Appendices

A Site assessment table

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Supplied site information				Calculated site information					Completions
JBA_ID	VoWH_ID	Site classification	Site	Area_ha	Settlement	Type	Housing_Units x ha	Potential Housing Units	Housing Completions 2011/12 -2012/13
S1		strategic	Land South of Park Road, Faringdon	30.03			25	751	
S2		strategic	Crab Hill	52.22			25	1306	
S3-S4		strategic	Valley Park	170.00			25	4250	
S5		strategic	Harwell	13.81			25	345	
S6		strategic	Monks Farm Phase I & II	48.25			25	1206	
C1	17	contingency	East Harwell Oxford Campus	139.56			25	3489	
C2	6	contingency	South Faringdon	32.08			25	802	
C3	1	contingency	North Abingdon	69.37			25	1734	
C4	10	contingency	South Valley Park	22.93			25	573	
C5	11	contingency	North West Valley Park	46.95			25	1174	
C6	31	contingency	North Shrivenham	31.47			25	787	
C7	22	contingency	South Cumnor	11.73			25	293	
C8	25	contingency	South Kennington	11.79			25	295	
C9	28	contingency	North West Radley	12.66			25	317	
C10	30	contingency	South Shrivenham	11.62			25	291	
C11	13	contingency	Residential development on Didcot A site	46.17			25	1154	
C12	12	contingency	current Valley Park allocation site	147.07			5	735	
C14	38	contingency	West Stanford in the Vale	11.62			25	291	
C15	23	contingency	North West East Challow	12.71			25	318	
C17	40	contingency	Milton Heights	53.44			25	1336	
C18	43	contingency	East Wootton	7.85			25	196	
C19	42	contingency	North West Abingdon	12.60			25	315	
C20	45	contingency	Land south of East Hanney	50.12			25	1253	
C22	44	contingency	Land west of Harwell Village	50.00			25	1250	
C26	21	contingency	South Drayton	20			25	500	
C27	27	contingency	South Marcham	8.59			25	215	
C28	29	contingency	North Radley	18.53			25	463	
C29	33	contingency	East Sutton Courtenay					200	
C30	5	contingency	South West Faringdon					200	
C31	48	contingency	Kingston Bagpuize East	11.85			25	296	
C32	49	contingency	Kingston Bagpuize South	8			25	200	
P1	P04/V2030	Completed	Land adj to police HQ, Colwell Drive						9
P2	P10/V1301	Completed	Land opp Shepherds Hey & Southbourne, Bessels Way						14
P3	P03/V0247	Completed	Manor Farm, Fernham						4
P4	P10/V1846	Completed	St Johns Court, Oxford Ln						10
P5	P10/V2032	Completed	Amey Plc, Appleford Rd						15
P6	P08/V1739	Completed	Abbey House, Stirlings Rd						10
P7	P05/V1700; P05/\	Completed	Former bus depot site, Grove St & Limborough Rd						30
P8	P08/V0694	Completed	St Marys School, Newbury St						56
P9	P08/V1237	Under construction	The Old Gaol Leisure Centre						20
P10	P11/V1557/RM	Under construction	Land to the South of Chilton Field						76
P11	P08/V0325/RM	Under construction	Timbmet Ltd, Cumnor Hill						35
P12	P08/V1078/RM	Under construction	Former Tree Nursery & Cricket Club & Jespers Hill, Park Rd						219
P13	P10/V1614	Under construction	Land adj 31 & 34 Simpsons Way						15
P14	P12/V2196/FUL	Planning permission gra	33 West, St Helen						
P15	P12/V0870	Planning permission gra	Champion House, 12 Wootton Rd						
P16	P11/V1960/EX	Planning permission gra	Challow Country Club, Woodhill Ln						
P17	P12/V1261/FUL	Planning permission gra	Nalder Estate & The Old Canal Building, Main St						
P18	P11/V2103	Planning permission gra	Land South of Alfreds Place						
P19	P13/V0344/FUL	Planning permission gra	Land adj to Folly Park, Park Rd						
P20	P07/V1772/RM	Planning permission gra	Land adj Coxwell House & Winslow House, Coxwell Rd						
P21	P12/V1240/FUL	Planning permission gra	Land at Stockham Farm, Denchworth Rd						
P22	P12/V1410/FUL	Planning permission gra	98-100 West Way, Botley						
P23	P12/V2582/FUL	Planning permission gra	East of Highworth Rd						
P24	P12/V0324	Planning permission gra	Land between Station Rd & Townsend Rd						
P25	P12/V1329/FUL	Planning permission gra	Land Opp Shrivenham Hundred Business Park						
P26	P11/V1520	Planning permission gra	46 Newbury Street						
P27	P12/V0270/EX	Planning permission gra	Ambulance Station, Ormond Rd						
P28	P12/V1836/O	Planning permission gra	Land West of Witney Road and South of A420						
P29	P12/V1302/O	Planning permission gra	Land South of Faringdon Rd, Southmoor						
P30	P07/V0741/O	Planning permission gra	Land adj NE & NW of Tilbury Ln, Botley						
P31	P13/V0094/O	Planning permission gra	Land off Barnett Rd						
P32	P02/V1594/O	Planning permission gra	Land at Didcot Road, Great Western Park						
P33	P11/V1453/O	Planning permission gra	Broadwater, Manor Rd						
P34	P12/V2283/O	Planning permission gra	Cowan's Camp Depot, High St						
P35	P13/V0497/RM	Planning permission gra	Land off Lime Rd, Botley						
P36	P10/V1907/O	Planning permission gra	Major Amey's Site						
P37	P12/V0958	Planning permission gra	17 to 20 Millbrook Sq						
P38	P11/V0086	Resolution to grant	Christ Church, Hobbyhorse Ln						
P39	P12/V0845	Resolution to grant	Anson Field, Morland Rd, Hyde Copse, Howard Cornish Rd						
P40	P13/V0145/O	Resolution to grant	South of Lamb Ave						
P41	P12/V2316/O	Resolution to grant	Land east of Chainhill Rd						
P42	P12/V2429/O	Resolution to grant	Land off Rectory Farm Cl						
P43	P12/V0299/O	Application under consid	Land at Grove Air Field, Denchworth Rd						
P44	P13/V0401/O	Resolution to grant	Milton Road, Sutton Courtenay						
P45	P13/V0692/FUL	Resolution to grant	Land at Causeway Farm, The Causeway						
P46	P13/V0859/FUL	Planning permission gra	Land North of Priory Lane						
P47	P13/V0467/O	Resolution to grant	Land at Milton Hill, Milton						
P48	P12/V2048/FUL	Planning permission gra	Land off Walnut Trees Hill						
P49	P13/V0381/FUL	Planning permission gra	Land East of A338, Crown Meadow, East Hanney						
P50	P12/V2653/FUL	Planning permission gra	Land off Draycott Road						
P51	P12/V2266/FUL	Planning permission gra	Land East of Drayton Road						
P52	P13/V0575/O	Resolution to grant	King's Field, Sheepstead Rd, Marcham						
P53	P13/V1040/O	Resolution to grant	Alder View, Land South of Grove Road, Harwell						
P54	P13/V0458/O	Planning permission gra	Chailey House, Bessels Way, Blewbury						
P55	P13/V1543/O	Resolution to grant	Land North of 92-112 Milton Rd						
P56	P13/V0139/O	Resolution to grant	Fernham Fields, Land East of Coxwell Rd						
P57	P12/V1878/FUL	Planning permission gra	Land West of Portway Villas, Reading Rd						
P58	P13/V0146/FUL	Permissions since Apr 2	Land West of the A417						
P59	P13/V0339/O	Resolution to grant	Land off Colton Road						
P60	P13/V1826/FUL	Resolution to grant	Land South of Downsview Road (Stockham Farm Phase 2)						
na	na	Remainder of dwellings	LPP2 villages						
na	na	permissions under 10 d	Small sites						189
na	na	Assumptions based on	Windfall						

JBA_ID	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	Total houses 2013-31	Planned Housing 2013/14-2020/211	Planned Housing 2021/22-2030/31	Planned housing total 2013/14 - 2030/31
S1			80	80	80	80	60												380	380	0	380.0
S2			50	100	100	100	100	132	134	134	162	162	162	164					1500	582	784	1366.0
S3-S4				50	175	175	175	175	175	175	175	175	175	175	175	175			2150	750	1225	1975.0
S5		35	80	80	80	80	45												400	400	0	400.0
S6				14	59	59	59	59	59	59	59	59	52	45	45	45			673	250	364	614.0
C1			50	50	50	50	100	100	100	100	100	100	100	100	100	100	100	100	1400	400	900	1300.0
C2			50	50	50	50													200	200	0	200.0
C3			50	50	50	50	50	50	50	50	10								410	300	60	360.0
C4															33	33	33	33	132	0	132	132.0
C5															33	33	33	33	132	0	132	132.0
C6			50	50	50	50	50	50	50	50									400	300	50	350.0
C7			50	50	50	50													200	200	0	200.0
C8			50	50	50	50	50	20											270	270	0	270.0
C9			50	50	50	50	40												240	240	0	240.0
C10			50	50	50	50													200	200	0	200.0
C11																			0	0	0	0.0
C12															34	34	34	34	136	0	136	136.0
C14			50	50	50	50	50	40											290	290	0	290.0
C15			50	50	50	50													200	200	0	200.0
C17			50	50	50	50	100	100	100	100	100	100	100	100	100	100	100	100	1400	400	900	1300.0
C18			50	50	50	50													200	200	0	200.0
C19			50	50	50	50													200	200	0	200.0
C20			50	50	50	50													200	200	0	200.0
C22			50	50	50	50													200	200	0	200.0
C26			50	50	50	50													200	200	0	200.0
C27			50	50	50	50													200	200	0	200.0
C28			50	50	50	50													200	200	0	200.0
C29			50	50	50	50	20												220	220	0	220.0
C30			50	50	50	50													200	200	0	200.0
C31			17	17	17	17	17	17	17	17	18	18	18	18	18	18	18	18	280	102	161	263.0
C32			12	12	12	12	12	12	12	12	13	13	13	13	13	13	13	13	200	72	116	188.0
P1																			0	0	0	0.0
P2																			0	0	0	0.0
P3																			0	0	0	0.0
P4																			0	0	0	0.0
P5																			0	0	0	0.0
P6																			0	0	0	0.0
P7																			0	0	0	0.0
P8																			0	0	0	0.0
P9	14	14	13																41	41	0	41.0
P10	75	93	31																199	199	0	199.0
P11	157																		157	157	0	157.0
P12		58																	58	58	0	58.0
P13	1																		1	1	0	1.0
P14	10																		10	10	0	10.0
P15	24																		24	24	0	24.0
P16			14																14	14	0	14.0
P17	10	20	20	21															71	71	0	71.0
P18	7	8																	15	15	0	15.0
P19		28																	28	28	0	28.0
P20		35																	35	35	0	35.0
P21	48	48	48	48	8														200	200	0	200.0
P22	10																		10	10	0	10.0
P23		36																	36	36	0	36.0
P24	30																		30	30	0	30.0
P25	40	40	40																120	120	0	120.0
P26		23																	23	23	0	23.0
P27		11																	11	11	0	11.0
P28			14	14	14	14	14	14	14	10									108	84	10	94.0
P29	11	39																	50	50	0	50.0
P30		50	50	50															150	150	0	150.0
P31					50														50	50	0	50.0
P32			100	100	100	100	100	100	100										700	600	0	600.0
P33		14																	14	14	0	14.0
P34		30	50	20															100	100	0	100.0
P35	16	40	40	40															136	136	0	136.0
P36		50	50	40															140	140	0	140.0
P37				11															11	11	0	11.0
P38		15																	15	15	0	15.0
P39		25	26																51	51	0	51.0
P40		18																	18	18	0	18.0
P41		28	57																85	85	0	85.0
P42		13																	13	13	0	13.0
P43				100	200	200	200	200	200	200	200	200	200	200	200	200			2500	900	1400	2300.0
P44			5	5	5	5	5	5	5	5	5	5	5	5	5	5			70	30	35	65.0
P45			5	5	5	5	5	5	1										31	30	0	30.0
P46			5	5	5	3													18	18	0	18.0
P47						5	5	5	5	5	5	5	5	5	3				48	15	28	43.0
P48			5	5	5	3													18	18	0	18.0
P49			5	5	5	5	5												25	25	0	25.0
P50			14	14	14	14	14	14	14										98	84	0	84.0
P51			14	14	14	14	14	14	14	14	14	14	14	6					160	84	62	146.0
P52				5	5	5	5	5	5	5	5	3							43	25	13	38.0
P53						5	5	5	5	5	5	5	5	5	5	5			55	15	35	50.0
P54						5	5	5	5	5	5								30	15	10	25.0
P55			5	5	5	5	5	5	4										34	30	0	30.0
P56						14	14	14	14	14	14	14	14	14	14	14			154	42	98	140.0
P57			5	5	5	5	1												21	21	0	21.0
P58			5	5	5	5	5	5	5	5	5	5	5	5	5	5			70	30	35	65.0
P59						5	5	5	5	5	5	5	5	5	5	5			55	15	35	50.0
P60					5	5	5	5	5	5	5	5	5	5	5	5			60	20	35	55.0
na (LPP2 villages)						96	96	96	96	96	96	96	96	96	96	95			1055	288	671	959.0
na (Small sites)	102	102	102	102	102														510	510	0	510.0
na (Windfall)						65	65	65	65	65	65	65	65	65	65	65	65	65	845	195	585	780.0

JBA_ID	Water resources and supply									
	Population equivalent increase	Employment Land	Water Company	Demand_MLD 2.4p/h*134l/p/h	Water Resource Zone	Flow monitoring Zone	Water resources assessment	Comment on: Water resources assessment	Water supply infrastructure assessment	Comment on: Water supply infrastructure assessment
S1	912	0	Thames Water	0.122	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
S2	3600	0	Thames Water	0.482	SWOX	Wantage	A		R	Cannot accommodate all site allocations
S3-S4	5160	0	Thames Water	0.691	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
S5	960		Thames Water	0.129	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
S6	1615	0	Thames Water	0.216	SWOX	Wantage	A		R	Cannot accommodate all site allocations
C1	3360	0	Thames Water	0.450	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C2	480	0	Thames Water	0.064	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
C3	984	0	Thames Water	0.132	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
C4	317	0	Thames Water	0.042	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C5	317	0	Thames Water	0.042	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C6	960	0	Thames Water	0.129	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
C7	480	0	Thames Water	0.064	SWOX	Boars Hill	A		G	Can accommodate sites without upgrades
C8	648	0	Thames Water	0.087	SWOX	Boars Hill	A		G	Can accommodate sites without upgrades
C9	576	0	Thames Water	0.077	SWOX	Brasenose	A		G	Can accommodate sites without upgrades
C10	480	0	Thames Water	0.064	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
C11	0	0	Thames Water	0.000	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C12	326	0	Thames Water	0.044	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C14	696	0	Thames Water	0.093	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
C15	480	0	Thames Water	0.064	SWOX	Wantage	A		R	Cannot accommodate all site allocations
C17	3360	0	Thames Water	0.450	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C18	480	0	Thames Water	0.064	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
C19	480	0	Thames Water	0.064	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
C20	480	0	Thames Water	0.064	SWOX	Wantage	A		R	Cannot accommodate all site allocations
C22	480	0	Thames Water	0.064	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C26	480	0	Thames Water	0.064	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C27	480	0	Thames Water	0.064	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
C28	480	0	Thames Water	0.064	SWOX	Brasenose	A		G	Can accommodate sites without upgrades
C29	528	1	Thames Water	0.071	SWOX	Hagbourne Hill	A		G	Can accommodate sites without upgrades
C30	480	2	Thames Water	0.064	SWOX	Faringdon	A		R	Cannot accommodate all site allocations
C31	672		Thames Water	0.090	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
C32	480		Thames Water	0.064	SWOX	Abingdon	A		G	Can accommodate sites without upgrades
P1	0	3	Thames Water	0.000	SWOX					
P2	0	4	Thames Water	0.000	SWOX					
P3	0	5	Thames Water	0.000	SWOX					
P4	0	6	Thames Water	0.000	SWOX					
P5	0	7	Thames Water	0.000	SWOX					
P6	0	8	Thames Water	0.000	SWOX					
P7	0	9	Thames Water	0.000	SWOX					
P8	0	10	Thames Water	0.000	SWOX					
P9	98	11	Thames Water	0.013	SWOX					
P10	478	12	Thames Water	0.064	SWOX					
P11	377	13	Thames Water	0.050	SWOX					
P12	139	14	Thames Water	0.019	SWOX					
P13	2	15	Thames Water	0.000	SWOX					
P14	24	16	Thames Water	0.003	SWOX					
P15	58	17	Thames Water	0.008	SWOX					
P16	34	19	Thames Water	0.005	SWOX					
P17	170	20	Thames Water	0.023	SWOX					
P18	36	21	Thames Water	0.005	SWOX					
P19	67	22	Thames Water	0.009	SWOX					
P20	84	24	Thames Water	0.011	SWOX					
P21	480	25	Thames Water	0.064	SWOX					
P22	24	26	Thames Water	0.003	SWOX					
P23	86	27	Thames Water	0.012	SWOX					
P24	72	28	Thames Water	0.010	SWOX					
P25	288	29	Thames Water	0.039	SWOX					
P26	55	30	Thames Water	0.007	SWOX					
P27	26	31	Thames Water	0.004	SWOX					
P28	259	32	Thames Water	0.035	SWOX					
P29	120	34	Thames Water	0.016	SWOX					
P30	360	35	Thames Water	0.048	SWOX					
P31	120	36	Thames Water	0.016	SWOX					
P32	1680	37	Thames Water	0.225	SWOX					
P33	34	38	Thames Water	0.005	SWOX					
P34	240	39	Thames Water	0.032	SWOX					
P35	326	40	Thames Water	0.044	SWOX					
P36	336	41	Thames Water	0.045	SWOX					
P37	26	42	Thames Water	0.004	SWOX					
P38	36	44	Thames Water	0.005	SWOX					
P39	122	45	Thames Water	0.016	SWOX					
P40	43	46	Thames Water	0.006	SWOX					
P41	204	47	Thames Water	0.027	SWOX					
P42	31	48	Thames Water	0.004	SWOX					
P43	6000	49	Thames Water	0.804	SWOX					
P44	168	50	Thames Water	0.023	SWOX					
P45	74	51	Thames Water	0.010	SWOX					
P46	43	52	Thames Water	0.006	SWOX					
P47	115	53	Thames Water	0.015	SWOX					
P48	43	54	Thames Water	0.006	SWOX					
P49	60	55	Thames Water	0.008	SWOX					
P50	235	56	Thames Water	0.032	SWOX					
P51	384	57	Thames Water	0.051	SWOX					
P52	103	58	Thames Water	0.014	SWOX					
P53	132	59	Thames Water	0.018	SWOX					
P54	72	60	Thames Water	0.010	SWOX					
P55	82	61	Thames Water	0.011	SWOX					
P56	370	62	Thames Water	0.050	SWOX					
P57	50	63	Thames Water	0.007	SWOX					
P58	168	64	Thames Water	0.023	SWOX					
P59	132	65	Thames Water	0.018	SWOX					
P60	144	66	Thames Water	0.019	SWOX					
na (LPP2 villages)	2532	67	Thames Water	0.339	SWOX					
na (Small sites)	1224		Thames Water	0.164	SWOX					
na (Windfall)	2028		Thames Water	0.272	SWOX					

JBA_ID	Wastewater											Flood risk		
	Receiving WwTW	Receiving_WwTW _ID	Alternative WwTW	Flow increase l/s (1*DWF)	Flow increase m3/d (1*DWF)	WwTW capacity assessment	Comment on: WwTW capacity assessment	Water quality assessment	Sewerage infrastructure assessment	Comment on: Sewerage infrastructure assessment	Odour Assessment	WwTW additional flow flood risk	Fluvial Flood Risk	Pluvial Flood Risk
S1	FARINGDON STW	PUTE0073		1.344	116.098	R	Cannot accommodate all pro	A	R		G	G	G	G
S2	WANTAGE STW	POCE0025		5.304	458.280	R	Can accommodate the propo	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
S3-S4	DIDCOT STW	PTHE0052		7.603	656.868	G	No Upgrades Needed	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	A	A
S5	DIDCOT STW			1.414	122.208	G	Upgrades Needed	A			G	G	G	A
S6	WANTAGE STW	POCE0025		2.380	205.615	R	Can accommodate the propo	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	A	G	R	A
C1	DIDCOT STW	PTHE0052		4.951	427.728	G	Upgrades Needed	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C2	FARINGDON STW	PUTE0073		0.707	61.104	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, current wastewater treatment capacity in this area is unlikely to be able to support the demand anticipated from this development. Drainage infrastructure is likely to be required to ensure sufficient capacity is brought forward ahead of the development. In the first instance a drainage strategy would be required from the developer to determine the exact impact on our infrastructure and the significance of the infrastructure to support the development. It should be noted that in the event of an upgrade to our assets being required, up to three years lead in time will be potentially necessary for the delivery of the infrastructure, alternatively the developer may wish to requisition the infrastructure to deliver it sooner. We are also likely to request a Grampian planning condition to ensure the infrastructure is in place ahead of occupation of the development.	G	G	G	G
C3	ABINGDON STW	PTHE0252		1.450	125.263	G	Upgrades Needed	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	A
C4	DIDCOT STW	PTHE0052		0.467	40.329	G	No Upgrades Needed	A	R		G	G	G	G
C5	DIDCOT STW	PTHE0052		0.467	40.329	G	No Upgrades Needed	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	R	A
C6	SHRIVENHAM STW	PUTE0115		1.414	122.208	R	Upgrades Needed	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	A
C7	APPLETON STW	POCE0003		0.707	61.104	A	No Upgrades Needed	A			G	G	G	A
C8	OXFORD STW	PTHE0144		0.955	82.490	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	A
C9	OXFORD STW	PTHE0144	ABINGDON STW	0.849	73.325	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	A
C10	SHRIVENHAM STW	PUTE0115		0.707	61.104	R	Cannot accommodate all pro	A			G	G	G	G
C11	DIDCOT STW	PTHE0052		0.000	0.000	R	Cannot accommodate all pro	A			G	G	G	A
C12	DIDCOT STW	PTHE0052		0.481	41.551	R	Cannot accommodate all pro	A			G	G	A	A
C14	STANFORD IN THE V	POCE0021		1.025	88.601	G	Can accommodate the propo	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C15	WANTAGE STW	POCE0025		0.707	61.104	R	Can accommodate the propo	A			G	G	G	G
C17	DIDCOT STW	PTHE0052		4.951	427.728	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C18	ABINGDON STW	PTHE0252		0.707	61.104	G	Can accommodate the propo	A			G	G	G	A
C19	ABINGDON STW	PTHE0252		0.707	61.104	G	Can accommodate the propo	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	A
C20	WANTAGE STW	POCE0025		0.707	61.104	R	Can accommodate the propo	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C22	DIDCOT STW	PTHE0052		0.707	61.104	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C26	DRAYTON STW			0.707	61.104	G	No Upgrades Needed	A			A	G		
C27	APPLETON STW	POCE0003		0.707	61.104	A	Can accommodate the propo	A			G	G		
C28	OXFORD STW	PTHE0144		0.707	61.104	R	Cannot accommodate all pro	A	R	Note TWUL call this North West Radley: We have concerns regarding Wastewater Services in relation to this site. Specifically, current wastewater treatment capacity in this area is unlikely to be able to support the demand anticipated from this development. Drainage infrastructure is likely to be required to ensure sufficient capacity is brought forward ahead of the development. In the first instance a drainage strategy would be required from the developer to determine the exact impact on our infrastructure and the significance of the infrastructure to support the development. It should be noted that in the event of an upgrade to our assets being required, up to three years lead in time will be potentially necessary for the delivery of the infrastructure, alternatively the developer may wish to requisition the infrastructure to deliver it sooner. We are also likely to request a Grampian planning condition to ensure the infrastructure is in place ahead of occupation of the development.We have concerns regarding Wastewater Services in relation to this site. Specifically, current wastewater network in this area is unlikely to be able to support the demand anticipated from this development. Drainage infrastructure is likely to be required to ensure sufficient capacity is brought forward ahead of the development. In the first instance a drainage strategy would be required from the developer to determine the exact impact on our infrastructure and the significance of the infrastructure to support the development. It should be noted that in the event of an upgrade to our assets being required, up to three years lead in time will be potentially necessary for the delivery of the infrastructure, alternatively the developer may wish to requisition the infrastructure to deliver it sooner. We are also likely to request a Grampian planning condition to ensure the infrastructure is in place ahead of occupation of the development.	G	G		
C29	DRAYTON STW			0.778	67.214	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	R
C30	FARINGDON STW			0.707	61.104	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C31	KINGSTON BAGPUIZE STW			0.990	85.546	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
C32	KINGSTON BAGPUIZE STW			0.707	61.104	R	Cannot accommodate all pro	A	R	We have concerns regarding Wastewater Services in relation to this site. Specifically, curr	G	G	G	G
P1	ABINGDON STW			0.000	0.000									
P2	DIDCOT STW			0.000	0.000									
P3	SHRIVENHAM STW			0.000	0.000									
P4	WANTAGE STW			0.000	0.000									
P5	DRAYTON STW			0.000	0.000									
P6	WANTAGE STW			0.000	0.000									
P7	WANTAGE STW			0.000	0.000									
P8	WANTAGE STW			0.000	0.000									
P9	ABINGDON STW			0.145	12.526									
P10	DIDCOT STW			0.704	60.798									
P11	OXFORD STW			0.555	47.967									
P12	FARINGDON STW			0.205	17.720									
P13	OXFORD STW			0.004	0.306									
P14	ABINGDON STW			0.035	3.055									
P15	ABINGDON STW			0.085	7.332									
P16	WANTAGE STW			0.050	4.277									
P17	WANTAGE STW			0.251	21.692									
P18	WANTAGE STW			0.053	4.583									
P19	FARINGDON STW			0.099	8.555									
P20	FARINGDON STW			0.124	10.693									
P21	WANTAGE STW			0.707	61.104									
P22	OXFORD STW			0.035	3.055									
P23	SHRIVENHAM STW			0.127	10.999									
P24	SHRIVENHAM STW			0.106	9.166									
P25	SHRIVENHAM STW			0.424	36.662									
P26	WANTAGE STW			0.081	7.027									
P27	WANTAGE STW			0.039	3.361									
P28	KINGSTON BAGPUIZE STW			0.382	32.996									
P29	KINGSTON BAGPUIZE STW			0.177	15.276									
P30	OXFORD STW			0.530	45.828									
P31	DRAYTON STW			0.177	15.276									
P32	DIDCOT STW			2.475	213.864									
P33	WANTAGE STW			0.050	4.277									
P34	SHRIVENHAM STW			0.354	30.552									
P35	OXFORD STW			0.481	41.551									
P36	DRAYTON STW			0.495	42.773									
P37	WANTAGE STW			0.039	3.361									
P38	DRAYTON STW			0.053	4.583									
P39	ABINGDON STW			0.180	15.582									
P40	DIDCOT STW			0.064	5.499									
P41	WANTAGE STW			0.301	25.969									
P42	WANTAGE STW			0.046	3.972									
P43	WANTAGE STW			8.840	763.800									
P44	DRAYTON STW			0.248	21.386									
P45	DRAYTON STW			0.110	9.471									
P46	APPLETON STW			0.064	5.499									
P47	DIDCOT STW			0.170	14.665									
P48	SHRIVENHAM STW			0.064	5.499									
P49	WANTAGE STW			0.088	7.638									
P50	KINGSTON BAGPUIZE STW			0.347	29.941									
P51	ABINGDON STW			0.566	48.883									
P52	APPLETON STW			0.152	13.137									
P53	DIDCOT STW			0.194	16.804									
P54	DIDCOT STW			0.106	9.166									
P55	DRAYTON STW			0.120	10.388									
P56	FARINGDON STW			0.545	47.050									
P57	WANTAGE STW			0.074	6.416									
P58	STANFORD IN THE VALE STW			0.248	21.386									
P59	SHRIVENHAM STW			0.194	16.804									
P60	WANTAGE STW			0.212	18.331									
na (LPP2 villages)	N/A			3.731	322.324									
na (Small sites)	N/A			1.803	155.815									
na (Windfall)	N/A			2.988	258.164									

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B Water Quality Assessment

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B Water quality assessment

B.1 Introduction

The increased discharge of effluent due to an increase in the population served by a Sewage Treatment Works (STW) may impact on the quality of the receiving water. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new environmental permit may be required for the STW to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a “no deterioration” or “load standstill".

EA guidance states that a 10% deterioration in the receiving water can be allowed in some circumstances as long as this does not cause a class deterioration to occur.

If a watercourse fails the 'good status' target, further investigations are needed in order to define the 'reasons for fail' and which actions could be implemented to reach such status.

During the preparation of the phase I Water Cycle Study (WCS) the EA advised that it would be necessary to undertake an assessment of the water quality impact of development in the 11 STW catchments which will receive the majority of additional flows in the Vale of White Horse District (12 outfalls as Abingdon has 2 outfalls to different watercourses).

This report assesses the potential water quality impacts due to growth in STW effluent flows and loads at those 11 STW discharge points.

B.2 Standards

The WFD targets for Biological Oxygen Demand (BOD), Ammonia (NH_4) and Phosphate (P) set by the EA are shown in Table 1 and Table 2 below:

Table 1: WFD targets

Determinand	Statistic	1st cycle (2009)	2nd cycle (2013)
BOD	90 percentile	5mg/l	5mg/l
NH_4	90 percentile	0.6mg/l	0.6mg/l
P	Mean	0.12 mg/l	See Table 2 below for reach-specific targets

For cycle 2 (2013 onwards) the EA has set reach-specific targets for P based on environmental modelling using SIMCAT. The EA has advised that for unlisted sites a target of 0.08 mg/l as an annual average orthophosphate (PO4-P) should be used.

