Appendix A

Incoming Data Register

Incoming Data

ID	Dataset	Data quality	Comments	Name	Description	Sent By	Stakeholder	Format
INF01	Development Plan 2012. Sets the context for new development within Uttlesford for the next 15 years	1	Draft	Development Plan Management Policies Draft_Jan_2012[1].pdf	Policy Document		Uttlesford District Council	PDF
	Report on the Results of the Further Consultation on Local Development Framework Core Strategy Preferred Options	1	2010	Environment Committee Report on way forwards.pdf	Policy Document		Uttlesford District Council	PDF
	Public Participation on the Role of Settlements and Site Allocations	1	2012	Settlement Allocations Plan Draft_Jan_2012_revised[1].pdf	Policy Document		Uttlesford District Council	PDF
	UTTLESFORD DEVELOPMENT FRAMEWORK	1	2011	Uttlesford LDS Revision 5 July 11[1].pdf	Policy Document		Uttlesford District Council	PDF
	UTTLESFORD DEVELOPMENT FRAMEWORK	1	Chart showing programme of Local Development Documents	Uttlesford LDS.pdf	Policy Document		Uttlesford District Council	PDF
INF02	Uttlesford District Council Development Management Policies	1	Jan-12	Development Management DPD.doc	Policy Document		Uttlesford District Council	Word
	Development Management Policies DPD consulltation	1	Anglain Water consultation comments	Development Management Policies DPD consulltation.htm	Policy Document		Uttlesford District Council	HTML
	Uttlesford District Council Site Allocations DPD	1	01/01/2012 Environment Agency Response	Site Allocations DPD.doc	Policy Document		Uttlesford District Council	Word
INF03	Anglian Water development policy	1		AWS_cordon_sanitaire_document.pdf	Policy Document		Anglian Water	PDF
INF04	Wastewater Environmental Capacity Assessment	1	2009. Identifies environmental constraints to future growth	Wastewater capacity assessment 2009.pdf	Policy Document		Anglian Water	PDF
INF05	UDC housing tradjectory	1	Site and numbers for housing developments and employment sites.	Potential sites for June 2012 consultation 26 3 12.xls	Policy Document		Uttlesford District Council	Excel
INF06	Uttlesford Water Cycle Study – Initial Response	1	Stansted Mountfitchet STW consents and information	Uttlesford Water Cycle Study Notes April 2012.doc	Policy Document		Uttlesford District Council	Word
INF07	Natural England Response to consultation	1	Site Allocations Development Plan Document (DPD).	43759 Uttlesford Site Allocations DPD March 2012.pdf	Policy Document		Uttlesford District Council	PDF
		1	Development Management Policies DPD.	43765 Uttlesford Development Management Policies DPD March 2012.pdf	Policy Document		Uttlesford District Council	PDF
INF08	Report into Greater Essex Demographic Forecasts	1	Apr-12	cabinet report demographics.doc	Policy Document		Uttlesford District Council	PDF
	MapInfo SHLAA GIS dataset	2		SHLAA2.DAT	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2.dbf	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2.ID	Policy Document		Uttlesford District Council	GIS

	MapInfo SHLAA GIS dataset	2		SHLAA2.MAP	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2.shp	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2.shx	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2.TAB	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_LIN.DBF	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_lin.shp	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_lin.shx	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_POI.DBF	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_poi.shp	Policy Document		Uttlesford District Council	GIS
	MapInfo SHLAA GIS dataset	2		SHLAA2_poi.shx	Policy Document		Uttlesford District Council	GIS
	Demographics and occupancy rates	1	Email from UDC to Hyder	Uttlesford Occupancy rates and trajectory information 190412.pdf	Policy Document		Uttlesford District Council	PDF
INF09	Anglian Water consultation response	1	Anglain Water DPD consultation comments	Anglian Water.htm	Policy Document		Uttlesford District Council	Word
	Uttlesford District Council Development Management Policies	1	Environement Agency Consultation Response	Development Management DPD.doc	Policy Document		Uttlesford District Council	Word
	Uttlesford District Council Site Allocations DPD	1	Environement Agency Consultation Response	Site Allocations DPD.doc	Policy Document		Uttlesford District Council	Word
INF10	SHLAA2 GIS Dataset	2	MapInfo	SHLAA2.DAT	Policy Document	Melanie Jones	Uttlesford District Council	GIS
		2		SHLAA2.dbf	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2.ID	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2.MAP	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2.shp	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2.shx	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2.TAB	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_LIN.DBF	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_lin.shp	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_lin.shx	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_POI.DBF	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_poi.shp	Policy Document		Uttlesford District Council	GIS
		2		SHLAA2_poi.shx	Policy Document		Uttlesford District Council	GIS
INF11	UDC housing tradjectory	1	Site and numbers for housing developments and employment sites.	Potential sites for June 2012 consultation 26 3 12.xlsx	Policy Document		Uttlesford District Council	Excel
	UDC key notes summary on incoming data	1	Hyder notes on INF11	UDC Key notes.pdf	Policy Document			PDF
	Uttlesford Development Matrix	1		Uttlesford Representations matrix.xlsx	Policy Document		Uttlesford District Council	Excel

INF12	Spreadsheet showing details of current licensed abstractions in the Uttlesford District Council area	1	Licensed abstractions	Uttlesford District Council.xls	Licensed Abstractions	Melanie Jones	Uttlesford District Council	Excel
INF13	Water Quality Data	2	Anglian and Thames Water Quality Data	Uttlesford District Council.xls	Water Quality Data	Melanie Jones	Uttlesford District Council	Excel
		2	EA Description of code types	Sample Point Code Types.xls	Water Quality Data		Uttlesford District Council	Word
		2	EA Description of analyitical results	Analytical Data Notes.doc	Water Quality Data		Uttlesford District Council	Excel
		2	Thames raw water quality data	47645 WQ raw data Thames 3.xls	Water Quality Data		Uttlesford District Council	Excel
		2	Thames raw water quality data	47645 WQ raw data Thames 1.xls	Water Quality Data		Uttlesford District Council	Excel
		2	Thames raw water quality data	12941 WQ raw data Thames 2.xls	Water Quality Data		Uttlesford District Council	Excel
		2	Anglian raw water quality data	47645 WQ raw data Anglian 1.xls	Water Quality Data		Uttlesford District Council	Excel
		2	Anglian raw water quality data	47645 WQ raw data Anglian 1.xls	Water Quality Data		Uttlesford District Council	Excel
INF14	RQP Tool	1		Uttlesford Detailed WCS.xls	Water Quality Data		Environment Agnecy	Excel
INF15	UDC Master Plans	1	Drawings of Masterplans in UDC	1533_Layout 2 Sketch_A.jpg	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	Jpeg
				3074006 Masterplan Option F.pdf	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	PDF
				Elsenham_A3 Presentation_1111111.pdf	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	PDF
				North View - scheme v5b.pdf	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	PDF
				MWA-11-048-SK1 A.pdf	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	PDF
				Prelim 24 scheme to CH 25-01-12.pdf	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	PDF
				proposed_school_site.jpg	Planning Application Supporting Document	Melanie Jones	Uttlesford District Council	Jpeg
INF16	Guidance Docs	1	Guidance Documents for completion of WCS	Andrew-pitt-technical-aspects-of-water-efficiency.pdf	Policy Document		Internet Download	PDF
				AW_EA Joint Position Statements - full set.pdf	Policy Document		Internet Download	PDF
				EA WCS 2009.pdf	Policy Document		Internet Download	PDF
INF17	Allocation GIS Layer	1	UDC Allocations GIS	ALLOC.DAT	Policy Document		Uttlesford District Council	GIS
				ALLOC.dbf	Policy Document		Uttlesford District Council	GIS
				ALLOC.ID	Policy Document		Uttlesford District Council	GIS
				ALLOC.MAP	Policy Document		Uttlesford District Council	GIS
				ALLOC.shp	Policy Document		Uttlesford District Council	GIS
				ALLOC.shx	Policy Document		Uttlesford District Council	GIS
				ALLOC.tab	Policy Document		Uttlesford District Council	GIS
				ALLOC_POI.dbf	Policy Document		Uttlesford District Council	GIS
				ALLOC_poi.shp	Policy Document		Uttlesford District Council	GIS
				ALLOC_poi.shx	Policy Document		Uttlesford District Council	GIS
INF18	Development Phasing	1	UDC Housing trajectories for SHLAA Sites	Allocation June 2012 trajectory.xls	Policy Document		Uttlesford District Council	Excel
				Housing Trajectory_5-year supply at 2011.doc	Policy Document		Uttlesford District Council	Word
INF19	Veiola Water Company Water Resource Management Plan	1	Water Resource Management Plan and Spporting Tables	9033,VWC-FWRMP-Version_3.9-Website.pdf	Policy Document		Veiola Water	PDF

				13562,ResourceMGMTPlanTablesv2.pdf	Policy Document		Veiola Water	PDF
INF20	Veiola Water Initial Response to Allocated Sites	1	Email response	RE Uttlesford District Council Water Cycle Study.msg	Email Response	Nicolas Gilbert	Veiola Water	Msg
INF21	Natural England GIS Datasets	1	Download of Environmental Designations in Study Area	spsittab.zip	GIS	Internet Download	Natural Englnd	GIS
				tlawitab.zip	GIS	Internet Download	Natural Englnd	GIS
				thleshtab.zip	GIS	Internet Download	Natural Englnd	GIS
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				tqspatab.zip	GIS	Internet Download	Natural Englnd	GIS
				tqssstab.zip	GIS	Internet Download	Natural Englnd	GIS
INF22	UDC Representations Received	1	EA, TWU and AWS repsonses to UDC Development Managment Policies	Development Management DPD.doc	Policy Document	Melanie Jones	Uttlesford District Council (EA Response)	Word
				DM Policies with new Cover.pdf	Policy Document	Melanie Jones	Uttlesford District Council	PDF
				Site Allocations DPD.doc	Policy Document	Melanie Jones	Uttlesford District Council (EA Response)	Word
				Thames Water.doc	Policy Document	Melanie Jones	Uttlesford District Council (TWU Response)	Word
				Anglian Water.htm	Policy Document	Melanie Jones	Uttlesford District Council (AWS Response	html
INF23	AWS WwTW	1	Response to initial SHLAA Sites	C00013566_120306141001978623.htm__00057869_Site Allocation Consultation table Uttlesford.pdf	Policy Document	Rob Morris	Anglian Water	pdf
			Waste Water Treatment Data	WwTW data 01.xls	Policy Document	Rob Morris	Anglian Water	Excel

