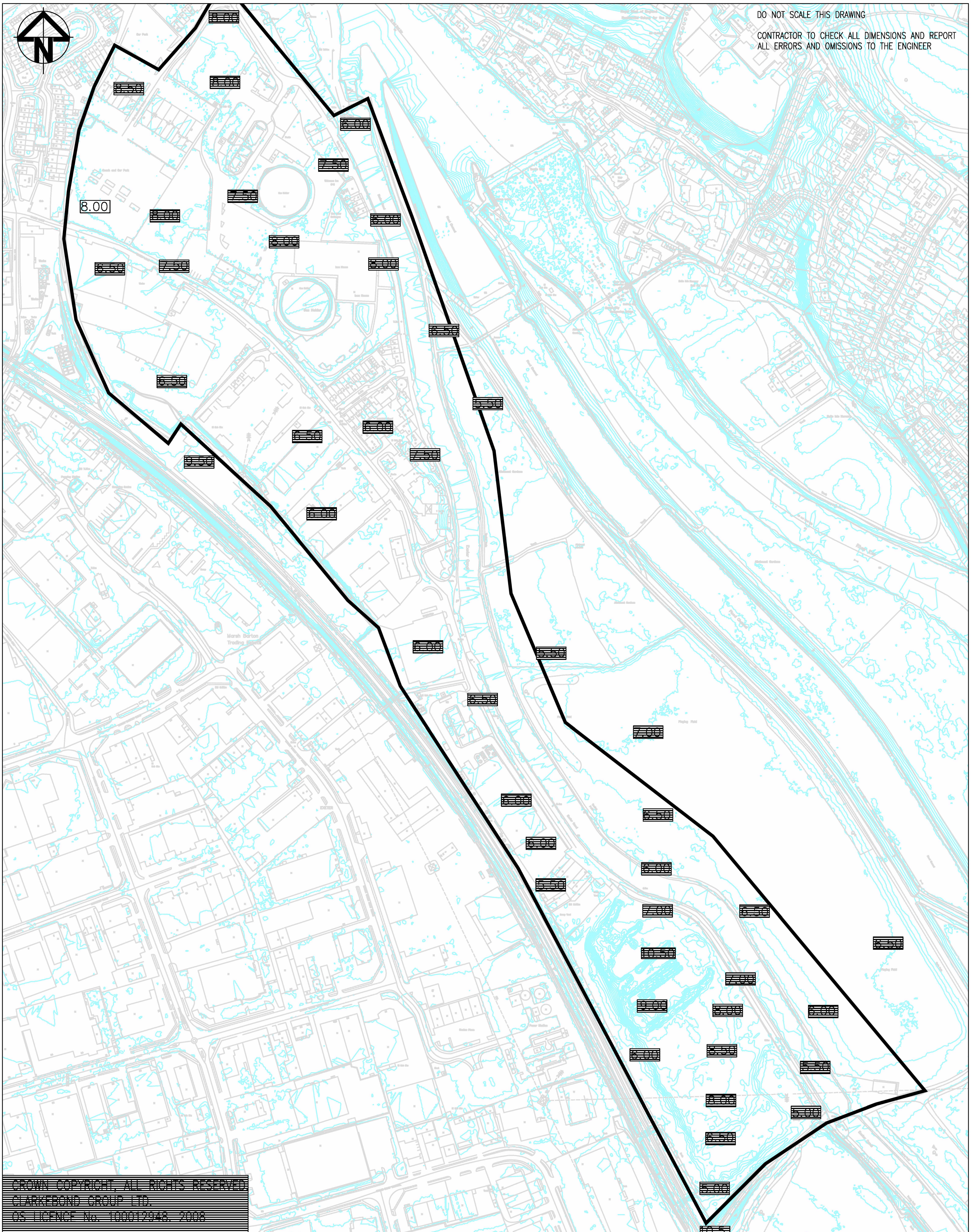

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Drawing Title
Site Topography Plan