Table 2: Targets for Mean Phosphate, 2013

SIMCAT model node	Site Name	2nd cycle standard (mg/l)
POCR0006	LETCOMBE BROOK AT WEIR FARM, EAST HANNEY	0.08
POCR0071	PORTOBELLO DITCH BELOW RAILWAY	0.083
POCR0019	OCK AT STANFORD IN THE VALE ROAD BRIDGE, STANFORD IN THE VALE	0.081
POCR0011	MARCHAM BROOK AT MILL ROAD, MARCHAM	0.084
POCR0013	OCK ABOVE THAMES	0.086
POCR0016	OCK AT MILL ROAD, MARCHAM	0.085
POCR0017	OCK AT OCK BRIDGE, LYFORD	0.083
PTHR0065	THAMES 400M BELOW BOVENEY DITCH	0.09
PTHR0075	THAMES ABOVE NSWC INTAKE, EGHAM	0.092
PTHR0079	THAMES AT BOVENEY WEIR	0.09
PTHR0108	THAMES AT THREE VALLEYS WATER INTAKE, SUNNYMEADS	0.092
PTHR0074	THAMES ABOVE NSWC INTAKE, WALTON	0.09
PTHR0076	THAMES AT RAVENS AIT, SURBITON	0.088
PTHR0094	THAMES AT MWD INTAKE, WALTON	0.09
PTHR0096	THAMES AT NSWC INTAKE, CHERTSEY	0.092
PTHR0107	THAMES AT TEDDINGTON WEIR	0.09
PTHR0082	THAMES AT COOKHAM BRIDGE	0.089
PTHR0088	THAMES AT HENLEY BRIDGE	0.087
PTHR0102	THAMES AT SONNING WEIR	0.087
PTHR0104	THAMES AT SPADE OAK	0.089
PTHR0204	FAWLEY COURT STREAM AT GARDEN CENTRE ROAD BRIDGE, HENLEY	0.091
PTHR0054	PORTLANE BROOK ABOVE THAMES	0.088
PTHR0265	LONGFORD RIVER AT HIGH STREET, HAMPTON	0.093
PTHR0014	CHALVEY DITCH ABOVE THAMES	0.087
PTHR0005	ASH ABOVE THAMES	0.094
PTHR0124	CUT ABOVE THAMES	0.089
PTHR0125	CUT AT BUCK BRIDGE, BINFIELD	0.077
PTHR0223	HEYWOOD STREAM ABOVE THE CUT	0.093
PTHR0008	BOVENEY DITCH ABOVE THAMES	0.095

SIMCAT model node	Site Name	2nd cycle standard (mg/l)
PTHR0016	CHOLSEY BROOK 500M BELOW CHOLSEY STW	0.087
PTHR0041	MOOR DITCH ABOVE DIDCOT STW	0.084
PTHR0043	MOOR DITCH AT B4016, APPLEFORD	0.086
PTHR0029	GINGE BROOK AT B4016, SUTTON COURTENAY	0.086
PTHR0048	NORTHFIELD BROOK AT SANDFORD	0.08
PTHR0026	FILCHAMPSTEAD BROOK ABOVE THAMES	0.079
PTHR0216	HARCOURT BROOK ABOVE LIMB BROOK	0.083
PTHR0080	THAMES AT CAVERSHAM WEIR	0.086
PTHR0111	THAMES AT WALLINGFORD BRIDGE	0.084
PTHR0120	THAMES JUST ABOVE GORING WEIR	0.084
PTHR0121	THAMES ABOVE MAPLEDURHAM WEIR	None
PTHR0113	THAMES AT WATER INTAKE, FARMOOR	0.079
PTHR0077	THAMES AT ABINGDON WEIR	0.08
PTHR0081	THAMES AT CLIFTON HAMPDEN BRIDGE	0.081
PTHR0083	THAMES AT DAYS LOCK	0.083
PTHR0085	THAMES AT FOLLY BRIDGE, OXFORD	0.08
PTHR0098	THAMES AT RADLEY COLLEGE BOATHOUSE, RADLEY	0.082
PTHR0099	THAMES AT SANDFORD	0.081
PTHR0105	THAMES AT SUTTON BRIDGE, CULHAM	0.083
PTHR0110	THAMES AT TROUT INN, GODSTOW	0.08
PTHR0152	ODHAY HILL DITCH ABOVE GINGE BROOK	0.085
PTHR0186	THAMES AT DONNINGTON BRIDGE, OXFORD	0.08
PTHR0221	CLIFTON HAMPDEN DITCH ABOVE THAMES	0.081
PUTR0249	LENTA BROOK AT HINTON MARSH FARM	0.074
PUTR0116	TUCKMILL BROOK BELOW SHRIVENHAM STW	0.075
PUTR0024	COLE AT B4000, SEVENHAMPTON	0.073
PUTR0108	THAMES AT WATERHAY BRIDGE, ASHTON KEYNES	0.071
PUTR0002	AMPNEY BROOK AT SHEEPPEN BRIDGE	0.077
PUTR0090	THAMES AT CASTLE EATON	0.075
PUTR0091	THAMES AT CRICKLADE	0.073
PUTR0093	THAMES AT EYSEY	0.074

SIMCAT model node	Site Name	2nd cycle standard (mg/l)
PUTR0096	THAMES AT HANNINGTON BRIDGE	0.076
PUTR0097	THAMES AT INGLESHAM	0.077
PUTR0070	RAY AT MORRIS STREET, SWINDON	0.075
PUTR0069	RAY AT MOREDON BRIDGE, SWINDON	0.073
PUTR0071	RAY AT SEVEN BRIDGES, CRICKLADE	0.076
PUTR0072	RAY AT TADPOLE BRIDGE, PURTON	0.076
PUTR0057	KEY AT A419 ROADBRIDGE, CRICKLADE	0.077
PUTR0077	SHARE DITCH AT ROADBRIDGE, CASTLE EATON	0.078
PUTR0025	COLE AT B4019, COLESHILL	0.077
PUTR0104	THAMES AT SOMERFORD KEYNES ROADBRIDGE	0.074
PUTR0009	CERNEY WICK BROOK AT SPINE ROAD, SOUTH CERNEY	0.077
PUTR0051	GREAT BROOK AT CHIMNEY LANE, ASTON	0.082
PUTR0013	CHURN AT GAUGING STATION, CERNEY WICK	0.07
PUTR0017	CHURN BELOW HORSESHOE LAKE FISHERY	0.07
PUTR0014	CHURN AT NORTH CERNEY	0.057
PUTR0213	CHURN 300M BELOW COCKLEFORD FISH FARM	0.053
PUTR0036	COLN AT FOSSEBRIDGE	0.064
PUTR0037	COLN AT GAUGING STATION, BIBURY	0.068
PUTR0039	COLN AT ROUNDHOUSE, LECHLADE	0.076
PUTR0040	COLN AT WITHINGTON	0.058
PUTR0061	LEACH AT B4449, LECHLADE	0.078
PUTR0052	GREAT BROOK AT ISLE OF WIGHT BRIDGE	0.082
PUTR0080	SHILL BROOK AT ROADBRIDGE, BLACK BOURTON	0.077
PUTR0081	SHILL BROOK JUST ABOVE CARTERTON S/W	0.078
PUTR0175	AMPNEY BROOK BELOW AMPNEY MILL	0.071
PUTR0099	THAMES AT NEWBRIDGE	0.079
PUTR0107	THAMES AT WATER INTAKE, BUSCOT	0.077

On this basis the following P targets have been used at the STW discharge points assessed:

Table 3: Phosphate targets by STW

STW	Value	SIMCAT Model Node
ABINGDON (New outfall)	0.085	PTHR0152
ABINGDON (Lagoon)	0.08	PTHR0077
APPLETON	0.084	POCR0011
DIDCOT	0.086	PTHR0041
DRAYTON	0.086	PTHR0314
FARINGDON	0.08	None – default target used
KINGSTON BAGPUIZE	0.08	None – default target used
OXFORD	0.08	None – default target used
SHRIVENHAM	0.075	PUTR0117
STANFORD IN THE VALE	0.081	POCR0019
WANTAGE	0.08	POCR0008

B.3 Methodology

The contaminants assessed were Biochemical Oxygen Demand (BOD), Ammonia (NH_4) and Phosphate (P).

The selected approach was to use the EA River Quality Planning (RQP) tool in conjunction with their recommended guidance documents: "Water Quality Planning: no deterioration and the Water Framework Directive" and "Horizontal guidance"[1]. This uses a steady state Monte Carlo Mass Balance approach where flows and water quality are sampled from modelled distributions based on data where available.

The data required to run the RQP software were:

Upstream river data:

- Mean flow
- 95% exceedance flow
- Mean for each contaminants
- Standard deviation for each contaminant

Discharge data:

- Mean flow
- Standard deviation for the flow
- Mean for each contaminants
- Standard deviation for each contaminant

River quality target data:

- No deterioration target
- 'Good status' target

The above data inputs should be based on observations where available. In the absence of observed data EA guidance requires that:

[1] https://www.gov.uk/government/publications/h1-environmental-risk-assessment-for-permits-overview

- If the observed STW discharge flow and quality data are not available the following values may be used:
    - Flow mean: 1.25*DWF
    - Flow SD: 1/3*mean
    - Quality data: environmental permit values
- If observed river flows were not available this were obtained from an existing model or a low-flows estimation software.
- If observed water quality data were not available these were obtained from an existing model or a neighbouring catchment with similar characteristics.
- Where a treatment works was predicted to lead to either a WFD class deterioration, or a deterioration of greater than 10%, it was necessary to determine a possible future environmental permit value which would prevent either class deterioration or would return the works to a "no deterioration or "load standstill" situation, as follows:
    - For a class deterioration situation, the RQP tool can be set to "calculate required discharge quality" to calculate an environmental permit value that would retain the water body at its current class.
    - For a "no-deterioration" situation, the future scenario presenting the worst case deterioration was used for each determinand. The discharge data Mean Quality and Standard Deviation were iteratively reduced until the present day 90th-percentile value was achieved. The standard deviation was assumed to be 1/3 of the mean.

B.4 Study objectives

RQP models were required to be set up and run using the present-day and 2019/20 and 2030/31 growth scenario effluent flows to assess the impact of the increased contaminant loads on the receiving watercourses due to the extra wastewater flows. These results were required to confirm that there will not be deterioration on the watercourse which will cause a downgrading of the current class for each individual element. This forms the water quality assessment for the Water Cycle Study. Should deterioration result a new environmental permit value was required to be calculated.

Modelling was required to be undertaken for those STWs that are predicted to fail the 'good status' target due to the proposed growth in the population that they serve. This was to determine whether improvements are required both upstream as well as at each STW.

Addressing existing diffuse pollution is beyond the remit of the WCS, and therefore the analysis was undertaken following the assumption that that the upstream diffuse sources of pollution had been addressed (i.e. 'good status' achieved upstream). This was achieved by setting the upstream quality at the level of 'good status' in the model.

Table 4 below lists all the STWs to be assessed together with the actual environmental permit values.

Table 4: STWs to be assessed and permitted values

STW	Permited Flow - DWF Max value (m3/d)	Permited BOD 5 Day ATU 95%ile (mg/l)	Permited BOD - Max Value (mg/l)	Permited Ammoniacal Nitrogen as N 95%ile (mg/l)	Permited Ammoniacal Nitrogen as N Max value (mg/l)	Permited Phosphate Max value (mg/l)
ABINGDON (New outfall)	4524	20	55	15	44	2
ABINGDON (Lagoon)	8335	15	50	5	20	2
ABINGDON (Lagoon) from 31/03/2015	8335	10	50	3	May to Oct = 14; Nov to Apr = 20	2
APPLETON	2559	16	51	4	20	
DIDCOT	11476	10	50	9	33	2

DRAYTON	1672	20	56	12	41	
FARINGDON	2812	30	64			
KINGSTON BAGPUIZE	633	15	50	7	27	
OXFORD	50985	10	50	3	May to Oct = 14; Nov to Apr = 20	1
SHRIVENHAM	2842	11	50	2.5	May to Oct = 13; Nov to Apr = 20	
STANFORD IN THE VALE	650	30				
WANTAGE	6250	30	64	5	20	2

B.5 Data collection

The datasets required to assess the discharge permits are the following:

- River flow data (received from the EA)
- River quality data (received from the EA)
- Current STWs permits (received from the EA and Thames Water)
- RQP tool (received from the EA)
- Existing water quality models (received from the EA)
- Current river classifications (received from the EA)
- 2009 base line and 2013 WFD river target for BOD, P and NH_4 (received from the EA, see section B.2)
- EA guidance documents (received from the EA)
- STWs flow and quality data (received from Thames Water)
- STWs discharge information (e.g. location, receiving water, etc.) (received from Thames Water)
- GIS SIMCAT model (received from the EA)

B.6 Input data and results

The input data and RQP results are presented for each STW in a summary table. This contains also the source of each value. The STWs discharge flow statistics were calculated from the Dry Weather Flow (DWF) provided by Thames Water (see section 4.2.4.1 of main report) and as stated in the methodology the mean and standard deviation were estimates using the following relationships:

- Flow mean = 1.25*DWF
- Flow SD = 1/3*mean

Thames Water also provided all the effluent quality data for BOD and Ammonia. For Phosphate (P) data were available only for the sites with P permit limits: Abingdon Lagoon and New Stream, Didcot, Oxford and Wantage. The statistical values were derived from the 2011-13 observed values. For the others sites the data were extracted from the Thames 2009 SIMCAT model. Whilst for BOD and Ammonia Thames Water provided a future concentration value according to the future performances, for phosphate the same parameters were used for all the scenarios because this is removed by chemical dosing and therefore it was assumed that the same P reduction performance can be maintained by increasing the dosing.

All the upstream river flow data were extracted from the SIMCAT model since no low flow estimates were provided. Also the majority of the water river quality data were extracted from SIMCAT (calculated or observed) for two reasons:

- There are no water quality monitoring points upstream of the study STWs.

- The number of samples for the period 2008-13 were too low to make a sound statistical analysis.

B.6.1 Red / Amber / Green Analysis - STWs

Thames Water provided a red / amber / green traffic light score to assess the future final effluent (FE) concentration values for BOD and Ammonia. The colour definitions are shown below (for more information see section 4.2.2.1 of main report):

Can accommodate the proposed site allocation without upgrades <70% of permit (90% for DWF)	Can accommodate the proposed site allocation without upgrades but will bring the works close to its current capacity limit 70-80% of permit (90-100% for DWF)	Further modelling will be required to determine the scale of the WwTW upgrades that may be needed >80% of permit (or other known issue)(>100% for DWF)

B.6.2 WFD Compliance

Compliance against WFD targets for the 2019/20 and 2030/31 scenarios was calculated using the Current situation as baseline. Compliance / or non-compliance is indicated on the results tables as follows:

Modelled water quality is within the WFD target for the determinand in question.	Modelled water quality does not meet the WFD target for the determinand in question.

B.6.3 Abingdon STW (Lagoon outfall)

Abingdon STW has two discharge points: Lagoon and New Stream. Lagoon discharges into the Thames as shown in Figure 1. Note that this analysis only considers the water quality impact at the immediate point of discharge and the combined impacts of both outfalls once their flow combines at the confluence of the Odhay Hill Ditches with the Thames is not considered.

The status of the receiving watercourse is summarised in the Table 5 below where the baseline (2009) and the 2013 status are reported together with the objective for the waterbody.

Table 5: Thames status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Poor	Poor	Good	High	Moderate
2013 status	Moderate	Moderate	Good	High	Moderate
Objective	Good Status by 2027	Good Status by 2027	High status by 2015	NA	2015: Moderate (Disproportionately expensive (P1c))

Figure 1: GIS SIMCAT map of Abingdon Lagoon discharge location.

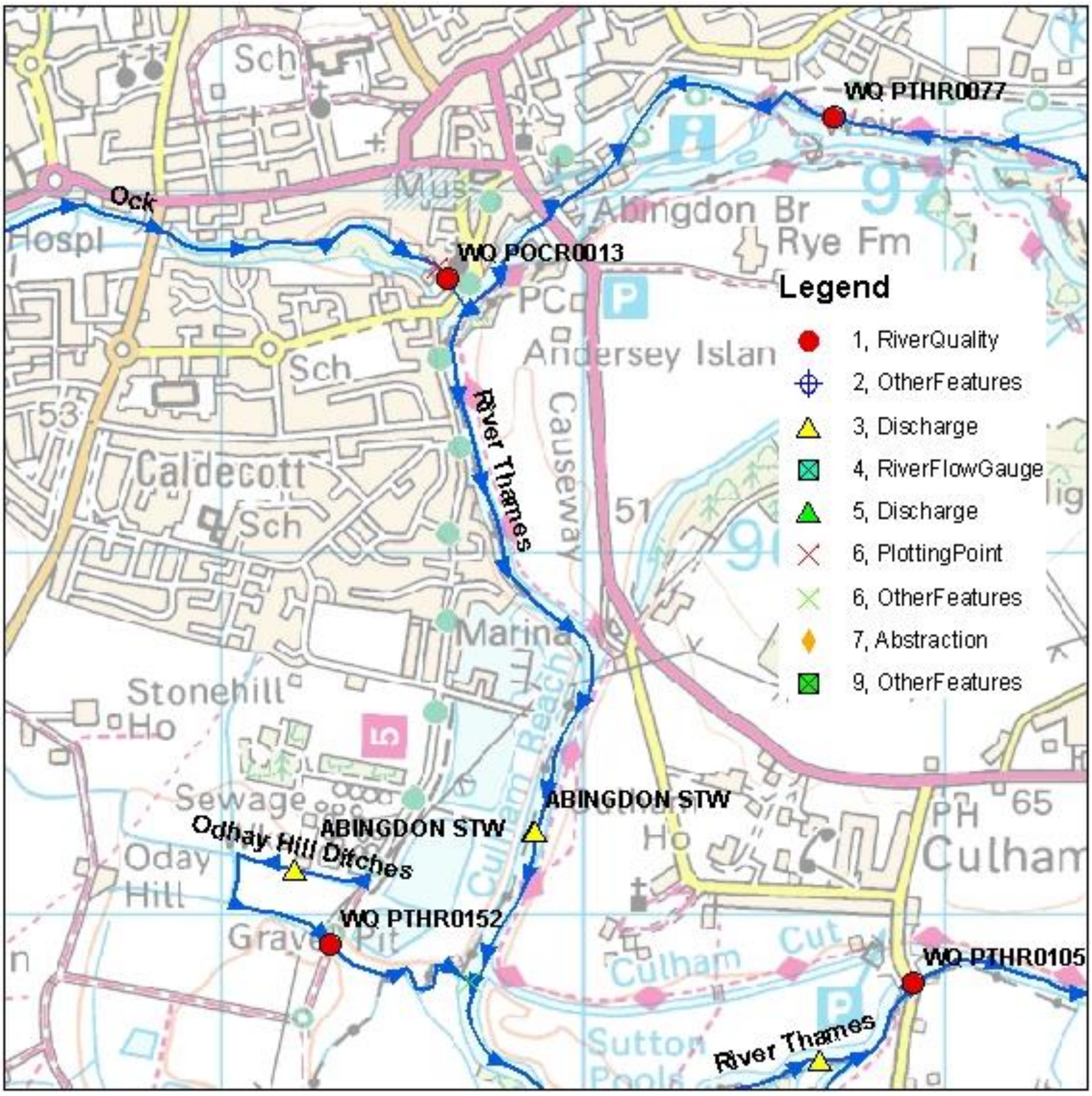


Table 6 shows the input data and RQP results for Abingdon Lagoon. The works has permited values for BOD and ammonia (see Table 4) and currently it is operating within its permit. Future scenarios predict that the STW will be working below such values but it will be close to its current capacity for BOD. As predicted deterioration is less than 10%, no amendments to the permit would be required.

Table 6: input data and RQP results for Abingdon Lagoon STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	2773.5	SIMCAT calculated value just upstream STW	7.81	Thames Water	NA	7.99	Thames Water	NA	7.5	Thames Water	NA
	SD			2.6			2.66			2.5		
	5%ile	611.5										
BOD (mg/l)	Mean	1.25	U/s WQ point PTHR0077 from SIMCAT	4.2	Thames Water	2.04	4.3	Thames Water	2.04	4.3	Thames Water	2.04
	SD	0.62										
	95%ile			7.4			7.6			7.6		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.06	U/s WQ point PTHR0077 from SIMCAT	0.7	Thames Water	0.11	0.8	Thames Water	0.11	0.8	Thames Water	0.11
	SD	0.04										
	95%ile			1.7			1.9			2		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.17	U/s WQ point PTHR0077 from SIMCAT	1.18	Thames Water	0.18	1.18	Thames Water	0.18	1.18	Thames Water	0.18
	SD	0.08		0.87			0.87			0.87		
	Target Mean	0.08	2013 WFD									

The upstream WQ point is 2.98km from the discharge point. Table 7 below shows the statistics used in SIMCAT and those derived from the observed data provided:

Table 7: statistics used in SIMCAT and those derived from the observed data for WQ point PTHR0077.

			SIMCAT model				Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Distribution	Mean	SD	Samples	Data period
PTHR0077	2.98	BOD	1.254	0.622	36	2 Log-Normal			no data	
PTHR0077	2.98	Amm	0.055	0.038	38	1 Normal	0.019	0.01	5	09 only
PTHR0077	2.98	P	0.167	0.081	38	2 Log-Normal	0.121	0.063	5	09 only

Due to the low number of samples for the period 09-13 the SIMCAT data were used. This was a conservative assumption since the SIMCAT values for mean Ammonia and Phosphate are higher than those from the observed data. For consistency the SIMCAT observed data were used also for BOD. The EA guidance suggests considering the effect of the natural purification when the upstream point is some distance from the discharge point. However in order to take into account the load from the river Ock, which joins the Thames between the WQ point and the

STW, no decay rate has been applied, again maintaining a degree of conservatism. Table 8 shows the SIMCAT calculated values immediately upstream of the STW:

Table 8: SIMCAT calculated values immediately upstream of the STW.

SIMCAT calculated values		
Pollutant	**Mean**	**SD**
BOD	1.260	0.190
Amm	0.039	0.016
P	0.248	0.075

Figure 2 and Figure 3 show the 2009 SIMCAT results where phosphate is the only pollutant that breaches the target. The RQP results confirm that the upstream WFD target for phosphate is not achieved for the present-day situation and the future scenarios. "No deterioration" is achieved for all pollutants.

SIMCAT shows that the watercourse fails its phosphate target upstream of the STW. The RQP function to calculate the required discharge quality in order to meet the river target for P using the present-day situation as input data (see Table 6) reports that: "the river quality target is not achievable without improving the upstream water quality".

The RQP tool was also run using the SIMCAT calculated values for BOD to check the impact of our assumption in choosing the input data. Table 9 shows that by using a smaller SD and a similar mean there is a lower impact on the downstream river concentration.

Table 9: input data and RQP results for BOD using SIMCAT calculated values.

Parameter	**Statistic**	**River**	**Source**	**Present day (2013)**			**2019/20**			**2030/31**		
				STW	**Source**	**RQP Result**	**STW**	**Source**	**RQP Result**	**STW**	**Source**	**RQP Result**
Flow (Ml/d)	**Mean**	2773.5	SIMCAT calculated value just upstream STW	7.81	Thames Water	NA	7.99	Thames Water	NA	7.5	Thames Water	NA
	SD			2.6			2.66			2.5		
	5%ile	611.5										
BOD (mg/l)	**Mean**	1.26	SIMCAT calculated value just upstream STW	4.2	Thames Water	1.52	4.3	Thames Water	1.52	4.3	Thames Water	1.52
	SD	0.19										
	95%ile			7.4			7.6			7.6		
	Target 90%ile	5	2013 WFD									

Figure 2: SIMCAT result for flow and phosphate.

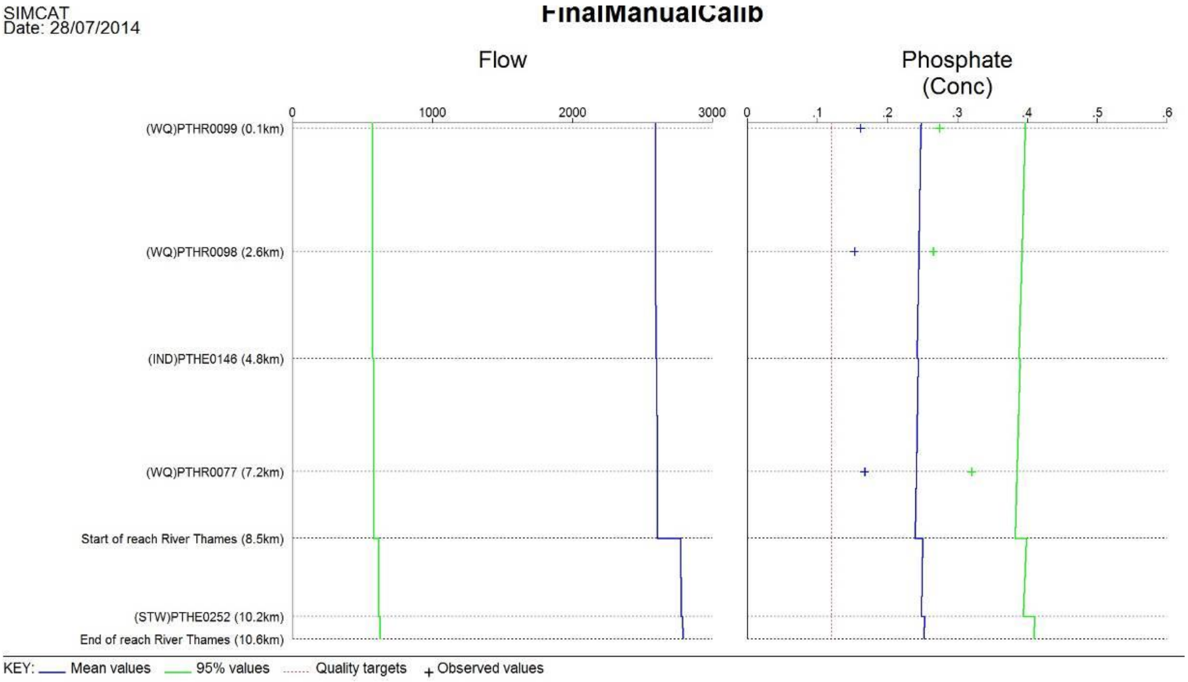
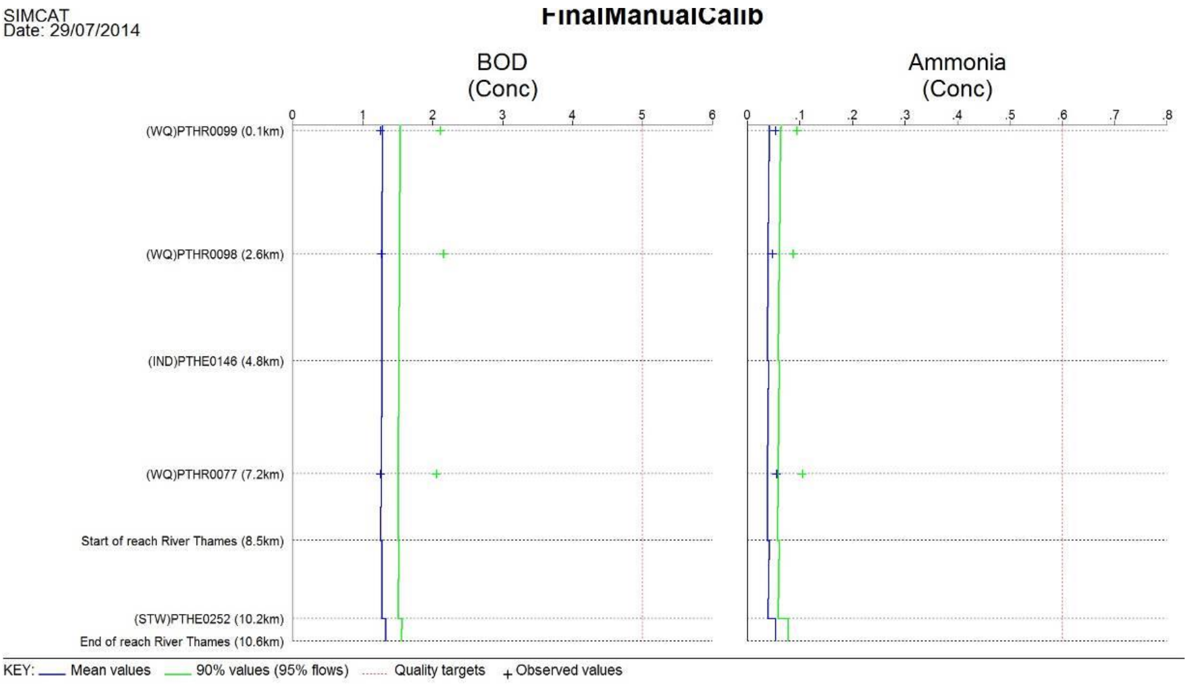


Figure 3: SIMCAT result for BOD and Ammonia.



B.6.4 Abingdon STW (New Stream Outfall)

Abingdon STW has two discharge points: Lagoon and New Stream. New Stream discharges into the Odhay Hill Ditches as shown in Figure 4. Note that this analysis only considers the water quality impact at the immediate point of discharge and the combined impacts of both outfalls once their flow combines at the confluence of the Odhay Ditches with the Thames is not considered.

The status of the receiving watercourse is summarised in the Table 10 below:

Table 10: Odhay Hill Ditches status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Poor	Poor	Good	High	Moderate
2013 status	Moderate	Moderate	Good	High	Moderate
Objective	Good Status by 2027	Good Status by 2027	High status by 2015	NA	2015: Moderate (Disproportionately expensive (P1c))

Figure 4: GIS SIMCAT map of Abingdon New Stream discharge location.

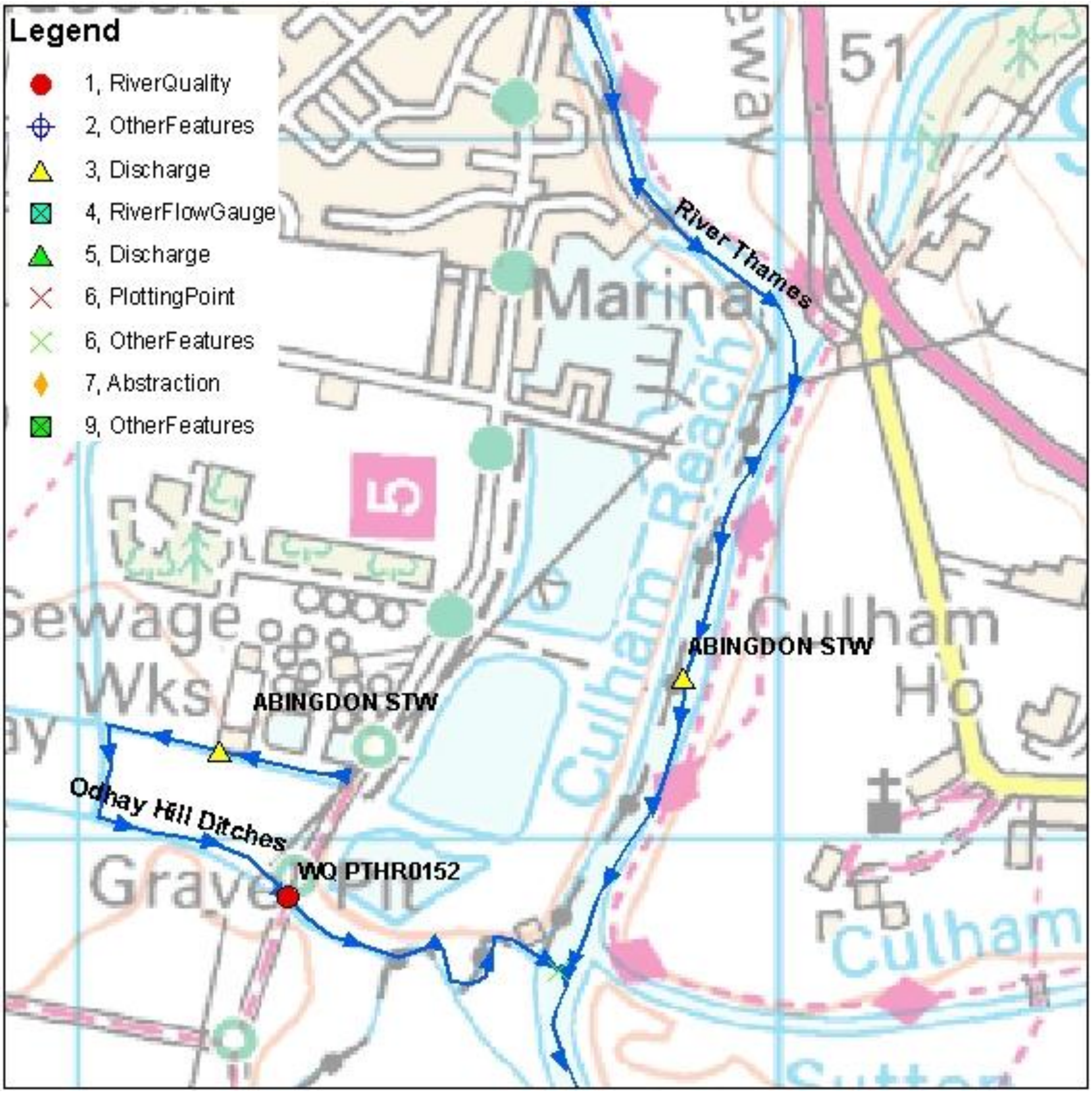


Table 11 shows the input data and RQP results for Abingdon New Stream. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its permit, but it will be close to its current capacity for BOD.

Table 11: input data and RQP results for Abingdon New Stream STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	1.15	SIMCAT calculated value just upstream STW	2.92	Thames Water	NA	2.96	Thames Water	NA	2.72	Thames Water	NA
	SD			0.97			0.99			0.91		
	5%ile	0.53										
BOD (mg/l)	Mean	4.57	SIMCAT calculated value just upstream STW	7.8	Thames Water	9.85	8	Thames Water	10.07	8	Thames Water	10.04
	SD	3.63										
	95%ile			12.8			13.1			13.2		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.83	SIMCAT calculated value just upstream STW	2.2	Thames Water	3.23	2.4	Thames Water	3.55	2.5	Thames Water	3.61
	SD	0.33										
	95%ile			5.1			5.7			5.9		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.14	SIMCAT calculated value just upstream STW	1.38	Thames Water	1.06	1.38	Thames Water	1.06	1.38	Thames Water	1.04
	SD	0.034		0.76			0.76			0.76		
	Target Mean	0.085	2013 WFD									

There is no WQ point upstream of the STW and the river quality data were taken from the SIMCAT calculated values just upstream of the discharge point. The model underestimates the observed data for BOD and ammonia as shown in Figure 5 and Figure 6. However it indicates a failure of the targets for all the pollutants.

The RQP results indicate that the watercourse fails its targets for BOD, NH_4 and P for the present-day situation and the future scenarios. There is a 2% deterioration for BOD for both scenarios; 10% and 12% deterioration for ammonia for 2019/20 and 2030/31 respectively; no deterioration for phosphate with small improvement for the 2030/31 scenario.

SIMCAT shows that phosphate and ammonia fail their targets upstream of the STW. The RQP function to calculate the required discharge quality in order to meet the river target (and no-deterioration) using the present-day scenarios for all the pollutants (see Table 11) as input data gives the following results (Table 12):

Table 12: STW discharge quality required to meet WFD targets - Abingdon STW (New Stream)

Pollutant	Target	Mean	SD	95%ile
BOD	5	3.48	1.24	5.96
Amm	0.6	0.41	0.15	0.71
P	0.09	0.08	0.03	0.13

Figure 5: SIMCAT result for flow and phosphate.