Appendix B

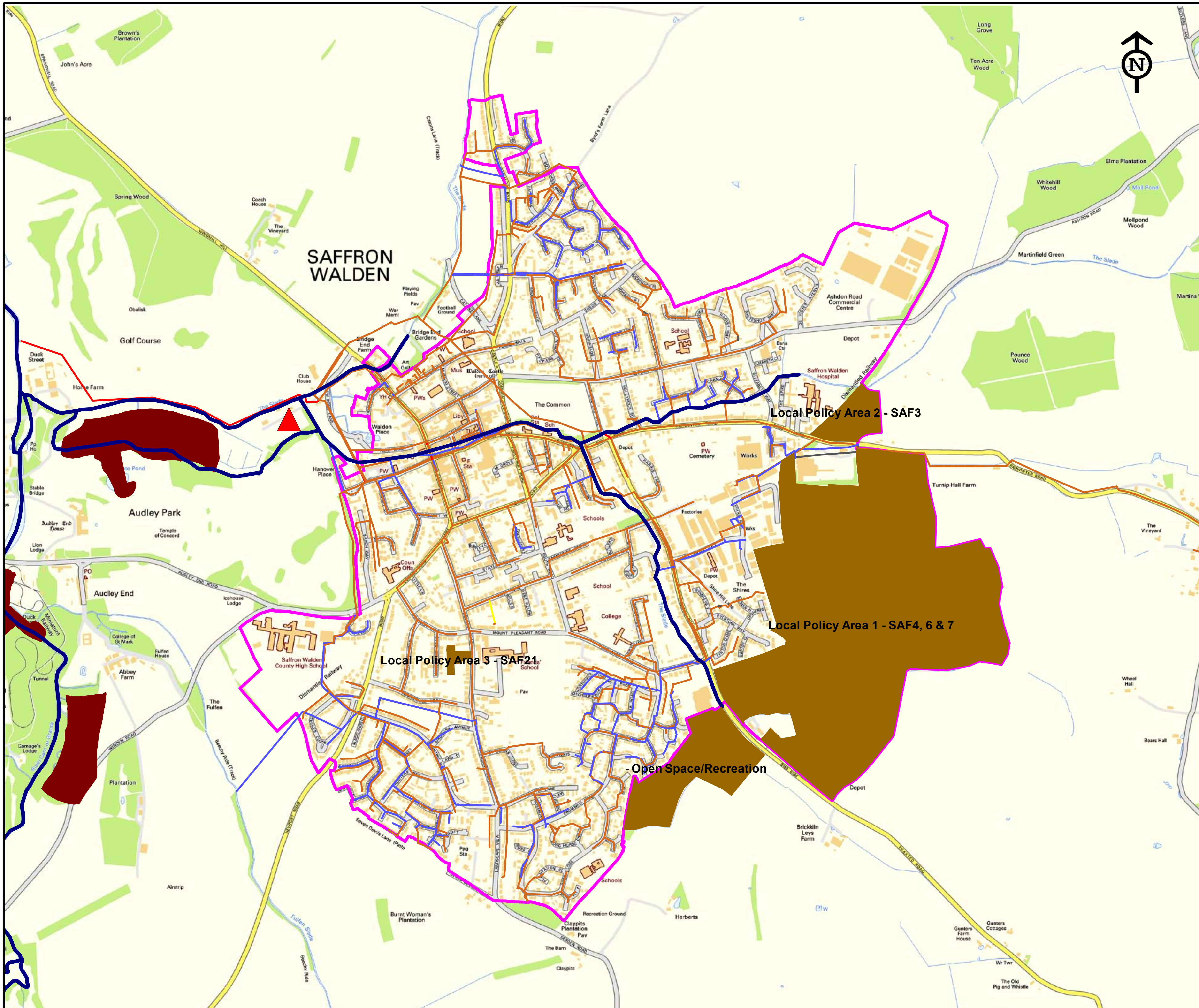
Housing Trajectories

Settlement	UDC Policy Area Reference	Site address	SHLAA reference	Possible capacity	Construction Commences	Dwellings per year															Total within SHLAA Site	Total Within Settlement
						Yr1 13/14	Yr2 14/15	Yr3 15/16	Yr4 16/17	Yr5 17/18	Yr6 18/19	Yr7 19/20	Yr8 20/21	Yr9 21/22	Yr10 22/23	Yr11 23/24	Yr12 24/25	Yr13 25/26	Yr14 26/27	Yr15 27/28		
	Saffron Walden Policy Area 2	119 - 121 Radwinter Road, Former Willis and Gambier site	SAF03	60	2014		30	30													**60**	
	Saffron Walden Policy Area 1	Land between Radwinter Road and Thaxted Road East of SW	SAF04, 6 and 7	800	2020								100	100	100	100	100	100	100	100	**800**	
Saffron Walden	Saffron Walden Policy Area 3	Tudor Works, Debden Road	SAF21	20	2014		20														**20**	**880**
	Great Dunmow Policy Area 1	Land west of Great Dunmow	GtDUN13 and 2	850	2019							50	100	100	100	100	100	100	100	100	**850**	
Great Dunmow	Great Dunmow Policy Area 2	Smiths Farm, Hoblongs	GtDUN14	300	2017					100	100	100									**300**	**1150**
	Elsenham Local Policy Area 1	Land west of Station Road (Also Live Application)	ELS6	155	2014		25	30	50	50											**155**	
	Elsenham Local Policy Area 2	Land west of Hall Road	ELS9	115	2015			40	40	35											**115**	
Elsenham	Elsenham Local Policy Area 3	Land south Stansted Road	ELS1	130	2017					30	50	50									**130**	**400**
	Great Chesterford Local Policy Area 1	Greenhouse site, New World Timber, London Road	GtCHE 1 and 8	40	2015			20	20												**40**	
Great Chesterford	Great Chesterford Local Policy Area 2	Land south of Stanley Road	GtCHE3	60	2014		30	30													**60**	**100**
	Newport Local Policy Area 2	Land at London Road by primary school	NEW2	70	2015			20	50												**70**	
Newport	Newport Local Policy Area 1	Bury Water Lane/Whiteditch Lane/Secondary school	NEW4, 5, 6 and 7	300	2015						100	100	100								**300**	**370**
	Stansted Local Policy Area 1	14-28 Cambridge Road	STA10	11	2014		11														**11**	
	Stansted Local Policy Area 2	Land at 10 Cambridge Road	STA11	14	2014		14														**14**	
Stansted	Stansted Local Policy Area 3	St Mary's Primary School, St Johns Rd		35	2015			35													**35**	**60**

	Takeley Local Policy Area 1	Land at and to the rear of Takeley Primary School	TAK2	122	2015			40	40												**80**	
	Takeley Local Policy Area 2	Land South of Dunmow Road and east of The Pastures/Orchard Fields	TAK7	38	2013		12	13	13												**38**	
	Takeley Local Policy Area 3	North View and 3 The Warren	LtCan4	40	2013		20	20													**40**	
	Takeley Local Policy Area 4	Land at Former Takeley Service Station and between Ridge House and Remarc	TAK16	12	2016					15											**15**	
	Takeley Local Policy Area 5	Land to the south of the B1256 between Olivias and New Cambridge House	TAK15	30	2015				15	15											**30**	**203**
Thaxted	Thaxted Local Policy Area 1	Sampford Road	THA11	60	2014		30	30													**60**	**60**
				Total		**0**	**192**	**308**	**228**	**245**	**250**	**300**	**300**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**3223**	

Appendix C

Preferred Sites



LEGEND

- Settlement Boundary
- Local Policy Areas
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

Hyder

Uttlesford District Council

Council Offices London Road Saffron Walden
Essex CB11 4ER

UTTLESFORD WATER CYCLE STRATEGY

SAFFRON WALDON SHLAA SITES

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	Checked	HT	MAY 2012
	Approved	RG	MAY 2012

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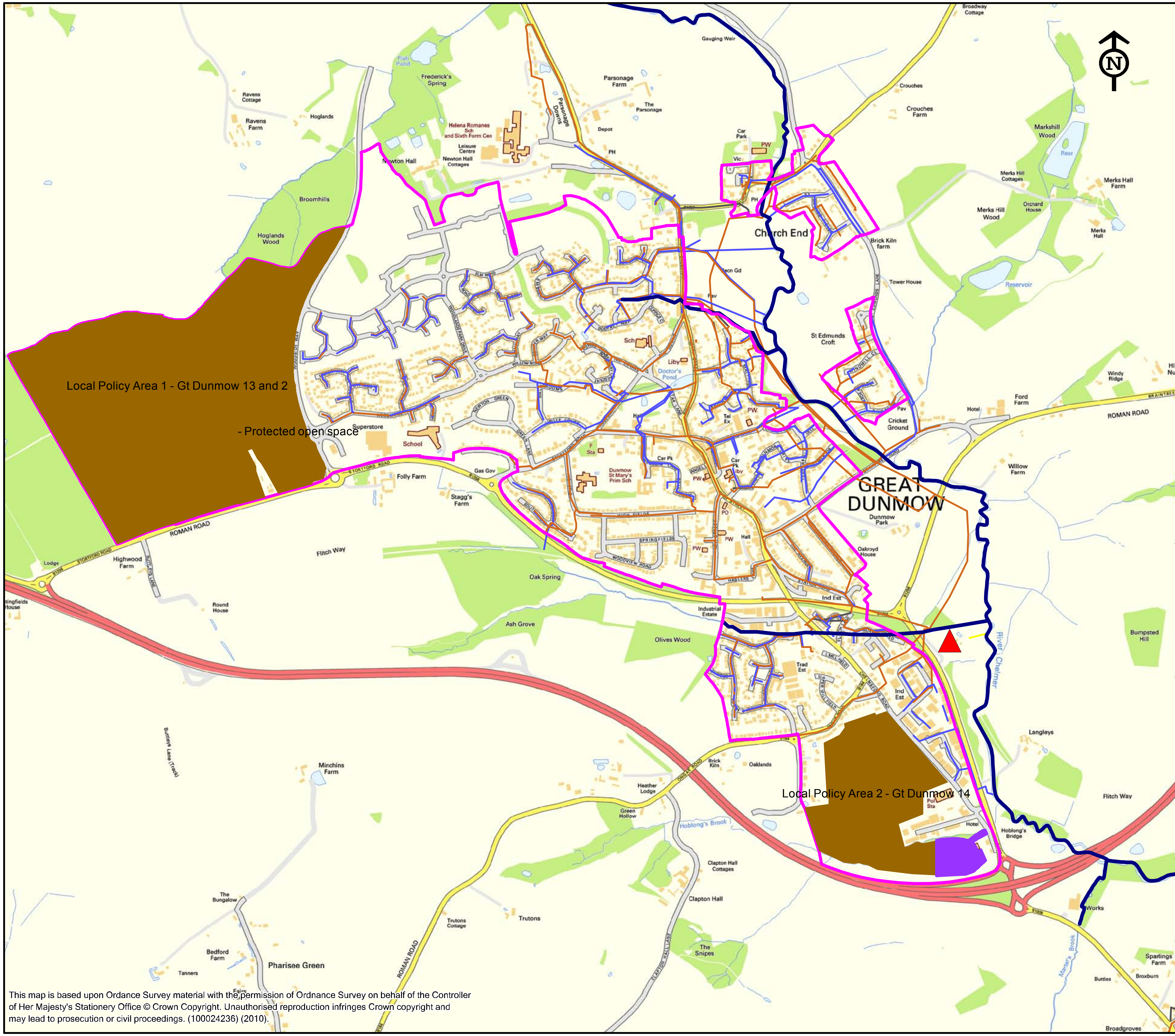

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

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UTTLESFORD WATER CYCLE STRATEGY

GREAT DUNMOW SHLAA SITES

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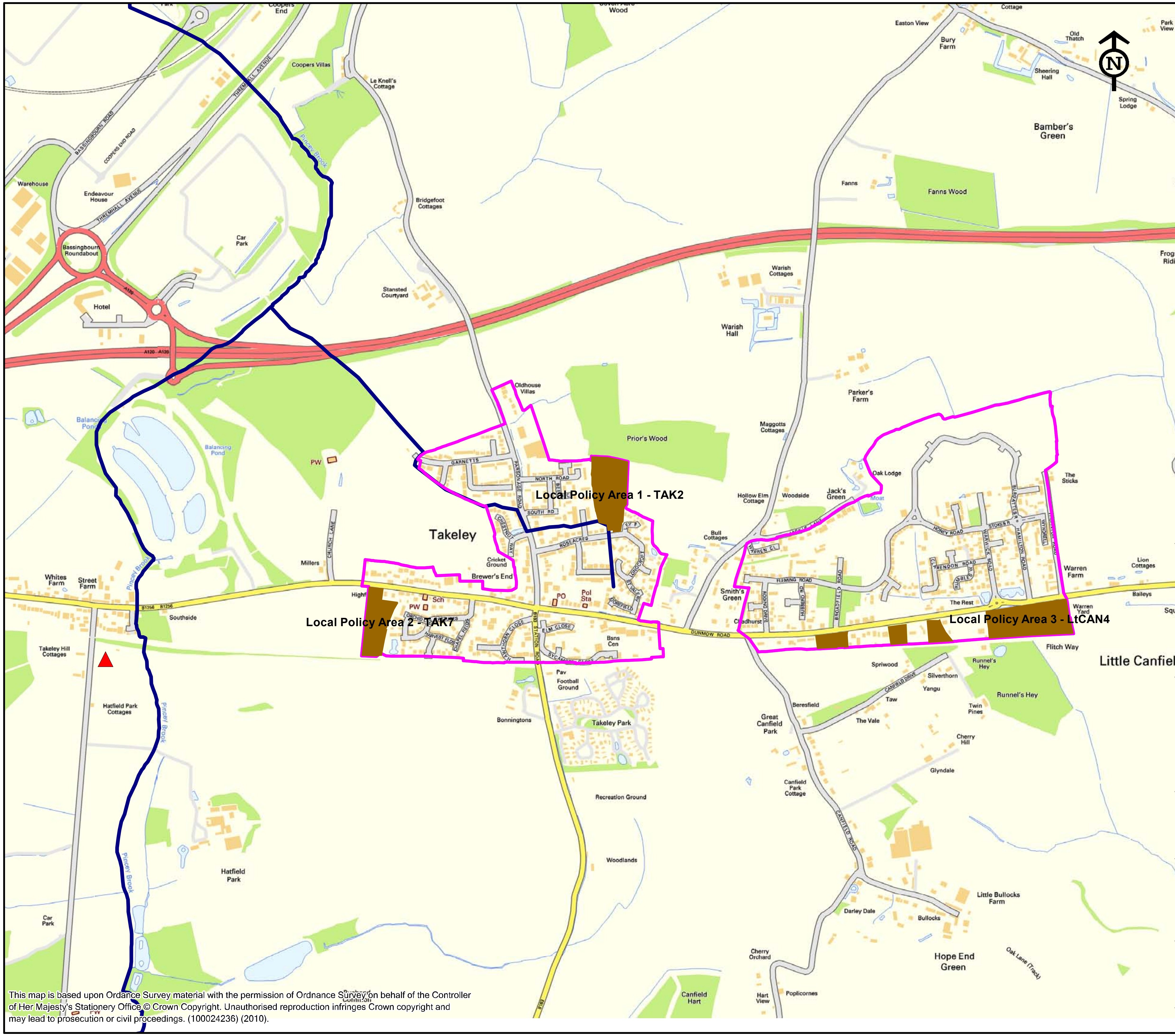