Project No.	Discipline	Drawing No.
WE00261	C	HB/Fig3

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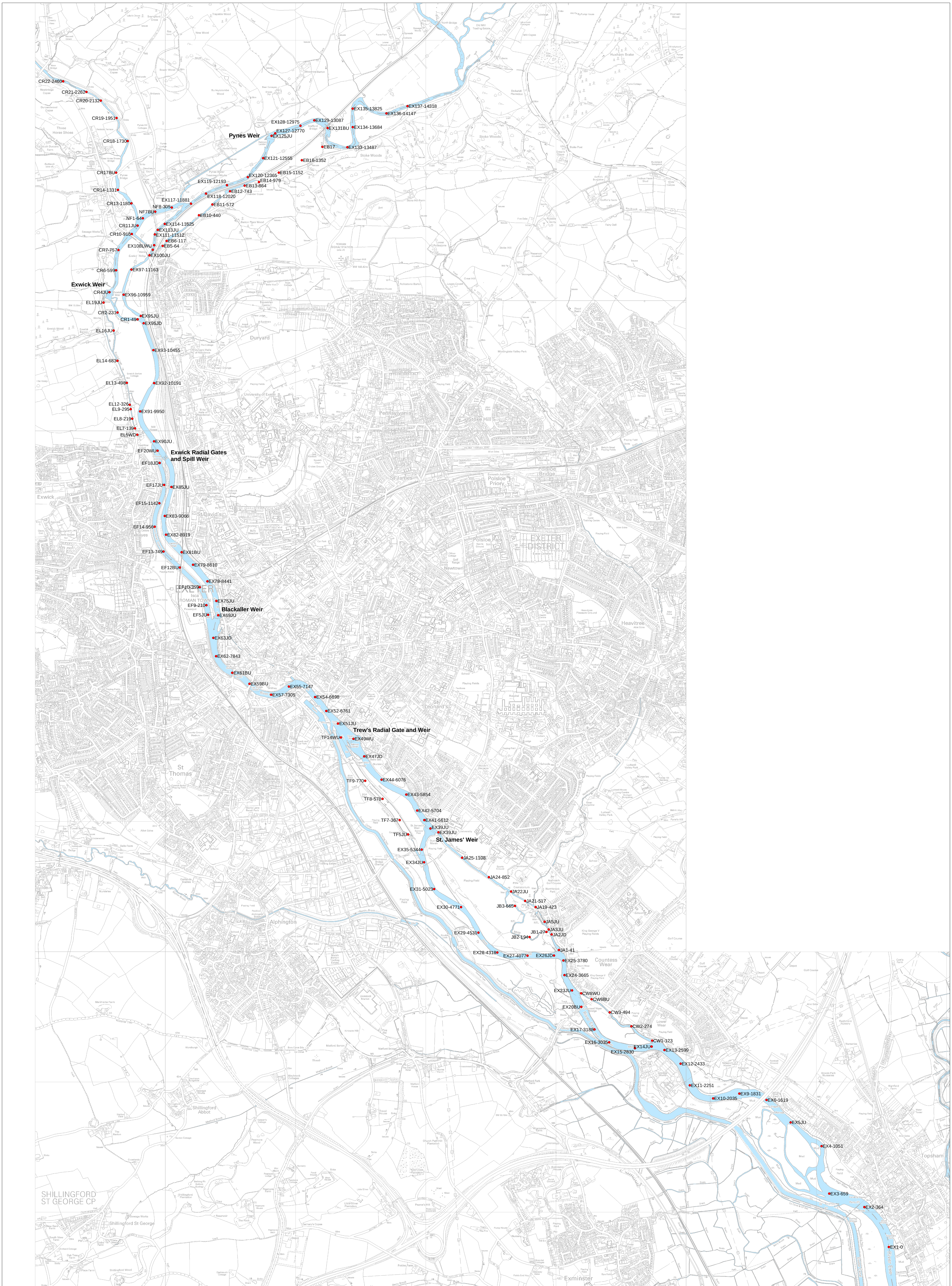
Appendix B

Hydrology & Modelling

ISIS Node Plan
Original ISIS Model Data
Flow Against Time Relationship Graphs
Hydrographs used with the ISIS Models
Maximum Result Sheet



GEOGRAPHIC MODEL SCHEMATIC

EX52-6761

year	flow	stage
2	308	6.48
5	433	6.615
10	521	6.683
25	615	6.721
50	680	6.753
75	716	6.77
100	742	6.778
150	769	6.784
200	786	6.89