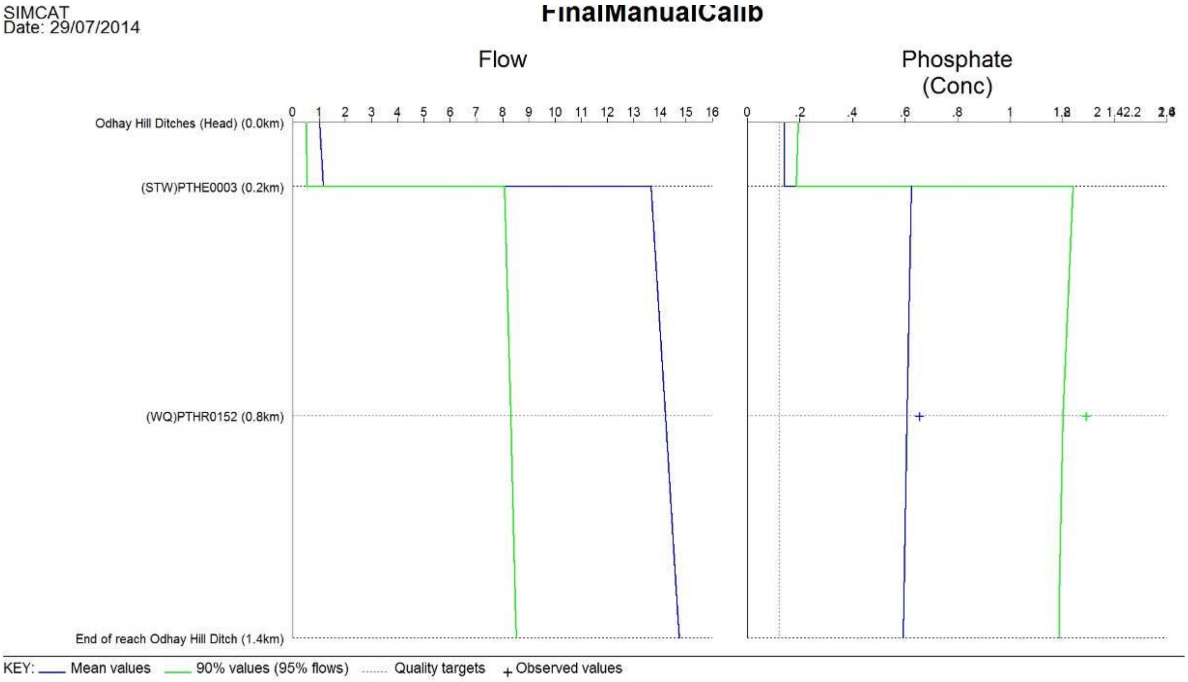
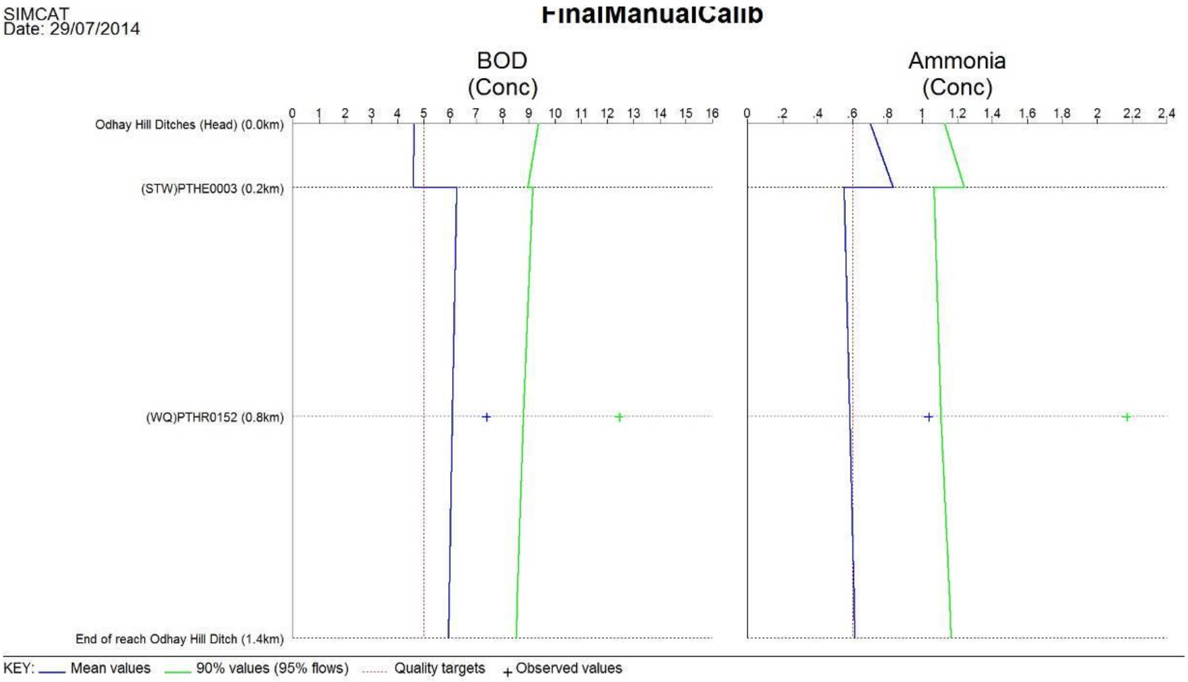


Figure 6: SIMCAT result for BOD and Ammonia.



B.6.5 Appleton STW

Appleton STW discharges into the Marcham Brook as shown in Figure 7.

The status of the receiving watercourse is summarised in the Table 13 below:

Table 13: Marcham Brook status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	not available	High	Bad
2013 status	Moderate	Moderate	not available	High	Poor
Objective	Good Status by 2027	Good Status by 2027	High status by 2015	NA	2015: Bad (Disproportionately expensive (P1a))

Figure 7: GIS SIMCAT map of Appleton discharge location.

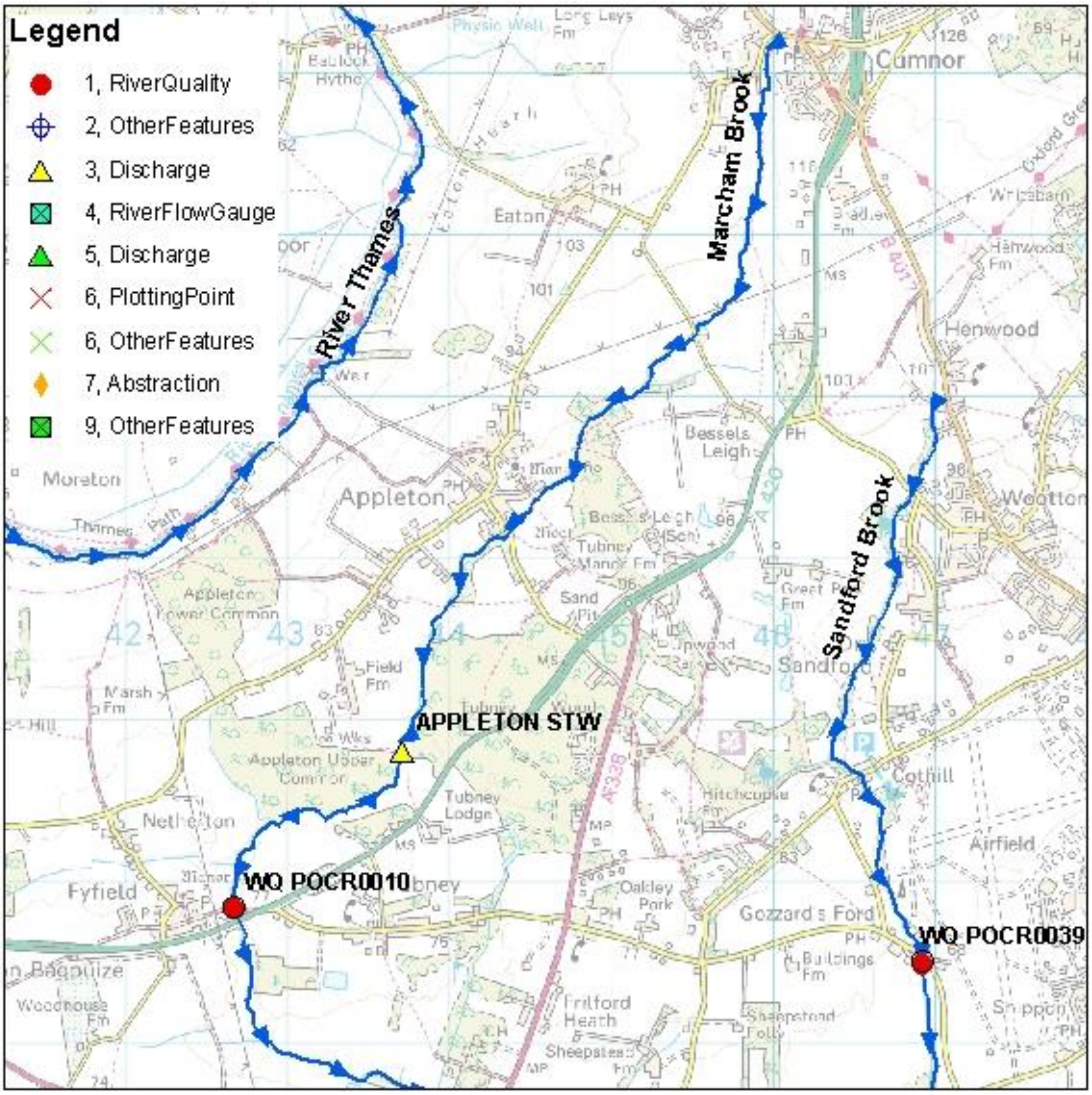


Table 14 shows the input data and RQP results for Appleton. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its permit but it will be close to its current capacity for BOD.

Table 14: input data and RQP results for Appleton STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	5.06	SIMCAT calculated value just upstream STW	1.04	Thames Water	NA	1.19	Thames Water	NA	1.06	Thames Water	NA
	SD			0.35			0.4			0.35		
	5%ile	1.9										
BOD (mg/l)	Mean	0.585	SIMCAT calculated value just upstream STW	6.6	Thames Water	2.58	7.1	Thames Water	2.98	7.1	Thames Water	2.8
	SD	0.097										
	95%ile			10.6			11.4			11.5		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.011	SIMCAT calculated value just upstream STW	0.6	Thames Water	0.27	0.8	Thames Water	0.4	0.9	Thames Water	0.4
	SD	0.005										
	95%ile			1.8			2.5			2.6		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	1.23	SIMCAT calculated value just upstream STW	5.37	SIMCAT observed values	2.03	5.37	SIMCAT observed values	2.12	5.37	SIMCAT observed values	2.05
	SD	0.152		1.44			1.44			1.44		
	Target Mean	0.084	2013 WFD									

There is not a WQ point upstream of the STW and the river quality data were taken from the SIMCAT calculated values just upstream of the discharge point. The SIMCAT model overestimates the concentration for ammonia and gives a good calibration for phosphate and BOD as shown in Figure 8 and Figure 9. Only phosphate fails its target.

The RQP results show as well that only phosphate is failing its target for the present-day situation and the future scenarios. There is a 16% and 9% deterioration for BOD for 2019/20 and 2030/31 respectively; 48% deterioration for ammonia for both scenarios; 4% and 1% deterioration for phosphate for 2019/20 and 2030/31 respectively.

SIMCAT shows that phosphate is failing its target upstream of the STW. The RQP function to calculate the required discharge quality in order to meet the river target for P using the present-day situation as input data (see Table 14) gives as result: "the river quality target is not achievable without improving the upstream water quality".

Since the river target could not be reached for P using the actual condition for the upstream river quality values, the RQP function to calculate the required discharge quality in order to meet the river target was run assuming that the river upstream has Good Ecological Status (GES). A mean of 0.08mg/l P4 and a SD of 0.027 mg/l were used. The worst case scenario was modelled first to verify if the required discharge quality in order to meet the river target, could be achieved with the Best Available Technology (BAT) (for P this is a mean of 0.5mg/l). The other scenarios were modelled if this was not achieved. Table 15 shows that the required target cannot be achieved for any of the scenarios with BAT even when assuming GES upstream of the discharge point.

Table 15: Permit values required to meet river targets assuming GES upstream

Scenario	Pollutant	Target	Mean	SD	95%ile
2019/20	P	0.084	0.08	0.02	0.12
2030/31	P	0.084	0.08	0.02	0.12
Present	P	0.084	0.1	0.03	0.15

New permit values were calculated for the determinands that present a deterioration of more than 10% or a class deterioration. These were calculated using the present day concentration in the river plus a 10% deterioration as the river target or, if there was a class deterioration, the limit of the current class. Table 16 shows the results for BOD and ammonia where for both BOD and ammonia the present day concentration + 10% deterioration was used because class deterioration was not predicted. For Ammonia the 10% deterioration matches with the "High" class boundary. Both permit values can be achieved with BAT (for ammonia this is a 95%ile of 1mg/l, for BOD is a 95%ile of 5mg/l).

Table 16: 'No deterioration' permit values for Appleton STW

Parameter	Scenario with the strictest permit requirement	Present day + 10% deterioration or class boundary target	Permit values required to meet "no-deterioration"		
			Mean Quality	Standard Deviation	95th Percentile
BOD	2019/20	2.84	6.83	2.19	10.88
Ammonia	2030/31	0.30	0.62	0.71	1.93
Phosphate	-	-	-	-	-

Figure 8: SIMCAT result for flow and phosphate.

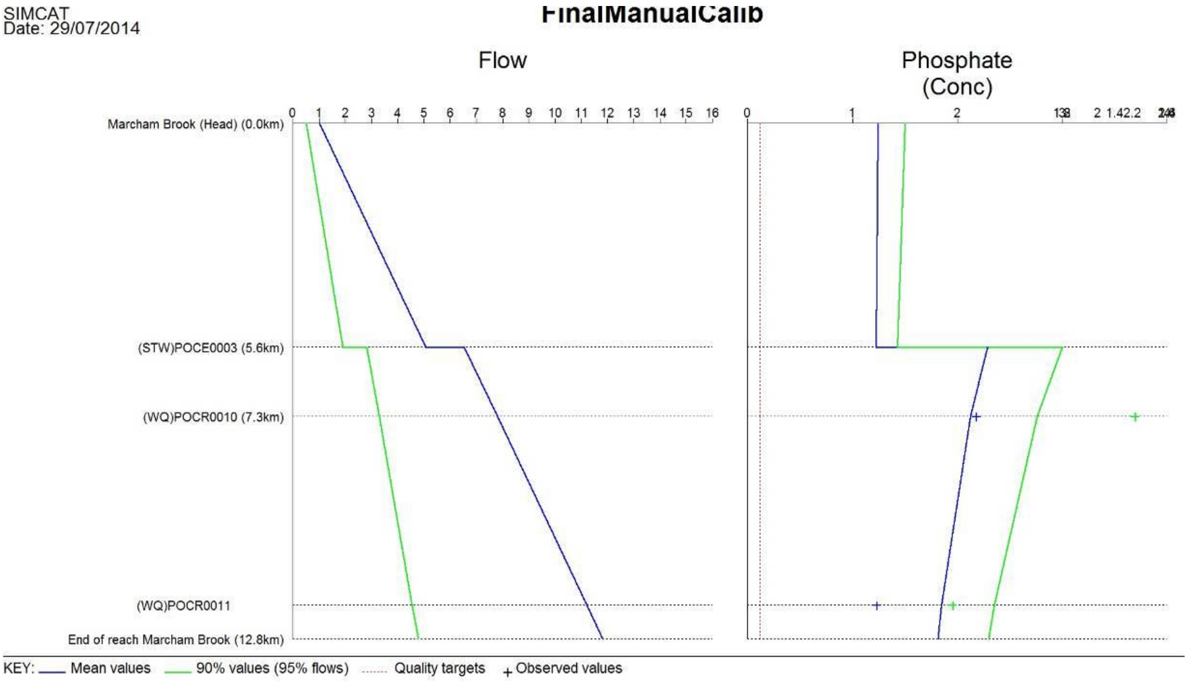
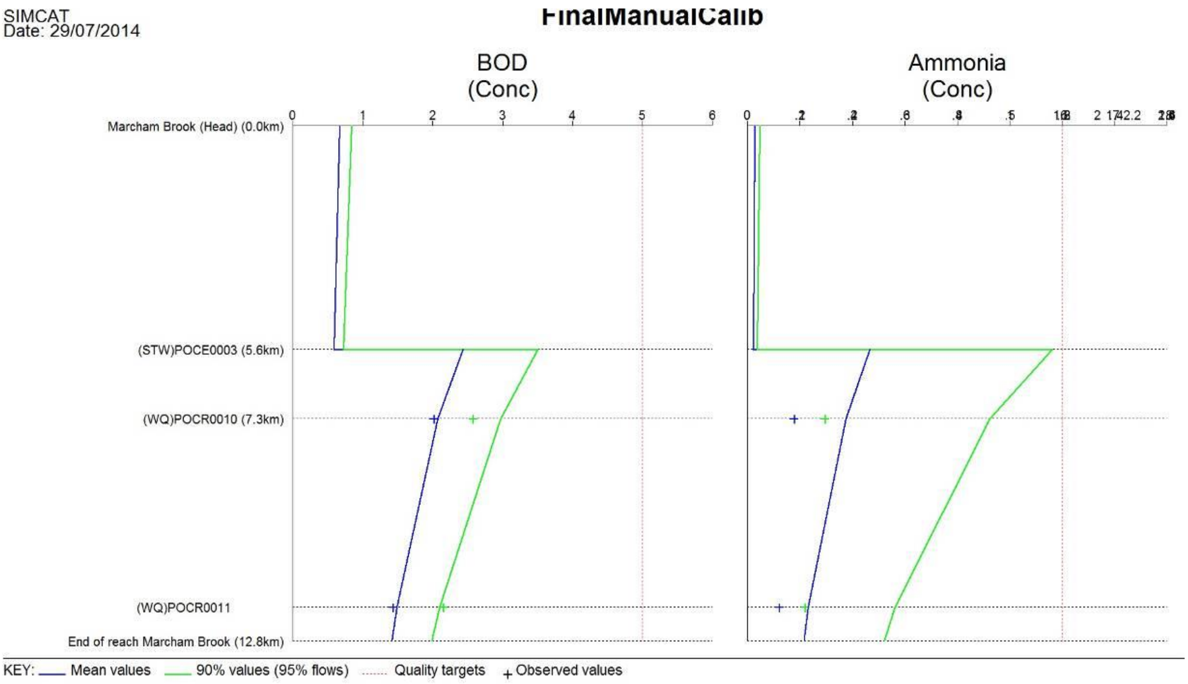


Figure 9: SIMCAT result for BOD and Ammonia.



B.6.6 Didcot STW

Didcot STW discharges into the Moor Ditch as shown in Figure 10.

The status of the receiving watercourse is summarised in the Table 17 below:

Table 17: Moor Ditch status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Poor	Poor	Good	High	Moderate
2013 status	Poor	Poor	Good	Good	Moderate
Objective	Good Status by 2027	Good Status by 2027	High status by 2015	NA	2015: Moderate (Disproportionately expensive (P1b))

Figure 10: GIS SIMCAT map of Didcot discharge location.

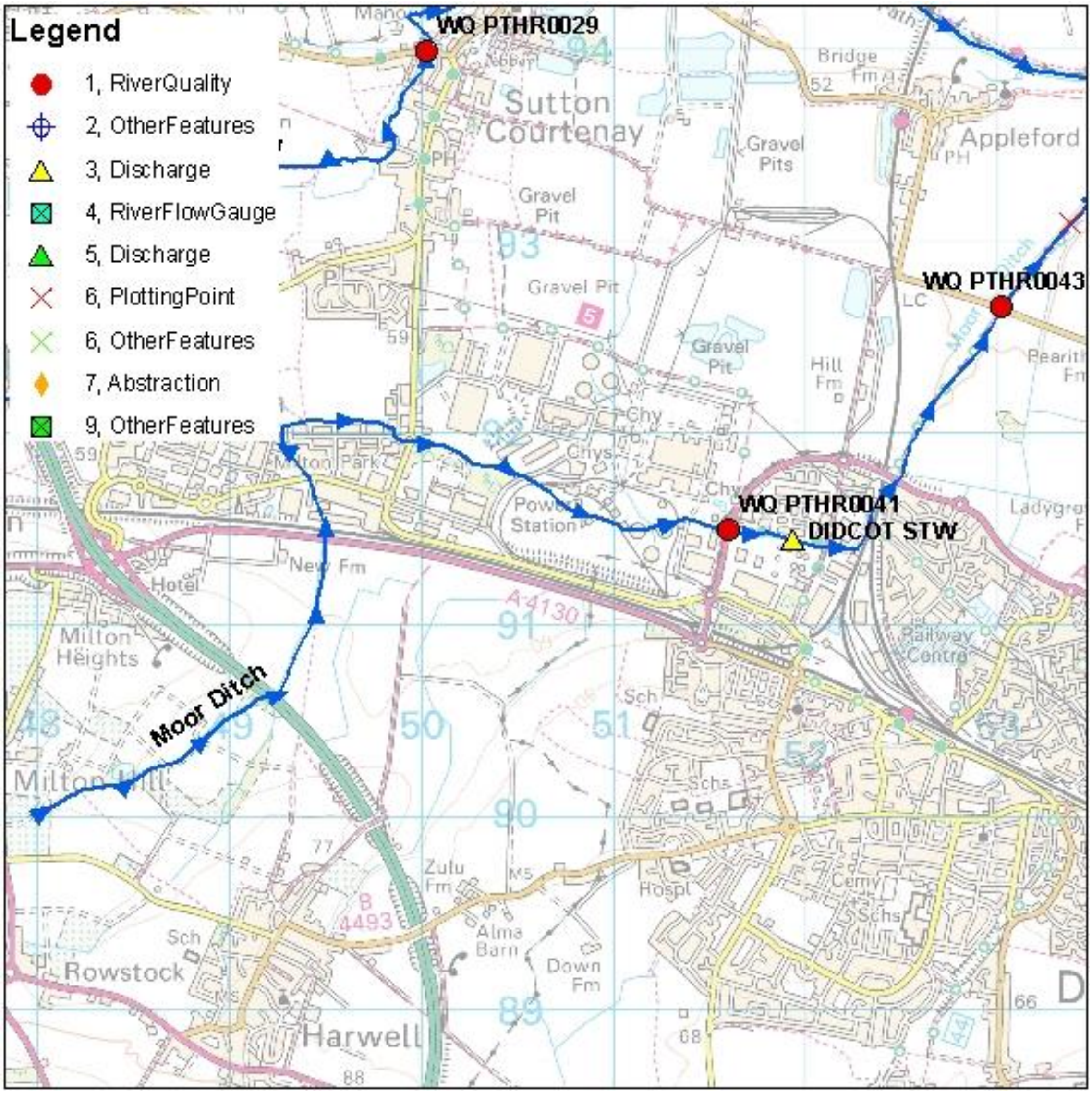


Table 18 shows the input data and RQP results for Didcot. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its permit but it will be close to its current capacity for BOD. The RQP tool did not allow the 95%ile provided by Thames Water for ammonia (2.8mg/l) to be entered, and therefore the highest value accepted (2.7mg/l) was used instead as reported in the summary table.

Table 18: input data and RQP results for Didcot STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	9.64	SIMCAT calculated value just upstream STW	10	Thames Water	NA	10.9	Thames Water	NA	11.8	Thames Water	NA
	SD			3.33			3.62			3.94		
	5%ile	2.42										
BOD (mg/l)	Mean	1.87	U/s WQ point PTHR0041 from SIMCAT	3	Thames Water	3.56	3.3	Thames Water	3.84	3.8	Thames Water	4.33
	SD	1.05										
	95%ile			5			5.5			6.3		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.06	U/s WQ point PTHR0041 from SIMCAT	0.7	Thames Water	0.93 (95% used =2.7)	1.1	Thames Water	1.53 (95% used =4.2)	2.1	Thames Water	2.9 (95% used =8.1)
	SD	0.05										
	95%ile			2.8			4.4			8.3		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.18	U/s WQ point PTHR0041 from SIMCAT	1.14	Thames Water	0.73	1.14	Thames Water	0.75	1.14	Thames Water	0.77
	SD	0.056		1.06			1.14			1.06		
	Target Mean	0.086	2013 WFD									

The upstream WQ point is 0.36km from the discharge point and the table below shows the statistics used in SIMCAT and those derived from the observed data provided:

Table 19: statistics used in SIMCAT and those derived from the observed data for WQ point PTHR0041.

			SIMCAT model				Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Distribution	Mean	SD	Samples	Data period
PTHR0041	0.36	BOD	1.868	1.051	35	Log-Normal				no data
PTHR0041	0.36	Amm	0.058	0.048	38	Log-Normal	0.079	0.071	17	09 and 13
PTHR0041	0.36	P	0.180	0.056	38	Log-Normal	0.137	0.044	17	09 and 13

Due to the low number of samples for the period 09-13 the SIMCAT data were used. Because of the close distance to the discharge point the effect of the natural purification is negligible.

Figure 11 and Figure 12 show the 2009 SIMCAT results where phosphate is the only pollutant that breaches the target. The RQP results confirm that phosphate is still not reaching its target for the present-day situation and the future scenarios and indicate that ammonia also fails to reach its targets all scenarios.

There is an 8% and 22% deterioration for BOD for 2019/20 and 2030/31 respectively; 65% and 212% for ammonia for 2019/20 and 2030/31 respectively; 3% and 5% deterioration for phosphate for 2019/20 and 2030/31 respectively.

SIMCAT shows that phosphate is failing its target upstream of the STW. The RQP function to calculate the required discharge quality in order to meet the river target using the present-day situation for all the pollutants (see Table 18) as input data gives the following results below (Table 20):

Table 20: STW discharge quality required to meet WFD targets - Didcot STW

Pollutant	Target	Mean	SD	95%ile
Amm	0.6	0.43	0.95	1.73
P	0.09	0.02	0.01	0.05

Since the river target could not be reached for P with BAT (for P this is a mean of 0.5mg/l, for ammonia this is a 95%ile of 1mg/l) using the actual condition for the upstream river quality values, the RQP function to calculate the required discharge quality in order to meet the river target was run assuming that the river upstream has GES. Amean of 0.086mg/l and a SD of 0.028mg/l were used. The worst case scenario was modelled first to verify if the required discharge quality, in order to meet the river target, could be achieved with the BAT. The other scenarios were modelled if this was not achieved. . Table 21 shows that the required target cannot be achieved for any of the scenarios with BAT even when assuming GES upstream of the discharge point.

Table 21: Permit values required to meet river targets assuming GES upstream

Scenario	Pollutant	Target	Mean	SD	95%ile
2030/31	P	0.086	0.09	0.07	0.23
2019/20	P	0.086	0.08	0.08	0.23
Present	P	0.086	0.08	0.07	0.22

New permit values were calculated for the determinands that present a deterioration of more than 10% or a class deterioration. These were calculated using the present day concentration in the river plus a 10% deterioration as the river target or, if there was a class deterioration, the limit of the current class. Table 22 shows the results for BOD and Ammonia where for both determinands the present day concentration + 10% deterioration was used because a class deterioration was not predicted. Both permit values can be achieved with BAT (for ammonia this is a 95%ile of 1mg/l, for BOD is a 95%ile of 5mg/l)

Table 22: 'No deterioration' permit values for Didcot STW

Parameter	Scenario with the strictest permit requirement	Present day + 10% deterioration or class boundary target	Permit values required to meet "no-deterioration"		
			Mean Quality	Standard Deviation	95th Percentile
BOD	2030/31	3.92	3.42	1.18	5.61
Ammonia	2030/31	1.02	0.72	1.58	2.89
Phosphate	-	-	-	-	-

Figure 11: SIMCAT result for flow and phosphate.

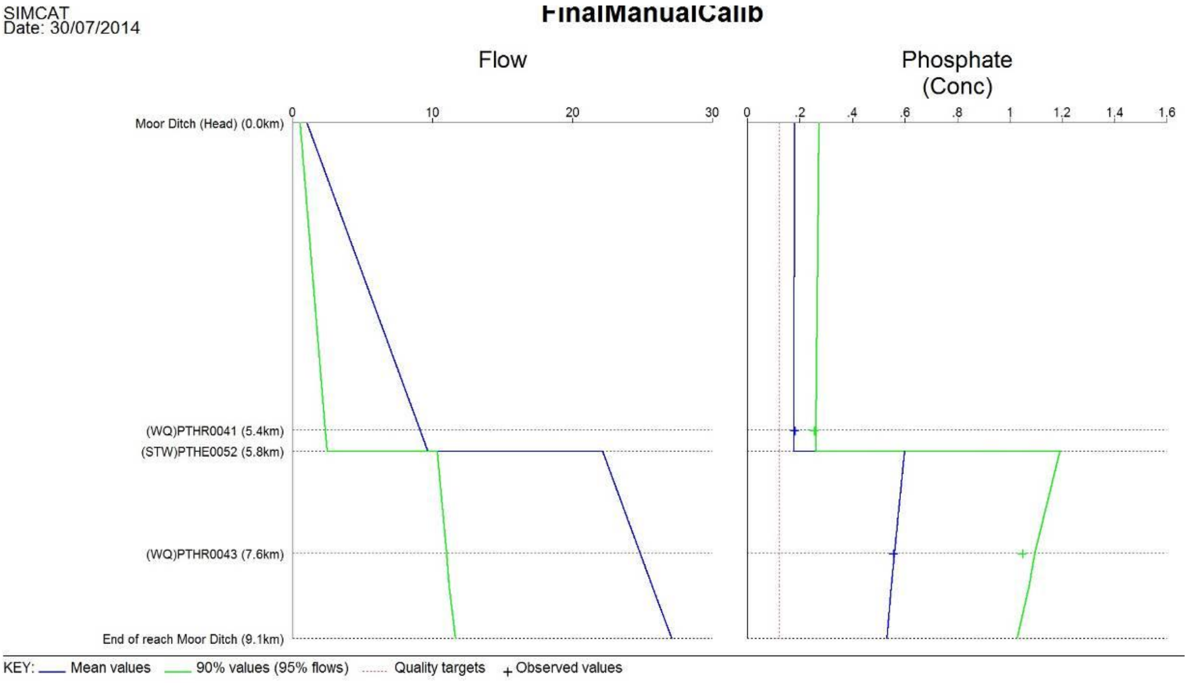
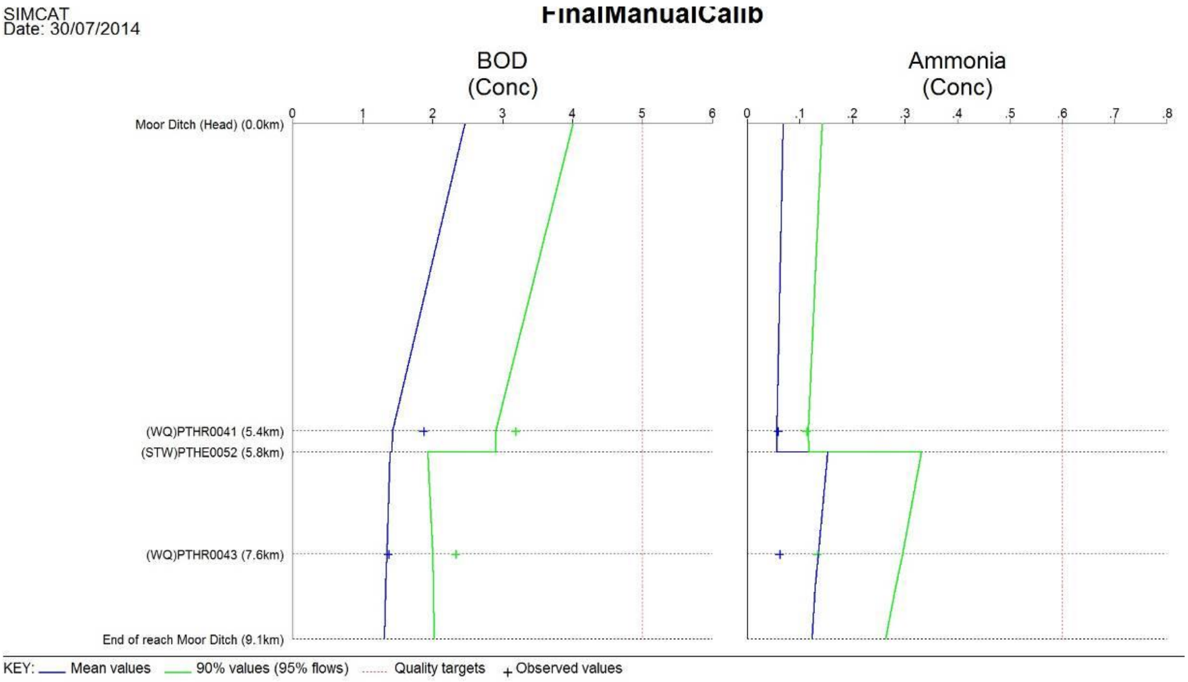


Figure 12: SIMCAT result for BOD and Ammonia.



B.6.7 Drayton STW

Drayton STW discharges into the Ginge Brook as shown in Figure 13.

The status of the receiving watercourse is summarised in the Table 23 below:

Table 23: Ginge Brook status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Good	Good	Not available	High	Good
2013 status	Poor	Poor	Not available	High	Poor
Objective	Good Status by 2015	Good Status by 2015	NA	NA	NA

Figure 13: GIS SIMCAT map of Drayton discharge location.