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

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UTTLESFORD WATER CYCLE STRATEGY

TAKELEY SHLAA SITES

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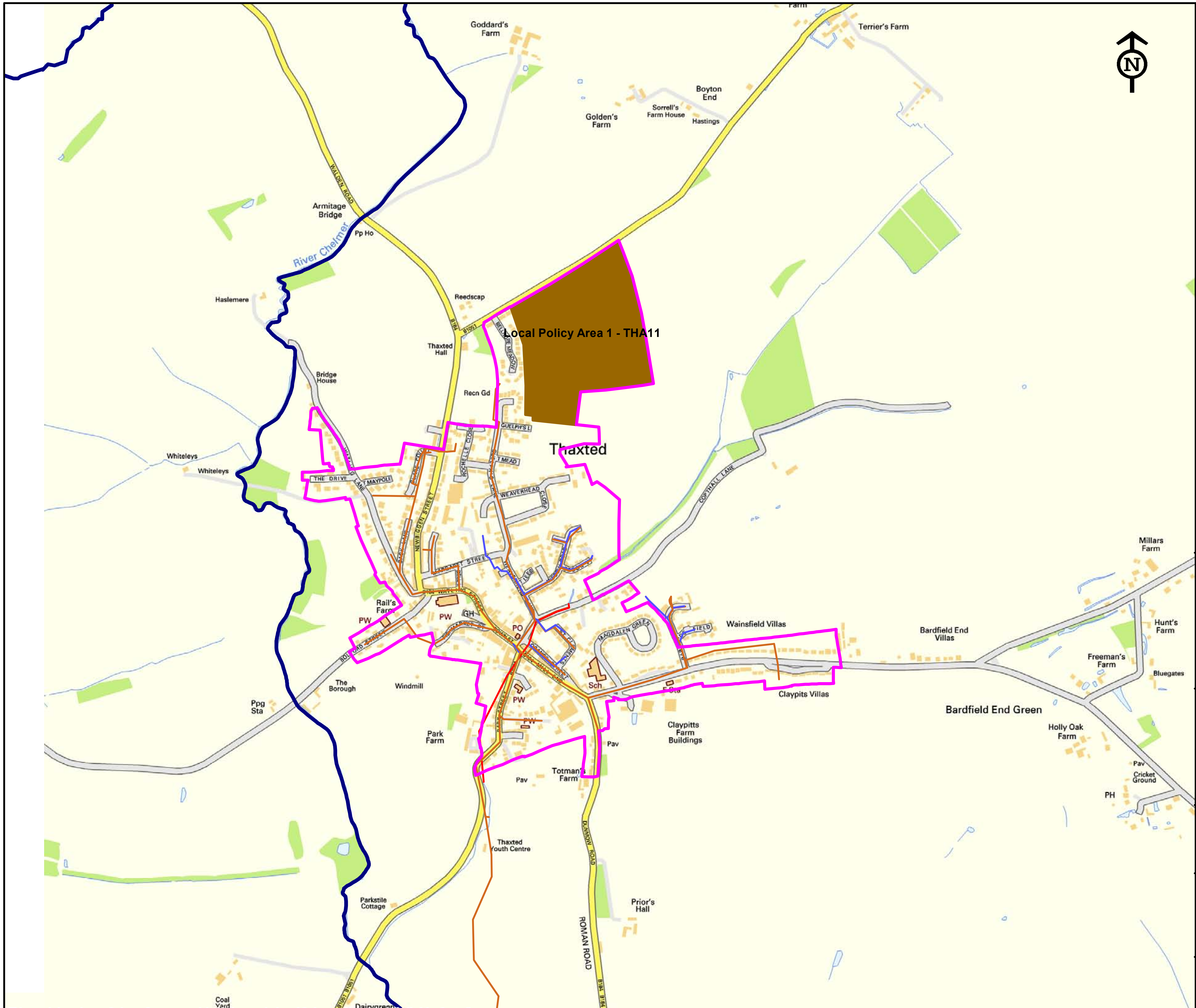

LEGEND

- Settlement Boundary
- Preferred SHLAA Sites
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

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Uttlesford District Council

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UTTLESFORD WATER CYCLE STRATEGY

THAXTED SHLAA SITES

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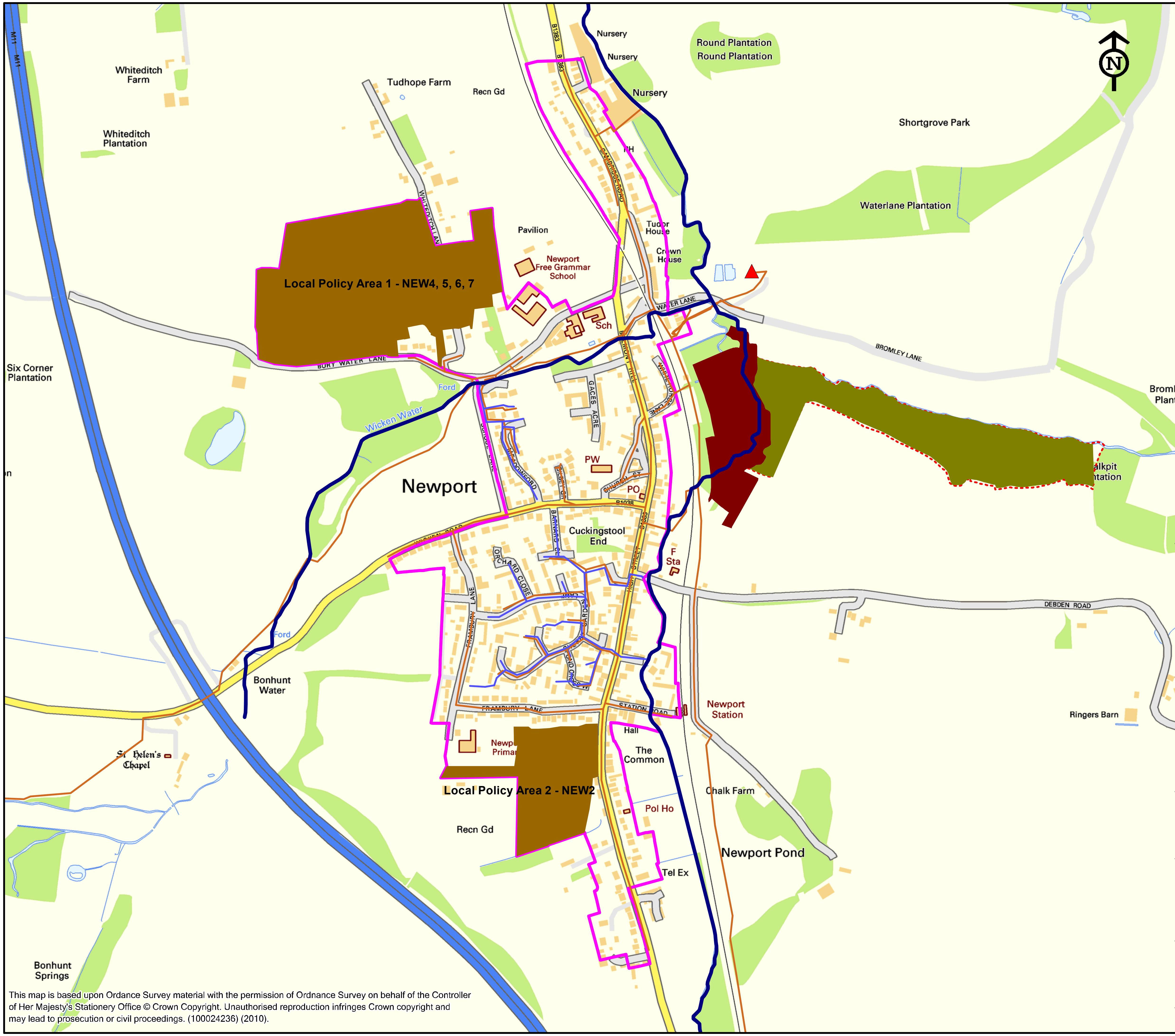

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

Hyder

Uttlesford District Council

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UTTLESFORD WATER CYCLE STRATEGY

NEWPORT SHLAA SITES

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	Approved	RG	MAY 2012

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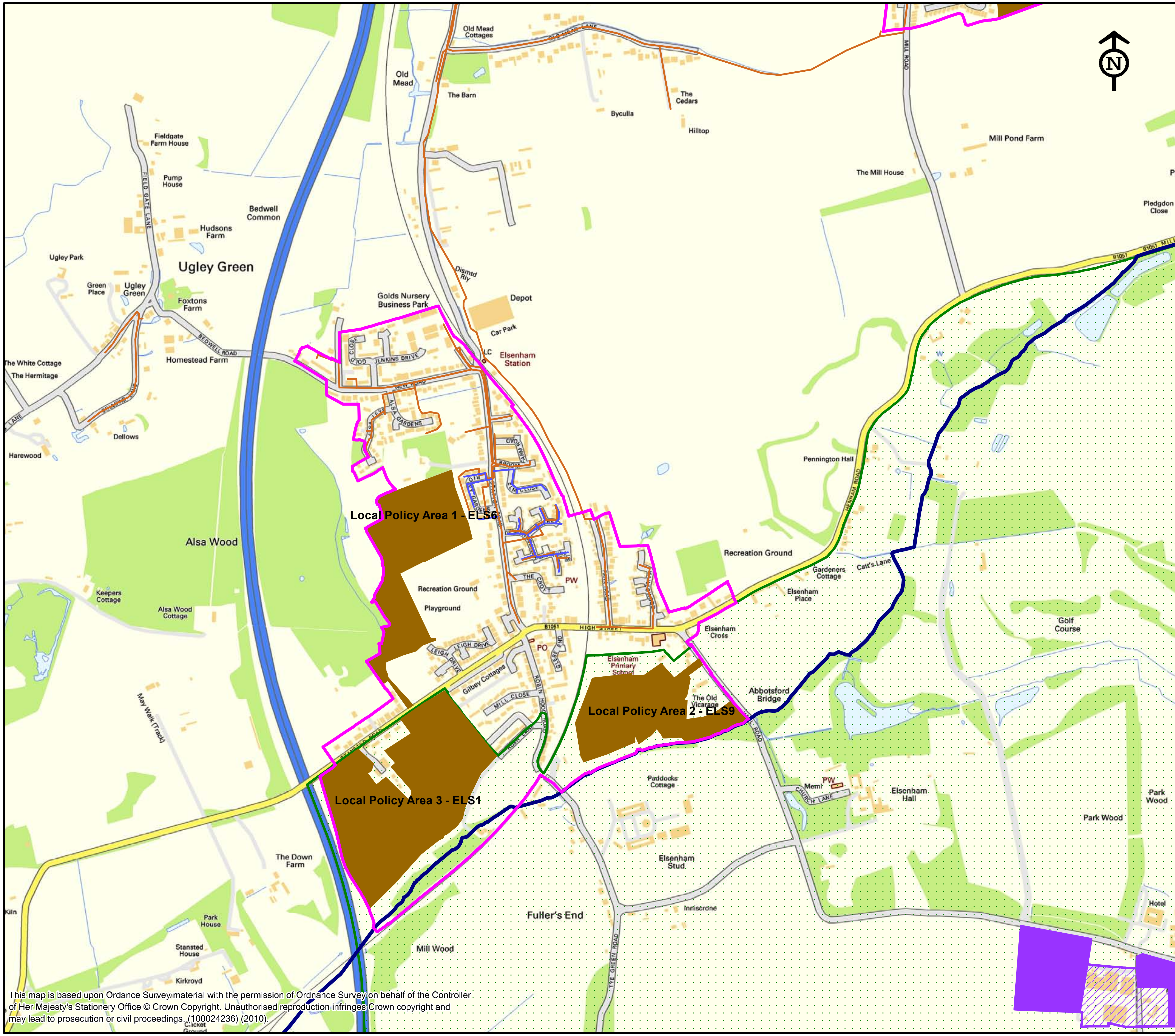

