

# Oxford Flood Alleviation Scheme: Downstream Impacts Summary Table

PREPARED FOR:	Environment Agency
PREPARED BY:	Chris Weeks
APPROVED BY	Phil Marsh
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## 1. Introduction

This note summarises the checks which have been undertaken to review the potential downstream impacts of the Oxford Flood Alleviation Scheme (FAS) on the River Thames immediately downstream of Oxford from Sandford to Reading Bridge. This exercise utilised the 1D-2D calibrated model of the River Thames from Sandford to Reading which was developed by CH2M and reviewed by JBA Consultants.

## 2. Design Event Results

Tables 1 and 2 overleaf show the results for the design event at each lock along the River Thames. The figures in the tables are levels in metres above Ordnance Datum for the following return periods, 1 in 5 year, 1 in 20 year, 1 in 50 year, 1 in 100 year and 1 in 100 year +35% climate change. The results presented are from the updated Baseline (existing conditions) and the final peer reviewed FAS models during the Oxford detailed design stage of the study, which incorporated new topographic and channel survey.

The 'Baseline' figures are for the pre-Oxford FAS situation and the 'FAS' column shown predicted levels post implementation of the proposed Oxford FAS (detailed design). The third column ('Diff (m)') for each return period indicates the change in level as a result of the scheme, a positive number indicates an increase in flood levels and a negative number indicates a decrease in flood levels.

Table 1 – Pre and Post scheme flood levels for 1 in 5, 1 in 20 and 1 in 50 year events

Location / Weir	5-year			20-year			50-year		
	Baseline	FAS	Diff (m)	Baseline	FAS	Diff (m)	Baseline	FAS	Diff (m)
Sandford Head	54.30	54.30	0.00	54.44	54.44	0.00	54.53	54.53	0.00
Sandford Tail	53.53	53.52	-0.01	53.80	53.80	0.00	53.95	53.95	0.00
Abingdon Head	51.56	51.56	-0.01	51.74	51.74	0.00	51.82	51.82	0.00
Abingdon Tail	51.05	51.04	-0.01	51.33	51.33	0.00	51.48	51.49	0.01
Culham Head	50.22	50.21	-0.01	50.37	50.37	0.00	50.44	50.44	0.00
Culham Tail	49.10	49.09	-0.01	49.44	49.43	0.00	49.66	49.66	0.00
Sutton Courtenay	48.87	48.86	-0.01	49.22	49.21	0.00	49.44	49.44	0.00
Clifton Head	48.23	48.23	-0.01	48.45	48.44	-0.01	48.63	48.63	0.00
Clifton Tail	47.87	47.86	-0.01	48.29	48.29	-0.01	48.54	48.53	0.00
Days Head	46.84	46.83	-0.01	47.25	47.24	-0.01	47.53	47.53	0.00
Days Tail	46.75	46.74	-0.01	47.19	47.18	-0.01	47.47	47.47	0.00
Benson Head	45.26	45.25	-0.01	45.66	45.66	-0.01	45.93	45.93	0.00
Benson Tail	45.13	45.12	-0.01	45.55	45.54	-0.01	45.84	45.83	0.00
Cleeve Head	42.80	42.80	0.00	43.02	43.02	0.00	43.27	43.26	-0.01
Cleeve Tail	42.38	42.38	-0.01	42.81	42.81	0.00	43.14	43.13	-0.01
Goring Head	42.15	42.15	-0.01	42.52	42.52	0.00	42.81	42.81	-0.01
Goring Tail	42.00	41.99	-0.01	42.51	42.51	0.00	42.84	42.83	-0.01
Whitchurch Head	40.26	40.25	-0.01	40.50	40.50	0.00	40.64	40.63	0.00
Whitchurch Tail	39.93	39.92	0.00	40.18	40.18	0.00	40.33	40.33	0.00
Mapledurham Head	39.18	39.17	0.00	39.35	39.35	0.00	39.47	39.47	0.00
Mapledurham Tail	38.77	38.76	-0.01	39.07	39.07	0.00	39.24	39.24	-0.01
Reading Bridge	36.98	36.97	-0.01	37.34	37.34	0.00	37.61	37.60	-0.01