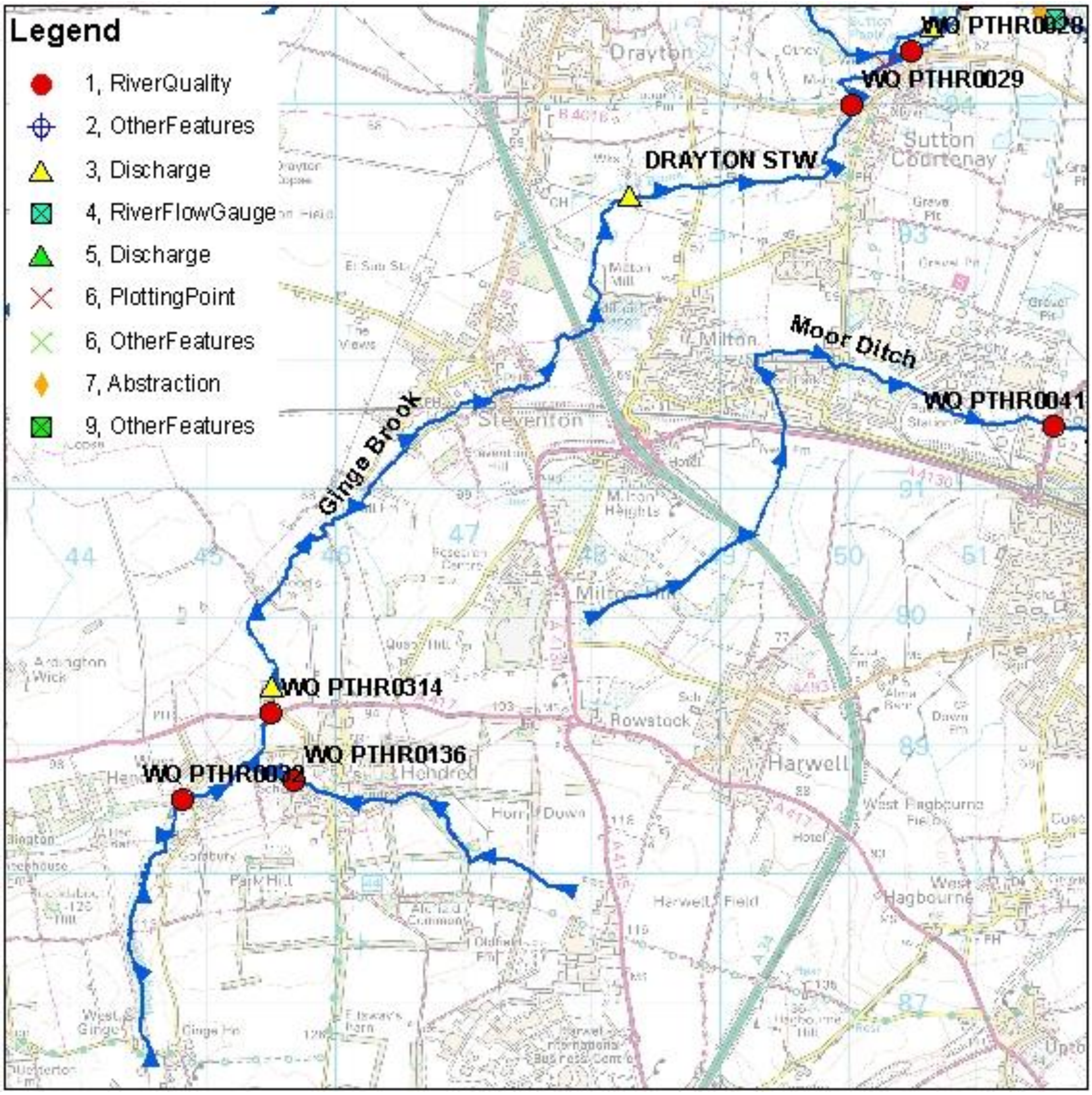


Table 24 shows the input data and RQP results for Drayton. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will be working above such values for BOD with upgrades required from 2019/20 scenario and below such values for ammonia reaching its capacity in 2019/20 scenario and with upgrades required from 2030/31 scenario.

Table 24: input data and RQP results for Drayton STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	22	SIMCAT calculated value just upstream STW	1.4	Thames Water	NA	1.68	Thames Water	NA	1.52	Thames Water	NA
	SD			0.47			0.56			0.51		
	5%ile	10.6										
BOD (mg/l)	Mean	1.27	SIMCAT calculated value just upstream STW	10.3	Thames Water	2.73	11.3	Thames Water	2.98	11.4	Thames Water	2.89
	SD	0.57										
	95%ile			19.1			20.9			21.1		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.05	SIMCAT calculated value just upstream STW	2.5	Thames Water	0.38	3.7	Thames Water	0.63	3.8	Thames Water	0.59
	SD	0.02										
	95%ile			6.4			9.5			9.8		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.075	SIMCAT calculated value just upstream STW	5.93	SIMCAT observed values	0.46	5.93	SIMCAT observed values	0.52	5.93	SIMCAT observed values	0.48
	SD	0.019		1.5			1.5			1.5		
	Target Mean	0.086	2013 WFD									

There is no WQ point upstream of the STW and the river quality data were taken from the SIMCAT calculated values just upstream of the discharge point. The model presents a good calibration with the WQ point PTHR0314 upstream of the industrial discharge as shown in Figure 14 and Figure 15 and indicates a failure of the target for phosphate.

The RQP results show as well that phosphate fails its target for the present-day situation and the future scenarios and ammonia fails its target for the 2019/20 scenario. There is a 9% and 6% deterioration for BOD for 2019/20 and 2030/31 respectively; 66% and 55% for ammonia for 2019/20 and 2030/31 respectively; 13% and 4% deterioration for phosphate for 2019/20 and 2030/31 respectively.

The RQP function to calculate the required discharge quality in order to achieve no deterioration and meet the river target using the 2019/20 scenarios for ammonia, and the present-day situations for phosphate (see Table 24) as input data gives the following results (Table 25):

Table 25: STW discharge quality required to meet WFD targets - Drayton STW

Pollutant	Target	Mean	SD	95%ile
Amm	0.6	2.14	1.72	5.45
P	0.09	0.31	0.08	0.46

To achieve no deterioration for BOD for future scenarios, improvements to the STW would be required.

Figure 14: SIMCAT result for flow and phosphate.

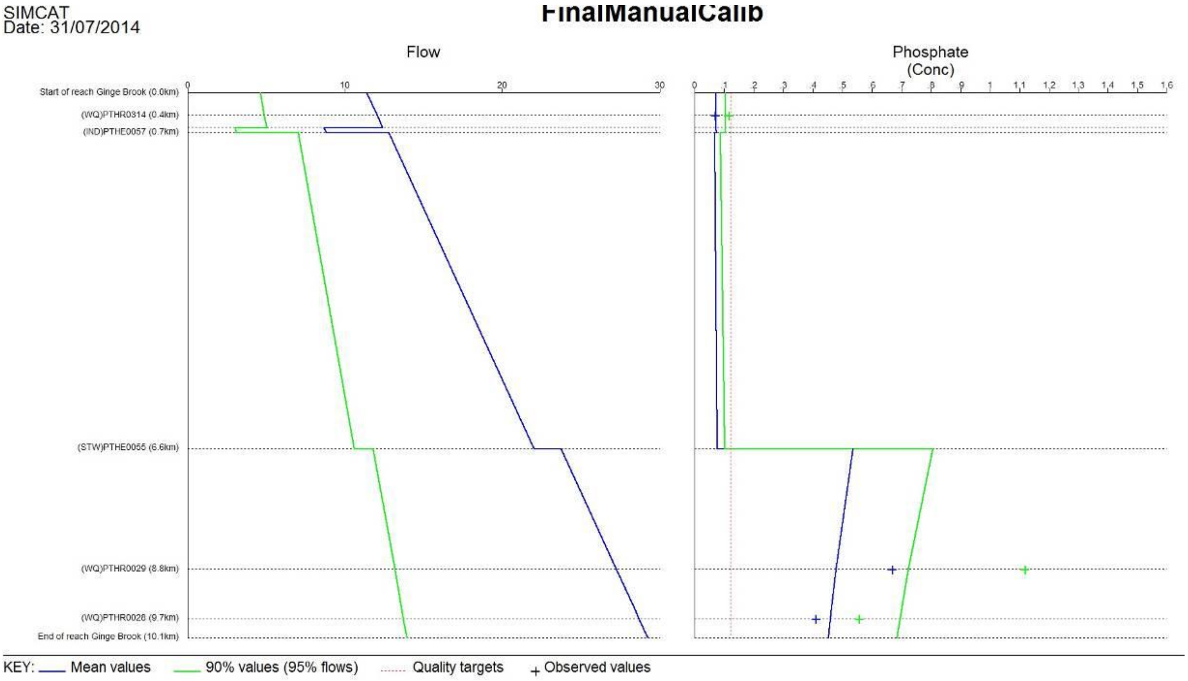
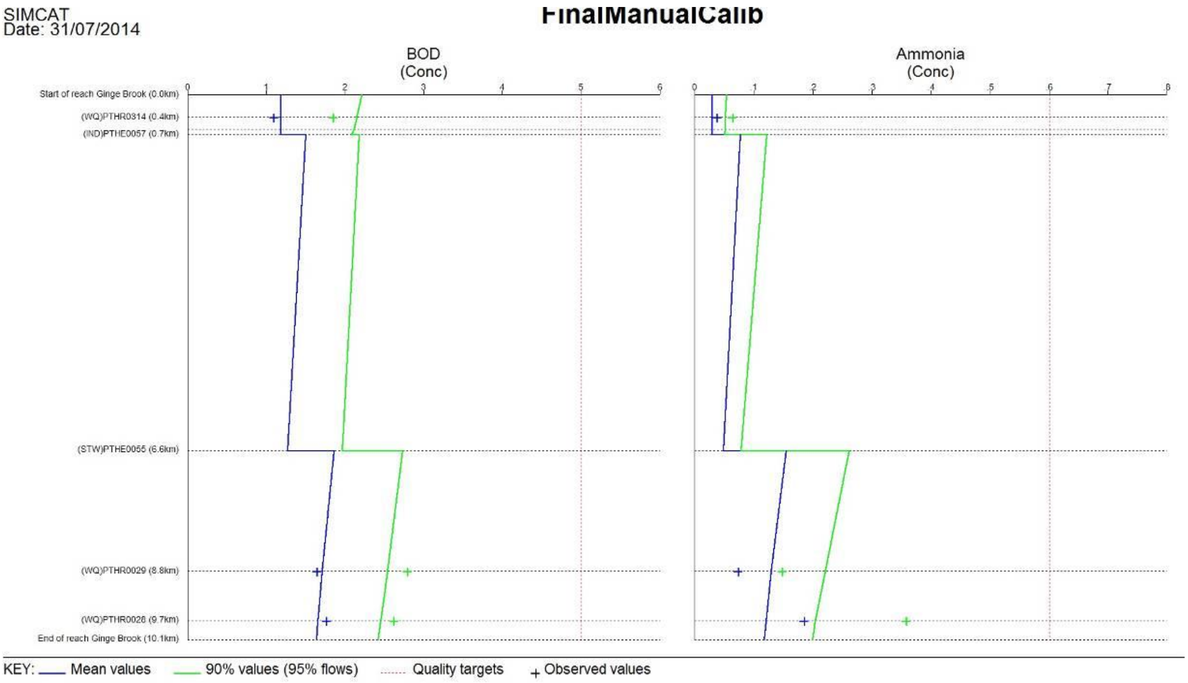


Figure 15: SIMCAT result for BOD and Ammonia.



B.6.8 Faringdon STW

Faringdon STW discharges into the Faringdon Brook as shown in Figure 16.

The status of the receiving watercourse is summarised in the Table 26 below:

Table 26: Faringdon status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Good	High	Moderate
2013 status	Moderate	Moderate	Fail	High	Moderate
Objective	Good Status by 2017	Good Status by 2017	High Status by 2015	NA	2015: Moderate (Disproportionately expensive (P1c))

Figure 16: GIS SIMCAT map of Faringdon discharge location.

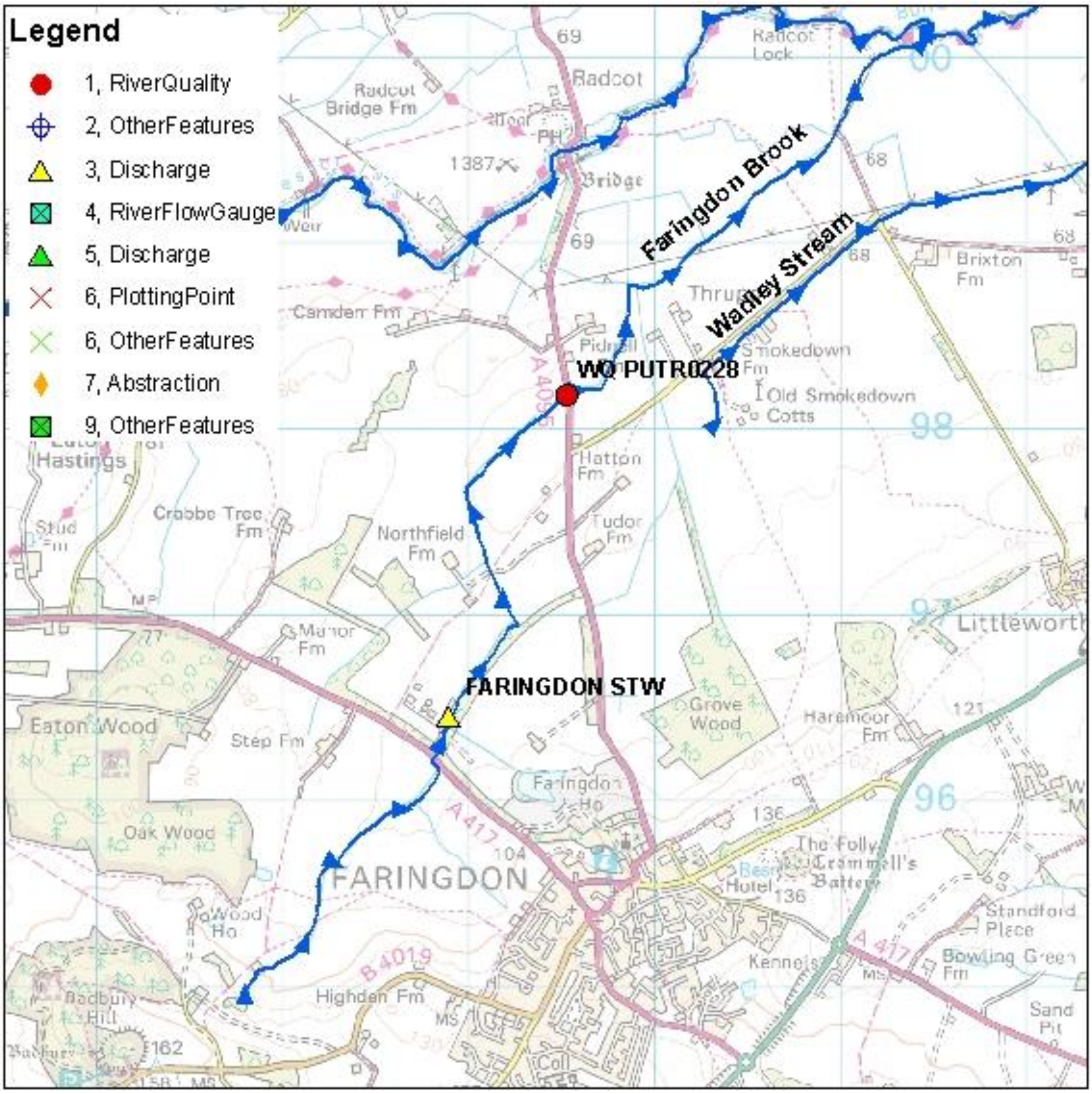


Table 27 shows the input data and RQP results for Faringdon. The works has permit values for BOD (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its permit but it will be close to its permited capacity for BOD.

Table 27: input data and RQP results for Faringdon STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	2.84	SIMCAT calculated value just upstream STW	1.39	Thames Water	NA	1.74	Thames Water	NA	1.58	Thames Water	NA
	SD			0.46			0.58			0.53		
	5%ile	0.9										
BOD (mg/l)	Mean	0.51	SIMCAT calculated value just upstream STW	10	Thames Water	6.97	11.2	Thames Water	8.77	11.4	Thames Water	8.45
	SD	0.18										
	95%ile			20			22.5			22.8		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.03	SIMCAT calculated value just upstream STW	4.3	Thames Water	2.97	6.9	Thames Water	5.36	7.4	Thames Water	5.49
	SD	0.06										
	95%ile			9			14.5			15.5		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	1.79	SIMCAT calculated value just upstream STW	5.33	SIMCAT observed values	3.1	5.33	SIMCAT observed values	3.28	5.33	SIMCAT observed values	3.2
	SD	0.35		0.62			0.62			0.62		
	Target Mean	0.08	2013 WFD									

There is no WQ point upstream of the STW and the river quality data were taken from the SIMCAT calculated values just upstream of the discharge point. The model presents a good calibration for ammonia and phosphate but overestimates the concentration for BOD as shown in Table 27 and Table 31 and indicates a failure of the target for all pollutants.

The RQP results indicate that the watercourse fails its targets for BOD, NH4 and P for the present-day situation and the future scenarios. There is a 26% and 21% deterioration for BOD for 2019/20 and 2030/31 respectively; 80% and 85% for ammonia for 2019/20 and 2030/31 respectively; 6% and 3% deterioration for phosphate for 2019/20 and 2030/31 respectively.

SIMCAT shows that phosphate is failing its target upstream of the STW. The RQP function to calculate the required discharge quality in order to meet the river target using the present-day situation for all the pollutants (see Table 27) as input data gives the following results for BOD and ammonia (Table 28):

Table 28: STW discharge quality required to meet WFD targets - Faringdon STW

Pollutant	Target	Mean	SD	95%ile
BOD	5	7.18	3.66	14.19
Amm	0.6	0.86	0.48	1.78

For phosphate the RQP tool reports that "the river quality target is not achievable without improving the upstream water quality".

In order to prevent a water quality deterioration at Faringdon for future scenarios, sewage treatment would have to be improved to meet higher standards for BOD and Ammonia. In order to meet the 'No deterioration' permit, the revised permit values shown in Table 29 must be met.

Table 29: 'No deterioration' permit values for Farringdon STW

Parameter	Scenario with the strictest permit requirement	Present day 90 percentile (the "no-deterioration" target)	Permit values required to meet "no-deterioration"		
			Mean Quality	Standard Deviation	95th Percentile
BOD	19/20	6.97	9.87	3.29	15.97
Ammonia	30/31	2.97	4.58	1.5	7.31
Phosphate	-	-	-	-	-

Figure 17: SIMCAT result for flow and phosphate.

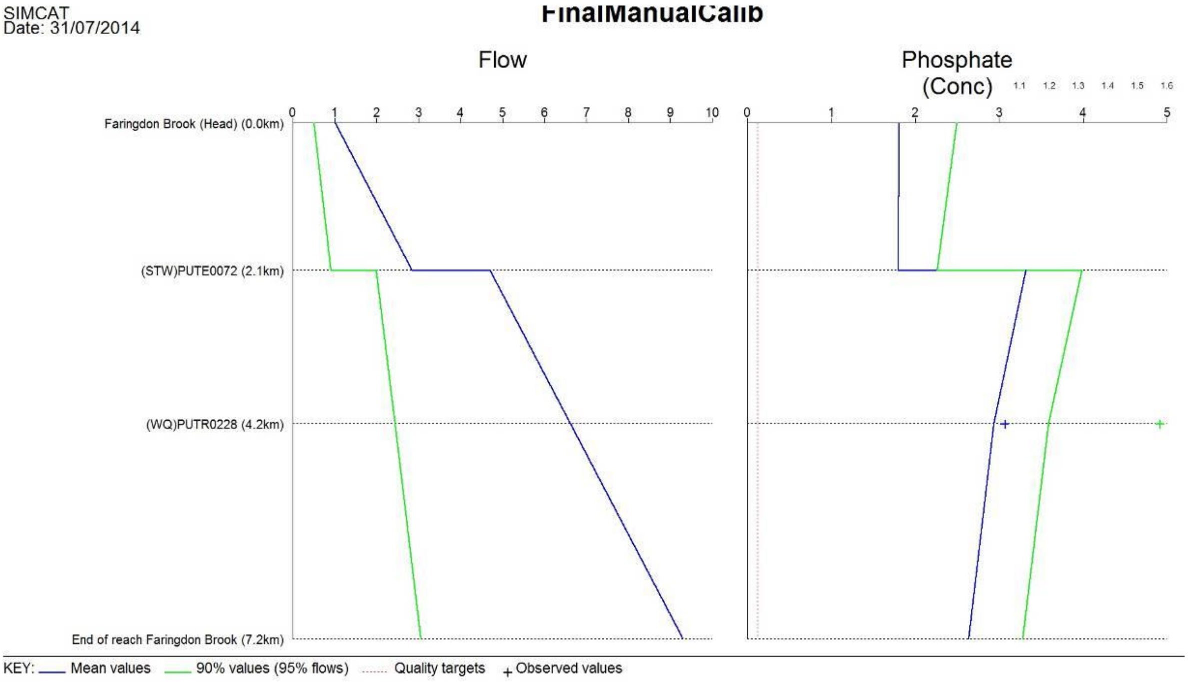
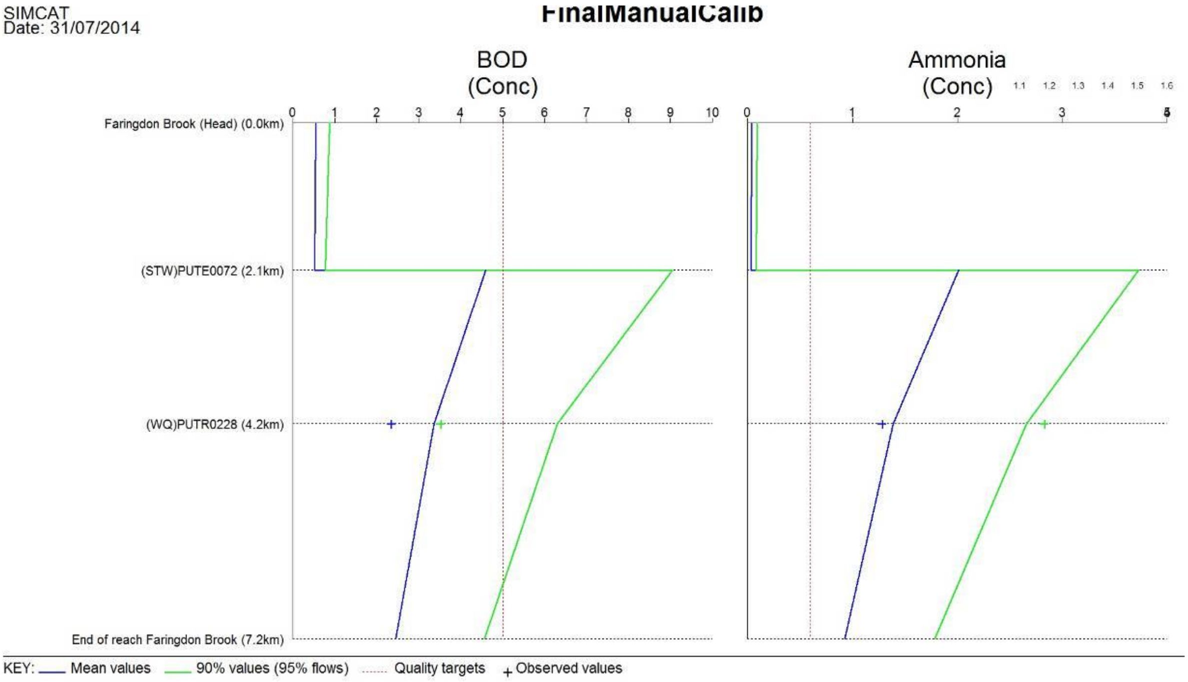


Figure 18: SIMCAT result for BOD and Ammonia.



B.6.9 Kingston Bagpuize STW

Kingston Bagpuize STW discharges into the River Ock as shown in Figure 19.

The status of the receiving watercourse is summarised on the Table 30 below:

Table 30: River Ock status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Good	High	Moderate
2013 status	Moderate	Moderate	Good	High	Poor
Objective	Good Status by 2027	Good Status by 2027	High Status by 2015	NA	2015: Moderate (Disproportionately expensive (P1a))

Figure 19: GIS SIMCAT map of Kingston Bagpuize discharge location.

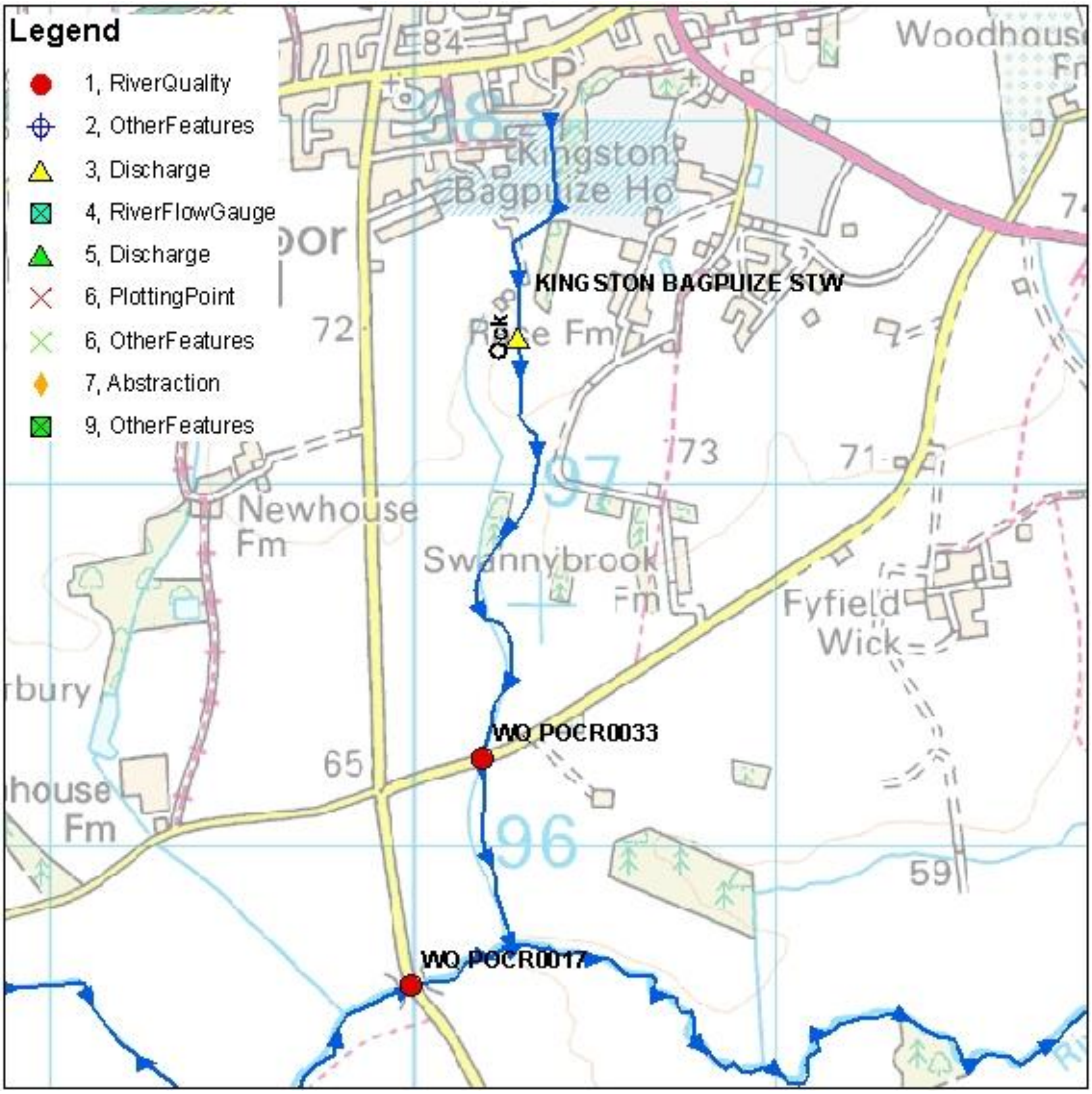


Table 31 shows the input data and RQP results for Kingston Bagpuize without contingency sites. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will be working below such values for BOD and above for ammonia from 2019/20 scenario. Upgrades are needed for ammonia from 2019/20 scenario. The STW is also predicted to reach its hydraulic capacity by 2019/20.

Table 31: input data and RQP results for Kingston Bagpuize STW without contingencies sites.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	1.3	SIMCAT calculated value just upstream STW	0.68	Thames Water	NA	0.75	Thames Water	NA	0.7	Thames Water	NA
	SD			0.23			0.25			0.23		
	5%ile	0.56										
BOD (mg/l)	Mean	0.66	SIMCAT calculated value just upstream STW	6	Thames Water	3.85	6.4	Thames Water	4.29	6.5	Thames Water	4.23
	SD	1.34										
	95%ile			9.3			9.9			10.1		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.03	SIMCAT calculated value just upstream STW	1.3	Thames Water	1.11	1.7	Thames Water	1.55	1.9	Thames Water	1.69
	SD	0.02										
	95%ile			5			6.5			7.2		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	1.74	SIMCAT calculated value just upstream STW	6.39	SIMCAT observed values	3.44	6.39	SIMCAT observed values	3.55	6.39	SIMCAT observed values	3.48
	SD	1.65		1.02			1.02			1.02		
	Target Mean	0.08	2013 WFD									

There is not a WQ point upstream of the STW and the river quality data were taken from the SIMCAT calculated values just upstream of the discharge point. The model underestimates the concentration for ammonia as shown in Figure 20 and Figure 21 and indicates a failure of the target for ammonia and phosphate.

The RQP results also indicate that ammonia and phosphate fail to meet their target for the present-day situation and the future scenarios. There is a 11% and 10% deterioration for BOD for 2019/20 and 2030/31 respectively; 40% and 52% for ammonia for 2019/20 and 2030/31 respectively; 3% and 1% deterioration for phosphate for 2019/20 and 2030/31 respectively.

The RQP tool was used to calculate the required discharge quality in order to meet the river target using the present-day situation for ammonia and P (see Table 31 **Error! Reference source not found.**). The results for ammonia are shown in Table 32 below:

Table 32: STW discharge quality required to meet WFD targets - Kingston Bagpuize STW

Pollutant	Target	Mean	SD	95%ile
Amm	0.6	0.68	1.45	2.72

For phosphate the RQP tool reports that "the river quality target is not achievable without improving the upstream water quality".

Figure 20: SIMCAT result for flow and phosphate.