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River
- Countryside Protection Zone

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Uttlesford District Council

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UTTLESFORD WATER CYCLE STRATEGY

ELSENHAM SHLAA SITES

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LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River
- Metropolitan Green Belt

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UTTLESFORD WATER CYCLE STRATEGY

STANSTED SHLAA SITES

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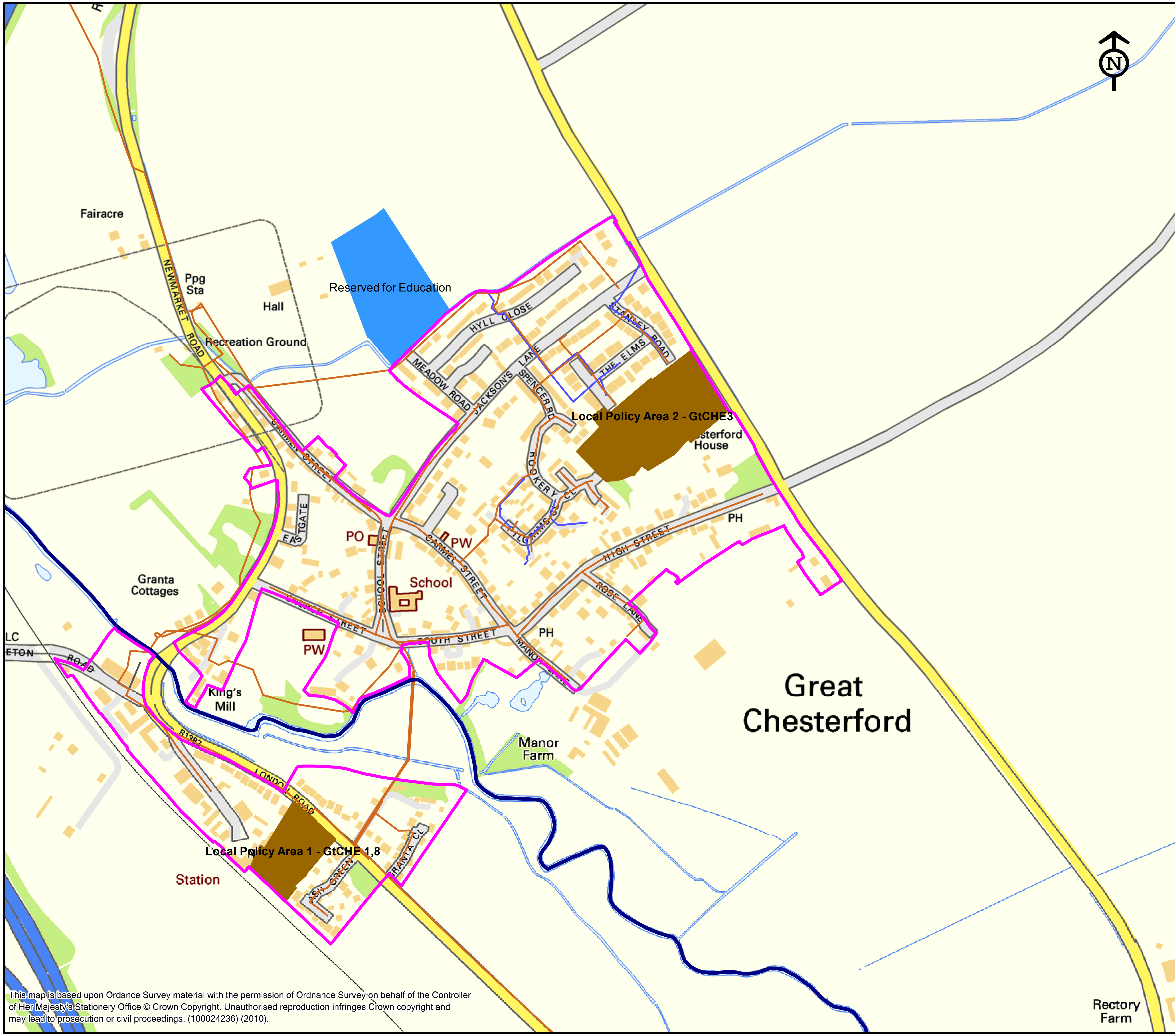

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River

Hyder

Uttlesford District Council

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UTTLESFORD WATER CYCLE STRATEGY

GREAT CHESTERFORD SHLAA SITES

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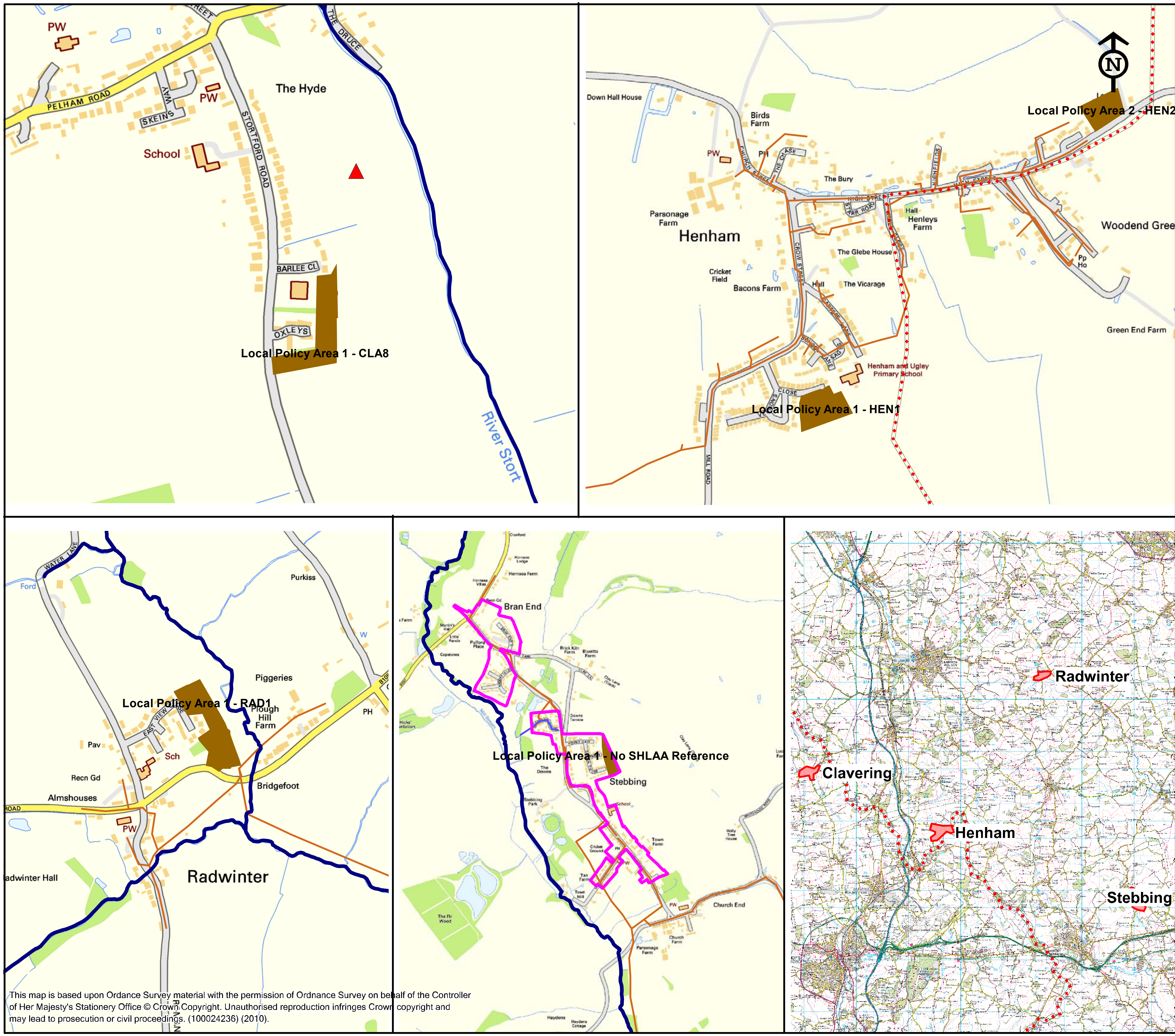

LEGEND

- Settlement Boundary
- Local Policy Areas
- Employment Site
- Wastewater Treatment Works
- Combined Network
- Storm Network
- Foul Network
- SSSI Boundary
- Floodplain Garzing
- Low Meadows
- Wet Woodlands
- Local Wildlife Sites
- Main River
- AWS TWU Boundary

Hyder

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UTTLESFORD WATER CYCLE STRATEGY

RURAL SETTLEMENTS SHLAA SITES

SCALE			
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	Checked	HT	MAY 2012
	Approved	RG	MAY 2012

DRAWING NO. 0010-UA004462-BMD-01

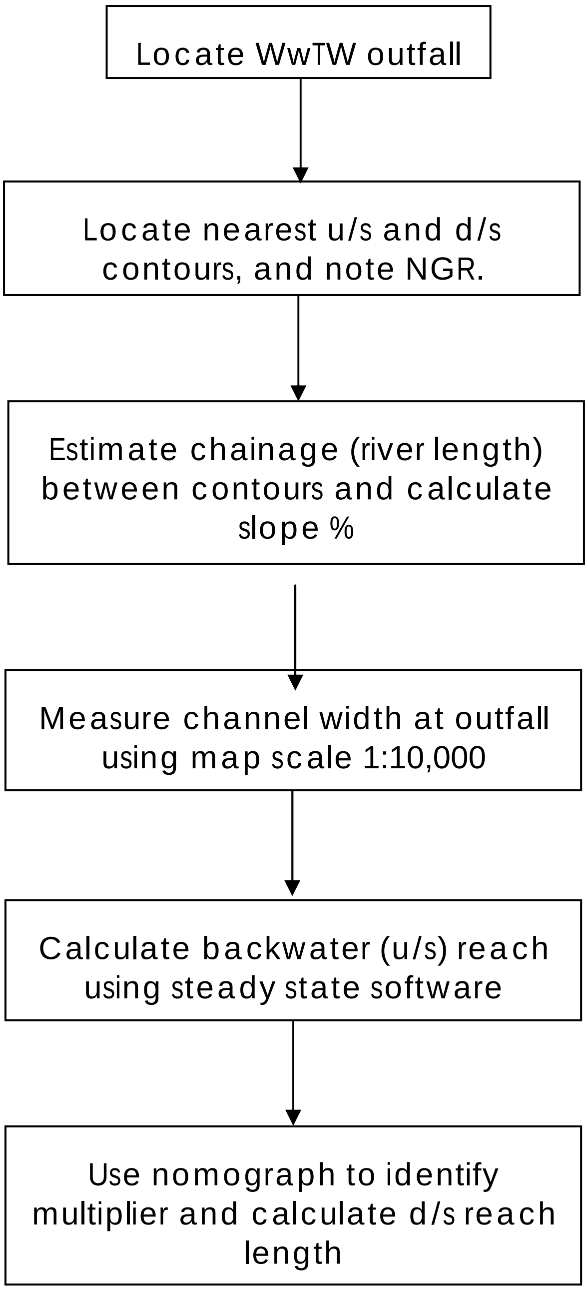
Appendix D

WwTW Capacity Assessment Methodology and Results

4 Appendices

4.1 Appendix A Decision Trees

CALCULATE REACH LENGTHS



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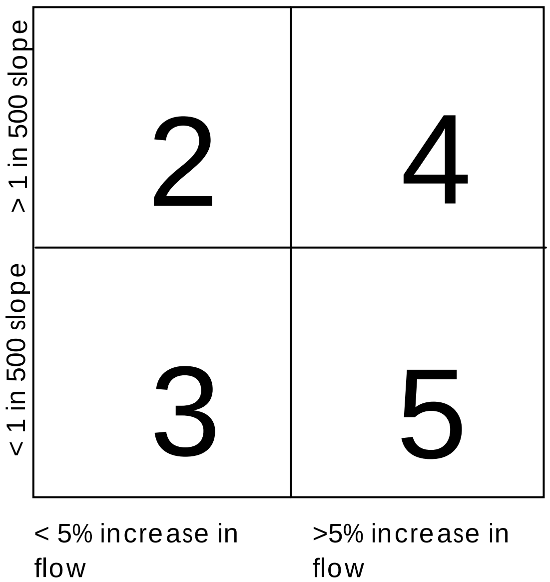