Table 2 – Pre and Post scheme flood levels for 1 in 100 and 1 in 100 year +35% climate change events

Location / Weir	100-year			100-year+35%		
	Baseline	FAS	Diff (m)	Baseline	FAS	Diff (m)
Sandford Head	54.60	54.60	0.00	54.84	54.84	0.00
Sandford Tail	54.06	54.06	0.00	54.41	54.41	0.01
Abingdon Head	51.88	51.88	0.00	52.10	52.10	0.00
Abingdon Tail	51.62	51.62	0.00	51.95	51.95	0.00
Culham Head	50.51	50.52	0.00	50.69	50.69	0.00
Culham Tail	49.84	49.85	0.01	50.31	50.32	0.00
Sutton Courtenay	49.62	49.63	0.01	50.10	50.11	0.00
Clifton Head	48.79	48.80	0.01	49.14	49.14	0.00
Clifton Tail	48.71	48.71	0.01	49.06	49.06	0.00
Days Head	47.79	47.80	0.01	48.16	48.16	0.00
Days Tail	47.73	47.74	0.01	48.11	48.11	0.00
Benson Head	46.26	46.28	0.02	46.92	46.91	0.00
Benson Tail	46.19	46.21	0.02	46.84	46.84	0.00
Cleeve Head	43.61	43.63	0.02	44.35	44.35	0.00
Cleeve Tail	43.53	43.56	0.02	44.31	44.31	0.00
Goring Head	43.23	43.26	0.02	44.09	44.09	0.00
Goring Tail	43.24	43.26	0.02	44.07	44.07	0.00
Whitchurch Head	40.80	40.81	0.01	41.11	41.11	0.00
Whitchurch Tail	40.50	40.51	0.01	40.80	40.80	0.00
Mapledurham	39.62	39.63	0.01	39.91	39.91	0.00
Mapledurham Tail	39.43	39.43	0.01	39.76	39.76	0.00
Reading Bridge	37.84	37.84	0.00	38.10	38.10	0.00

### 3. Observed / Calibration Event Results

In addition to the theoretical design events the results from the Oxford FAS for the observed 2003 and 2007 flood events were also run through the downstream model. The results for these are presented in Tables 3 and 4 below. In the following tables the 'Recorded' column relates to the actual levels recorded during the events at each lock. 'Baseline' is the pre-scheme model levels and the 'Oxford FAS' column relates to post scheme predicted levels. All levels are in metres above Ordnance Datum. The 'Diff (m)' columns relate to the difference between the modelled and recorded levels for each model run in metres. The 'FAS Difference' column shows the difference between the pre and post scheme model runs in metres.

Overall the baseline model calibration is good, with the majority of peak level comparisons within the +/- 0.15m (tolerance specified by the Environment Agency). Where the level differences are greater than +/-0.15m they can be explained by either data errors with the recorded levels or uncertainty of tributary inflows (e.g. the Ock, which would impact Abingdon Tail and the Thames which impacts Benson Lock).