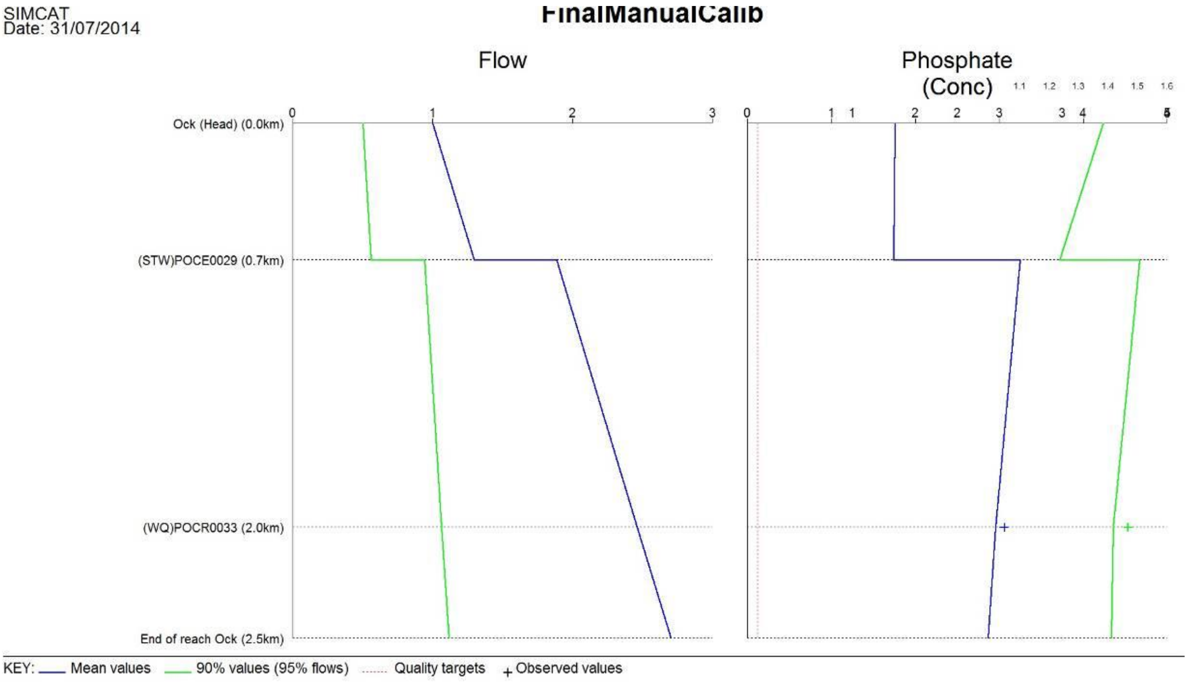
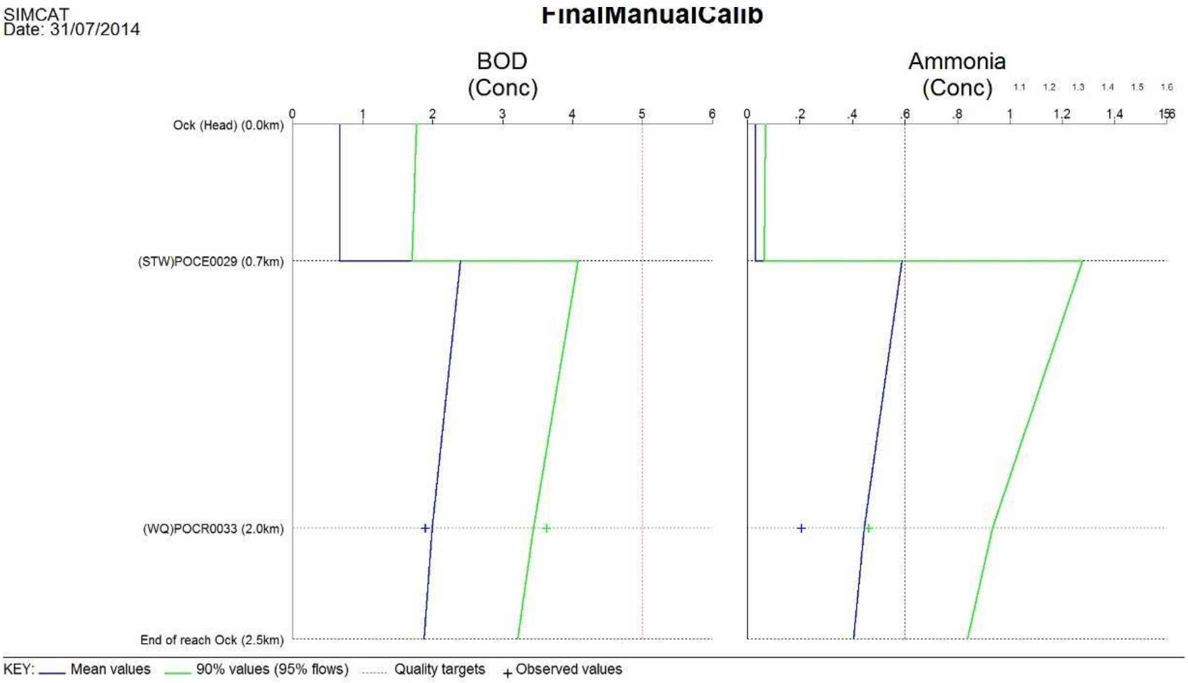


Figure 21: SIMCAT result for BOD and Ammonia.



B.6.10 Oxford STW

Oxford STW discharges into the Northfield Brook as shown in Figure 22.

The status of the receiving watercourse is summarised in the Table 33 below:

Table 33: Northfield Brook status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Not available	Good	Poor
2013 status	Moderate	Moderate	Good	Poor	Poor
Objective	Good Status by 2027	Good Status by 2027	Not available	NA	2015: Poor (Disproportionately expensive (P1a))

Figure 22: GIS SIMCAT map of Oxford discharge location.

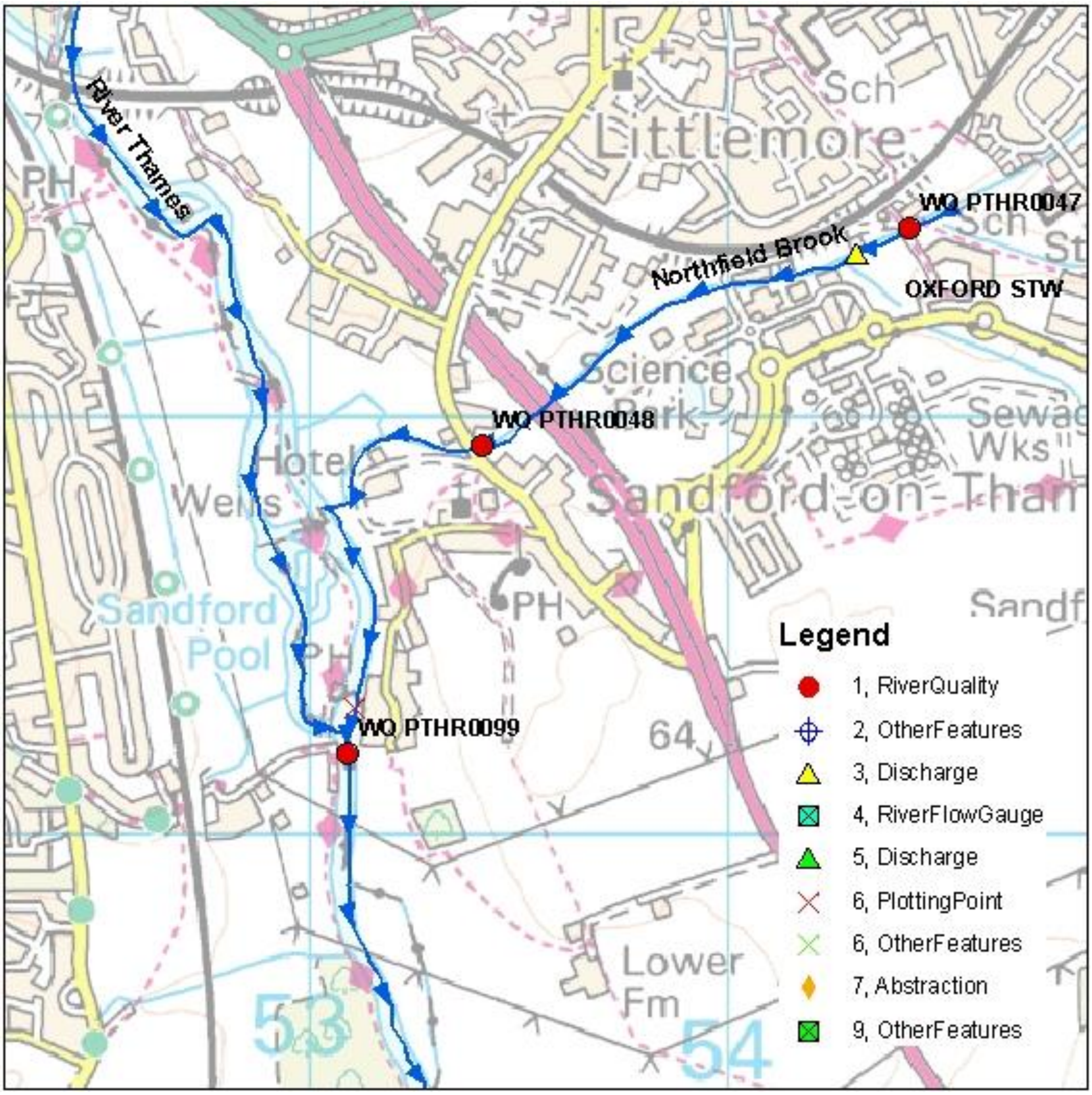


Table 34 shows the input data and RQP results for Oxford. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its BOD permit, but will exceed its ammonia permit by the 2019/20 scenario. Upgrades are needed for ammonia from 2019/20 scenario. The works also gets close to its flow permit in the 2019/20 scenario, but the flow headroom is predicted to improve by 2030/31 as the impacts of reduced water consumption are felt. As deterioration is less than 10%, no changes to permits are required.

Table 34: input data and RQP results for Oxford STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	6.42	SIMCAT calculated value just upstream STW	59.81	Thames Water	NA	59.1	Thames Water	NA	54.7	Thames Water	NA
	SD			19.94			19.7			18.2		
	5%ile	0.94										
BOD (mg/l)	Mean	3.28	U/s WQ point PTHE0144 (old ref. PTHR0047) from 09-13 data	3.5	Thames Water	5.18	3.5	Thames Water	5.18	3.5	Thames Water	5.17
	SD	1.85										
	95%ile			6			6			6		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.74	U/s WQ point PTHE0144 (old ref. PTHR0047) from 09-13 data	1	Thames Water	2.13	1.1	Thames Water	2.29	1.1	Thames Water	2.28
	SD	1.42										
	95%ile			3			3.2			3.2		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.03	SIMCAT calculated value just upstream STW	0.83	Thames Water	0.78	0.83	Thames Water	0.78	0.83	Thames Water	0.77
	SD	0.004		0.44			0.44			0.44		
	Target Mean	0.08	2013 WFD									

There is a WQ point 0.14km upstream of the STW called PTHR0047 that now is called PTHE0144. There are no observed values in SIMCAT for this WQ point. The river quality data were taken from the 2009-13 observed data for BOD and ammonia. Phosphate statistics were taken from the SIMCAT calculated values just upstream of the discharge point since there are no observed data. Table 35 below summarises the statistics calculated in Aardvark (see Figure 23 and Figure 24).

Table 35: Aardvark statistics for PTHE0144.

			Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Data period
PTHE0144	0.14	BOD	3.276	1.854	175	09-13
PTHE0144	0.14	Amm	0.736	1.422	58	09-13
PTHE0144	0.14	P				no data

The Aardvark analysis has shown no seasonality, trends or step changes and a good fit with the LogNormal plot for both pollutants as shown on Figure 25 and Figure 26. Because of the close distance to the discharge point the effect of the natural purification is negligible.

The SIMCAT model underestimates the concentration for BOD, overestimates the concentration for ammonia and gives a good calibration for phosphate as shown in Figure 27 and Figure 28 and indicates that ammonia and phosphate fail their targets.

The RQP results show that all the pollutants are failing their targets for the present-day situation and the future scenarios. There is no deterioration for BOD for both scenarios; 8% and 7% deterioration for ammonia for 2019/20 and 2030/31 respectively and no deterioration for phosphate with a small improvement predicted for the 2030/31 scenario..

The RQP tool was used to calculate the discharge quality required in order to meet the river target using the present-day situation for all the pollutants as input data (see Table 34) gives the following results (Table 36):

Table 36: STW discharge quality required to meet WFD targets - Oxford STW

Pollutant	Target	Mean	SD	95%ile
BOD	5	3.43	1.28	5.83
Amm	0.6	0.24	0.26	0.72
P	0.08	0.08	0.04	0.17

Since the river target could not be reached for P and ammonia with BAT (for P this is a mean of 0.5mg/l, for ammonia a 95%ile of 1mg/l, for BOD is a 95%ile of 5mg/l), using the actual condition for the upstream river quality values, the RQP function to calculate the required discharge quality in order to meet the river target was run assuming that the river upstream has GES for ammonia. For P the river quality upstream for the present-day situation already has GES. A mean of 0.29mg/l and a SD of 0.29mg/l for ammonia were used. The worse case future scenario was modelled first to verify if the required discharge quality, in order to meet the river target, could be achieved with the BAT.. The other scenarios were modelled if this was not achieved.. The target was not reached in any of the scenarios for ammonia as shown in Table 37 even when assuming GES upstream the discharge point.

Table 37: Permit values required to meet river targets assuming GES upstream

Scenario	Pollutant	Target	Mean	SD	95%ile
Present	Amm	0.6	0.3	0.31	0.88
2019/20	Amm	0.6	0.3	0.3	0.85
2030/31	Amm	0.6	0.3	0.3	0.86

Figure 23: Aardvark summary for BOD for PTHE0144.

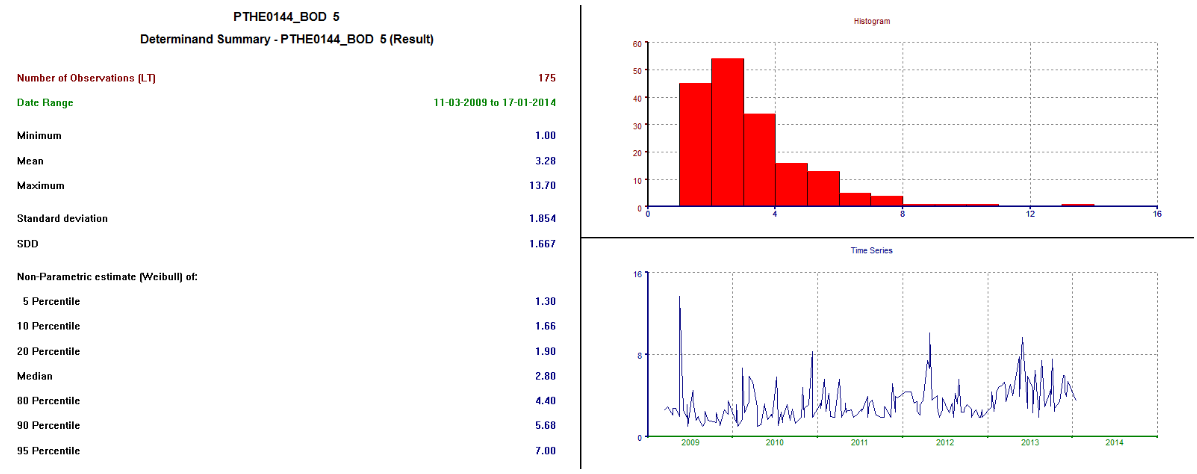


Figure 24: Aardvark summary for ammonia for PTHE0144.

PTHE0144_Ammonia

Determinand Summary - PTHE0144_Ammonia (Result)

Number of Observations (LT)	58
Date Range	15-04-2009 to 29-11-2013
Minimum	0.0400
Mean	0.7360
Maximum	7.8800
Standard deviation	1.4222
SDD	1.3686
Non-Parametric estimate (Weibull) of:	
5 Percentile	0.0400
10 Percentile	0.0970
20 Percentile	0.1300
Median	0.2100
80 Percentile	1.1460
90 Percentile	1.8930
95 Percentile	2.3495

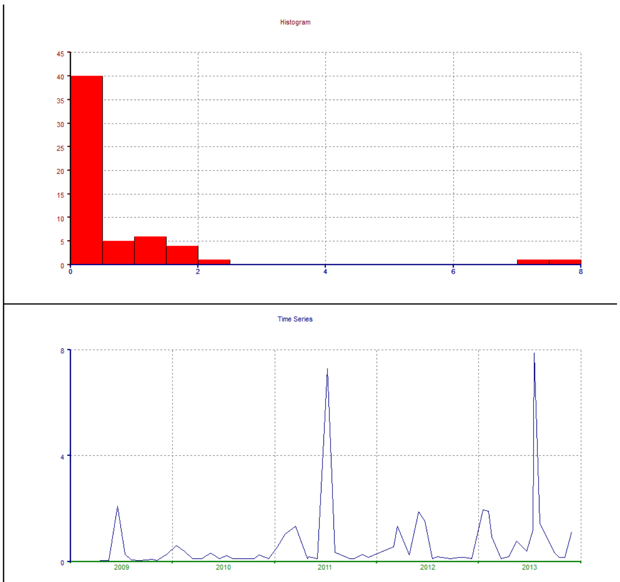


Figure 25: Aardvark LogNormal plot for BOD for PTHE0144.

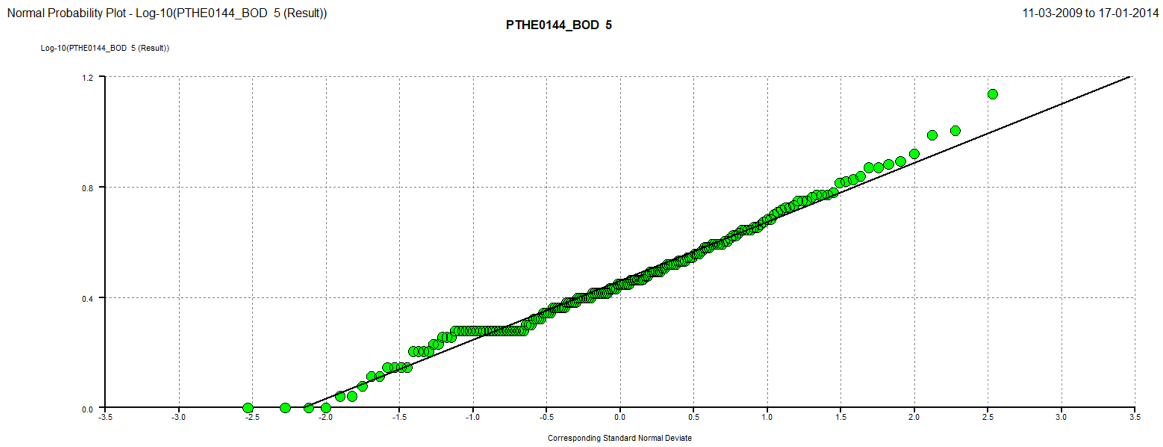


Figure 26: Aardvark LogNormal plot for ammonia for PTHE0144.

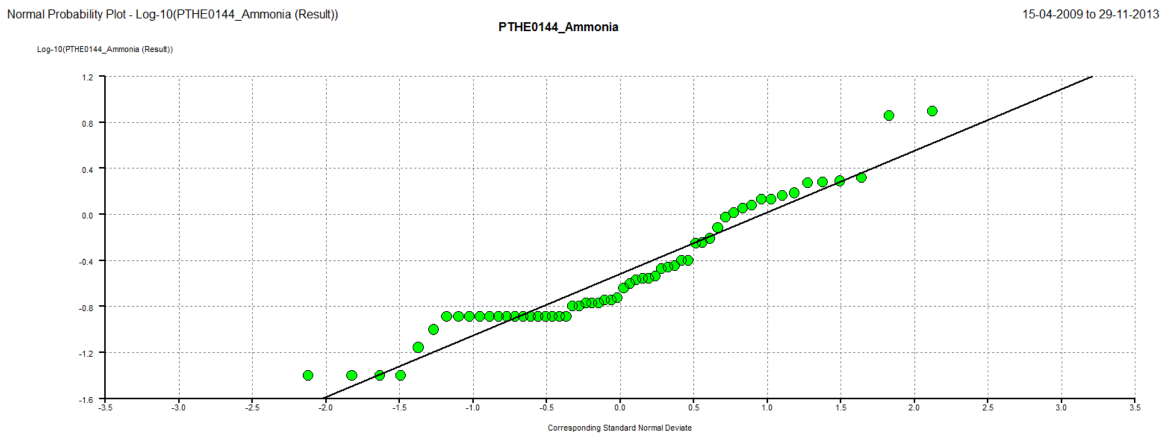


Figure 27: SIMCAT result for flow and phosphate.

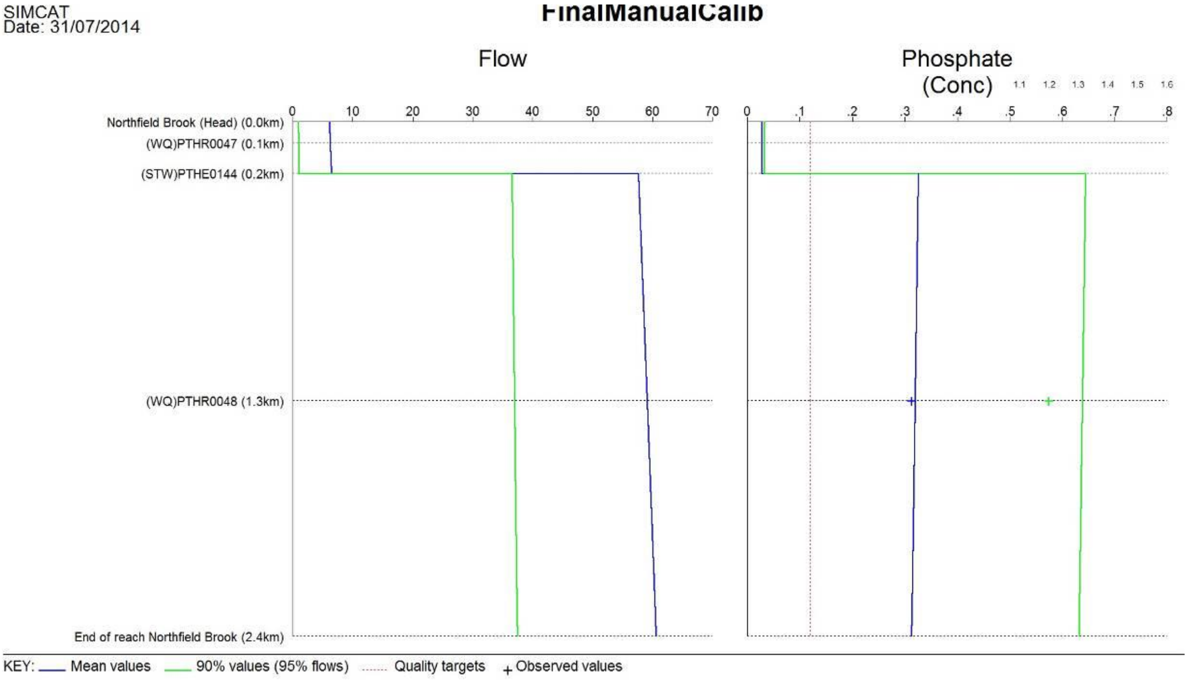
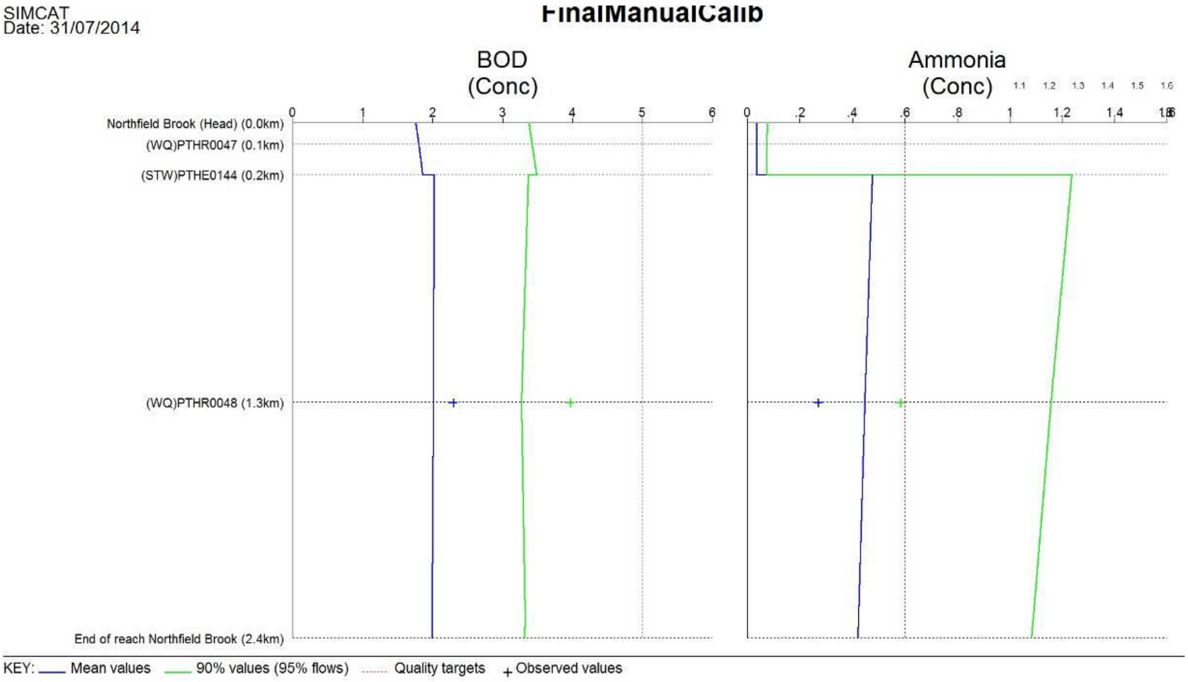


Figure 28: SIMCAT result for BOD and Ammonia.



B.6.11 Shrivenham STW

Shrivenham STW discharges into the Tuckmill Brook as shown in Figure 29. The status of the receiving watercourse is summarised in the Table 38 below:

Table 38: Tuckmill Brook status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Not available	High	Moderate
2013 status	Moderate	Moderate	Not available	High	Poor
Objective	Good Status by 2027	Good Status by 2027	Not available	NA	2015: Moderate (Disproportionately expensive (P1b))

Figure 29: GIS SIMCAT map of Shrivenham discharge location.

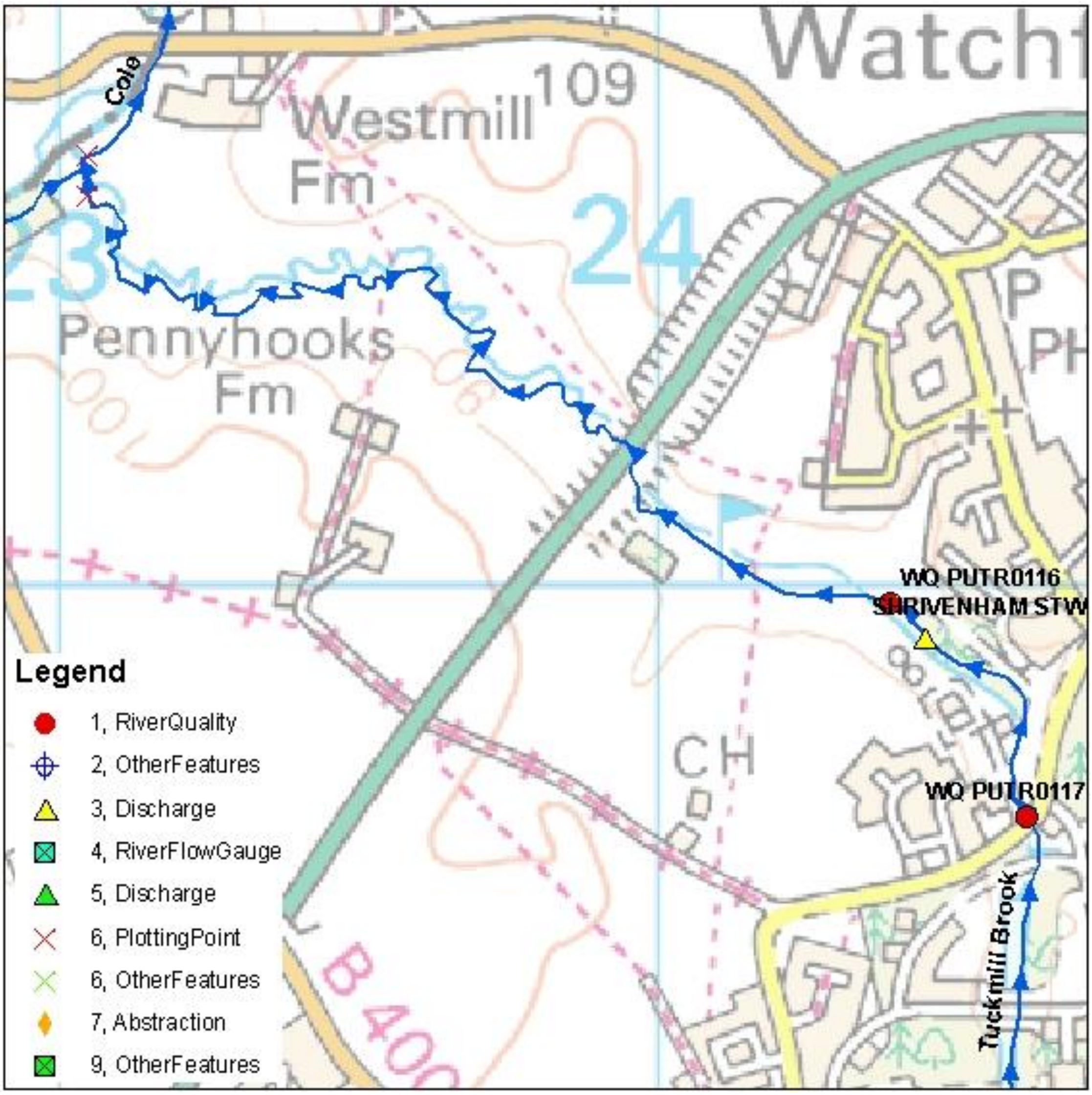


Table 39 shows the input data and RQP results for Shrivenham. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will be exceeding its permit for Ammonia by 2019/20 and for BOD by 2030/31. Upgrading of the works would therefore be required by 2019/20.

Table 39: input data and RQP results for Shrivenham STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	11.41	SIMCAT calculated value just upstream STW	1.77	Thames Water	NA	2.06	Thames Water	NA	1.97	Thames Water	NA
	SD			0.59			0.69			0.66		
	5%ile	1.82										
BOD (mg/l)	Mean	1.39	U/s WQ point PUTR0117 from SIMCAT	3.4	Thames Water	2.73	4.5	Thames Water	3.22	4.8	Thames Water	3.32
	SD	0.65										
	95%ile			6.5			8.5			9.1		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.11	U/s WQ point PUTR0117 from SIMCAT	0.3	Thames Water	0.29	0.8	Thames Water	0.53	1	Thames Water	0.64
	SD	0.11										
	95%ile			0.9			2.3			3.1		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.085	U/s WQ point PUTR0117 from SIMCAT	2.83	SIMCAT observed values	0.65	2.83	SIMCAT observed values	0.72	2.83	SIMCAT observed values	0.7
	SD	0.039		1			1			1		
	Target Mean	0.075	2013 WFD									

The upstream WQ point is 0.41km from the discharge point and Table 40 below shows the statistics used in SIMCAT and those derived from the observed data provided:

Table 40: statistics used in SIMCAT and those derived from the observed data for WQ point PUTR0117.

			SIMCAT model				Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Distribution	Mean	SD	Samples	Data period
PUTR0117	0.41	BOD	1.391	0.652	27	Normal				no data
PUTR0117	0.41	Amm	0.109	0.112	29	Log-Normal	0.061	0.045	10	13 only
PUTR0117	0.41	P	0.085	0.039	29	Log-Normal	0.057	0.033	10	13 only

Due to the low number of samples for the period 09-13 the SIMCAT data were used. Because of the close distance to the discharge point the effect of the natural purification is negligible. The model presents a good calibration for all pollutants as shown in Figure 30 and Figure 31 and indicates a failure of the target for phosphate.

The RQP results confirm that the target for phosphate is not reached for the present-day situation and the future scenarios and also indicate that the watercourse will fail its target for ammonia by 2030/31. There is a 18% and 22% deterioration for BOD for 2019/20 and 2030/31 respectively; 83% and 120% for ammonia for 2019/20 and 2030/31 respectively; 9% and 7% deterioration for phosphate for 2019/20 and 2030/31 respectively.

SIMCAT shows that phosphate is failing its target upstream of the STW. The RQP tool was used to calculate the discharge quality required in order to meet the river target using the 2030/31 scenario for ammonia and the present-day for P as input data (see Table 39). The results are shown in Table 41 below

Table 41: STW discharge quality required to meet WFD targets - Shrivenham STW

Pollutant	Target	Mean	SD	95%ile
Amm	0.6	0.96	1.08	2.95
P	0.075	0.01	0.01	0.02

Since the river target could not be reached for P with BAT (for P this is a mean of 0.5mg/l, for ammonia a 95%ile of 1mg/l), using the actual condition for the upstream river quality values, the RQP function to calculate the required discharge quality in order to meet the river target was run assuming that the river upstream has GES for P. A mean of 0.075 and a SD of 0.025 for phosphate. The worst case future scenario was modelled first to verify if the required discharge quality, in order to meet the river target, could be achieved with the BAT. The other scenarios were modelled if this was not achieved. The target was not reached in any of the scenarios for P, even when assuming GES upstream the discharge point as shown in .

Table 42: Good quality upstream results

Scenario	Pollutant	Target	Mean	SD	95%ile
2019/20	P	0.075	0.07	0.03	0.12
2030/31	P	0.075	0.06	0.02	0.09
Present	P	0.075	0.05	0.02	0.09

New permit values were calculated for the determinands that present a deterioration of more than 10% or a class deterioration. These were calculated using the present day concentration in the river plus a 10% deterioration as the river target or, if there was a class deterioration, the limit of the current class. Table 43 shows the results for BOD where the present day concentration + 10% deterioration was used because a class deterioration was not predicted and Ammonia where the “High” class boundary was used. Permit values can be achieved with BAT for BOD since this is a 95%ile of 5mg/l. For ammonia the permit value is a 95%ile of 1mg/l and since the result is in the 10% of the model tolerance / variability this can be considered achievable.

Table 43: 'No deterioration' permit values for Shrivenham STW

Parameter	Scenario with the strictest permit requirement	Present day + 10% deterioration or class boundary target	Permit values required to meet "no-deterioration"		
			Mean Quality	Standard Deviation	95th Percentile
BOD	2030/31	3.00	4.1	1.89	7.71
Ammonia	2030/31	0.30	0.31	0.35	0.96
Phosphate	-	-	-	-	-

Figure 30: SIMCAT result for flow and phosphate.