JA-25-1108

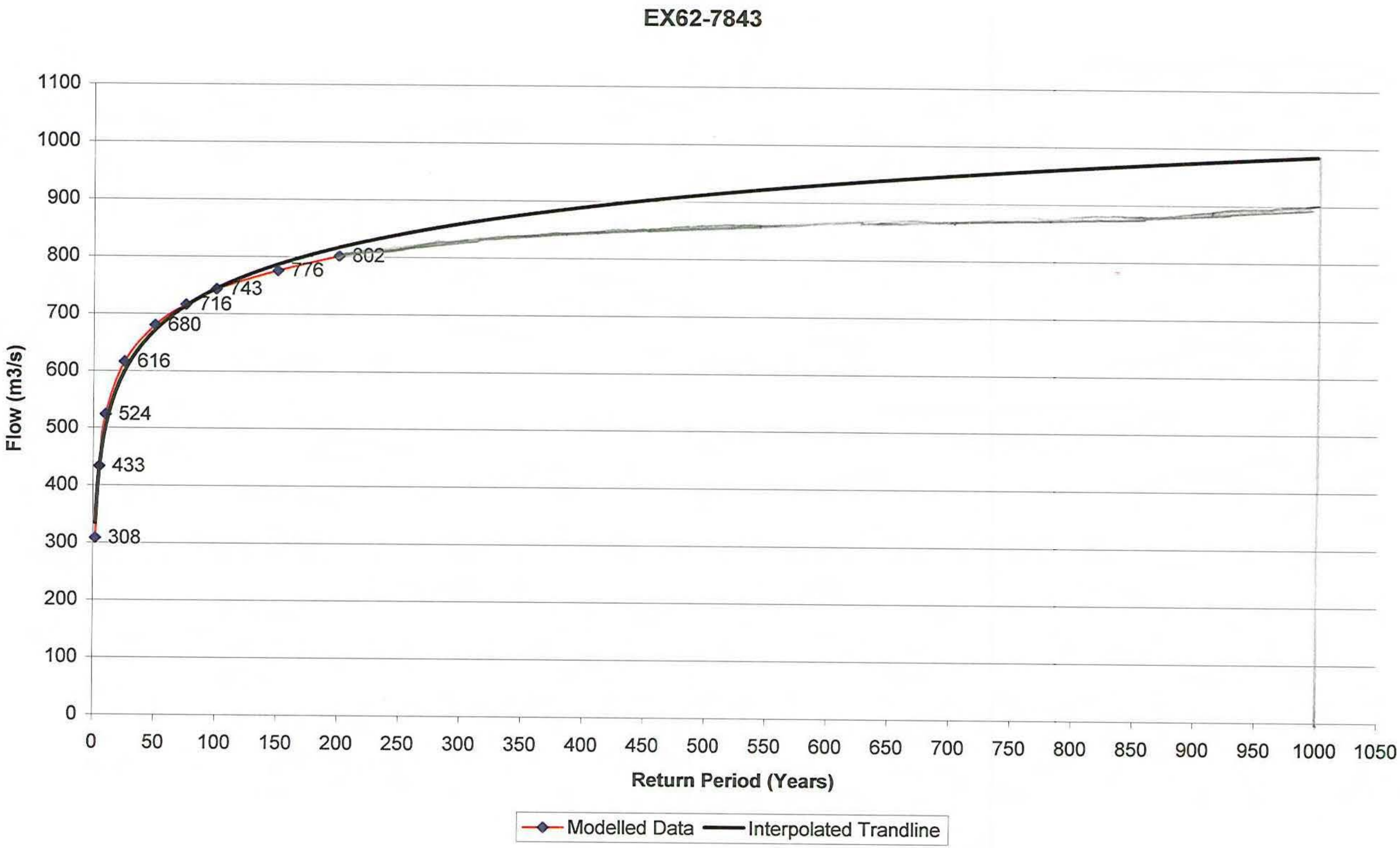
year	flow	stage
2	18	4.096
5	30	4.279
10	48	4.491
25	72	4.751
50	90	4.941
75	102	5.071
100	111	5.157
150	122	5.275
200	131	5.377