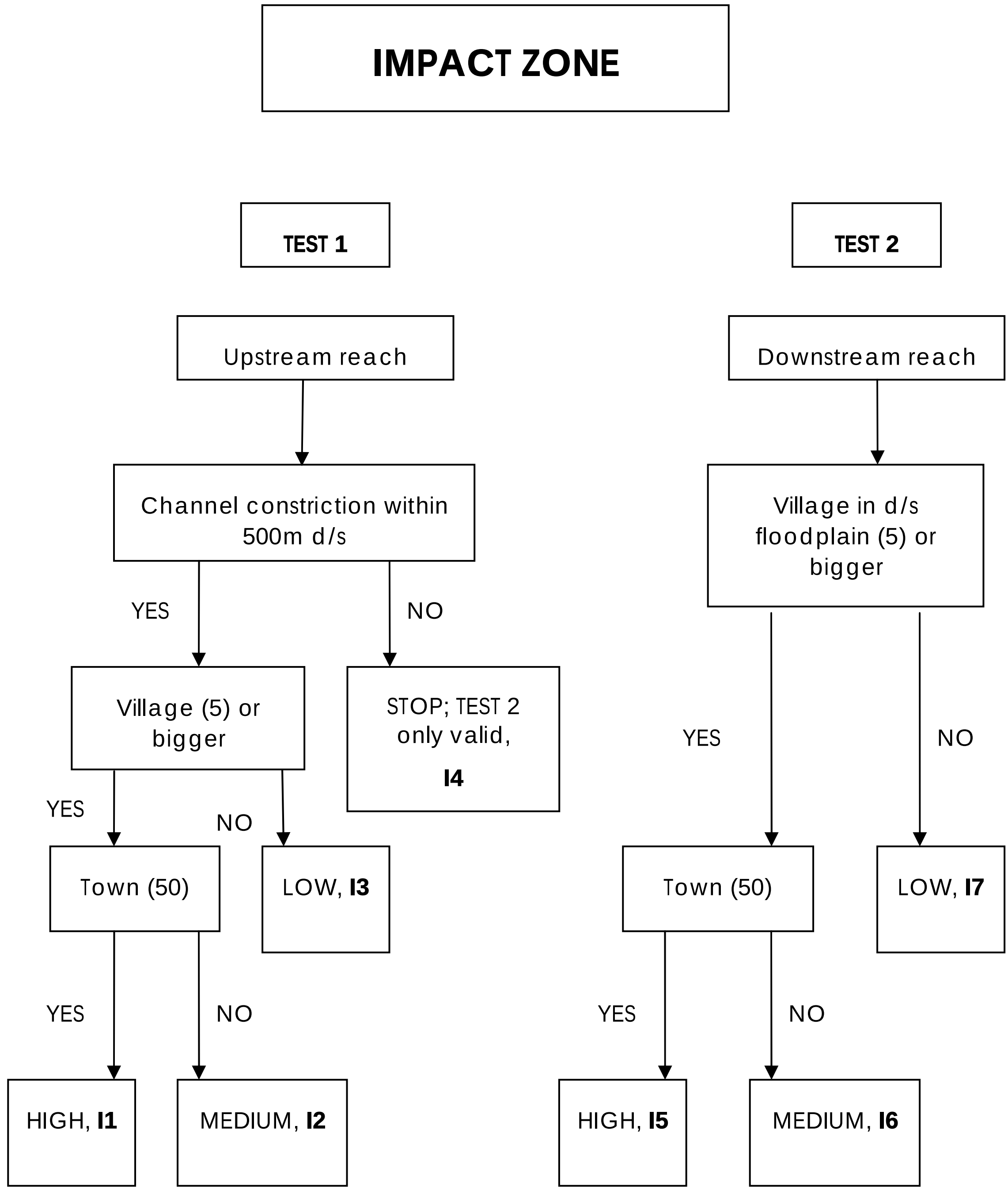
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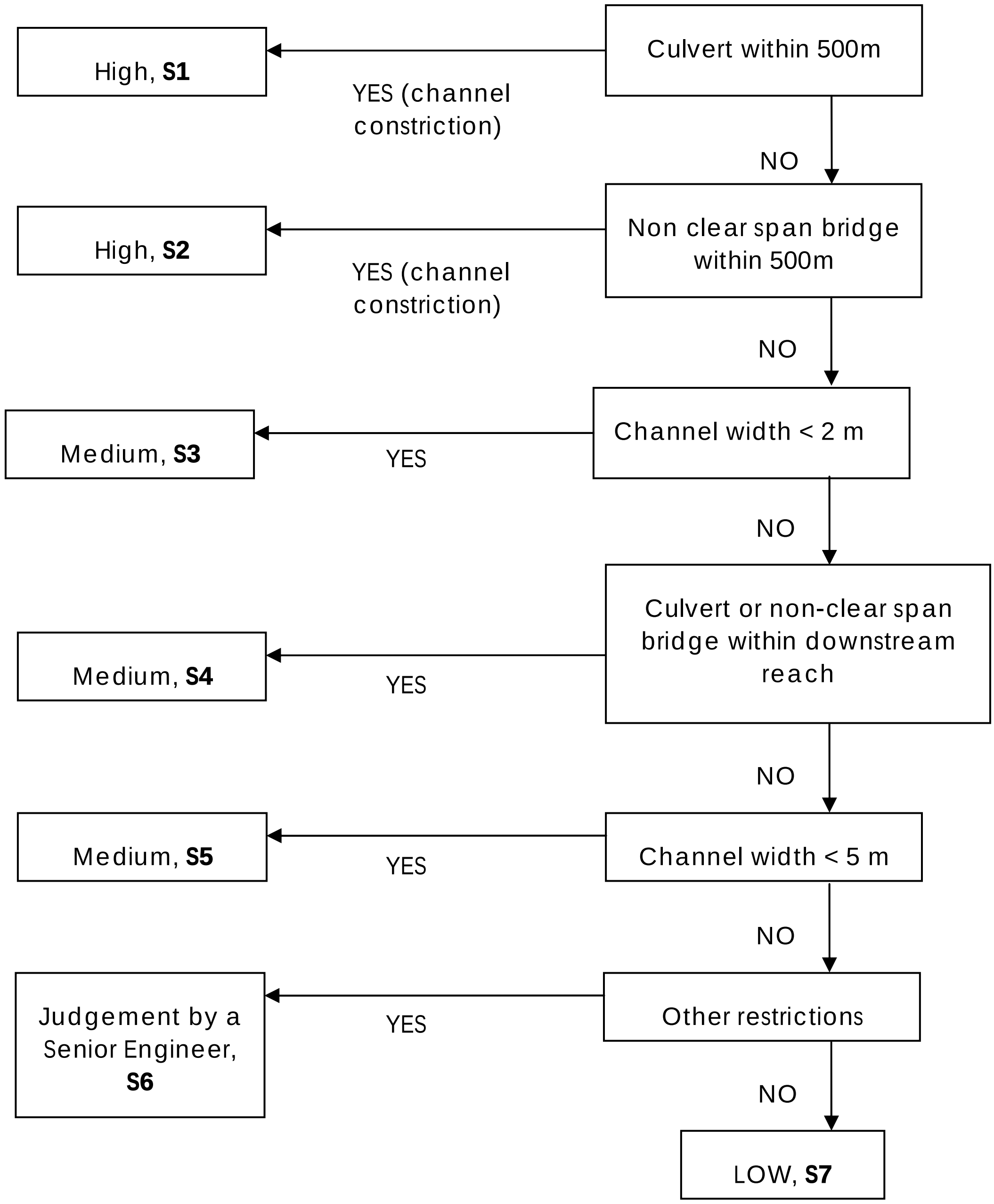
TEST 2
Upstream reach
Downstream reach
Channel constriction within 500m d/s
Village in d/s floodplain (5) or bigger
YES
NO
Village (5) or bigger
STOP; TEST 2 only valid, I4
YES
NO
Town (50)
LOW, I3
Town (50)
LOW, I7
YES
NO
HIGH, I1
MEDIUM, I2
HIGH, I5
MEDIUM, I6

SENSITIVITY OF WATER LEVELS



4.2 Appendix B Multi-Criteria Scoring

1) Sensitivity and impact assessment, the risk will be marked as followed:

- Low risk: 1
- Medium risk: 3
- High risk: 5

2) Percentage increase in flood flow due to growth:

- Flow increase between 0 and 1%: 1
- Flow increase between 1 and 3%: 2
- Flow increase between 3 and 10%: 3
- Flow increase between 10 and 20%: 4
- Flow increase greater than 20%: 5

3) Weights were given to each criterion as followed:

- Sensitivity assessment: 0.3
- Impact assessment: 0.3
- Percentage of increased flow: 0.4

UA004462- Uttlesford Water Cycle Study-FFT Calculations

1 in 2 year Peak Flows m3/s			Existing FFT		Future Total 2030 FFT		Current Total Flow with ppl growth (River Peak + FFT)		Predicted Future Total Flow (River Peak CC +		New FFT due to growth	
Site	**1 in 2**	**1 in 2 CC**	**m3/s**	**%**	**m3/s**	**%**	**m3/s**	**m3/s**	**m3/s**	**m3/s**	**%**	**% with CC**
Saffron Waldon	2.17	2.60	0.098	4.53%	0.110	4.22%	2.26	0.012	2.70	0.012	**0.51%**	**0.43%**
Great Dunmow	8.21	9.85	0.051	0.62%	0.066	0.67%	8.26	0.015	9.90	0.015	**0.18%**	**0.15%**
Takeley	2.30	2.76	0.010	0.44%	0.013	0.46%	2.31	0.003	2.77	0.003	**0.11%**	**0.09%**
Great Easton	0.50	0.60	0.020	3.94%	0.021	3.42%	0.52	0.001	0.62	0.001	**0.15%**	**0.13%**
Newport	5.42	6.50	0.017	0.31%	0.022	0.34%	5.44	0.005	6.52	0.005	**0.09%**	**0.07%**
Stansted Mountfitchet	5.49	6.59	0.054	0.98%	0.060	0.91%	5.54	0.006	6.64	0.006	**0.12%**	**0.10%**
Great Chesterford	8.61	10.33	0.019	0.22%	0.020	0.19%	8.62	0.001	10.35	0.001	**0.02%**	**0.01%**

Statistical Method

Site	**QMED**	**QMED CC**
Saffron Waldon	2.17	2.60
Great Dunmow	8.21	9.85
Takeley	2.30	2.76
Great Easton	0.50	0.60
Newport	5.42	6.50
Stansted Mountfitchet	5.49	6.59
Great Chesterford	8.61	10.33

Multi-Criteria Scoring (Halcrow, 2009)

Percentage increase in flood flow due to growth:		**Risk Score**	
Flow increase between 0 and 1%:	**1**	**1**	Low
Flow increase between 1 and 3%:	**2**		
Flow increase between 3 and 10%:	**3**	**3**	Medium
Flow increase between 10 and 20%:	**4**		
Flow increase greater than 20%:	**5**	**5**	High

UA004462- Uttlesford Water Cycle Study- Site Scoring

WwTW	Receiving Watercourse	Existing Flow	Increase in Flow	Percentage of Increased flow		Sensitivity		Impact		Total Risk Value (various weightings used)			Combined
		(m³/s)	(m³/s)	Percentage	Risk Value	Assessment	Risk Value	Assessment	Risk Value	Sensitivity 0.3	Impact 0.3	Water Levels 0.4	Risk Score
Saffron Waldon	Madgate Slade/ Kings Slade	0.10	0.012	0.51%	1	Medium	3	Low	1	0.9	0.3	0.4	**1.6**
Great Dunmow	Tributary of River Chelmer, Ash (	0.05	0.015	0.18%	1	Medium	3	Low	1	0.9	0.3	0.4	**1.6**
Takeley	Pincey Brook	0.01	0.003	0.11%	1	High	5	Low	1	1.5	0.3	0.4	**2.2**
Great Easton	Tributary of River Chelmer	0.02	0.001	0.15%	1	Medium	3	Medium	3	0.9	0.9	0.4	**2.2**
Newport	River Cam	0.02	0.005	0.09%	1	Medium	3	Medium	3	0.9	0.9	0.4	**2.2**
Stansted Mountfitchet	Stansted Brook	0.05	0.006	0.12%	1	Medium	3	Low	1	0.9	0.3	0.4	**1.6**
Great Chesterford	River Cam	0.02	0.001	0.02%	1	Medium	3	Low	1	0.9	0.3	0.4	**1.6**

The colour coding used is red for a combined risk value greater than 3, amber greater than 2.5 and green for less than 2.5.