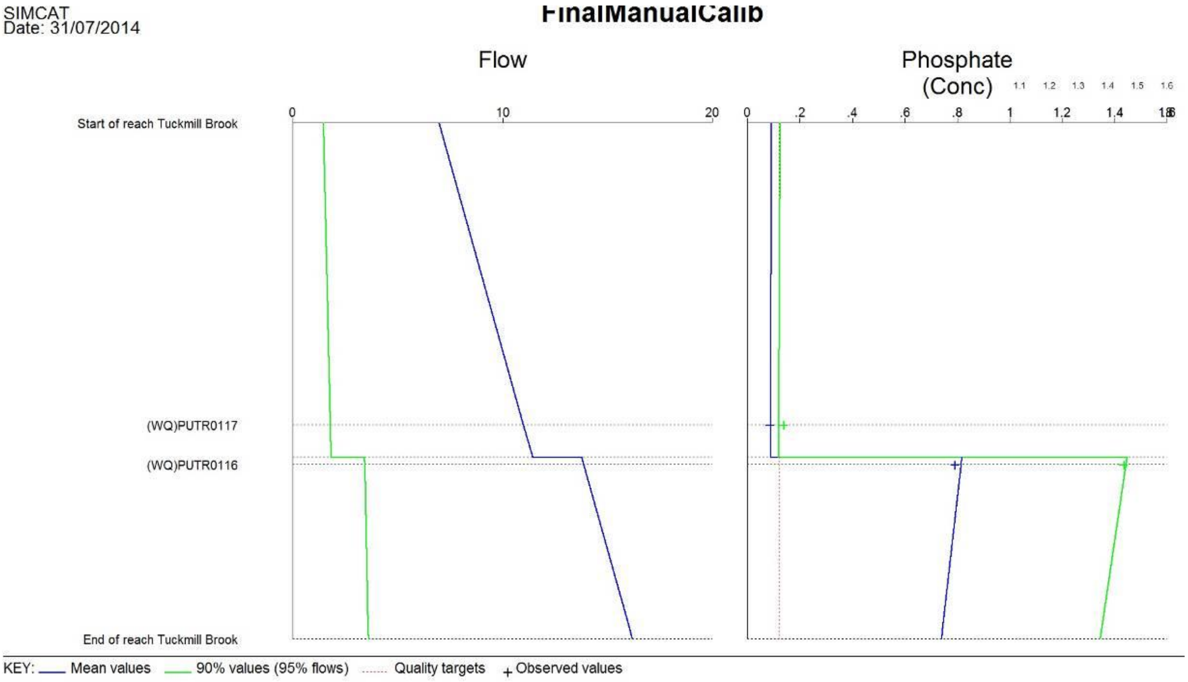
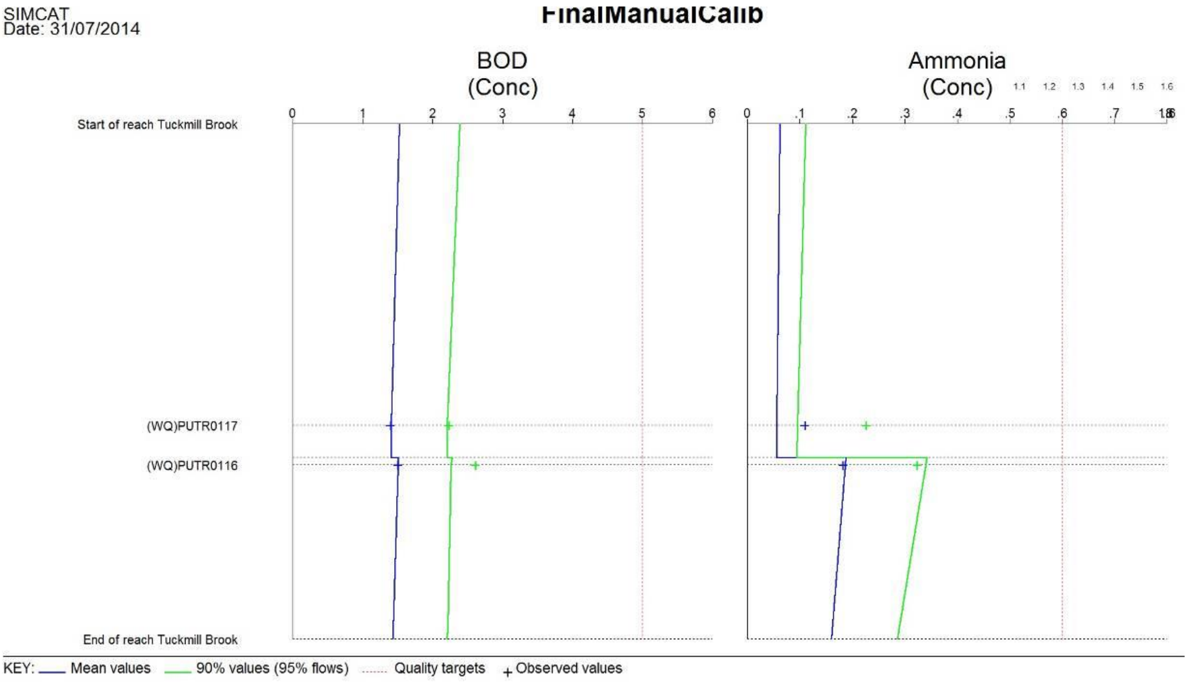


Figure 31: SIMCAT result for BOD and Ammonia.



B.6.12 Stanford in the Vale STW

Stanford in the Vale STW discharges into the River Ock as shown in Figure 32.

The status of the receiving watercourse is summarised in Table 44 below:

Table 44: River Ock status.

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Not available	High	Moderate
2013 status	Moderate	Moderate	Not available	High	Moderate
Objective	Good Status by 2027	Good Status by 2027	Not available	NA	2015: Moderate (Disproportionately expensive (P1a))

Figure 32: GIS SIMCAT map of Stanford in the Vale discharge location.

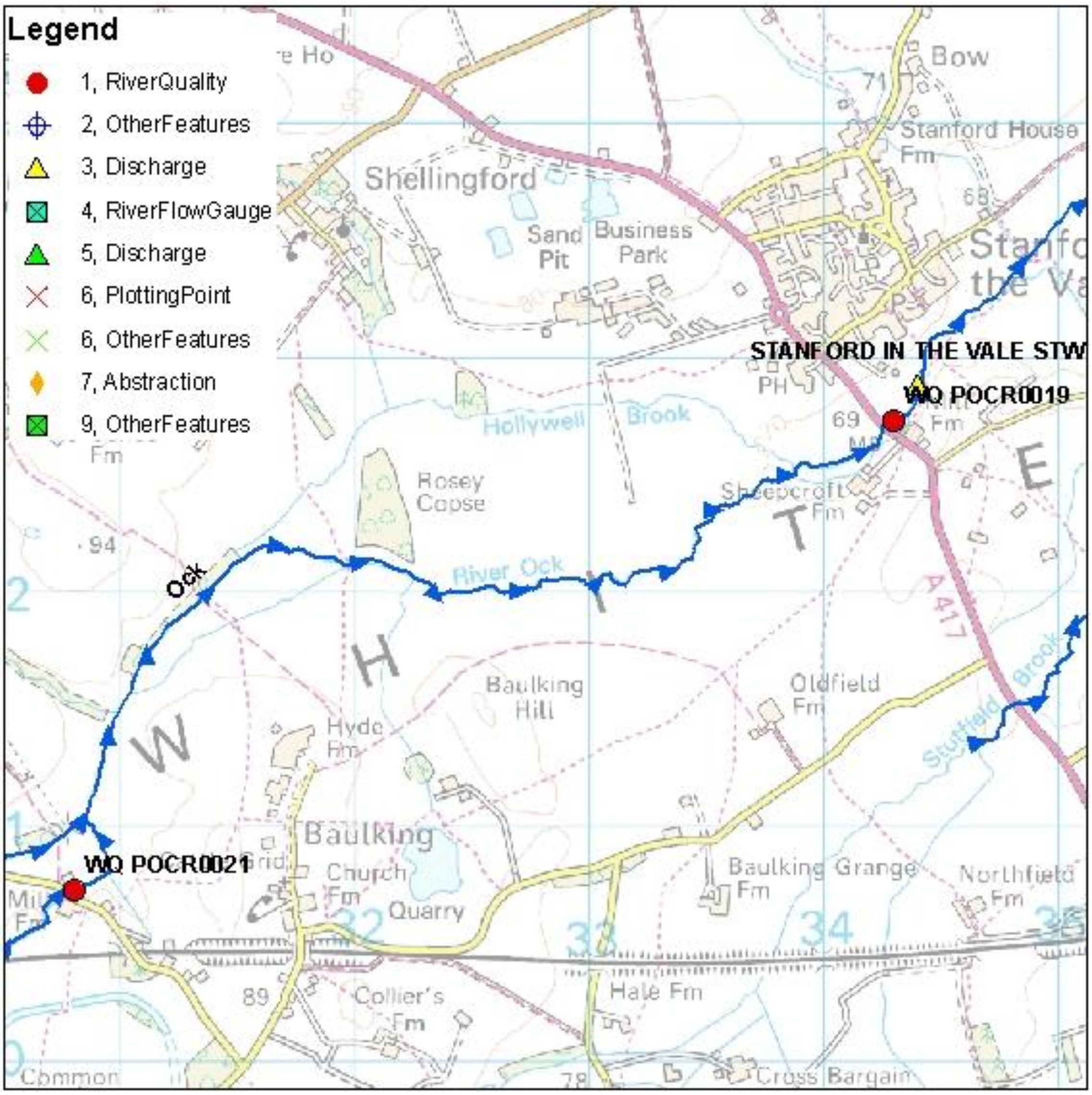


Table 45 shows the input data and RQP results for Stanford in the Vale. The works has a permit for BOD only (see Table 4) and currently it is operating within its permit. Future scenarios predict that the STW will continue to operate within its permit.

Table 45: input data and RQP results for Stanford in the Vale STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	15.64	SIMCAT calculated value just upstream STW	0.39	Thames Water	NA	0.49	Thames Water	NA	0.47	Thames Water	NA
	SD			0.13			0.16			0.16		
	5%ile	3.46										
BOD (mg/l)	Mean	1.14	U/s WQ point POCR0019 from SIMCAT	2.3	Thames Water	2.14	3.1	Thames Water	2.17	3.3	Thames Water	2.17
	SD	0.87										
	95%ile			3.6			4.8			5.2		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.04	U/s WQ point POCR0019 from 08-13 data	0.08	Thames Water	0.08	0.2	Thames Water	0.08	0.2	Thames Water	0.09
	SD	0.037										
	95%ile			0.13			0.3			0.3		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.167	U/s WQ point POCR0019 from SIMCAT	4.91	SIMCAT observed values	0.34	4.91	SIMCAT observed values	0.38	4.91	SIMCAT observed values	0.37
	SD	0.067		1.32			1.32			1.32		
	Target Mean	0.081	2013 WFD									

The upstream WQ point is 0.2km from the discharge point and Table 46 below shows the statistics used in SIMCAT and those derived from the observed data provided:

Table 46: statistics used in SIMCAT and those derived from the observed data for WQ point POCR0019.

			SIMCAT model				Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Distribution	Mean	SD	Samples	Data period
POCR0019	0.2	BOD	1.141	0.873	33	Log-Normal				no data
POCR0019	0.2	Amm	0.038	0.035	36	Log-Normal	0.04	0.037	58	08-13
POCR0019	0.2	P	0.167	0.067	36	Log-Normal	0.1	0.038	26	08-10 and 13

Due to the low number of samples for the period 2009-13 the SIMCAT data were used for BOD and phosphate. The statistics from the data period 2009-13 which were used for ammonia (see Aardvark summary on Figure 33) were virtually identical to the values used in SIMCAT. The Aardvark analysis has shown no seasonality, trends or step changes and a good fit with the LogNormal plot as shown on Figure 34. Because of the close distance to the discharge point the effect of the natural purification is negligible.

The model presents a good calibration for all pollutants as shown on Figure 35 and Figure 36, and indicates a failure of the target for phosphate and for ammonia for a short length of reach downstream the discharge point.

The RQP results also predict that the watercourse fails its target for phosphate for the present-day situation and the future scenarios. There is a 1% deterioration for BOD for both scenarios; 13% deterioration for ammonia for 2030/31 scenario; 11% and 8% deterioration for phosphate for 2019/20 and 2030/31 respectively.

SIMCAT shows that phosphate fails its target upstream of the STW. The RQP tool was used to calculate the discharge quality for the future scenario including the contingency sites that would be required in order to meet the river targets for P, but reported that "the river quality target is not achievable without improving the upstream water quality".

In order to prevent a water quality deterioration at Stanford in the Vale for future scenarios, sewage treatment would have to be improved to meet standards for Ammonia and Phosphate. In order to meet the 'No deterioration' permit, the revised permit values shown in Table 47 must be met.

Table 47: 'No deterioration' permit values for Stanford in the Vale STW

Parameter	**Scenario with the strictest permit requirement**	**Present day 90 percentile / mean (the "no-deterioration" target)**	**Permit values required to meet "no-deterioration"**		
			Mean Quality	**Standard Deviation**	**95th Percentile**
BOD	-	-	-	-	-
Ammonia	30/31	0.08	0.15	0.05	0.24
Phosphate	19/20	0.34	1.68	0.44	2.49

Figure 33: Aardvark summary for ammonia for POCR0019.

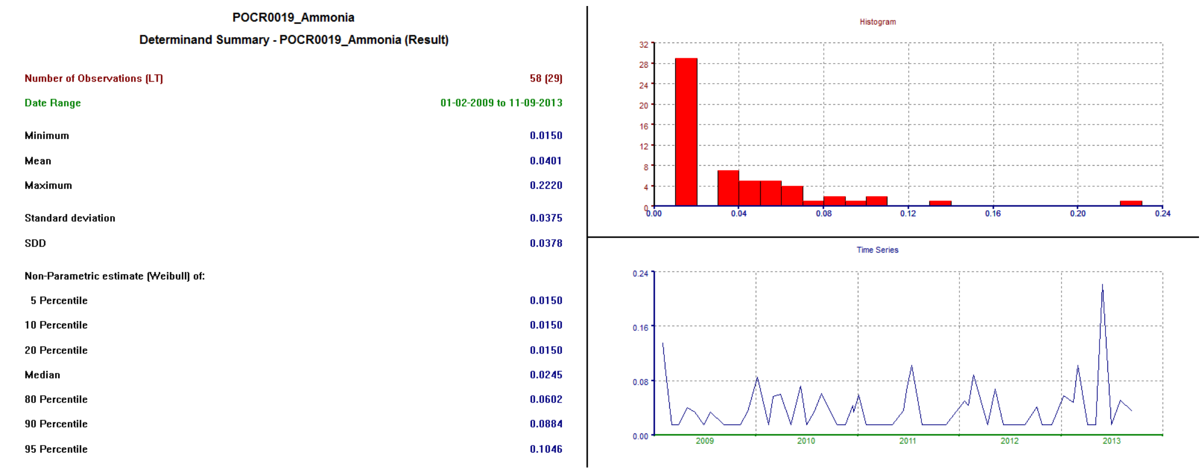


Figure 34: Aardvark LogNormal plot for ammonia for POCR0019.

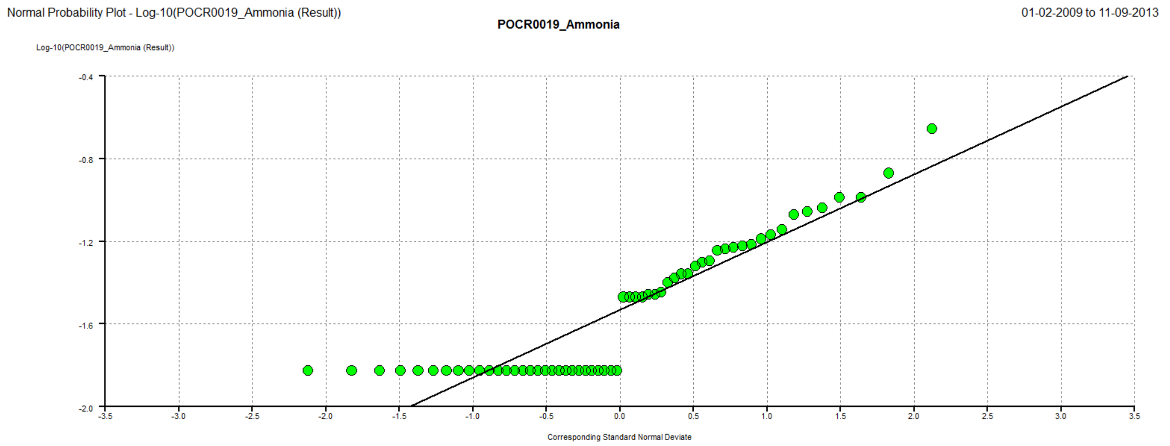


Figure 35: SIMCAT result for flow and phosphate.

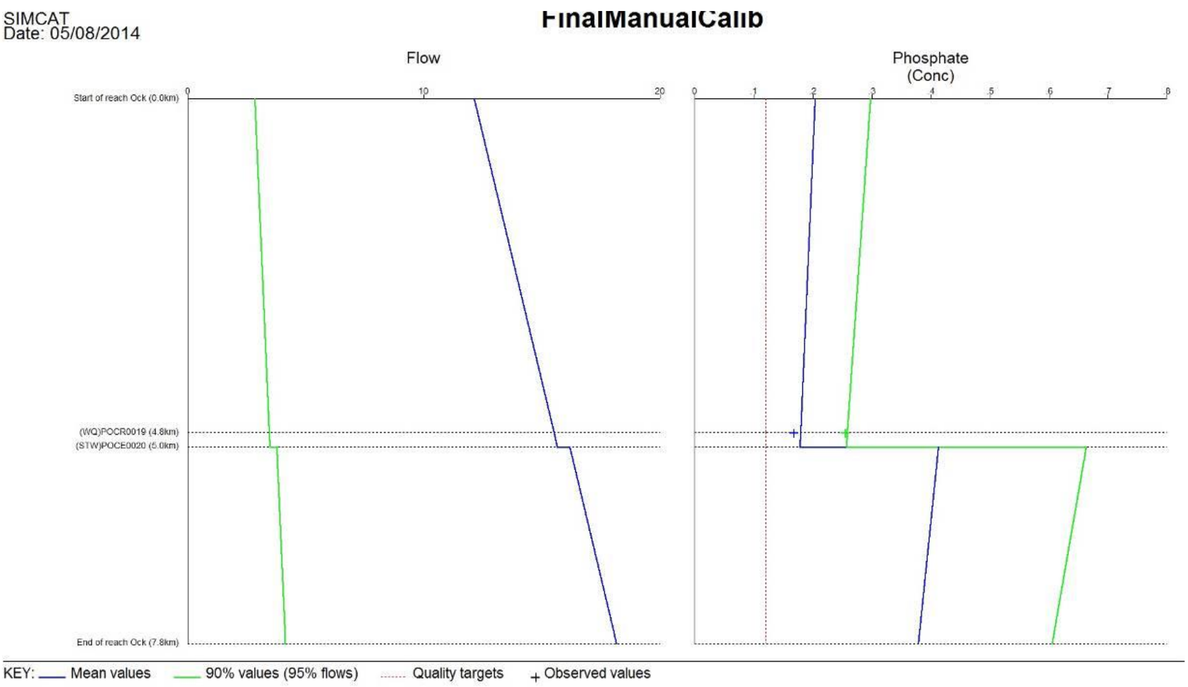
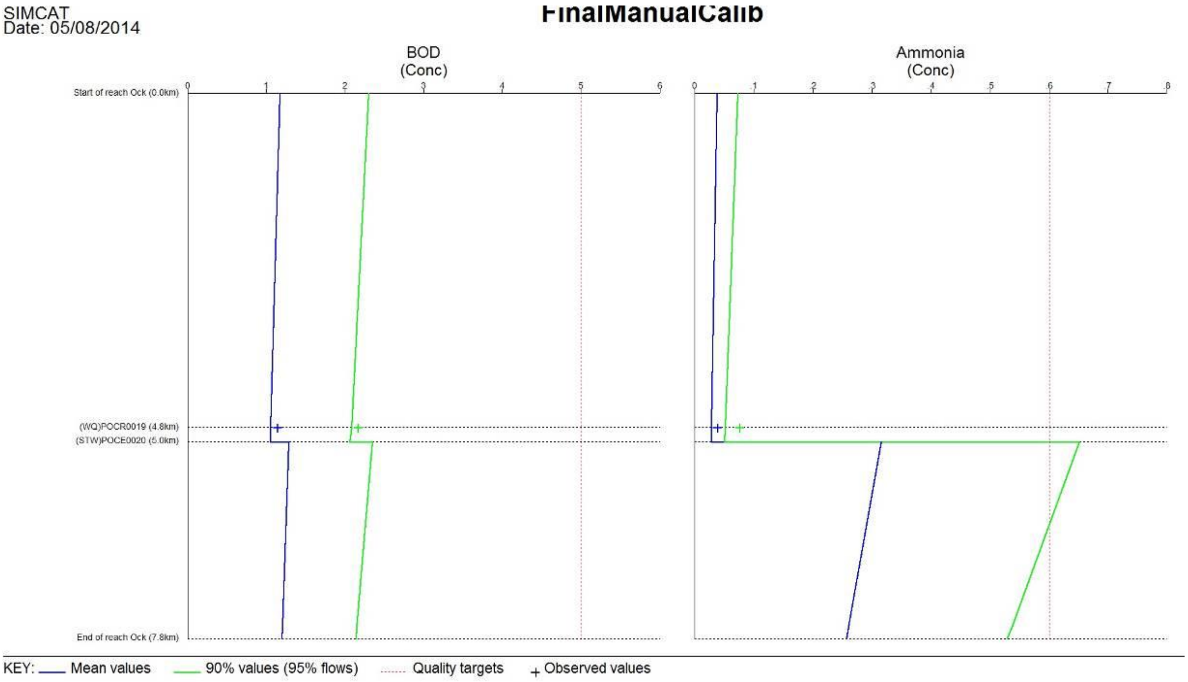


Figure 36: SIMCAT result for BOD and Ammonia.



B.6.13 Wantage STW

Wantage STW discharges into the Letcombe Brook as shown in Figure 37.

The status of the receiving watercourse is summarised in the table below:

	Overall	Ecological	Chemical	Ammonia	Phosphate
Baseline status	Moderate	Moderate	Not available	High	Moderate
2013 status	Moderate	Moderate	Not available	High	Moderate
Objective	Good Status by 2027	Good Status by 2027	Not available	NA	2015: Moderate (Disproportionately expensive (P1a))

Figure 37: GIS SIMCAT map of Wantage discharge location.

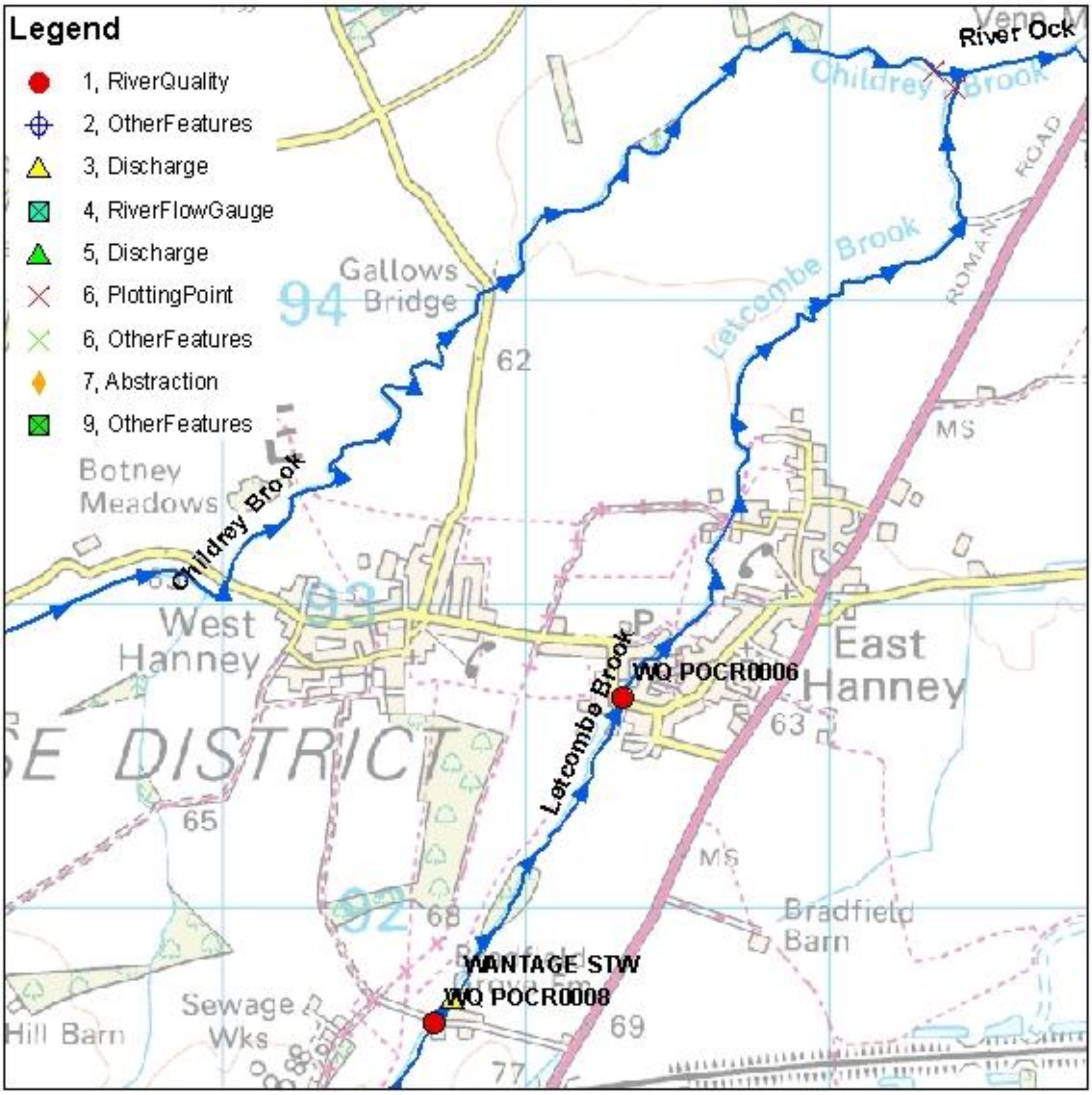


Table 48 shows the input data and RQP results for Wantage. The works has permit values for BOD and ammonia (see Table 4) and currently it is operating within its permits. Future scenarios predict that the STW will continue to operate within its permits, but will be close to its capacity for ammonia by the 2030/31 scenario.

Table 48: input data and RQP results for Wantage STW.

Parameter	Statistic	River	Source	Present day (2013)			2019/20			2030/31		
				STW	Source	RQP Result	STW	Source	RQP Result	STW	Source	RQP Result
Flow (Ml/d)	Mean	38.61	SIMCAT calculated value just upstream STW	6.19	Thames Water	NA	6.98	Thames Water	NA	7.68	Thames Water	NA
	SD			2.06			2.33			2.56		
	5%ile	5.54										
BOD (mg/l)	Mean	1	U/s WQ point POCR0008 from SIMCAT	6	Thames Water	3.57	6.5	Thames Water	3.95	7.3	Thames Water	4.53
	SD	0.57										
	95%ile			12			13			14.6		
	Target 90%ile	5	2013 WFD									
Amm (mg/l)	Mean	0.02	U/s WQ point POCR0008 from SIMCAT	0.7	Thames Water	0.37	1	Thames Water	0.57	1.6	Thames Water	0.96
	SD	0.01										
	95%ile			1.8			2.6			4.1		
	Target 90%ile	0.6	2013 WFD									
P (mg/l)	Mean	0.35	U/s WQ point POCR0008 from SIMCAT	1.38	Thames Water	0.58	1.38	Thames Water	0.60	1.38	Thames Water	0.61
	SD	0.15		0.36			0.36			0.36		
	Target Mean	0.08	2013 WFD									

The upstream WQ point is 0.1km from the discharge point and the Table 49 below shows the statistics used in SIMCAT and those derived from the observed data provided:

Table 49: statistics used in SIMCAT and those derived from the observed data for WQ point POCR0008

			SIMCAT model				Data 09-13			
WQ point	Distance	Pollutant	Mean	SD	Samples	Distribution	Mean	SD	Samples	Data period
POCR0008	0.1	BOD	1.002	0.575	28	Log-Normal				no data
POCR0008	0.1	Amm	0.019	0.009	28	Log-Normal	0.025	0.02	9	2013
POCR0008	0.1	P	0.053	0.024	28	Log-Normal	0.046	0.023	9	2013

Due to the low number of samples for the period 09-13 the SIMCAT data were used. Because of the close distance to the discharge point the effect of the natural purification is negligible. The model presents a good calibration for all pollutants as shown in Figure 38 and Figure 39 and indicates a failure of the target for phosphate.

The RQP results also predict the watercourse to fail its target for phosphate for the present-day situation and the future scenarios and ammonia fails its target for the 2030/31 scenario. There is a 11% and 27% deterioration for BOD for 2019/20 and 2030/31 respectively; 54% and 159%

deterioration for ammonia for 2019/20 and 2030/31 respectively; 3% and 5% deterioration for phosphate for 2019/20 and 2030/31 respectively.

The RQP tool was used to calculate the required discharge quality in order to meet the river target using the 2030/31 scenario for ammonia (see Table 50)

Table 50: STW discharge quality required to meet WFD targets – Wantage STW

Pollutant	Target	Mean	SD	95%ile
Amm	0.6	0.27	0.27	0.79

For phosphate the RQP tool reports that "the river quality target is not achievable without improving the upstream water quality".

In order to prevent a water quality deterioration at Wantage for future scenarios, sewage treatment would have to be improved to meet standards for Ammonia and Phosphate. In order to meet the 'No deterioration' permit, the revised permit values shown in Table 39 must be met.

Table 51: 'No deterioration' permit values for Wantage STW

Parameter	Scenario with the strictest permit requirement	Present day 90 percentile (the "no-deterioration " target)	Permit values required to meet "no-deterioration"		
			Mean Quality	Standard Deviation	95th Percentile
BOD	-	-	-	-	-
Ammonia	30/31	0.37	0.73	0.24	1.17
Phosphate	30/31	0.85	1.25	0.36	1.89

Figure 38: SIMCAT result for flow and phosphate.

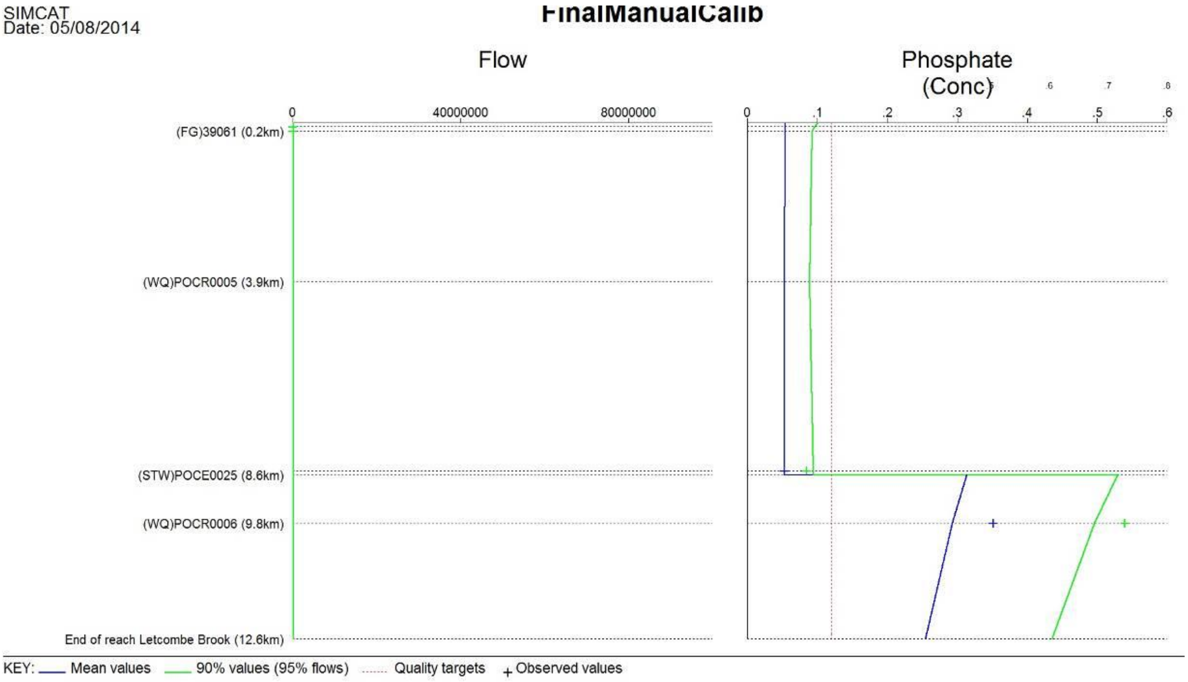
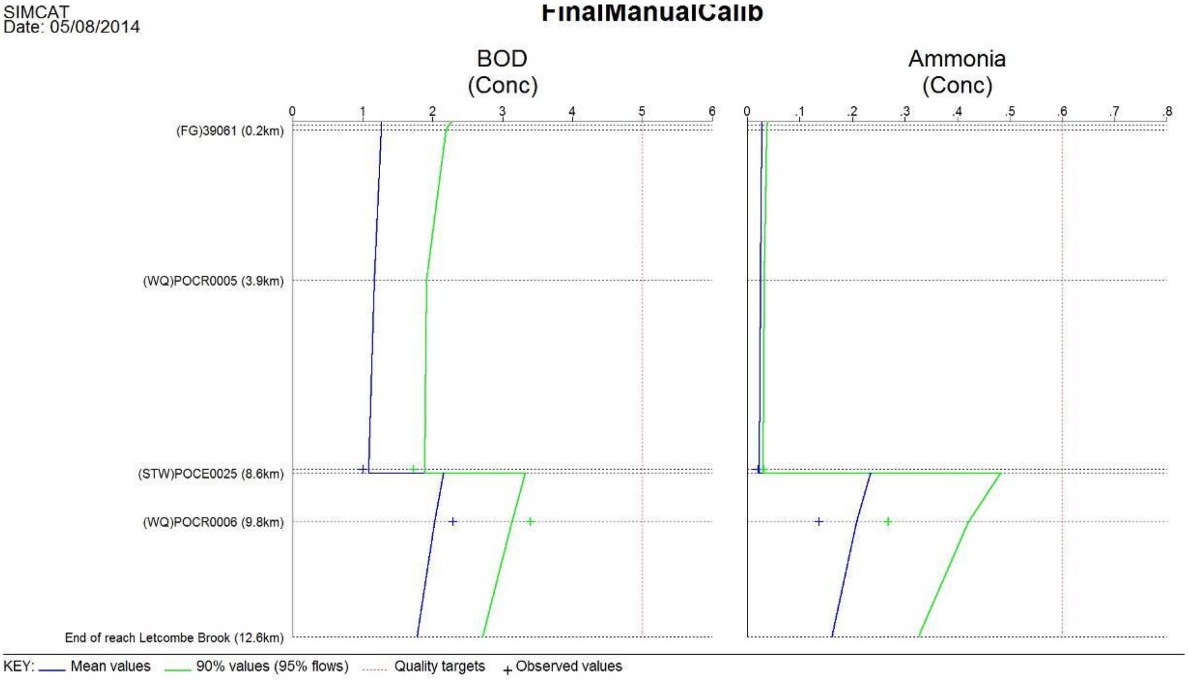


Figure 39: SIMCAT result for BOD and Ammonia.