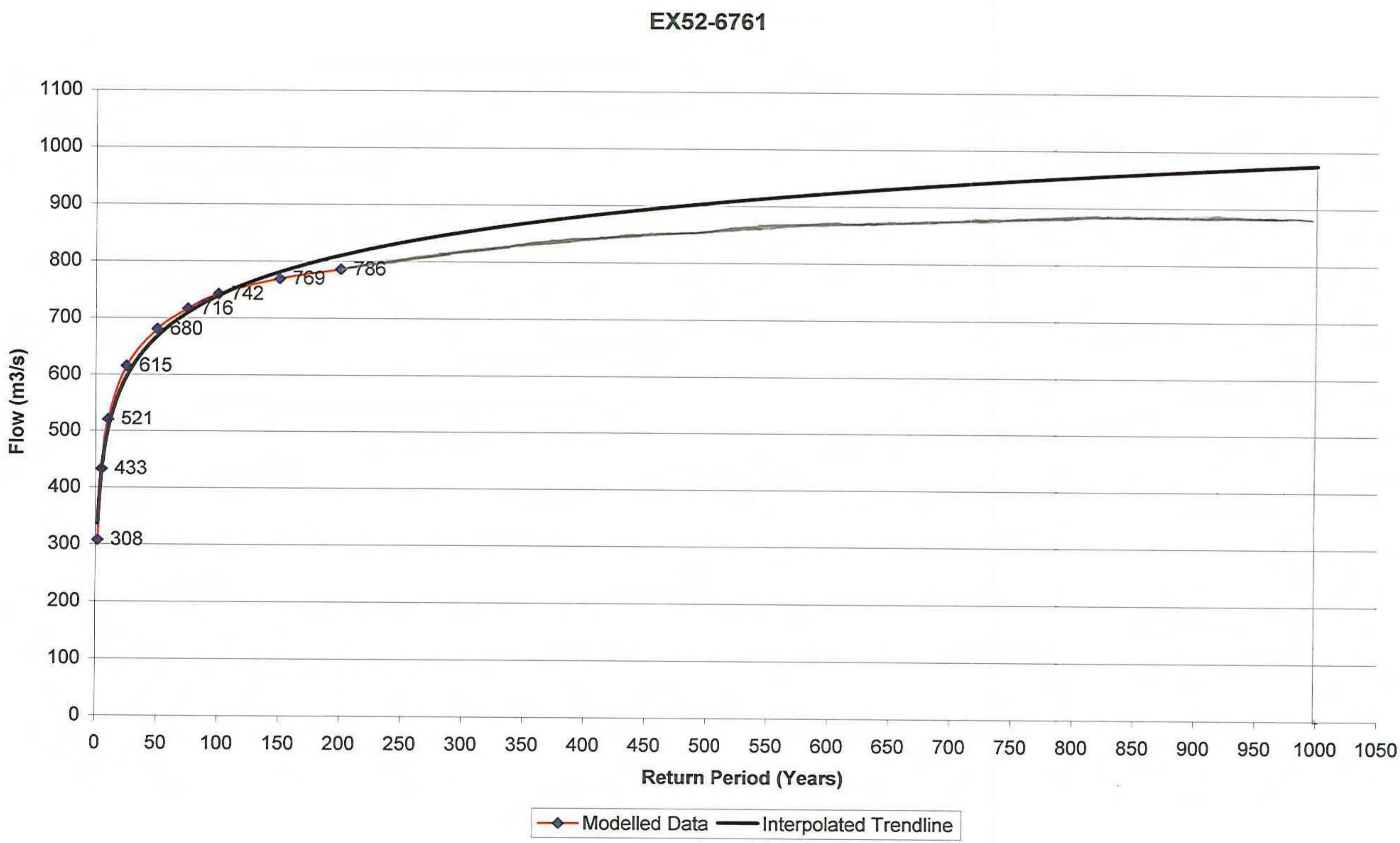
EX44-6076

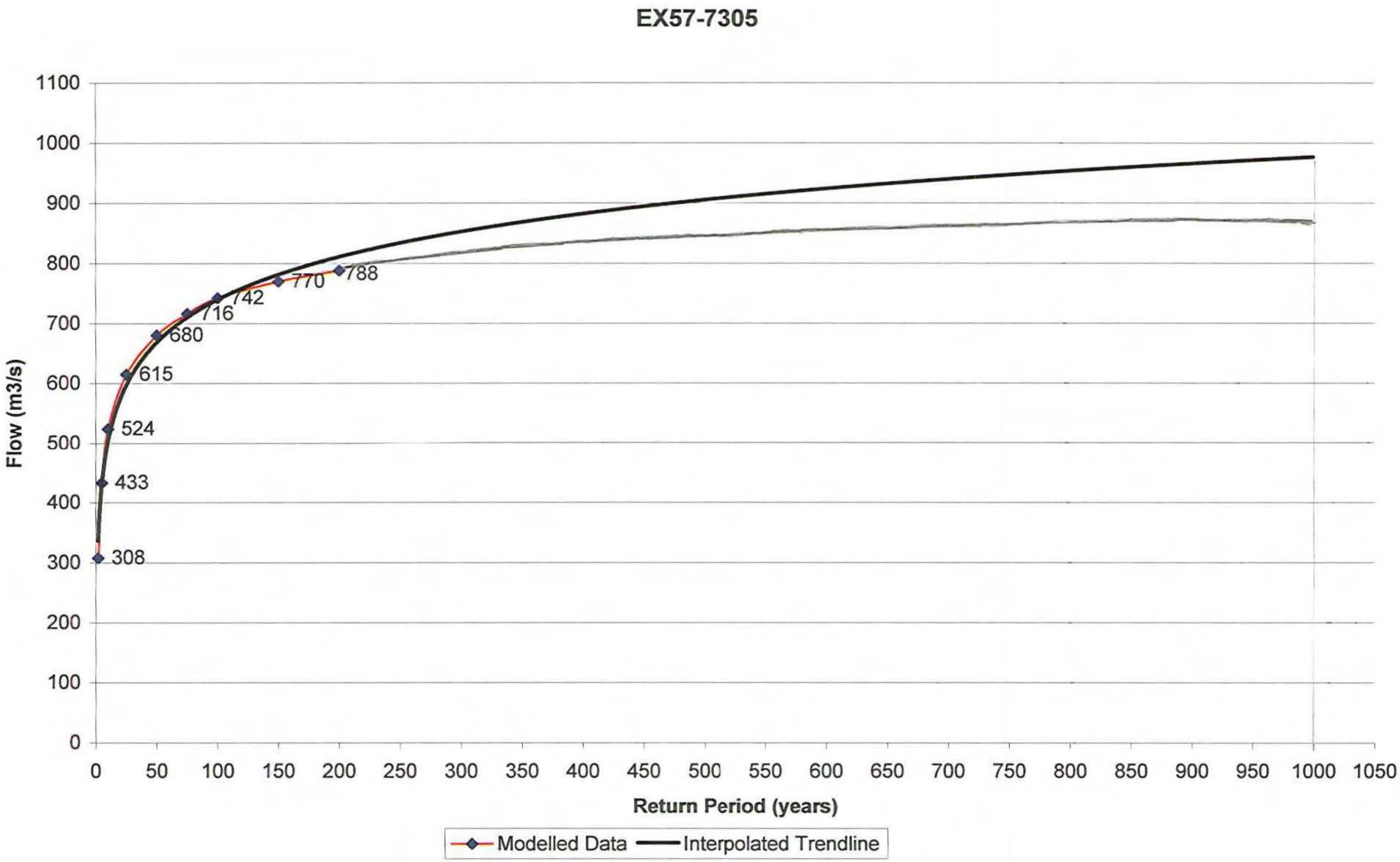
year	flow	stage
2	207	4.67
5	255	4.959
10	289	5.203
25	323	5.43
50	347	5.579
75	363	5.678
100	374	5.746
150	388	5.837
200	399	5.914

EX57-7305

year	flow	stage
2	308	6.801
5	433	7.161
10	524	7.423
25	615	7.687
50	680	7.872
75	716	7.97
100	742	8.041
150	770	8.125
200	788	8.212


EX62-7843
Flow (m3/s)
1100
1000
900
800
700
600
500
400
300
200
100
0
308
433
524
616
680
716
743
776
802
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
Return Period (Years)
Modelled Data
Interpolated Trandline


EX52-6761
Flow (m3/s)
Return Period (Years)
308
433
521
615
680
716
742
769
786
0
100
200
300
400
500
600
700
800
900
1000
1100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
Modelled Data
Interpolated Trendline


EX57-7305
1100
1000
900
800
700
600
500
400
300
200
100
0
Flow (m3/s)
308
433
524
615
680
716
742
770
788
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
Return Period (years)
Modelled Data
Interpolated Trendline