Appendix E

Water Quality Calculations

WFD Assessment Datasheet

Catchment	**Newport STW**
Date	08.05.2012
Receiving Water	River Cam
WFD Waterbody ID	GB105033037520
Upstream Sample Point	none
Downstream Sample Point	27M03

STW Permit limits

Variable	Unit	Limit	Statistic
DWF	m3/day	**738**	-
BOD	mg/l	**20**	95 %ile
Ammonia	mg/l	**10**	95 %ile
Phosphate	mg/l	**-**	AA

Post-growth DWF - m3/day

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**24192**	**3456**	**Q95** river flow. Estmated using Low Flows Enterprise, August 2009.
BOD	mg/l	**0.86**	**0.52**	No monitoring data upstream of discharge. Assume mid-High status quality for all parameters.
Ammonia	mg/l	**0.09**	**0.05**	
Phosphate	mg/l	**0.025**	**0.025**	

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**923**	**308**	Based on current (AMP5) DWF of 738 m3/day
Post-growth Flow	m3/day	**0**	**0**	
BOD	mg/l	**5.2**	**2.68**	01.01.2009 to 27.02.2012 (last step change)
Ammonia	mg/l	**1.27**	**0.96**	01.01.2010 to 27.02.2012 (last step change)
Phosphate	mg/l	**4.72**	**0.91**	12.12.2006 to 25.03.2009 (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**3.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Bad	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for River Cam (waterbody GB1050033037520)

No Deterioration
RBMP status (based on 2006-2008 data at sample point 27M03):
BOD - High
Ammonia - High
Phosphate - Bad
N.B. Bad status has no upper boundary, therefore to ensure 'no deterioration' in downstrean river phosphate quality, permit limits would be set to **maintain the current effluent load.**

Improve to Good Status
Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status.)

N.B. Assume mid-high status upstream for this assessment (0.025 mg/l mean, 0.025 mg/l sd)

WFD Assessment Datasheet

Catchment	**Great Chesterford STW**
Date	08.05.2012
Receiving Water	River Cam
WFD Waterbody ID	GB105033037580
Upstream Sample Point	27M04
Downstream Sample Point	27M07

STW Permit limits

Variable	Unit	Limit	Statistic
DWF	m3/day	**1284**	-
BOD	mg/l	**9**	95 %ile
Ammonia	mg/l	**5**	95 %ile
Phosphate	mg/l	**-**	AA

Post-growth DWF - m3/day

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**58752**	**9504**	**Q95** river flow. Estmated using Low Flows Enterprise, Aug 2009.
BOD	mg/l	**1.95**	**0.71**	08.03.2001 to 26.03.2007 (last step change)
Ammonia	mg/l	**0.11**	**0.07**	24.01.2000 to 26.03.2007 (no step change)
Phosphate	mg/l	**0.7**	**0.5**	Calculated following P-removal at Saffron Walden STW.

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**1605**	**535**	Based on current consented DWF of 1284 m3/day
Post-growth Flow	m3/day	**0**	**0**	
BOD	mg/l	**0.95**	**0.63**	17.04.2009 to 27.02.2021 (from last step change)
Ammonia	mg/l	**0.19**	**0.12**	24.06.2003 to 27.02.2012 (from last step change)
Phosphate	mg/l	**5.09**	**0.85**	09.02.2004 to 25.03.2009 (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**3.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Poor	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

N.B. Assume mid-Good status upstream for this assessment (0.085 mg/l mean, 0.085 mg/l sd)

Comments/Assumptions

Targets for River Cam (Waterbody GB105033037580)

No Deterioration

RBMP status (based on 2006-2008 data at sample point 27M07):

BOD - High

Ammonia - High

Phosphate - Bad

However, UWWTD P-removal scheme installed at the end of 2008 at Saffron Walden STW (a measure quoted in the RBMP) has resulted in an improvement to Poor status for Phosphate. As this measure is planned and accounted for in the RBMP, **Poor (i.e. current) status should be used as the No Deterioration target for phosphate.**

Improve to Good Status

Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status.)

WFD Assessment Datasheet

Catchment	**Saffron Walden STW**
Date	08-May-12
Receiving Water	Assume direct discharge to River Cam
WFD Waterbody ID	GB105033037580
Upstream Sample Point	27M03- R.CAM WENDONS AMBO RD.BR.B1052
Downstream Sample Point	27M04

STW Permit limits

Variable	Unit	Limit	Statistic	**Post-growth DWF - m3/day**
DWF	m3/day	**3700**	-	
BOD	mg/l	**11**	95 %ile	
Ammonia	mg/l	**3**	95 %ile	
Phosphate	mg/l	**2**	AA	as required by UWWTD

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**39916**	**8900**	**Q95** river flow.
BOD	mg/l	**1.77**	**1.43**	24.01.2000 to present (no step changes)
Ammonia	mg/l	**0.06**	**0.04**	17.02.2006 to 25.03.2010 (last time step change)
Phosphate	mg/l	**0.64**	**0.57**	17.11.2006 to 25.05.2010 (combined last 3 step changes)

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**4625**	**1542**	Based on current consented DWF of 3700 m3/day
Post-growth Flow	m3/day	**0**	**0**	
BOD	mg/l	**5.92**	**2.55**	24.01.2000 to 27.2.2012 (no step changes)
Ammonia	mg/l	**0.68**	**0.79**	07.02.2012 to 27.02.2012 (last step change)
Phosphate	mg/l	**1.03**	**0.3**	16.11.2011 to 30.2011(based OSM data only)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	RBMP Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**4.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Poor	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for River Cam (waterbody GB1050033037590)

<u>No Deterioration</u>
RBMP status (based on 2006-2008 data at sample point 27M04):
BOD - Good
Ammonia - High
Phosphate - Bad. However, UWWTD P-removal scheme was installed at the end of 2008 (a measure quoted in the RBMP) and river quality is now predicted to be Poor status.
Phosphate - Poor.

<u>Improve to Good Status</u>
Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status.)

N.B. Assume mid-Good status upstream for this assessment (0.085 mg/l mean, 0.085 mg/l sd)

WFD Assessment Datasheet

Catchment	**Felsted STW**
STW Sample Point	FELSNEW
STW Permit Number	AW2NF911
Date of Data Collation	30.05.2012
Receiving Water	Stebbing Brook/ main river chelmer downstream
WFD Waterbody ID	GB105037041190/ GB105037033950
Upstream Sample Point	CH0910 (WFD sample point for 2006, sampling now ceased).
Downstream Sample Point	CH08 (WFD sample point) in main river Chelmer, d/s of the confluence with the Stebbing Brook

STW Permit limits

Variable	Unit	Limit	Statistic	Comments/Assumptions
DWF	m3/day	**1630**	-	
BOD	mg/l	**20**	95 %ile	
Ammonia	mg/l	**10**	95 %ile	
Phosphate	mg/l	**-**	AA	

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**12110**	**2543**	**Q95** river flow. Estmated using Low Flows Enterprise, Aug 2009.
BOD	mg/l	**1.00**	**0.76**	13.01.2000 to 15.02.2007 (no step changes) sampling ceased in 2007
Ammonia	mg/l	**0.02**	**0.02**	13.01.2000 to 15.02.2007 (no step changes) sampling ceased in 2007
Phosphate	mg/l	**0.05**	**0.04**	13.01.2000 to 15.02.2007 (no step changes) sampling ceased in 2007

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**2038**	**679**	Based on current consented DWF of 1509m3/day
Post-growth Flow	m3/day			Please clearly set out in the WCS, or an Appendix, the figures used to calculate the post-growth DWF.
BOD	mg/l	**4.48**	**2.3**	16.03.2009 to 14.03.2012 (last 2 step changes)
Ammonia	mg/l	**0.36**	**0.65**	14.01.2009 to 07.03.2012 (no step change)
Phosphate	mg/l	**5.6**	**0.93**	09.12.2004 to 16.03.2009 (last step change) (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **N**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**4.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Poor	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for Pant (Waterbody GB105037041180)

Both the no deterioration and improve to good status scenarios need to be tested with the existing permitted flow and the future post-growth flow, and the results presented alongside eachother in the WCS. This is to make it clear whether the growth makes acheiving the WFD objectives any more difficult than the current permitted situation.

It would also be helpful to consider the post-growth outputs of the calculations for Great Easton and Great Dunmow as upstream quality.

No Deterioration of downstream quality

RBMP status (based on 2006-2008 data at sample point CH08, the main river Chelmer downstream of the confluence with the Stebbing Brook):
BOD - High (0.77mg/l, SD = 0.75, n=24 in 2006-2007)
Ammonia - High (0.045mg/l, SD = 0.065, n=36 in 2006-2008)
Phosphate - Poor (0.47mg/l, SD = 0.25, n=36 in 2006-2008).

Improve to Good Status

Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status). Upstream quality can be assumed as being of midpoint good status (0.085mg/l mean and 0.085mg/l SD).

WFD Assessment Datasheet

Catchment	**Great Dunmow STW**
STW Sample Point	DUNMOW
STW Permit Number	ASENF12255
Date of Data Collation	30.05.2012
Receiving Water	Chelmer
WFD Waterbody ID	GB105037033950
Upstream Sample Point	CH10 (WFD sample point)
Downstream Sample Point	CH0860 (WFD sample point, closed 2006)

STW Permit limits

Variable	Unit	Limit	Statistic	Comments/Assumptions
DWF	m3/day	**1509**	-	
BOD	mg/l	**13**	95 %ile	
Ammonia	mg/l	**20**	95 %ile	
Phosphate	mg/l	**-**	AA	

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**34773**	**7361**	**Q95** river flow. Estmated using Low Flows Enterprise, Aug 2009.
BOD	mg/l	**0.94**	**0.48**	16.02.2005 to 28.11.2007 (last step change)
Ammonia	mg/l	**0.05**	**0.05**	06.01.2000 to present (no step changes)
Phosphate	mg/l	**0.43**	**0.26**	18.10.2006 to present (from last step change)

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**1886**	**629**	Based on current consented DWF of 1509m3/day
Post-growth Flow	m3/day			Please clearly set out in the WCS, or an Appendix, the figures used to calculate the post-growth DWF. It would be helpful if the WCS could also incorporate scenarios relating to the closure of Felsted STW and the transfer of flows to Great Dunmow STW.
BOD	mg/l	**2.94**	**2.39**	25.01.2005 to 14.03.2012 (last step change)
Ammonia	mg/l	**0.38**	**0.48**	17.11.2005 to 14.03.2012 (last step change)
Phosphate	mg/l	**6.21**	**1.43**	05.04.2000 to 16.03.2009 (no step change) (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**3.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Poor	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for Chelmer (Waterbody GB105037033950)

Both the no deterioration and improve to good status scenarios need to be tested with the existing permitted flow and the future post-growth flow, and the results presented alongside eachother in the WCS. This is to make it clear whether the growth makes acheiving the WFD objectives any more difficult than the current permitted situation.