B.7 Climate change

The National Planning Policy Framework practice guidance[2] states that "addressing climate change is one of the core land use planning principles which the National Planning Policy Framework expects to underpin both plan-making and decision-taking. To be found sound, Local Plans will need to reflect this principle and enable the delivery of sustainable development in accordance with the policies in the National Planning Policy Framework."

Likewise the Environment Agency's Water Cycle Study Guidance states that the development of water infrastructure should contribute "to the shift to a low carbon economy."

The Thames RBMP Annex H includes an assessment of the evidence on climate change to 2050 and the potential impacts this will have on achieving WFD good ecological status. Key issues relevant to this water quality assessment are:

- higher summer temperatures leading to lower background levels of dissolved oxygen,
- reduced summer rainfall leading to lower mean summer flows, meaning that there will be reduced dilution of treated effluent, and
- requirements for higher standards of treatment (in particular for P removal) can lead to increased carbon emissions.

The EA's "Water Quality Planning: no deterioration and the Water Framework Directive" and "Horizontal guidance" make no mention of how to account for climate change in water quality planning. Various studies by UK Water Industry Research (UKWIR)[3,4] and the Environment Agency[5] do however provide some background to how to approach this issue. CEH's Future Flows and Groundwater Levels work provides an assessment at a number of gauges (including the Ock at Abingdon) as well as a methodology for how to apply climate change assessments to river flows at other sites[6].

This assessment has not specifically modelled the impacts of climate change on the status and deterioration of the watercourses and it would be advisable to address this issue at a local level when considering permit changes to STWs. It is likely that this would require as a minimum consideration of changes to river water temperature and flows.

The RBMP encourages us to look for win-win" actions, and integrated and catchment-based approaches are encouraged. One example here could be catchment based land management and river restoration projects could be used to both reduce diffuse P inputs and to help maintain summer base flows in watercourses. The RBMP cautions that taking actions for specific pressures may be counter-productive. So for example the carbon costs of increased treatment standards need to be assessed against the environmental benefits they will achieve.

B.8 Phosphate

The Thames RBMP indicates that phosphates (along with diatoms, macrophytes, fish and invertebrates) is one of the main individual elements which the EA assesses as leading to good ecological status not being achieved, with only around 35% of water bodies achieving their good status target for phosphate. Phosphate has been assessed as a major cause of biological failures (e.g. diatoms and macrophytes). Recent research on the Thames basin[7] has indicated that WFD targets can only be achieved by a combination of measures to reduce P both through agricultural management practices and removal at STWs. This paper found that a combined approach requiring 20% reduction in agricultural inputs and P removal at STWs to meet a

[2] Department of Communities and Local Government (2014) National Planning Policy Framework Practice Guidance: Climate Change.

[3] UKWIR (2007) Climate Change, the Aquatic Environment and the Water Framework Directive. Ref: 07/CL/06/5

[4] UKWIR (2005) Effects of Climate Change on River Water Quality. Ref: 05/CL/06/4

[5] Environment Agency (2007) Preparing for climate change impacts on freshwater ecosystems (PRINCE). Ref SC030300/SR. Accessed on 01/09/2014 at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291081/scho0507bmoj-e-e.pdf

6 Accessed on 01/09/2014 at

http://www.ceh.ac.uk/sci_programmes/water/future%20flows/ffgwlsites.html#Background

[7] Whitehead PG et al (2013) A cost-efectiveness analysis of water security and water quality: impacts of climate and land-use change on the River Thames system. Phil Trans R Soc A 371: 20120413. http://dx.doi.org/10.1098/rsta.2012.0413

discharge concentration of P of 0.3mgl^{-1} total P would be the most cost-effective approach for the Thames basin. Notably however this study did not take into account the high carbon costs of treating wastewaters to this standard.

The RBMP aims to tack this via the following measures:

- Agriculture and rural land management. A range of approaches are in use including promotion of best-practice, partnership working pilots and Water Protection Zones (WPZs). One large-scale project underway in South Oxfordshire is the River of Life project on the River Thames[8]. Here the Earth Trust are restoring wetland features and habitat along 2km of river bank and floodplain. This type of restoration and the use of buffer zones have the potential to reduce P inputs to the watercourse; the Whitehead et al (2013) paper found these to be the most cost-effective measure but not on their own sufficient to tackle the P issue in the Thames basin.
- Legislative and regulatory measures.
- Water industry measures, in particular P removal at STWs where the economic and carbon costs can be justified. The water industry is also increasingly seeking to play a role in catchment-based approaches with the aim of achieving WFD P targets at a lower economic and carbon cost. Thames Water are undertaking a catchment sensitive farming trial to address P[9].

B.9 Summary and conclusions

B.9.14 Method

The increased discharge of effluent due to an increase in the population served by a Sewage Treatment Works (STW) may impact on the quality of the receiving water. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new permit may be required for the STW to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a “no deterioration” or “load standstill".

During the preparation of the phase I Water Cycle Study (WCS) the Environment Agency advised that it would be necessary to undertake an assessment of the water quality impact of development in the 11 STW catchments which will receive the majority of additional flows in the Vale of White Horse District (12 outfalls as Abingdon has 2 outfalls to different watercourses).

The assessment was undertaken using the EA's River Quality Planning (RQP) tool which enables a Monte-Carlo analysis to be undertaken at a single point of discharge to a watercourse. This was supplemented by results from their SIMCAT model of the Thames River Basin District (RBD).

-RQP models were required to be set up and run using the present-day, 2019/20 and 2030/31 growth scenario effluent flows to assess the impact of the increased contaminant loads on the receiving watercourses due to the extra wastewater flows.

Addressing existing diffuse pollution is beyond the remit of the WCS, and therefore the analysis was undertaken following the assumption that the upstream diffuse sources of pollution had been addressed (i.e. ‘good status’ achieved upstream). This was achieved by setting the upstream quality at the level of ‘good status’ in the model. This assumption was used when good status could not be achieved downstream of the works with current upstream water quality even when BAT standards are applied to the works.

8 http://www.earthtrust.org.uk/Our-work/waterandwetlands/RiverofLife.aspx

[9] Thames Water (2014) Business Plan 2015-2020 Part A - Summary.

B.9.15 Results

Table 52 summarises the modelling results for assessing the 'Good status' and 'No > 10% deterioration' targets for each STW using their actual performance for the current situation and the future scenarios. The colour code used for the 'Good status' target is green for achieving it and red for failing it. For the 'No > 10% deterioration' target the table shows green for no deterioration, amber for <=10% deterioration and red for >10% deterioration. The actual upstream river quality input data were used for the assessment.

Table 52: Modelling results summary for assessing the 'Good status' the actual situation and 'No >10% deterioration' targets. The actual upstream river quality input data were used for the assessment.

Watercourse (STW discharging into it)	Scenario	Failing 'Good status' target?			Failing 'No > 10% deterioration' target?		
		BOD	Amm	P	BOD	Amm	P
	(green)	target achieved			no deterioration		
	(amber)	NA			deterioration ≤ 10%		
	(red)	target not achieved			deterioration > 10%		
River Thames (Abingdon Lagoon)	Actual	No	No	Yes	NA	NA	NA
	19/20	No	No	Yes	No	No	No
	30/31	No	No	Yes	No	No	No
Odhay Hill Ditches (Abingdon New Stream)	Actual	Yes	Yes	Yes	NA	NA	NA
	19/20	Yes	Yes	Yes	2%	10%	No
	30/31	Yes	Yes	Yes	2%	12%	-2%
Marcham Brook (Appleton)	Actual	No	No	Yes	NA	NA	NA
	19/20	No	No	Yes	15%	48%	4%
	30/31	No	No	Yes	9%	48%	1%
Moor Ditch (Didcot)	Actual	No	Yes	Yes	NA	NA	NA
	19/21	No	Yes	Yes	8%	65%	3%
	30/32	No	Yes	Yes	22%	212%	5%
Ginge brook (Drayton)	Actual	No	No	Yes	NA	NA	NA
	19/21	No	Yes	Yes	9%	66%	13%
	30/32	No	No	Yes	6%	55%	4%
Faringdon Brook (Faringdon)	Actual	Yes	Yes	Yes	NA	NA	NA
	19/21	Yes	Yes	Yes	26%	80%	6%
	30/32	Yes	Yes	Yes	21%	85%	3%
River Ock (Kingston Bagpuize)	Actual	No	Yes	Yes	NA	NA	NA
	19/22	No	Yes	Yes	11%	40%	3%
	30/33	No	Yes	Yes	10%	52%	1%
Northfield Brook (Oxford)	Actual	Yes	Yes	Yes	NA	NA	NA
	19/22	Yes	Yes	Yes	No	8%	No
	30/33	Yes	Yes	Yes	No	7%	-1%
Tuckmill Brook (Shrivenham)	Actual	No	No	Yes	NA	NA	NA
	19/22	No	No	Yes	18%	83%	9%
	30/33	No	Yes	Yes	22%	120%	7%
River Ock (Standford in the Vale)	Actual	No	No	Yes	NA	NA	NA
	19/23	No	No	Yes	1%	13%	11%
	30/34	No	No	Yes	1%	13%	8%
Letcome Brook	Actual	No	No	Yes	NA	NA	NA

Watercourse (STW discharging into it)	Scenario	Failing 'Good status' target?			Failing 'No > 10% deterioration' target?		
		BOD	Amm	P	BOD	Amm	P
(Wantage)		target achieved			no deterioration		
		NA			deterioration ≤ 10%		
		target not achieved			deterioration > 10%		
	19/23	No	No	Yes	11%	54%	3%
	30/34	No	No	Yes	27%	159%	5%

Table 53 summarises the modelling results for assessing if ‘good status’ can be achieved. The new permits calculated were compared against BAT. If these were ≥ BAT values then they are defined as achievable.

The EA advised that the following permit values are achievable using Best Available Technology (BAT):

- BOD (95%ile) = 5mg/l
- Ammonia (95%ile) = 1mg/l
- Phosphate (mean) = 0.5mg/l

This does not take in consideration if it is feasible to upgrade each existing STW to such technology due considering the variable and constrains that this may involve: cost, timing, space, carbon cost etc. Annex A reports Thames Water’s assessment of achievable permit values based on the type and size of each treatment works.

Table 53: Modelling results for assessing if ‘good status’ can be achived using BAT.

Watercourse (STW discharging into it)	Pollutant	Could the development prevent the water body from reaching GES?. NB: the actual upstream river water quality situation was used for the modelling calculation reported in this table.
		Passes
		Fails: target is achievable using BAT
		Fails: target is not achievable using BAT or withouth improving water quality upstream
River Thames (Abingdon Lagoon)	BOD	GES is reached for BOD
	Ammonia	GES is reached for ammonia
	P	GES for P cannot be achieved without improving the upstream quality of the river
Odhay Hill Ditches (Abingdon New Stream)	BOD	GES can be achieved for BOD with improvement to the work using BAT
	Ammonia	GES cannot be achieved for ammonia with improvement to the work using BAT
	P	GES cannot be achieved for P with improvement to the work using BAT
Marcham Brook (Appleton)	BOD	GES is reached for BOD
	Ammonia	GES is reached for ammonia
	P	GES for P cannot be achieved without improving the upstream quality of the river
Moor Ditch (Didcot)	BOD	GES is reached for BOD

Watercourse (STW discharging into it)	Pollutant	Could the development prevent the water body from reaching GES?. NB: the actual upstream river water quality situation was used for the modelling calculation reported in this table.
		Passes
		Fails: target is achievable using BAT
		Fails: target is not achievable using BAT or withouth improving water quality upstream
	Ammonia	GES can be achieved for ammonia with improvement to the work using BAT
	P	GES cannot be achieved for P with improvement to the work using BAT
Ginge brook (Drayton)	BOD	GES is reached for BOD
	Ammonia	GES can be achieved for ammonia with improvement to the work using BAT
	P	GES can be achieved for P with improvement to the work using BAT. The 95%ile requested is within the 10% model tolerance/variability
Faringdon Brook (Faringdon)	BOD	GES can be achieved for BOD with improvement to the work using BAT
	Ammonia	GES can be achieved for ammonia with improvement to the work using BAT
	P	GES for P cannot be achieved without improving the upstream quality of the river
River Ock (Kingston Bagpuize without contingencies sites)	BOD	No calculation was done for this scenario
	Ammonia	
	P	
River Ock (Kingston Bagpuize)	BOD	GES is reached for BOD
	Ammonia	GES can be achieved for ammonia with improvement to the work using BAT
	P	GES for P cannot be achieved without improving the upstream quality of the river
Northfield Brook (Oxford)	BOD	GES can be achieved for BOD with improvement to the work using BAT
	Ammonia	GES cannot be achieved for ammonia with improvement to the work using BAT
	P	GES cannot be achieved for P with improvement to the work using BAT
Tuckmill Brook (Shrivenham)	BOD	GES is reached for BOD
	Ammonia	GES can be achieved for ammonia with improvement to the work using BAT
	P	GES cannot be achieved for P with improvement to the work using BAT
River Ock (Standford	BOD	GES is reached for BOD

Watercourse (STW discharging into it)	Pollutant	Could the development prevent the water body from reaching GES?. NB: the actual upstream river water quality situation was used for the modelling calculation reported in this table.
in the Vale)		Passes
		Fails: target is achievable using BAT
		Fails: target is not achievable using BAT or withouth improving water quality upstream
	Ammonia	GES is reached for ammonia
	P	GES for P cannot be achieved without improving the upstream quality of the river
Letcome Brook (Wantage)	BOD	GES is reached for BOD
	Ammonia	GES cannot be achieved for ammonia with improvement to the work using BAT
	P	GES for P cannot be achieved without improving the upstream quality of the river

B.9.16 Assessment for Appleton, Didcot, Oxford and Shrivenham STWs assuming GES upstream of the discharge point and applying Best Available Technology (BAT) to the STWs.

Following the presentation of the final water quality assessment report (v1.3), the EA requested further analysis and information for Appleton, Didcot, Oxford and Shrivenham STWs assuming that the river upstream of the discharge point has achieved GES and the pollution problem upstream of the work has been addressed. The reason of this is to measure the actual impact of the discharge effluent on the receiving watercourse. The aspects covered were the following:

- will the STW remain within its existing permit?,
- will any of the determinands experience a 10% deterioration and this is / is not achievable using the BAT;
- will any of the determinands experience a class deterioration and this is / is not achievable using the BAT;
- will any of the determinands experience a failure in reaching good status and this is / is not achievable using the BAT.

The EA advised that the following permit values are achievable using Best Available Technology (BAT), and that these values should be used for modelling all STWs potential capacity irrespective of the existing treatment technology and size of the works:

- BOD (95%ile) = 5mg/l
- Ammonia (95%ile) = 1mg/l
- Phosphate (mean) = 0.5mg/l

This does not take in consideration if it is feasible to upgrade each existing STW to such technology due considering the variable and constrains that this may involve: cost, timing, space, carbon cost etc. Annex A reports Thames Water's assessment of achievable permit values based on the type and size of each treatment works.

Table 54 shows a summary of the conclusions using BAT whilst Table 55 reports information on the runs and the model results used to compare against BAT.

Table 54: Summary of results assuming BAT is applied

Watercourse (WwTW discharging into it)	DWF Permit Compliant	Pollutant	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
	(green)	Passes			
	(amber)	Fails: target is achievable using BAT or permit capacity is reached.			
	(red)	Fails: target is not achievable using BAT or permit capacity is exceeded.			
Marcham Brook (Appleton)	No DWF permit exceedance is predicted	BOD	10% deterioration is predicted for BOD. Upgrade to the WwTW is needed and it is achievable with the best technology available	No class deterioration is predicted for BOD. No WwTW upgrade is required	Good status is reached for BOD
		Amm	10% deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with the best technology available	Class deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with the best technology available	Good status is reached for Amm
		P	Predicted deterioration is less than 10% for P. No WwTW upgrade is required	No class deterioration is predicted for P. No WwTW upgrade is required	Good status is not reached for P. Upgrade to the WwTW is needed but it is not achievable with BAT also assuming GES upstream.
Moor Ditch (Didcot)	No DWF permit exceedance is predicted	BOD	10% deterioration is predicted for BOD. Upgrade to the WwTW is needed and it is achievable with the best technology available	Class deterioration is predicted for BOD. Upgrade to the WwTW is needed and it is achievable with the best technology available	Good status is reached for BOD
		Amm	10% deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with the best technology available	Class deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with the best technology available	Good status is not reached for Amm. Upgrade to the WwTW is needed and it is achievable with BAT for Amm also in the current upstream condition.

Watercourse (WwTW discharging into it)	DWF Permit Compliant	Pollutant	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
	(green)	Passes			
	(amber)	Fails: target is achievable using BAT or permit capacity is reached.			
	(red)	Fails: target is not achievable using BAT or permit capacity is exceeded.			
		P	Predicted deterioration is less than 10% for P. No WwTW upgrade is required	No class deterioration is predicted for P. No WwTW upgrade is required	Good status is not reached for P. Upgrade to the WwTW is needed but it is not achievable with BAT for P also assuming GES upstream.
Northfield Brook (Oxford)	DWF permit capacity is predicted to be achived for 2019/20 scenario	BOD	Predicted deterioration is less than 10% for BOD. No WwTW upgrade is required	No class deterioration is predicted for BOD. No WwTW upgrade is required	Good status is not reached for BOD. Upgrade to the WwTW is needed and it is achievable with BAT for BOD also in the current situation.
		Amm	Predicted deterioration is less than 10%. No WwTW upgrade is required	No class deterioration is predicted. No WwTW upgrade is required	Good status is not reached for Amm. Upgrade to the WwTW is needed but it is not achievable with BAT also assuming GES upstream.
		P	Predicted deterioration is less than 10% for P. No WwTW upgrade is required	No class deterioration is predicted for P. No WwTW upgrade is required	Good status is not reached for P. Upgrade to the WwTW is needed but it is not achievable with BAT for P (P has GES in the actual situation).
Tuckmill Brook (Shrivenham)	No DWF permit exceedance is predicted	BOD	10% deterioration is predicted for BOD. Upgrade to the WwTW is needed and it is achievable with the BAT	No class deterioration is predicted for BOD. No WwTW upgrade is required	Good status is reached for BOD

Watercourse (WwTW discharging into it)	DWF Permit Compliant	Pollutant	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
		Passes			
		Fails: target is achievable using BAT or permit capacity is reached.			
		Fails: target is not achievable using BAT or permit capacity is exceeded.			
		Amm	10% deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with the BAT. The 95%ile requested is within the 10% model tolerance/variability	Class deterioration is predicted for Amm. Upgrade to the WwTW is needed and it is achievable with BAT. The 95%ile requested is within the 10% model tolerance/variability	Good status is reached for Amm
		P	Predicted deterioration is less than 10% for P. No WwTW upgrade is required	No class deterioration is predicted for P. No WwTW upgrade is required	Good status is not reached for P. Upgrade to the WwTW is needed but it is not achievable with BAT also assuming GES upstream.

The results in Table 55 were highlighted in green if the result is => than the BAT value, amber if it is in the 10% of the BAT value and red if it is < than the BAT value. Further explanation of column headers are:

- Scenario considered: specifies the discharge flow and quality scenario data used as input in the RQP run;
- Run to assess: specifies if the RQP run is to assess the no + 10% deterioration / class deterioration or the GES target;
- Upstream river condition used: specifies if the upstream river condition used for the run is the actual situation or if GES was assumed. The latter is indicated by the GES target for the river;
- Present day +10% deterioration or class boundary target: scecifies the target used for the no deterioration run;
- Discharge values required to meet the target: these are the RQP tool output representing the discharge value required to meet thespecific target. For BOD and ammonia the value to comper with BAT is the 95%ile whilst for P is the mean.

Table 55: Summary of the model results used to compare against BAT

STW	Parameter	Scenario considered	Run to assess:	GES target assumed upstream	Present day + 10% deterioration or class boundary target	Discharge values required to meet target		
						Mean	SD	95%ile

STW	Parameter	Scenario considered	Run to assess:	GES target assumed upstream	Present day + 10% deterioration or class boundary target	Discharge values required to meet target		
						Mean	SD	95%ile
Appleton	BOD	2019/20	no deterioration	Actual situation	2.84	6.83	2.19	10.88
	Ammonia	2019/20	no deterioration	Actual situation	0.30	0.62	0.71	1.93
	Phosphate	Present	GES	GES = 0.084		0.1	0.03	0.15
Didcot	BOD	2030/31	no deterioration	Actual situation	3.92	3.42	1.18	5.61
	Ammonia	2030/31	no deterioration	Actual situation	1.02	0.72	1.58	2.89
	Phosphate	Present	GES	GES = 0.086		0.08	0.07	0.22
Oxford	BOD	Present	GES	Actual situation		3.43	1.28	5.83
	Ammonia	2030/31	GES	GES = 0.6		0.3	0.3	0.86
	Phosphate	2030/31	GES	GES = 0.08		0.08	0.04	0.16
Shrivenham	BOD	2030/31	no deterioration	Actual situation	3.00	4.1	1.89	7.71
	Ammonia	2030/31	no deterioration	Actual situation	0.30	0.31	0.35	0.96
	Ammonia	2030/31	GES	Actual situation		0.96	1.08	2.95
	Phosphate	Present	GES	GES = 0.075		0.05	0.02	0.09

B.9.17 Conclusions

There are numerous failures of WFD standards throughout the study reaches, with particular concerns over meeting targets for Phosphate. In summary:

- At all the STW outfalls the watercourse are predicted to fail their phosphate targets for the present-day situation, and at Abingdon Lagoon, Appleton, Farington, Kingston Bagpiuze, Stanford in the Vale and Wantage the P load from the upstream catchment is such that the P target for the watercourse could not be achieved by increased treatment at the works on its own. For Appleton, Didcot, and Shrivenam the river target cannot be achieved with BAT even assuming GES upstream of the work (Oxford has GES in the actual situation). This is indicative of a wider issue with P in the Thames basin and as such this has to be addressed at a catchment level.
- At six STW outfalls the watercourses are predicted to fail their ammonia target for the present-day situation and other two will fail it for future scenarios.
- At three STW outfalls the watercourse are predicted to fail their BOD targets for the present-day situation and another will fail for future scenarios.

- At Abingdon New Stream, Faringdon and Oxford STWs the watercourses are predicted to fail its targets for all pollutants for the present scenarios.
- The analysis reported here cannot comment conclusively on the apportionment of pollutant loads between point and diffuse sources, but in many cases the introduction of additional loads frequently results in significant deterioration (>10%). Only the Thames at Abingdon STW (Lagoon Stream) outfall the watercourse is predicted to not be at risk from significant deterioration in either of the future scenarios.

The implications for achieving the proposed growth within the Vale of White Horse are that:

- Ignoring phosphate, Abingdon STW's Lagoon Stream is the only STW were in the District where it is predicted that the watercourse will meet good status (for sanitary determinands) and where significant deterioration is not predicted within either of the future scenarios. Therefore development at Abingdon could be achieved without significant investment at the STW.
- Ignoring phosphate, at Appleton, Stanford in the Vale and Wantage, the receiving watercourses are predicted to meet their targets for sanitary determinands, however all are predicted to experience significant deterioration and therefore some upgrading of the STW will be required to prevent environmental deterioration.
- Ignoring phosphate, of the remaining STWs (Abingdon (New Stream), Didcot, Drayton, Faringdon, Kingston Bagpuize and Shrivenham), the watercourses are predicted to fail their targets and significant deterioration is also predicted in the future scenarios. Again, upgrading of these STWs will be required to ensure that the receiving watercourses can meet their targets and are not subject to significant deterioration.
- The assessments done at Appleton, Didcot, Oxford and Shrivenham uning BAT show that if this can allow to achieve the 'no more than 10% deterioration' and the 'no class deterioration' targets, it does not allow to achieve GES target even assuming GES ustream of the works.
- Phosphate is an issue that will need to be addressed across the Thames River basin. This is likely to require a combination of further P removal at STWs along with agricultural practices (e.g. reductions in P application) and catchment-sensitive farming including riparian buffer zones. .
- More detailed studies should consider accounting for the effects of climate change on the capacity of the receiving waters to receive wastewater effluents.
- In order to enable the watercoursse to achieve "Good" status at Appleton, Didcot, Oxford and Shrivenham, sewage treatment would have to be improved to meet standards for sanitary determinands which are higher than currently considered to be possible using Best Available Technologies. Meeting such targets could require investment in non-standard technologies which would significantly raise the costs of treatment. Therefore the ability to treat wastewater arising from Appleton, Didcot, Oxford and Shrivenham may represent a constraint to growth. Alternative solutions, for example transferring flows to another treatment works or transferring effluent to an outfall further downstream where dilution will be greater may be feasible in some cases although this hasn't been assessed within the scope of this study.
- A predicted WFD class failure or deterioration by 2020/21 means that the works would require upgrade during AMP6. Therefore if no upgrade is scheduled during AMP6 there could be timing issues which would require either additional funding or phasing of development after 2020/21.
- A predicted WFD class failure or deterioration between 2021 and 2030/31 could be addressed in AMP7 or 8 and so would not require phasing of development.

Annex A: Technical Feasibility of WwTW Improvements

This study has applied Best Available Technology (BAT) values for BOD, Ammonia and Phosphase as advised by the Environment Agency. Alternative values based on the type of works and population served were provided by Thames Water: whilst these were not used for this analysis, they provide a useful guide for understanding the potential scale of upgrading that might be required for a works to meet more stringent permit conditions up to the current limits of BAT.

Table 56: Works Size Ranges for Ammonia Permits

Population Equivalent Range	Ammonia Permit (95-percentile mg/l)	Process Selection
< 5,000	No permit	Percolating filters – single filtration
		Submerged aerated filters
		RBCs – where existing
	>= 4	Percolating filters – single filtration
		Submerged aerated filters
		RBCs (where existing)
	2 – 7	Percolating filters – double filtration
		Percolating filters & nSAF
		SAF & nSAF
		RBCs (where existing) & nSAF
		Crude sewage activated sludge (> 3,500 PE)
		Settled sewage activated sludge (> 3,500 PE)
	< 2	Crude sewage activated sludge
		Settled sewage activated sludge
5,000 – 50,000	>= 4	Percolating filters – single filtration
		SAF - as side stream for < 5,000 PE
		Crude sewage activated sludge (< 25,000 PE)
		Settled sewage activated sludge
	2 – 7	Percolating filters – double filtration
		Percolating filters & nSAF
		Crude sewage activated sludge (< 25,000 PE)
		Settled sewage activated sludge
> 50,001	All permits	Settled sewage activated sludge

Table 57: Process Selection Criteria for BOD Permits

Population Equivalent Range	95-percentile Solids/ BOD	Process	Suspended Solids Removal
< 5,000	10 / 7	Reed Beds	70%
	15 / 10	Land Treatment Area	50%
	10 / 7	Continuous Flow Sand Filters	65%
	13 / 8	Disc Filters	60%
5,000 – 50,000	10 / 7	Reed Beds	70%
	10 / 7	Continuous Flow Sand Filters	65%
	13 / 8	Disc Filters	60%
	8 / 6	Rapid Gravity Sand Filter	65%
> 50,000	13 / 8	Disc Filters	60%
	8 / 6	Rapid Gravity Sand Filter	65%

Table 58: Process types by treatment works

Outfall	STW Process
Abingdon (New outfall)	Percolating Filter
Abingdon (Lagoon)	Percolating Filter
Appleton	Percolating Filter
Didcot	Activated Sludge Plant
Drayton	Unknown
Faringdon	Filters
Kingston Bagpuize	Rotating Biological Contactor
Oxford	Activated Sludge
Shrivenham	Aeration
Stanford in the Vale	Unknown
Wantage	Sludge

C Environment Agency response to the water quality assessment

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Mr Giovanni Sindoni
8a Castle Street
Wallingford
Oxfordshire
OX10 8DL
UK

Our ref: WA/2006/000281/OR-26/PO1

Date: 07 May 2015

Updated Water Quality Assessment

Dear Giovanni,

Further to your e-mail dated 31 March 2015, containing the revised Water Quality Assessment (WQA), and the meeting held on 16 March 2015 we are now in a position to provide our formal position.

We have reviewed the Water Quality Assessment (ref 2013s7594 - VoWH WCS water quality assessment - Appendix v1.7) and we are pleased to see the changes advised in our letter dated 24 February (ref WA/2006/000281/OR-21/IS1) have been made and incorporated into the Water Quality Assessment.

The WQA highlights the potential risk posed to water from the planned allocated development within the Local Plan. Based on the information within the WQA it is determined that, when taking into account Best Available Technology (BAT), infrastructure upgrades can ensure there is no Water Framework Directive (WFD) class boundary deterioration, in accordance with the WFD objectives.

In addition the WQA concludes that it is not possible to reach Good Ecological Status (GES) for the waterbodies receiving discharges from Appleton (phosphate), Didcot (phosphate), Oxford (phosphate and ammonia) and Shrivenham (phosphate) sewage treatment works (STWs).

As part of the River Basin Management Plan (RBMP) we have recently undertaken assessments of what solutions would be required, in the present time, at STWs in order to get to GES in relation to Phosphate. Unfortunately we were unable to provide this information to meet the timescales of the WQA.

Our assessment for Phosphate has indicated that for Appleton, Didcot, Oxford and Shrivenham the solutions are currently deemed to be technically infeasible. Fundamentally this concludes that the planned allocated growth within the Local Plan

Cont/d..

has no, or very little, bearing on the ability of the waterbodies getting to GES in relation to Phosphate.

It is pertinent to note that trials of what is technically feasible in relation to Phosphate are being undertaken, the results of which will be available in March 2017. The results will be reviewed in line with water company investigations and the overarching objectives of the WFD.

We note that from the results of the WQA, Oxford STW would prevent the receiving waterbody from reaching GES when taking into account BAT in relation to Phosphate and Ammonia. Whilst the WQA is considered accurate and appropriate as evidence to support the Local Plan, we would also consider the conclusions to be conservative. The WQA has concluded that, based on infrastructure upgrades alone, the additional development would prevent it from reaching GES.

However, as part of the RBMP we have put forward an upgrade to Oxford STW (to tighten Ammonia limits to 1mg/l) which has been deemed technically feasible. This is primarily due to fact that the RBMP upgrades have combined infrastructure upgrades and habitat restoration. It is thought that with the infrastructure upgrades and additional habitat restoration any detrimental impact could be mitigated against to protect the waterbody against any potential impacts related to the works not achieving the 1mg/l limit. Therefore we are of the opinion that when taking into account the conservative WQA results, and the infrastructure upgrades (with the additional habitat restoration put forward within the RBMP) the growth would not prevent the receiving waterbody from reaching GES, in line with the overarching objectives of the WFD.