	25 YEAR	100 YEAR	CC	200 YEAR	1000 YEAR
time	flow	flow	flow	flow	flow
(hours)	hydrograph	hydrograph	hydrograph	hydrograph	hydrograph
0.0	41.034	37.383	44.8596	34.663	29.674
0.5	41.171	37.55	45.06	34.843	29.893
1.0	41.498	37.952	45.5424	35.272	30.417
1.5	42.03	38.605	46.326	35.97	31.271
2.0	42.792	39.541	47.4492	36.97	32.492
2.5	43.827	40.812	48.9744	38.329	34.152
3.0	45.136	42.418	50.9016	40.047	36.251
3.5	46.718	44.36	53.232	42.123	38.787
4.0	48.623	46.699	56.0388	44.623	41.842
4.5	50.869	49.457	59.3484	47.572	45.444
5.0	53.457	52.634	63.1608	50.969	49.594
5.5	56.393	56.238	67.4856	54.823	54.302
6.0	59.739	60.346	72.4152	59.214	59.667
6.5	63.555	65.03	78.036	64.222	65.785
7.0	67.894	70.357	84.4284	69.917	72.742
7.5	72.872	76.468	91.7616	76.45	80.724
8.0	78.633	83.541	100.2492	84.013	89.962
8.5	85.285	91.706	110.0472	92.743	100.628
9.0	92.893	101.047	121.2564	102.729	112.828
9.5	101.569	111.697	134.0364	114.116	126.739
10.0	111.543	123.941	148.7292	127.207	142.731
10.5	122.951	137.947	165.5364	142.18	161.024
11.0	135.819	153.743	184.4916	159.069	181.656
11.5	150.258	171.469	205.7628	178.02	204.808
12.0	166.22	191.065	229.278	198.972	230.404
12.5	183.594	212.394	254.8728	221.775	258.262
13.0	202.269	235.32	282.384	246.286	288.206
13.5	222.099	259.664	311.5968	272.313	320.003
14.0	242.926	285.232	342.2784	299.649	353.398
14.5	264.735	312.005	374.406	328.274	388.368
15.0	287.22	339.608	407.5296	357.785	424.421
15.5	310.187	367.802	441.3624	387.929	461.247
16.0	333.518	396.444	475.7328	418.552	498.657
16.5	357.136	425.438	510.5256	449.55	536.527
17.0	380.921	454.638	545.5656	480.769	574.667
17.5	404.596	483.702	580.4424	511.842	612.627
18.0	428.002	512.436	614.9232	542.563	650.158
18.5	450.995	540.662	648.7944	572.741	687.026
19.0	473.351	568.107	681.7284	602.084	722.872
19.5	494.799	594.438	713.3256	630.235	757.264
20.0	515.15	619.421	743.3052	656.946	789.896
20.5	534.28	642.906	771.4872	682.054	820.57
21.0	551.968	664.62	797.544	705.269	848.931
21.5	567.857	684.126	820.9512	726.124	874.409
22.0	581.688	701.105	841.326	744.277	896.586
22.5	593.373	715.45	858.54	759.614	915.322
23.0	602.696	726.896	872.2752	771.851	930.272
23.5	609.447	735.182	882.2184	780.711	941.096
24.0	613.523	740.187	888.2244	786.062	947.632
24.5	615	742	890.4	788	950
25.0	613.906	740.657	888.7884	786.564	948.247
25.5	610.401	736.354	883.6248	781.964	942.627
26.0	604.517	729.131	874.9572	774.241	933.191
26.5	596.655	719.479	863.3748	763.922	920.585
27.0	587.091	707.738	849.2856	751.369	905.249
27.5	575.968	694.083	832.8996	736.77	887.414
28.0	563.406	678.661	814.3932	720.282	867.271
28.5	549.574	661.682	794.0184	702.128	845.093
29.0	534.769	643.506	772.2072	682.696	821.354
29.5	519.178	624.366	749.2392	662.233	796.354
30.0	502.954	604.449	725.3388	640.938	770.34
30.5	486.208	583.891	700.6692	618.958	743.488
31.0	469.024	562.796	675.3552	596.405	715.935
31.5	451.44	541.209	649.4508	573.326	687.74
32.0	433.469	519.148	622.9776	549.739	658.924
32.5	415.181	496.696	596.0352	525.735	629.6
33.0	396.63	473.923	568.7076	501.387	599.855
33.5	377.845	450.862	541.0344	476.732	569.734
34.0	358.844	427.535	513.042	451.792	539.266
34.5	339.709	404.045	484.854	426.677	508.584
35.0	320.484	380.443	456.5316	401.444	477.757
35.5	301.272	356.858	428.2296	376.228	446.952
36.0	282.154	333.388	400.0656	351.135	416.297
36.5	263.371	310.331	372.3972	326.484	386.181
37.0	245.059	287.849	345.4188	302.448	356.817
37.5	227.297	266.045	319.254	279.136	328.338
38.0	210.144	244.987	293.9844	256.622	300.833
38.5	193.658	224.748	269.6976	234.983	274.398
39.0	177.951	205.466	246.5592	214.369	249.214
39.5	163.145	187.29	224.748	194.935	225.473
40.0	149.291	170.282	204.3384	176.752	203.259
40.5	136.435	154.5	185.4	159.878	182.645
41.0	124.657	140.041	168.0492	144.42	163.76
41.5	114.002	126.96	152.352	130.434	146.674
42.0	104.446	115.229	138.2748	117.892	131.351
42.5	95.929	104.774	125.7288	106.714	117.695
43.0	88.386	95.514	114.6168	96.814	105.601
43.5	81.788	87.413	104.8956	88.153	95.02
44.0	76.03	80.345	96.414	80.596	85.788
44.5	70.971	74.134	88.9608	73.956	77.676
45.0	66.544	68.7	82.44	68.146	70.578
45.5	62.702	63.983	76.7796	63.103	64.417
46.0	59.383	59.909	71.8908	58.747	59.096
46.5	56.487	56.353	67.6236	54.946	54.452
47.0	53.931	53.216	63.8592	51.591	50.354
47.5	51.679	50.451	60.5412	48.635	46.743
48.0	49.696	48.017	57.6204	46.032	43.563
48.5	47.951	45.874	55.0488	43.741	40.764
49.0	46.43	44.007	52.8084	41.746	38.326
49.5	45.134	42.416	50.8992	40.045	36.248
50.0	44.045	41.08	49.296	38.616	34.502
50.5	43.141	39.97	47.964	37.429	33.053
51.0	42.417	39.081	46.8972	36.479	31.892
51.5	41.87	38.409	46.0908	35.76	31.014
52.0	41.476	37.926	45.5112	35.244	30.383
52.5	41.218	37.608	45.1296	34.904	29.968
53.0	41.078	37.436	44.9232	34.721	29.744
53.5	41.034	37.383	44.8596	34.663	29.674