Table 3 – Pre and Post scheme flood levels for the observed 2003 flood event

Location (model node)	Baseline			Oxford FAS		FAS Difference
	Recorded	Model	Diff (m)	Model	Diff (m)	Diff (m)
Sandford Head (46c.002A)	54.40 <sup>(1)</sup>	54.33	-0.07	54.34	-0.06	0.00
Sandford Tail (45.164)	53.68 <sup>(2)</sup>	53.58	-0.10	53.58	-0.10	0.00
Abingdon Head (45.002)	51.61	51.59	-0.02	51.60	-0.01	0.00
Abingdon Tail (44.098)	51.31	51.10	-0.21	51.11	-0.20	0.01
Culham Head (44a.001A)	50.28	50.26	-0.02	50.27	-0.01	0.01
Culham Tail (43.076)	49.31	49.18	-0.13	49.20	-0.11	0.02
Sutton Courtenay (43.059)	49.02	48.96	-0.07	48.97	-0.05	0.02
Clifton Head (43b.002A)	48.40	48.29	-0.11	48.30	-0.10	0.01
Clifton Tail (42.100)	48.09	48.03	-0.06	48.05	-0.04	0.02
Days Head (42.001)	47.19	47.22	0.03	47.25	0.06	0.03
Days Tail (41.141)	47.15 <sup>(1)</sup>	47.18	0.03	47.21	0.06	0.03
Benson Head (41.001)	45.75	45.72	-0.03	45.74	-0.01	0.02
Benson Tail (40.040X)	45.47 <sup>(1)</sup>	45.60	0.13	45.63	0.16	0.02
Cleeve Head (40.002)	43.15	43.06	-0.09	43.08	-0.07	0.01
Cleeve Tail (39.019)	43.03	42.88	-0.15	42.90	-0.13	0.02
Goring Head (39.002)	42.72 <sup>(1)</sup>	42.58	-0.14	42.59	-0.13	0.02
Goring Tail (38.132)	42.55	42.57	0.02	42.59	0.04	0.02
Whitchurch Head (38.001D)	40.62	40.53	-0.09	40.53	-0.09	0.01
Whitchurch Tail (37.075)	40.10	40.21	0.11	40.22	0.12	0.01
Mapledurham Head (37.002)	39.47	39.37	-0.10	39.38	-0.09	0.01
Mapledurham Tail (36.153)	39.30	39.11	-0.20	39.11	-0.19	0.01
Reading Bridge (36.012)	37.41	37.40	-0.01	37.41	0.00	0.01

<sup>(1)</sup> No telemetry at peak, tackle sheet used, <sup>(2)</sup> 2002/3 Flood levels Sandford Lock level survey, Survey 8515, 27 October 2005

Table 4 – Pre and Post scheme flood levels for the observed 2007 flood event

Location (model node)	Baseline			Oxford FAS		FAS Difference
	Recorded	Model	Diff (m)	Model	Diff (m)	Diff (m)
Sandford Head (46c.002A)	54.49 <sup>(3)</sup>	54.34	-0.15	54.34	-0.15	0.00
Sandford Tail (45.164)	53.97 <sup>(3)</sup>	53.59	-0.38	53.60	-0.37	0.01
Abingdon Head (45.002)	51.59	51.62	0.03	51.63	0.03	0.01
Abingdon Tail (44.098)	51.17	51.13	-0.04	51.14	-0.03	0.01
Culham Head (44a.001A)	50.29	50.30	0.01	50.30	0.01	0.01
Culham Tail (43.076)	49.39	49.25	-0.14	49.26	-0.13	0.01
Sutton Courtenay (43.059)	49.08 <sup>(4)</sup>	49.02	-0.06	49.04	-0.04	0.01
Clifton Head (43b.002A)	48.35	48.33	-0.02	48.33	-0.02	0.01
Clifton Tail (42.100)	48.06	48.08	0.02	48.09	0.03	0.01
Days Head (42.001)	47.02	47.00	-0.02	47.00	-0.02	0.00
Days Tail (41.141)	46.89	46.92	0.03	46.92	0.03	-0.01
Benson Head (41.001)	45.33	45.41	0.08	45.40	0.07	-0.01
Benson Tail (40.040X)	45.13	45.28	0.15	45.27	0.14	-0.01
Cleeve Head (40.002)	42.88	42.86	-0.02	42.86	-0.02	0.00
Cleeve Tail (39.019)	42.46	42.53	0.07	42.53	0.06	-0.01
Goring Head (39.002)	42.35	42.27	-0.08	42.26	-0.09	-0.01
Goring Tail (38.132)	42.08	42.20	0.12	42.19	0.11	-0.01
Whitchurch Head (38.001D)	40.31	40.36	0.05	40.35	0.04	0.00
Whitchurch Tail (37.075)	39.91	40.03	0.12	40.03	0.12	0.00
Mapledurham Head (37.002)	39.26	39.24	-0.02	39.24	-0.02	0.00
Mapledurham Tail (36.153)	38.86	38.90	0.04	38.90	0.04	0.00
Caversham Head (36.012)	36.93	37.13	0.20	37.13	0.20	0.00

<sup>(3)</sup> Oxford Initial Assessment Modelling Report, December 2014, <sup>(4)</sup> Hydraulic Models for Flood Forecasting: July 2007 Flood Review