Conclusions

We consider that the revised WQA is now considered appropriate and accurate for use within the WCS. Its conclusions highlight the potential risks posed to water quality deterioration from significant levels of growth. Notwithstanding this there are no limiting factors for growth based on the levels indicated within the Local Plan, subject to the relevant mitigation measures and infrastructure upgrades indicated within the WQA being delivered.

The conclusions of the WQA will also inform the evidence required to support developing schemes for the National Environment Programme.

We look forward to reviewing the final collated WCS, if you have any further questions please don’t hesitate to contact me.

Yours sincerely

Mr Ashley Maltman
Planning Advisor

Direct dial 01491 828338
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D Appendix: Conclusions to questions raised by Environment Agency

Table D-1 summarises the conclusions to the questions raised by the Environment Agency in the original project scope.

Table D-1: Summary of conclusions to questions raised by the Environment Agency

Question	Conclusion
Water Resources and Water Supply	
Is there capacity in existing licences for development?	There is scope for abstraction from the Cole and the Ock but there is no additional water (surface or groundwater) available for licensing in the majority of the District.
Will existing licences remain valid?	Due to abstraction, several water bodies in the district have fallen below the Ecological Flow Indicator (EFI) which may lead the EA to change or revoke some abstraction licenses. This underlines the need to reduce abstraction by using more efficient management practices.
Can we reduce abstraction by better management practices?	Improving water efficiency is recommended by the Abstraction Licensing Strategies and Thames Waters' Water Resource Management Plan. However, the removal of Code for Sustainable Homes and the proposed amendment to only allow LPAs to impose a lower limit of 110l/person/day in water stressed areas may limit the District's ability to manage water demand through the planning system. Likewise uncertainties over delivery of SuDS may inhibit uptake of measures such as rainwater harvesting.
If new major infrastructure (reservoirs, water treatment works, boreholes) are needed, can they be provided in time, can they be funded, and are they sustainable?	Both Thames Water and the EA concluded in their Position Statement that they are confident that through their annual Water Resources review process and deploying any required mitigation measures identified in the Water Resources Position Statement, Thames Water will be able maintain the security of supply in its SWOX Water Resource Zone in the next 5 years to 2020. Beyond this period, the next review of the Water Resources Management Plan, due to be published in draft form in 2018, will assess and programme future water resource requirements reflecting the revised housing growth projections
Wastewater Collection and Treatment	
Is there volumetric capacity in existing effluent discharge consent for growth?	This has been assessed at each of the WwTWs planned to receive additional flows. Drayton, Faringdon, Kingston Bagpuize, Oxford and Shrivenham WwTWs are particular constrained as upgrades would be required by 2021 to enable them to accommodate expected growth without failing their consents.
Will discharge consent be valid to meet future standard (e.g. WFD)?	With the exception of Abingdon WwTW's Lagoon Stream discharge to the River Thames, all of the WwTWs receiving significant additional flows due to growth would require a tightening of their treatment consents to either meet Water Framework Directive Good Status or to prevent a deterioration of greater than 10%. At several WwTWs, the revised consents required would be tighter than could be achieved using the existing treatment processes and therefore may require additional more

Question	Conclusion
	expensive treatment processes rather than alternative treatment processes.
Will additional discharge be allowed if there is no additional environmental capacity to assimilate it?	EA have confirmed that this question falls beyond the scope of the WCS.
If new major infrastructure (wastewater treatment works, major pumping mains or sewer mains) are needed, can they be provided in time, and can they be funded?	Where new major infrastructure is required, for example new water resources or treatment works, this would be most likely funded through Thames Water's business planning process where customers' bills reflect the investment Thames Water are required to make to meet its statutory obligations. Thames Water will plan to deliver these major upgrades in time for the growth. For other local upgrades, such as local sewerage network improvements, costs will be shared between developer and undertaker, with phasing within developments being necessary in some incidences to ensure network infrastructure is in place at the appropriate development phase. Where necessary this can be controlled by appropriate planning conditions
Environmental Opportunities	
Are we making the most of our new development?	Currently a number of drivers mitigate against the use of SuDS and Water Sensitive Urban Design (WSUD) within new developments. Principle among these are: Uncertainties regarding the funding, adoption and maintenance of SuDS. Proposed changes to the Building Regulations will restrict the ability of LPAs to require water efficient design standards. A lack of appreciation amongst developers and buyers of the whole-life cost of a house, and a lack of incentivisation to developers to adopt any efficiency measures which may increase the construction costs, even where these may significantly reduce the running costs of that house.
Are there multi-use options that will provide water resources, flood risk management and water quality benefits?	

E Environmental Designations

			No buffer zone applicable				100m buffer							200m buffer	500m buffer					1000m buffer				2000m buffer		
CDC_Ref	Number of individual features within buffer	Number of feature categories within buffer	Aquifer Maps - Bedrock Deposit Designation	Aquifer Maps - Superficial Deposits Designation	Groundwater Source Protection Zone	WFD Classification	LNR	Greenbelt	Historic landfill	Landfill site	ALC	Ancient or Semi-Natural Woodland	Listed Buildings	Water courses	Scheduled Monument	Parks and Gardens	World Heritage Sites	Registered Battlefield	National Trails	AONB	NNR	National Park	SSSI	Ramsar	SAC	SPA
3132	6	6	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
6236	9	7	1	2	0	0	0	0	0	2	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0
A_2	7	6	2	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
A_3A	6	6	1	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
A_3B	13	8	1	2	0	0	0	0	0	2	1	0	4	1	1	0	0	0	0	1	0	0	0	0	0	0
A_4	9	7	1	1	0	0	0	0	1	2	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
A_5	5	5	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
A_7	8	7	1	0	0	0	0	0	0	1	1	0	2	1	1	0	0	0	0	1	0	0	0	0	0	0
AND_E2	15	9	2	2	1	0	0	0	0	2	1	0	4	1	1	0	0	0	0	1	0	0	0	0	0	0
B_10	8	7	1	1	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0
B_15A	24	9	1	1	0	0	0	0	0	2	1	0	15	1	1	0	0	0	0	1	0	0	1	0	0	0
B_15B	22	9	1	2	0	0	0	0	0	2	2	0	11	1	1	0	0	0	0	1	0	0	1	0	0	0
B_16	10	6	1	2	0	0	0	0	0	2	2	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0
B_20	14	8	1	1	0	0	0	0	0	2	1	0	6	0	1	0	0	0	0	1	0	0	1	0	0	0
B_22	12	8	1	1	0	0	0	0	0	2	1	0	4	0	1	0	0	0	0	1	0	0	1	0	0	0
B_25	9	7	1	1	0	0	0	0	0	2	2	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0
B_26	5	5	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0
B_3	29	8	1	1	0	0	0	0	0	1	1	0	21	1	2	0	0	0	0	1	0	0	0	0	0	0
B_30	10	6	2	3	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0
B_32	10	9	1	1	0	0	0	0	0	2	1	0	1	1	1	0	0	0	0	1	0	0	1	0	0	0
B_52	11	6	2	1	0	0	0	0	0	0	1	0	4	0	2	0	0	0	0	1	0	0	0	0	0	0
B_53	6	6	1	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
B_54	11	7	1	2	0	0	0	0	0	0	1	0	4	1	1	0	0	0	0	1	0	0	0	0	0	0
B_6	17	8	1	1	0	0	0	0	0	2	1	0	9	0	1	0	0	0	0	1	0	0	1	0	0	0
BK_1	6	5	1	0	1	0	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0
BK_11	5	4	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_12	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
BK_14A	7	6	1	2	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_14B	6	6	1	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_3	8	5	4	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_4	7	6	1	1	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_5	5	5	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_6	7	6	1	2	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_7	9	4	6	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BK_8	4	4	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BLK_E2	6	6	1	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
BOW_E1	10	7	1	2	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0
BOW_E2	8	7	1	1	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0
BOW_E3	9	8	1	1	0	0	0	0	0	2	1	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0
BOW_E4	12	8	1	1	0	0	0	0	0	2	1	0	4	0	1	0	0	0	0	1	0	0	1	0	0	0
C_101A	26	8	1	1	0	0	0	0	0	0	1	0	16	1	4	1	0	0	0	1	0	0	0	0	0	0
C_105	39	7	7	0	0	0	0	0	0	1	22	0	3	1	4	0	0	0	0	1	0	0	0	0	0	0
C_106	23	9	2	1	0	0	0	0	0	2	1	0	10	1	4	1	0	0	0	1	0	0	0	0	0	0
C_111	7	6	1	0	1	0	0	0	0	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
C_124	9	6	1	0	0	0	0	0	0	2	2	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0
C_132	6	4	2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
C_136	11	7	2	1	0	0	0	0	0	1	1	0	3	0	2	0	0	0	0	1	0	0	0	0	0	0
C_143	9	7	1	1	0	0	0	0	0	2	1	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0
C_145	15	8	2	1	0	0	0	0	0	2	1	0	5	0	2	1	0	0	0	1	0	0	0	0	0	0
C_146	8	6	1	0	0	0	0	0	0	2	1	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0
C_148	7	5	2	0	0	0	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
C_150	41	8	1	1	0	0	0	0	0	0	1	0	31	2	3	1	0	0	0	1	0	0	0	0	0	0
C_158	6	6	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
C_16	10	6	4	0	0	0	0	0	0	1	1	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0
C_161	3	3	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C_164	11	6	5	1	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C_165	21	7	8	0	0	0	0	0	0	2	2	0	2	2	4	0	0	0	0	1	0	0	0	0	0	0
C_17	15	8	2	1	0	0	0	0	0	2	1	0	4	0	3	1	0	0	0	1	0	0	0	0	0	0
C_173	7	4	3	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C_174	4	4	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C_22	18	7	2	1	0	0	0	0	0	0	1	0	10	1	2	0	0	0	0	1	0	0	0	0	0	0
C_39	7	6	1	0	0	0	0	0	0	1	1	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0
C_42	11	7	2	0	0	0	0	0	0	2	3	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0
C_44	15	7	1	1	0	0	0	0	0	0	1	0	7	0	3	1	0	0	0	1	0	0	0	0	0	0
C_52	29	8	3	1	0	0	0	0	0	0	1	0	19	1	2	1	0	0	0	1	0	0	0	0	0	0
C_57	29	8	1	1	0	0	0	0	0	0	1	0	20	1	3	1	0	0	0	1	0	0	0	0	0	0
C_58	5	4	1	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
C_64	5	4	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C_70	63	9	2	1	0	0	0	0	0	2	1	0	50	1	4	1	0	0	0	1	0	0	0	0	0	0
C_70B	14	9	1	1	0	0	0	0	0	1	1	0	3	1	4	1	0	0	0	1	0	0	0	0	0	0
C_75	30	9	16	0	1	0	0	0	1	2	3	0	4	0	1	1	0	0	0	1	0	0	0	0	0	0
C_76	9	6	1	0	0	0	0	0	0	2	2	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0
C_77	10	6	3	0	1	0	0	0	0	2	2	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
C_79	6	5	1	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
C_80	9	6	3	1	0	0	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
C_81	8	5	3	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C_82	18	7	2	1	0	0	0	0	0	2	1	0	9	0	2	0	0	0	0	1	0	0	0	0	0	0
C_84A	11	5	4	0	0	0	0	0	1	2	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C_84B	9	4	3	0	0	0	0	0	0	2	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C_84C	6	4	1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

			No buffer zone applicable				100m buffer							200m buffer	500m buffer					1000m buffer				2000m buffer		
CDC_Ref	Number of individual features within buffer	Number of feature categories within buffer	Aquifer Maps - Bedrock Deposit Designation	Aquifer Maps - Superficial Deposits Designation	Groundwater Source Protection Zone	WFD Classification	LNR	Greenbelt	Historic landfill	Landfill site	ALC	Ancient or Semi-Natural Woodland	Listed Buildings	Water courses	Scheduled Monument	Parks and Gardens	World Heritage Sites	Registered Battlefield	National Trails	AONB	NNR	National Park	SSSI	Ramsar	SAC	SPA
C_84D	6	4	1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C_89	10	7	2	2	0	0	0	0	0	0	1	0	1	2	1	0	0	0	0	1	0	0	0	0	0	0
C_93	21	8	1	1	0	0	0	0	0	1	1	0	12	0	3	1	0	0	0	1	0	0	0	0	0	0
C_97	24	9	2	1	0	0	0	0	0	2	1	0	11	1	4	1	0	0	0	1	0	0	0	0	0	0
CC_23A	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CC_23B	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CC_23C	5	4	1	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
CC_23D	7	5	2	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0
CC_23E	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CC_29	8	5	2	1	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
CC_38A	8	6	2	0	0	0	0	0	0	0	1	0	2	0	1	0	0	0	1	1	0	0	0	0	0	0
CC_38B	7	6	1	0	0	0	0	0	0	0	1	0	2	0	1	0	0	0	1	1	0	0	0	0	0	0
CC_40	8	5	2	0	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0
CC_41	5	5	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
CC_43	4	4	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
CC_44	8	6	1	0	0	0	0	0	0	0	2	0	2	1	0	0	0	0	1	1	0	0	0	0	0	0
CC_48	21	6	2	0	0	0	0	0	0	0	1	0	15	0	1	0	0	0	1	1	0	0	0	0	0	0
CC_49A	7	5	2	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
CC_50	7	3	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CCN_E1	8	5	2	1	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
CCN_E2	4	3	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CCN_E3A	6	5	1	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
CCN_E3B	9	6	2	2	0	1	0	0	0	0	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
CIR_E1	8	5	3	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
CIR_E10	29	8	1	1	0	0	0	0	0	0	1	0	20	1	3	1	0	0	0	1	0	0	0	0	0	0
CIR_E11	9	7	1	1	0	1	0	0	0	1	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0
CIR_E12	24	9	2	1	0	0	0	0	0	2	1	0	11	1	4	1	0	0	0	1	0	0	0	0	0	0
CIR_E13	23	9	2	1	0	0	0	0	0	2	1	0	10	1	4	1	0	0	0	1	0	0	0	0	0	0
CIR_E14	22	8	2	1	0	1	0	0	0	0	1	0	11	2	3	0	0	0	0	1	0	0	0	0	0	0
CIR_E15A	12	9	1	1	0	1	0	0	0	1	1	0	3	2	1	0	0	0	0	1	0	0	0	0	0	0
CIR_E15B	11	9	1	2	0	1	0	0	0	1	1	0	1	2	1	0	0	0	0	1	0	0	0	0	0	0
CIR_E16	40	9	2	1	0	0	0	0	0	2	1	0	27	1	4	1	0	0	0	1	0	0	0	0	0	0
CIR_E17	10	7	3	2	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
CIR_E2	7	5	2	0	0	0	0	0	0	0	1	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0
CIR_E20	10	6	3	0	0	0	0	0	1	2	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
CIR_E4A	6	4	1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CIR_E4B	6	4	1	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CIR_E5	30	9	16	0	1	0	0	0	1	2	3	0	4	0	1	1	0	0	0	1	0	0	0	0	0	0
CIR_E6	10	6	3	0	1	0	0	0	0	2	2	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
CIR_E8	11	7	3	0	1	0	0	0	0	2	2	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0
CIR_E9	5	4	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
DA_1A	12	6	1	1	3	0	0	0	0	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_1B	12	6	1	1	3	0	0	0	0	1	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_2	8	6	1	1	3	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
DA_4	11	8	1	1	2	0	0	0	0	2	1	0	2	0	1	0	0	0	0	0	0	0	0	0	1	0
DA_5A	12	6	1	1	3	0	0	0	0	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_5B	8	5	1	1	3	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_5C	12	6	1	1	3	0	0	0	0	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_7	10	7	1	1	2	0	0	0	0	1	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
DA_8	7	5	1	1	3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DA_9	8	5	1	2	2	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F_14	12	6	3	2	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
F_15	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
F_20A	9	6	2	1	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
F_24	6	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
F_26	2	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F_32	6	4	1	0	3	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F_34	10	5	2	2	3	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F_35B	7	5	1	1	3	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
F_36B	14	7	2	3	3	0	0	0	0	0	3	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
F_38	9	6	1	1	1	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0
F_41	6	5	1	1	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
F_44	6	4	1	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F_45	7	6	1	1	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
F_46	7	5	1	1	3	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
FFD_E2	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
FFD_E3	9	6	2	1	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
K_1A	11	7	1	0	0	0	0	0	0	2	1	0	2	2	0	0	0	0	1	0	0	0	2	0	0	0
K_1B	7	5	1	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0
K_1C	8	6	1	0	0	0	0	0	0	2	1	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0
K_2	7	6	1	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	2	0	0	0
K_3	7	5	3	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
K_4	10	7	2	1	0	0	0	0	0	2	1	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0
K_5	4	4	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
K_6A	10	7	1	0	0	0	0	0	0	2	1	0	2	2	0	0	0	0	1	0	0	0	1	0	0	0
K_6B	5	5	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
L_1	16	7	1	1	0	0	0	0	0	0	1	0	9	0	2	1	0	0	1	0	0	0	0	0	0	0
L_12	5	5	1	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
L_13A	11	7	1	1	0	0	0	0	0	0	2	0	4	0	1	1	0	0	1	0	0	0	0	0	0	0
L_13B	7	6	1	1	0	0	0	0	0	0	2	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0

			No buffer zone applicable				100m buffer							200m buffer	500m buffer					1000m buffer				2000m buffer		
CDC_Ref	Number of individual features within buffer	Number of feature categories within buffer	Aquifer Maps - Bedrock Deposit Designation	Aquifer Maps - Superficial Deposits Designation	Groundwater Source Protection Zone	WFD Classification	LNR	Greenbelt	Historic landfill	Landfill site	ALC	Ancient or Semi-Natural Woodland	Listed Buildings	Water courses	Scheduled Monument	Parks and Gardens	World Heritage Sites	Registered Battlefield	National Trails	AONB	NNR	National Park	SSSI	Ramsar	SAC	SPA
L_14	6	6	1	1	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
L_16	6	5	1	1	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
L_17	4	4	1	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
L_18B	13	7	1	2	0	0	0	0	0	0	1	0	6	0	1	0	0	0	1	0	0	0	1	0	0	0
L_19	8	6	1	1	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	1	0	0	0
L_22	4	4	1	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
L_26	6	4	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L_29	13	8	2	3	0	0	0	0	1	2	2	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
L_30	11	8	1	1	0	0	0	0	0	0	2	0	2	1	2	1	0	0	1	0	0	0	0	0	0	0
L_8	5	5	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
L_9	7	6	1	1	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0	0	0	0	1	0	0	0
LEC_E1	9	6	1	2	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	1	0	0	0
LEC_E2A	6	5	1	1	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
LEC_E2B	6	5	1	1	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
LEC_E3	14	8	2	3	0	0	0	0	1	2	2	0	0	1	2	0	0	0	0	1	0	0	0	0	0	0
LEC_E4	10	8	1	1	0	0	0	0	0	0	2	0	2	1	1	1	0	0	1	0	0	0	0	0	0	0
M_11	8	6	1	2	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
M_12A	7	5	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_12B	6	5	1	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_12C	5	5	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_13	8	6	1	3	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
M_14A	7	5	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_14B	8	6	1	2	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
M_14C	7	5	1	1	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_16	9	6	1	1	0	0	0	0	0	2	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
M_19A	10	5	1	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_19B	8	6	1	2	0	0	0	0	0	2	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_19C	10	6	1	3	0	0	0	0	0	1	3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_21	8	5	1	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_24	18	6	1	1	0	0	0	0	0	0	1	0	12	0	2	0	0	0	0	1	0	0	0	0	0	0
M_25	8	5	1	1	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_27	9	7	1	2	0	1	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_29	15	7	1	2	0	0	0	0	0	0	1	0	7	1	2	0	0	0	0	1	0	0	0	0	0	0
M_31	9	6	1	2	0	0	0	0	0	1	2	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
M_51	19	7	1	1	0	0	0	0	0	0	1	0	12	1	2	0	0	0	0	1	0	0	0	0	0	0
M_56	19	7	1	2	0	0	0	0	0	0	1	0	11	1	2	0	0	0	0	1	0	0	0	0	0	0
M_57	7	6	1	1	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
M_58	10	7	1	1	0	0	0	0	0	1	2	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0
M_59	5	5	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M_60	15	6	1	2	0	0	0	0	0	0	1	0	8	0	2	0	0	0	0	1	0	0	0	0	0	0
M_7	8	5	1	2	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
M_9	9	6	1	3	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_9A	7	6	1	1	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_9B	7	6	1	1	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_9C	8	6	1	3	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
M_9D	6	6	1	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
MIC_E1A	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MIC_E1B	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_1	11	6	1	1	0	0	0	0	0	0	1	0	6	0	0	1	0	0	0	1	0	0	0	0	0	0
MK_2A	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_2B	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_3	4	4	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_4	4	3	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_7	6	4	1	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_8A	8	5	1	1	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0
MK_8B	5	4	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E1	8	6	1	2	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
MOR_E10	7	5	1	2	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E11	6	5	1	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E12	8	5	1	1	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E3	8	6	1	2	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
MOR_E4	9	6	1	2	0	0	0	0	0	2	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
MOR_E5	11	6	1	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
MOR_E6	8	5	1	1	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E7	9	5	1	2	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MOR_E8	10	5	1	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E9A	6	5	1	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MOR_E9B	6	5	1	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
N_12A	26	5	2	0	0	0	0	0	0	0	2	0	20	1	0	0	0	0	0	1	0	0	0	0	0	0
N_12B	22	8	7	1	0	1	0	0	0	1	2	0	8	1	0	0	0	0	0	1	0	0	0	0	0	0
N_12C	9	5	2	1	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0
N_13A	8	5	3	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0
N_13B	8	4	1	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0
N_13C	9	6	1	2	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0
N_14A	8	5	2	0	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0
N_14B	6	5	2	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
N_15	4	4	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
N_1A	6	5	1	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
N_1B	8	7	1	1	0	1	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
N_2	18	7	5	1	0	0	0	0	0	1	2	0	7	1	0	0	0	0	0	1	0	0	0	0	0	0

	No buffer zone applicable						100m buffer							200m buffer	500m buffer					1000m buffer				2000m buffer		
CDC_Ref	Number of individual features within buffer	Number of feature categories within buffer	Aquifer Maps - Bedrock Deposit Designation	Aquifer Maps - Superficial Deposits Designation	Groundwater Source Protection Zone	WFD Classification	LNR	Greenbelt	Historic landfill	Landfill site	ALC	Ancient or Semi-Natural Woodland	Listed Buildings	Water courses	Scheduled Monument	Parks and Gardens	World Heritage Sites	Registered Battlefield	National Trails	AONB	NNR	National Park	SSSI	Ramsar	SAC	SPA
N_5A	20	5	1	1	0	0	0	0	0	0	1	0	16	0	0	0	0	0	0	1	0	0	0	0	0	0
N_5B	22	5	1	1	0	0	0	0	0	0	1	0	18	0	0	0	0	0	0	1	0	0	0	0	0	0
N_8	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
NOR_E1	9	6	1	2	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0
NOR_E2	23	5	2	0	0	0	0	0	0	0	2	0	17	1	0	0	0	0	0	1	0	0	0	0	0	0
NOR_E3A	6	5	1	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
NOR_E3B	8	7	1	1	0	1	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
RUR_E10	4	4	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
RUR_E12	8	6	1	1	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
RUR_E13	15	7	1	2	3	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
RUR_E14	21	11	3	2	3	0	0	0	1	2	3	0	1	1	1	0	0	0	0	0	0	0	3	0	1	0
RUR_E15	16	7	2	2	3	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
RUR_E16	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
RUR_E17	4	4	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
RUR_E18	15	7	7	1	2	0	0	0	0	2	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
RUR_E19	8	5	3	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
RUR_E7	16	8	1	1	3	0	0	0	0	0	2	0	3	1	1	0	0	0	0	0	0	0	3	0	1	0
S_1	12	8	1	0	1	0	0	0	0	2	1	0	2	0	3	1	0	0	0	1	0	0	0	0	0	0
S_14	7	4	4	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
S_2	18	7	1	0	0	0	0	0	0	2	1	0	10	0	2	1	0	0	0	1	0	0	0	0	0	0
S_20	7	5	2	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
S_22A	6	5	2	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
S_22B	5	3	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
S_34A	9	7	2	0	1	0	0	0	0	2	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
S_34B	9	7	2	0	1	0	0	0	0	2	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
S_39	8	7	1	0	0	0	0	0	0	1	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
S_43	24	7	1	0	0	0	0	0	0	2	1	0	16	0	2	1	0	0	0	1	0	0	0	0	0	0
S_46	18	7	1	0	0	0	0	0	0	2	1	0	10	0	2	1	0	0	0	1	0	0	0	0	0	0
S_47	9	7	1	0	0	0	0	0	0	2	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
S_48	11	8	3	0	1	0	0	0	0	1	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
S_49	6	5	2	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
S_50	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
S_51	8	7	2	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
S_52	11	8	3	0	1	0	0	0	0	1	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
S_53	7	7	1	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
S_54	14	6	8	0	0	0	0	0	0	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
S_55	14	6	3	0	0	0	0	0	0	1	1	0	6	0	2	0	0	0	0	1	0	0	0	0	0	0
S_57	8	5	3	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
S_8A	11	7	1	0	0	0	0	0	0	2	1	0	3	0	2	1	0	0	0	1	0	0	0	0	0	0
SC_11	18	8	1	1	2	0	0	0	0	0	3	0	8	1	1	0	0	0	0	0	0	0	1	0	0	0
SC_12	13	9	1	1	2	1	0	0	2	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
SC_13A	12	8	1	1	2	0	0	0	1	2	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
SC_19	29	7	1	1	2	0	0	0	0	0	2	0	20	1	2	0	0	0	0	0	0	0	0	0	0	0
SC_20	9	7	3	1	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
SC_21	5	3	3	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC_22	11	7	1	2	2	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
SC_23	10	8	1	1	2	0	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0
SC_27	16	7	2	2	3	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
SC_28	15	7	2	1	3	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
SC_29	15	7	1	2	3	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
SC_9	27	7	1	2	2	0	0	0	0	0	2	0	17	1	2	0	0	0	0	0	0	0	0	0	0	0
SC_E1	13	7	3	2	2	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	2	0	0	0
SC_E2	15	10	1	1	2	1	0	0	3	2	2	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0
SD_1	10	6	3	0	0	0	0	0	2	1	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_10	8	5	3	0	0	0	0	0	0	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_11	9	6	3	1	0	0	0	0	0	1	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_12	10	6	3	0	1	0	0	0	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_13	6	4	2	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_14	9	6	2	0	0	0	0	0	1	2	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_2	6	6	1	1	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_3	5	4	2	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_4	10	5	1	1	0	0	0	0	0	0	1	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_5	6	4	3	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_6	7	4	3	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_8	5	4	1	0	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_9A	9	5	3	0	0	0	0	0	1	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_9B	11	6	3	0	0	0	0	0	1	1	2	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0
SD_9C	14	6	3	0	1	0	0	0	2	2	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
SD_9D	9	5	3	0	1	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SID_E1	6	4	3	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
SID_E2	8	5	2	0	0	0	0	0	1	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SID_E3	10	5	1	1	0	0	0	0	0	0	1	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0
STW_E1	6	5	2	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
STW_E2	11	8	3	0	1	0	0	0	0	1	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
STW_E3	6	5	2	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
STW_E4	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
STW_E5	11	8	3	0	1	0	0	0	0	1	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
STW_E6	7	7	1	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
STW_E7	7	5	2	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
STW_E9	9	7	2	0	1	0	0	0	0	2	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0

			No buffer zone applicable				100m buffer							200m buffer	500m buffer					1000m buffer				2000m buffer		
CDC_Ref	Number of individual features within buffer	Number of feature categories within buffer	Aquifer Maps - Bedrock Deposit Designation	Aquifer Maps - Superficial Deposits Designation	Groundwater Source Protection Zone	WFD Classification	LNR	Greenbelt	Historic landfill	Landfill site	ALC	Ancient or Semi-Natural Woodland	Listed Buildings	Water courses	Scheduled Monument	Parks and Gardens	World Heritage Sites	Registered Battlefield	National Trails	AONB	NNR	National Park	SSSI	Ramsar	SAC	SPA
T_1	7	6	1	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_17	34	7	1	0	2	0	0	0	0	2	1	0	26	0	1	0	0	0	0	1	0	0	0	0	0	0
T_22	41	7	1	0	2	0	0	0	0	2	1	0	33	0	1	0	0	0	0	1	0	0	0	0	0	0
T_26	8	6	1	0	2	0	0	0	0	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
T_28	10	7	2	0	2	0	0	0	0	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
T_31A	9	6	1	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_31B	8	7	1	1	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_31C	11	7	2	1	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_34	12	8	3	1	2	0	0	0	0	2	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
T_34C	9	6	3	1	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_34D	10	6	3	0	2	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
T_35	9	6	2	0	2	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_38	11	7	1	0	2	0	0	0	1	2	3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
T_39	7	6	1	0	2	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
T_40	11	7	2	0	2	0	0	0	0	2	2	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
T_45	12	7	4	1	2	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
T_50	31	8	2	0	2	0	0	0	0	1	1	0	22	1	1	0	0	0	0	1	0	0	0	0	0	0
T_51	8	5	2	0	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_52	13	8	3	0	2	0	0	0	1	2	2	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
T_55	7	5	1	0	2	0	0	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_57	12	7	1	0	2	0	0	0	0	2	1	0	4	0	1	0	0	0	0	1	0	0	0	0	0	0
T_61	7	5	1	0	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_62	13	8	2	0	2	0	0	0	0	2	1	0	3	1	1	0	0	0	0	1	0	0	0	0	0	0
T_63A	8	5	2	0	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_63B	8	5	2	0	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_63C	9	5	2	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
T_64	27	8	1	0	2	0	0	0	0	1	1	0	19	1	1	0	0	0	0	1	0	0	0	0	0	0
T_67	7	6	1	0	2	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
T_70	9	6	2	0	2	0	0	0	0	2	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
T_71	11	7	2	0	2	0	0	0	0	2	2	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
TET_E1	8	5	2	0	2	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
TET_E2	9	6	1	0	2	0	0	0	0	2	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
TET_E4	6	5	1	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
UR_2	7	4	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
UR_3	7	4	2	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
UR_E1	14	6	7	0	0	1	0	0	0	2	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
W_1A	12	4	1	0	0	0	0	0	0	0	1	0	9	0	0	0	0	0	0	1	0	0	0	0	0	0
W_1B	11	4	1	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	1	0	0	0	0	0	0
W_4	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_5	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_6	9	4	1	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	1	0	0	0	0	0	0
W_7A	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_7B	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_8A	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_8B	4	3	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_8C	5	3	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
W_9	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WIL_E1A	9	4	1	0	0	0	0	0	0	0	1	0	6	0	0	0	0	0	0	1	0	0	0	0	0	0
WIL_E1B	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WIL_E1C	3	3	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WPP1	386	11	34	7	0	8	0	0	2	2	4	0	318	2	7	1	0	0	0	1	0	0	0	0	0	0
WPP10	12	6	5	0	0	1	0	0	0	2	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
WPP11	40	6	1	1	0	0	0	0	0	0	2	0	34	0	0	1	0	0	0	1	0	0	0	0	0	0
WPP12	126	10	13	2	4	1	0	0	0	1	1	1	101	1	0	0	0	0	0	1	0	0	0	0	0	0
WPP13	24	11	5	3	1	1	0	0	2	2	1	0	5	1	2	0	0	0	0	1	0	0	0	0	0	0
WPP14	24	9	1	3	3	0	0	0	0	2	2	0	10	1	1	0	0	0	0	0	0	0	0	0	1	0
WPP15	136	10	2	8	0	1	0	0	0	2	3	0	113	2	3	0	0	0	0	1	0	0	1	0	0	0
WPP16	126	9	2	7	3	1	0	0	0	0	3	0	107	1	1	0	0	0	0	0	0	0	1	0	0	0
WPP17	31	8	6	0	2	0	0	0	0	2	1	0	16	1	0	0	0	0	1	0	0	0	2	0	0	0
WPP18	15	8	4	1	1	0	0	0	2	1	1	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0
WPP2	78	11	3	3	2	2	0	0	3	2	3	0	54	2	2	0	0	0	0	0	0	0	2	0	0	0
WPP3	96	9	2	2	0	1	0	0	0	2	2	1	84	1	0	0	0	0	0	1	0	0	0	0	0	0
WPP4	248	11	10	2	2	0	0	0	2	2	3	0	222	1	2	0	0	0	0	1	0	0	1	0	0	0
WPP5	227	9	11	3	0	1	0	0	0	0	3	0	205	1	1	0	0	0	1	1	0	0	0	0	0	0
WPP6	115	9	1	7	0	1	0	0	0	2	3	0	96	1	3	0	0	0	0	1	0	0	0	0	0	0
WPP7	121	11	2	4	0	1	0	0	0	2	3	0	103	1	2	1	0	0	1	0	0	0	1	0	0	0
WPP8	135	8	9	0	1	0	0	0	0	2	1	0	117	0	3	1	0	0	0	1	0	0	0	0	0	0
WPP9	28	4	2	0	0	0	0	0	0	0	1	0	24	0	0	0	0	0	0	1	0	0	0	0	0	0