	25-year				100-year				Climate Change				1000-year			
Label	Max Flow	Max Stage	Max Fr	Max Velocity	Max Flow	Max Stage	Max Fr	Max Velocity	Max Flow	Max Stage	Max Fr	Max Velocity	Max Flow	Max Stage	Max Fr	Max Velocity
EX63JD	614.9	9.342	0.29	1.782	741.912	9.999	0.302	1.841	890.254	10.506	0.32	1.972	949.84	10.588	0.329	2.046
EX63JU	614.864	9.274	0.299	1.81	741.824	9.936	0.307	1.867	893.909	10.435	0.327	2	949.823	10.513	0.337	2.08
EX63-7983	614.864	9.274	0.299	1.81	741.282	9.936	0.307	1.867	890.477	10.435	0.318	1.997	945.591	10.513	0.327	2.078
EX62-7843	614.824	9.087	0.38	2.223	741.174	9.744	0.394	2.293	887.478	10.237	0.433	2.435	928.645	10.314	0.439	2.483
EX61BU	614.769	8.895	0.4	2.348	740.802	9.559	0.4	2.419	857.045	10.122	0.4	2.517	880.108	10.187	0.401	2.526
EX60BD	614.769	8.443	0.452	2.595	740.802	8.969	0.455	2.731	857.045	9.431	0.477	2.923	880.108	9.462	0.479	2.941
EX59BU	614.744	8.388	0.361	2.242	740.784	8.911	0.373	2.4	862.929	9.376	0.398	2.613	880.122	9.399	0.397	2.615
EX58BD	614.744	7.986	0.445	2.61	740.784	8.368	0.47	2.852	862.929	8.744	0.525	3.218	880.122	8.742	0.524	3.224
EX57-7305	614.726	7.682	0.502	2.839	740.751	8.02	0.556	3.109	862.895	8.419	0.642	3.547	885.926	8.428	0.656	3.66
EX55-7147	614.72	7.598	0.581	2.447	740.714	8.082	0.647	2.448	911.841	8.536	0.653	2.584	914.966	8.541	0.653	2.584
EX54-6898	614.717	7.003	0.527	3.225	740.715	7.154	0.623	3.741	956.433	7.674	0.924	4.132	967.928	7.708	0.933	4.186
TREWS-GS	614.717	6.778	0.5	3.317	740.716	6.805	0.601	3.987	951.91	7.415	0.668	4.504	961.547	7.43	0.678	4.565
EX52-6761	614.717	6.715	0.512	3.393	740.716	6.721	0.624	4.122	950.475	7.287	0.698	4.701	959.383	7.305	0.712	4.777
EX51JU	614.85	6.917	0.476	2.16	740.993	7.061	0.714	2.388	972.89	7.303	0.829	2.59	980.325	7.311	0.832	2.593
EX63RBSPU	0	9.274	0	0	0.545	9.936	0	0	3.502	10.435	0	0	4.233	10.513	0	0
EX63RBSPD	0	7.671	0	0	0.545	7.671	0	0	3.502	8.372	0	0	4.233	8.456	0	0
EX63SPU	0	-9999.99	0	0	0	-9999.99	0	0	11.676	-9999.99	0	0	16.947	-9999.99	0	0
EX63SPD	0	7.671	0	0	0	7.671	0	0	11.676	8.372	0	0	16.947	8.456	0	0
EX62SPU	0	-9999.99	0	0	0.271	-9999.99	0	0	38.866	-9999.99	0	0	48.558	-9999.99	0	0
EX62SPD	0	7.671	0	0	0.271	7.671	0	0	38.866	8.372	0	0	48.558	8.456	0	0
EX60SPU	0	-9999.99	0	0	0	-9999.99	0	0	0	-9999.99	0	0	0	-9999.99	0	0
EX60SPD	0	7.671	0	0	0	7.671	0	0	0	8.372	0	0	0	8.456	0	0
EX58SPU	0	-9999.99	0	0	0	-9999.99	0	0	0.248	-9999.99	0	0	0.321	-9999.99	0	0
EX58SPD	0	7.671	0	0	0	7.671	0	0	0.248	8.372	0	0	0.321	8.456	0	0
EX57SPU	0	-9999.99	0	0	0	-9999.99	0	0	2.872	-9999.99	0	0	2.877	-9999.99	0	0