It would also be helpful to consider the post-growth outputs of the calculation for Great Easton as upstream quality.

No Deterioration of downstream quality

RBMP status (based on 2006-2008 data at sample point CH0860):
BOD - High (0.5mg/l, SD = 0.6, n=12 in 2006)
Ammonia - High (0.03mg/l, SD = 0.04, n=12 in 2006)
Phosphate - Poor (0.77mg/l, SD = 0.7, n=12 in 2006)

Improve to Good Status

Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status). Upstream quality can be assumed as being of midpoint good status (0.085mg/l mean and 0.085mg/l SD).

WFD Assessment Datasheet

Catchment	**Newport STW**
Date	08.05.2012
Receiving Water	River Cam
WFD Waterbody ID	GB105033037520
Upstream Sample Point	none
Downstream Sample Point	27M03

STW Permit limits

Variable	Unit	Limit	Statistic
DWF	m3/day	**738**	-
BOD	mg/l	**20**	95 %ile
Ammonia	mg/l	**10**	95 %ile
Phosphate	mg/l	**-**	AA

Post-growth DWF - m3/day

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**24192**	**3456**	**Q95** river flow. Estmated using Low Flows Enterprise, August 2009.
BOD	mg/l	**0.86**	**0.52**	No monitoring data upstream of discharge. Assume mid-High status quality for all parameters.
Ammonia	mg/l	**0.09**	**0.05**	
Phosphate	mg/l	**0.025**	**0.025**	

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**923**	**308**	Based on current (AMP5) DWF of 738 m3/day
Post-growth Flow	m3/day	**0**	**0**	
BOD	mg/l	**5.2**	**2.68**	01.01.2009 to 27.02.2012 (last step change)
Ammonia	mg/l	**1.27**	**0.96**	01.01.2010 to 27.02.2012 (last step change)
Phosphate	mg/l	**4.72**	**0.91**	12.12.2006 to 25.03.2009 (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**3.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Bad	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for River Cam (waterbody GB1050033037520)

No Deterioration
RBMP status (based on 2006-2008 data at sample point 27M03):
BOD - High
Ammonia - High
Phosphate - Bad
N.B. Bad status has no upper boundary, therefore to ensure 'no deterioration' in downstrean river phosphate quality, permit limits would be set to **maintain the current effluent load.**

Improve to Good Status
Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status.)

N.B. Assume mid-high status upstream for this assessment (0.025 mg/l mean, 0.025 mg/l sd)

WFD Assessment Datasheet

Catchment	**Great Easton STW**
STW Sample Point	GEASTON
STW Permit Number	ASENF10268
Date of Data Collation	30.05.2012
Receiving Water	Chelmer
WFD Waterbody ID	GB105037033950
Upstream Sample Point	CH1042 (not a WFD sample point, sampling ceased 2004)
Downstream Sample Point	CH10 (WFD sample point)

STW Permit limits

Variable	Unit	Limit	Statistic	Comments/Assumptions
DWF	m3/day	**874**	-	This flow is the new AMP5 increase in DWF, which means there is no 'headroom' available for any growth in the current permit.
BOD	mg/l	**20**	95 %ile	
Ammonia	mg/l	**6**	95 %ile	
Phosphate	mg/l	**-**	AA	

Upstream River data

Variable	Unit	Mean	SD	Comments/Assumptions
Flow	m3/day	**23874**	**4420**	**Q95** river flow. Estmated using Low Flows Enterprise, Aug 2009.
BOD	mg/l	**1.79**	**1.08**	21.11.2001 to 19.11.2004 (from last step change). Sample point not used for WFD purposes, sampling ceased in 2004.
Ammonia	mg/l	**0.03**	**0.02**	31.05.2001 to 19.11.2004 (from last step change) sampling ceased in 2004
Phosphate	mg/l	**0.09**	**0.03**	15.01.2001 to 19.11.2004 (from last step change) sampling ceased in 2004

STW discharge data

Variable	Unit	Mean	SD	Comments/Assumptions
Pre-growth Flow	m3/day	**1093**	**364**	Based on current consented DWF of 874m3/day
Post-growth Flow	m3/day			This post-growth figure must be based on the 874m3/day DWF as the baseline current flow situation. Please clearly set out in the WCS, or an Appendix, the figures used to calculate the post-growth DWF.
BOD	mg/l	**5.29**	**2.7**	13.01.2000 to 14.03.2012 (no step changes)
Ammonia	mg/l	**1**	**1.1**	17.05.2009 to 14.03.2012 (last step change)
Phosphate	mg/l	**5.92**	**1.34**	12.07.2007 to 16.03.2009 (last step change) (EA data prior to OSM)

Downstream WFD Targets

Salmonid Fishery (Y/N) ? **Y**

1. No Deterioration

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	High	**3.00**	**-**
Ammonia	High	**0.30**	**-**
Phosphate	Poor	**-**	**1.00**

2. Improve to Good Status

Variable	Status	90 %ile (mg/l)	AA (mg/l)
BOD	Good	**-**	**-**
Ammonia	Good	**-**	**-**
Phosphate	Good	**-**	**0.12**

Comments/Assumptions

Targets for Chelmer (Waterbody GB105037033950)

Both the no deterioration and improve to good status scenarios need to be tested with the existing permitted flow and the future post-growth flow, and the results presented alongside eachother in the WCS. This is to make it clear whether the growth makes acheiving the WFD objectives any more difficult than the current permitted situation.

No Deterioration of downstream quality

RBMP status (based on 2006-2008 data at sample point CH10):
BOD - High (0.77mg/l, SD = 0.75, n=24 in 2006 - 2007)
Ammonia - High (0.045mg/l, SD = 0.065, n=36 in 2006 - 2008)
Phosphate - Poor (0.47mg/l, SD = 0.25, n=36 in 2006 - 2008).

Improve to Good Status

Applies to Phosphate only (Ammonia and BOD are already at, or better than, Good status). Upstream quality can be assumed as being of midpoint good status (0.085mg/l mean and 0.085mg/l SD).

CONSENTED AND CALCULATED EXISTING AND FUTURE DRY WEATHER FLOW

Existing consent exceeded

DWF = P X G + 25%

EXISTING / **FUTURE**

		Existing DWF							New DWF							Net DWF change
		P	G (l/p/day)	I	**Consented DWF (m3/day)**	**Theoretical DWF (m3/day)**	**Measured DWF (m3/day)**	**DWF (m3/day) Calculated**	Increase in Dwellings	Occupancy rate	New P	Total P	G (l/p/day)	I	**New DWF (m3/day) calculated**	m3/day
Saffron Waldon	AWS	18,125	144	25%	**3,700**	**3,037**	**3,147**	**3,263**	**880**	2.43	2,138	20,263	144	25%	**3647**	385
Great Dunmow	AWS	9,439	144	25%	**1,509**	**1,777**	**497**	**1,699**	**1,150**	2.43	2,795	12,234	144	25%	**2202**	503
Takeley	TWUL	1,850	144	25%	**667**	-	-	**333**	**200**	2.43	486	2,336	144	25%	**420**	87
Great Easton	AWS	3,649	144	25%	**874**	**677**	**260**	**657**	**60**	2.43	146	3,795	144	25%	**683**	26
Newport	AWS	3,127	144	25%	**738**	**604**	**548**	**563**	**370**	2.43	899	4,026	144	25%	**725**	162
Stansted Mountfitchet	TWUL	9,900	144	25%	**2,650**	-	-	**1,782**	**490**	2.43	1,191	11,091	144	25%	**1996**	214
Great Chesterford	AWS	3,467	144	25%	**1,284**	**801**	**849**	**624**	**100**	2.43	243	3,710	144	25%	**668**	44
Felsted	AWS	6,469	144	25%	**1,630**	**1,328**	**1,598**	**1,164**	**43**	2.43	104	6,573	144	25%	**1183**	19

DRY WEATHER FLOW VALUES USED IN THE WCS

		Existing consented DWF used to represent the existing baseline sceanario in the WCS	**Future Post Growth DWF used in the WCS**
		Consented DWF (m3/day)	***New DWF (m3/day) calculated***
Saffron Waldon	AWS	3,700	3647
Great Dunmow	AWS	1,509	2202
Takeley	TWUL	667	420
Great Easton	AWS	874	683
Newport	AWS	738	725
Stansted Mountfitchet	TWUL	2,650	1996
Great Chesterford	AWS	1,284	668
Felsted	AWS	1,630	1183

NOTE:

The WCS uses the existing consented DWF to represent the existing present day situation.

Future flows have been calculated using the population figures provided for each WwTW catchment, plus the predicted future population post growth. The future DWF has not been added onto the consented DWF as this is not considered to represent the existing population served by each WwTW.

Biochemical oxygen demand (BOD) standards for rivers(i)				
Biochemical Oxygen Demand (mg/l)				
Type	**High**	**Good**	**Moderate**	**Poor**
1,2,4,6 and Salmonid	3	4	6	7.5
3,5 and 7	4	5	6.5	9

Ammonia standards for rivers				
Total Ammonia as nitrogen (mg/l)				
Type	**High**	**Good**	**Moderate**	**Poor**
1,2,4,and 6	0.2	0.3	0.75	1.1
3,5 and 7	0.3	0.6	1.1	2.5

Phosphorus standards for rivers				
Reactive Phosphorus standards	*Concentrations as mg/l as annual means*			
Type	**High**	**Good**	**Moderate**	**Poor**
1n	0.03	0.05	0.15	0.5
2n	0.02	0.04	0.15	0.5
3n & 4n	0.05	0.12	0.25	1

Phosphorus standards for rivers BASE DATA NOT USED				
Reactive Phosphorus standards	*Concentrations as ug/l as annual means*			
Type	**High**	**Good**	**Moderate**	**Poor**
1n	30	50	150	500
2n	20	40	150	500
3n & 4n	50	120	250	1000

Based on the worst case wastewater option and the predicted growth, the RQP tool predicts that the new discharges would have the following effect on downstream water quality, assuming the discharge were at the existing monitored physio chemical standards:

STW name	Existing consented DWF (m3/day)	Total calculated 2028 DWF (m3/day)	***Effect of Existing Consented Flow from WwTW on Downstream Water Quality***				***Effect of Future Post-growth Flow from WwTW on Downstream Water Quality***			
			Effect of No Deterioration Targets			**Effect of Good Status**	**Effect of WFD No Deterioration Targets**			**Effect of Good Status**
			BOD *(90%-ile)* mg/l	**Ammonia** *(90%-ile)* mg/l	**Phosphate** *(mean)* mg/l	**Phosphate** *(mean)* mg/l	**BOD** *(90%-ile)* mg/l	**Ammonia** *(90%-ile)* mg/l	**Phosphate** *(mean)* mg/l	**Phosphate** *(mean)* mg/l
Saffron Walden	3,700	3,647	3.79- *High*	0.29- *Good*	0.70- *Moderate*	0.23- *Good*	3.96- *High*	0.28- *High*	0.70- *Moderate*	0.23- *Good*
Great Dunmow	1,509	2,202	1.72- *High*	0.15- *High*	0.88- *Moderate*	0.56- *Moderate*	1.82- *High*	0.17- *High*	1.05- *Poor*	0.75- *Moderate*
Takeley	667	420	5.92- *Good*	1.29- *Poor*	5.85- *Poor*	3.25- *Poor*	5.29- *Good*	*1.14- Poor*	5.84- *Poor*	2.62- *Poor*
Great Easton	874	683	3.31- *High*	0.20- *High*	0.50- *Moderate*	0.50- *Moderate*	3.25- *High*	0.17- *High*	0.42- *Moderate*	0.41- *Moderate*
Newport	738	725	1.91- *High*	0.30- *Good*	0.35- *Moderate*	0.35- *Moderate*	1.91- *High*	0.30- *Good*	0.34- *Moderate*	0.34- *Moderate*
Stansted Mountfitchet	2,650	1,996	4.09- *Good*	0.63- *Good*	5.11- *Poor*	5.11- *Poor*	4.07- *Good*	0.61- *Good*	4.91- *Poor*	4.91- *Poor*
Great Chesterford	1,284	668	2.75- *High*	0.19- *High*	0.91- *Poor*	0.32- *Moderate*	2.81- *High*	0.19- *High*	0.82- *Moderate*	0.21- *Good*
Felsted	1,630	1,183	2.83- *High*	0.19- *High*	1.15- *Poor*	1.15- *Poor*	2.58- *High*	0.16- *High*	0.91- *Moderate*	0.91- *Moderate*

Table E.1 WwTW RQP downstream status results at current fully consented conditions

The RQP tool was used to calculate the indicative consent standards which would be required to ensure no deterioration in status following the full discharge.