EX57SPD	0	7.671	0	0	0	7.671	0	0	2.872	8.372	0	0	2.877	8.456	0	0
EX52SPU	-1.849	-9999.99	0	0	-1.849	-9999.99	0	0	-52.601	-9999.99	0	0	-65.876	-9999.99	0	0
EX52SPD	-1.849	7.671	0	0	-1.849	7.671	0	0	-52.601	8.372	0	0	-0.301	8.456	0	0
EX51JU	614.85	6.917	0.476	2.16	740.993	7.061	0.714	2.388	972.89	7.303	0.829	2.59	980.325	7.311	0.832	2.593
EX49WU	315.184	6.917	0.104	0.582	357.682	7.061	0.104	0.582	432.98	7.303	0.104	0.582	435.507	7.311	0.104	0.582
EX45-6295	321.95	5.642	0.306	1.582	367.252	6.018	0.314	1.6	446.091	6.458	0.318	1.661	448.882	6.602	0.319	1.67
EX44-6076	330.037	5.529	0.387	1.655	389.063	5.893	0.39	1.662	483.53	6.326	0.391	1.722	493.148	6.454	0.392	1.746
EX43-5854	350.866	5.415	0.528	1.686	429.91	5.768	0.527	1.697	543.92	6.191	0.529	1.704	564.49	6.319	0.532	1.708
EX42-5704	350.803	5.309	0.601	1.873	429.827	5.652	0.603	1.88	544.591	6.064	0.601	1.886	564.385	6.194	0.6	1.894
EX41-5612	350.761	5.231	0.475	1.668	429.771	5.576	0.483	1.675	544.67	5.988	0.488	1.686	564.229	6.123	0.488	1.703
EX39JU	350.72	5.146	0.476	1.741	429.709	5.49	0.512	1.763	544.405	5.901	0.517	1.779	564.119	6.042	0.519	1.785
EX39WU	276.894	5.146	0.097	0.37	314.201	5.49	0.097	0.37	361.369	5.901	0.097	0.37	365.997	6.042	0.097	0.37
EX39SPU	0.092	5.146	0.188	1.021	3.915	5.49	0.188	1.021	20.521	5.901	0.188	1.021	28.652	6.042	0.188	1.021
EX39WD	276.894	5.02	0.188	1.021	314.201	5.377	0.188	1.021	361.369	5.796	0.188	1.021	365.997	5.949	0.188	1.021
EX39SPD	0.092	5.02	0.188	1.021	3.915	5.377	0.188	1.021	20.521	5.796	0.188	1.021	28.652	5.949	0.188	1.021
EX36JD	276.976	5.02	0.33	1.312	317.929	5.377	0.334	1.319	381.435	5.796	0.336	1.323	390.423	5.949	0.338	1.329
EX35-5344	276.864	4.965	0.283	1.277	317.801	5.309	0.285	1.282	380.075	5.713	0.284	1.293	390.219	5.867	0.287	1.329
EX34JU	276.844	5	0.312	1.03	317.778	5.347	0.283	0.994	379.708	5.757	0.27	0.995	390.179	5.91	0.277	1.041
TF9-770	284.572	5.779	0.567	1.665	351.439	6.085	0.634	1.676	451.273	6.471	0.637	1.682	457.588	6.571	0.641	1.685
TF8-578	263.643	5.614	0.346	1.536	310.513	5.9	0.349	1.599	375.667	6.283	0.447	1.633	383.811	6.397	0.46	1.642
TF7-367	263.595	5.376	0.39	1.679	310.425	5.674	0.395	1.74	375.116	6.052	0.399	1.799	382.811	6.172	0.4	1.83
TF5JU	263.554	5.146	0.445	1.893	310.35	5.468	0.459	1.946	374.588	5.866	0.465	1.978	382.679	6.007	0.467	1.989
JA25-1108	73.707	4.769	0.665	0.782	111.594	5.151	0.664	0.783	160.646	5.592	0.776	0.818	173.831	5.775	0.701	0.811
JA24-852	73.431	4.609	1.035	1.132	111.215	5.036	0.999	1.139	158.415	5.509	1.015	1.153	172.96	5.703	1.005	1.093