STW name	Existing consented DWF (m3/day)	Total calculated 2028 DWF (m3/day)	*Existing Consented Flow*				*Future Post-growth Flow*			
			To Achieve WFD No Deterioration Targets			To Achieve Good Status	To Achieve WFD No Deterioration Targets			To Achieve Good Status
			BOD *(95%-ile)* mg/l	Ammonia *(95%-ile)* mg/l	Phosphate *(mean)* mg/l	Phosphate *(mean)* mg/l	BOD *(95%-ile)* mg/l	Ammonia *(95%-ile)* mg/l	Phosphate *(mean)* mg/l	Phosphate *(mean)* mg/l
Saffron Walden	3,700	3,647	11.10	2.18	3.12	0.32[1]	11.19	2.21	3.15	0.33[1]
Great Dunmow	1,509	2,202	30.33	4.15	7.90	0.53[1]	22.42	3.00	5.78	0.41[1]
Takeley	667	420	3.40	0.11[2]	1.76[2]	0.15[1]	2.50	0.35[2]	2.18[2]	0.16[1]
Great Easton	874	683	3.64	4.77	13.17	0.58[1]	3.65	5.96	16.48	0.70[1]
Newport	738	725	26.55	3.07	14.50	1.43[1]	26.99	3.11	14.67	1.46[1]
Stansted Mountfitchet	2,650	1,996	4.00	0.50	0.12	0.12[1]	3.96	0.53	0.13	0.13[1]
Great Chesterford	1,284	668	10.30	3.31	7.05	0.82[1]	15.66	5.85	12.48	1.45[1]
Felsted	1,630	1,183	15.45	2.09	4.89	0.41[1]	18.78	2.68	6.27	0.51[1]

Table E.2 WwTW RQP indicative consent results at fully consented conditions

[1] Assuming upstream improvements to Mid Good status (0.085) have been achieved discharge would have to be **0.12** mg/l SRP to achieve Good status

[2] The downstream target cannot be met without improving the upstream data to Good for phosphate (0.085). Target for ammonia cannot be met without improving the US data to High (0.20)

Additional Assessment Using the Consented Flow as the baseline

STW name	Existing consented DWF (m3/day)	Total calculated 2031 DWF (m3/day)	Existing Permitted Flow				Future Post-growth Flow			
			To Achieve WFD No Deterioration Targets			To Achieve Good Status	To Achieve WFD No Deterioration Targets			To Achieve Good Status
			BOD *(95%)*	Ammonia *(95%)*	Phosphate *(mean)*	Phosphate *(mean)*	BOD *(95%)*	Ammonia *(95%)*	Phosphate *(mean)*	Phosphate *(mean)*
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Great Dunmow	1,509	2,012	**30.33**	**4.15**	**7.90**	**0.53**	**24.09**	**3.24**	**6.22**	**0.43**
Great Easton	874	900	3.64	4.77	**13.17**	***0.58***	3.52	4.64	**12.84**	***0.50***
Newport	738	900	26.55	3.07	**14.50**	***1.43***	22.30	2.60	**12.11**	***1.15***

DWF Calculations

Great Dunmow

Consented DWF	1,509
Future Calculated DWF	503
Total	**2,012**

Great Easton

Consented DWF	874
Future Calculated DWF	26
Total	**900**

Newport

Consented DWF	738
Future Calculated DWF	162
Total	**900**

Input to RQP Tool

	Existing	Future	
Mean	1886	2515	Great Dunmow
SD	629	838	

Mean	1093	1125	Great Easton
SD	364	375	

Mean	923	1125	
SD	308	375	Newport

WwTW discharge Implications

Effect of Discharges on Downstream Water Quality

Table E1 shows the effect of the existing consented flow and the future post growth flow from the WwTW on water quality downstream i.e. the predicted water quality downstream of the WwTW discharge location.

At **Saffron Walden** the assessment indicates that BOD and Ammonia are high assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is moderate for the existing permitted flow and the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality improves to good for Phosphate.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW.

At **Great Dunmow** the assessment indicates that BOD and Ammonia are High assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is moderate for the existing permitted flow and poor for the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality improves to moderate for Phosphate post growth.

As the predicted future DWF is higher than the existing consented flow the future growth makes does result in the WFD objectives being more difficult to achieve than the current permitted situation. This highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW

At **Takeley** the assessment indicates that BOD is good assuming no deterioration targets downstream for both the existing consented flow and post development flow. Ammonia is poor assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is poor for the existing permitted flow and the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality remains poor for Phosphate.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, the results indicate that the WwTW is having a negative impact on downstream water quality as Ammonia and Phosphate results are classified as poor.

At **Great Easton** the assessment indicates that BOD and Ammonia are High assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is moderate for the existing permitted flow and the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality remains moderate for Phosphate.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW to make good status achievable for phosphate.

At **Newport** the assessment indicates that BOD and Ammonia are High assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is moderate for the existing permitted flow and the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality remains moderate for Phosphate.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW to make good status achievable for phosphate.

At **Stansted Mountfitchet** the assessment indicates that BOD and Ammonia are good assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is poor for the existing permitted flow and moderate for the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality improves to moderate for Phosphate under the post development sceanario.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW if good status objectives are to be achieved for Phosphate in the catchment.

At **Great Chesteford** the assessment indicates that BOD and Ammonia are High assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is poor for the existing permitted flow and moderate for the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality improves to good for Phosphate under the post development scenario.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW. Development in the catchment will not prevent good status being achieved for phosphate.

At **Felsted** the assessment indicates that BOD and Ammonia are High assuming no deterioration targets downstream for both the existing consented flow and post development flow. Assuming no deterioration targets Phosphate is poor for the existing permitted flow and moderate for the post growth flow. Assuming good mid point values upstream and a good downstream target downstream the downstream water quality improves to moderate for Phosphate under the post development scenario.

As the predicted future DWF is lower than the existing consented flow the future growth makes does not result in the WFD objectives being more difficult to achieve than the current permitted situation. However, this highlights the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW. Development in the catchment will not results in phosphate moving away from poor status.

In general the results in Table E1 highlights that BOD and Ammonia are at Good or High. However, the results highlight the importance of AWS working to improve the concentrations of SRP in the effluent discharges of upstream WwTW in all of the catchments, and on-going strategies to engage all upstream stakeholders in targeting diffuse pollution.

Given the small difference between the current DWF consent, and the worst case DWF by 2028; the results of the RQP modelling for the increased DWF at all WwTW produce results similar to the current consented condition. It can therefore be concluded that the increase from the proposed growth in the study area **will not** make achieving the requirements of the WFD significantly more difficult than the current consented position.

At Takeley the existing consented flow and future flow post growth are predicted to result in 'Poor' quality downstream of the WwTW for ammonia and phosphate. In addition, the downstream targets for ammonia and phosphate could not be met at Takeley WwTW without improving the upstream conditions. In the RQP calculations the upstream conditions were improved to 0.20 (High) for ammonia and 0.085 (Good) for phosphate. The results indicated that efforts should be focused to improve upstream water quality at Takeley. Drainage of Wastewater to Bishops Stortford via Canfield Pumping station may mitigate this issue but the implications of draining wastewater via Takeley, as set out above, should be considered.

The capacity of the WwTW is a key constraint in Great Dunmow. AWS predict that development could exceed the current process capacity, and could require a new volumetric discharge consent to be negotiated with the EA. In order to address this, AWS are planning to upgrade the process capacity at Great Dunmow WwTW at the end of AMP 5 (2014/15), to accommodate a DWF of 2,200 m^3/day; a 46% increase on the existing DWF consent.

Part of the flow from Great Dunmow is currently being transferred to Felsted WwTW. The population numbers provided by AWS are for the existing population served by Great Dunmow WwTW and do not take into account this transfer.

AWS have advised that the transferred flows vary and the calculations should be based on the consented figures. The WCS has therefore concluded that discharging the future DWF from Great Dunmow WwTW to the River Chelmer could be more constrained by WFD water quality requirements than the current consented position. The level of constraint depends on the timing of future upgrades, the processes to be employed, and the volume of flows that are transferred to Felsted in the future.

Indicative Discharge Consent Standards Required

The calculations show that that SRP concentration required to bring the downstream quality 'up to good status' is within the levels that could be currently achieved by enhanced operation of conventional processes at Great Easton, Newport and Great Chesterford (although, as these WwTW do not currently employ phosphorus stripping methods, significant investment may be required to provide the required processes).

The results presented in Table E2 indicate that the SRP concentration required to bring the downstream quality 'up to good status' is beyond the levels currently generally considered to be reliably economically achievable using conventional technology at Saffron Walden, Great Dunmow, Takeley and Stansted Mountfitchet.

Given the small difference between the current DWF consent, and the worst case DWF by 2028; the results of the RQP modelling for the increased DWF at all WwTW produce results similar to the current consented condition. It can therefore be concluded that the increase from the proposed growth in the study area **will not** make achieving the requirements of the WFD significantly more difficult than the current consented position.

At Takeley the existing consented flow and future flow post growth are predicted to result in 'Poor' quality downstream of the WwTW for ammonia and phosphate. In addition, the

downstream targets for ammonia and phosphate could not be met at Takeley WwTW without improving the upstream conditions. In the RQP calculations the upstream conditions were improved to 0.20 (High) for ammonia and 0.085 (Good) for phosphate. The results indicated that efforts should be focused to improve upstream water quality at Takeley. Drainage of Wastewater to Bishops Stortford via Canfield Pumping station may mitigate this issue but the implications of draining wastewater via Takeley, as set out above, should be considered.

The capacity of the WwTW is a key constraint in Great Dunmow. AWS predict that development could exceed the current process capacity, and could require a new volumetric discharge consent to be negotiated with the EA. In order to address this, AWS are planning to upgrade the process capacity at Great Dunmow WwTW at the end of AMP 5 (2014/15), to accommodate a DWF of 2,200 m^3/day; a 46% increase on the existing DWF consent.

Part of the flow from Great Dunmow is currently being transferred to Felsted WwTW. The population numbers provided by AWS are for the existing population served by Great Dunmow WwTW and do not take into account this transfer.

AWS have advised that the transferred flows vary and the calculations should be based on the consented figures. The WCS has therefore concluded that discharging the future DWF from Great Dunmow WwTW to the River Chelmer could be more constrained by WFD water quality requirements than the current consented position. The level of constraint depends on the timing of future upgrades, the processes to be employed, and the volume of flows that are transferred to Felsted in the future.

Appendix F

Grey water & Rainwater Harvesting Techniques

Domestic level rainwater harvesting

Domestic level RWH would involve the installation of a rainwater tank for each property (preferably at basement level or buried in the garden) to collect filtered rainwater from the roof drainage.

It is anticipated that the filtration would be in two stages; a 'first flush' system on the guttering downpipe to exclude any debris which may accumulate during a dry period, followed by a filter with a maximum particle size of < 1.25 mm prior to the inlet to the tank. BSI 8515:2009 states that such a filter provides suitable quality for toilet flushing and laundry in most residential situations.

This filtered and settled rainwater is then pumped from the tank back into the house for use in the toilet and washing machine; hence requiring the inlets of these fittings to be connected to internal non-potable plumbing, separate to other potable water plumbing in the house.

High level design using the 'intermediate approach' from BSI 8515:2009, assuming an occupancy rate of 2.43, implies a tank size of approximately 1,600 l. For costing purposes, a domestic RWH system of this specification has been assumed to have a provision and install cost of approximately £2,000 per house, assuming a mass discount for the developer broadly in line with EA estimates[i].

The UK Climate Projections (2009)[ii] medium emissions scenario predicts that by 2050, the decrease in summer rainfall in the study area is unlikely to be less than 30%. Based on historic data from the gauging station at Arkesden, this would result in average total rainfall for June, July and August decreasing from 228 mm to 160 mm.

It is estimated that a 3,000 l tank would therefore be required for each house to ensure that potable water from the mains is not required to augment non-potable supplies from RWH in the future. The WCS has assumed a cost of £2,500 for such a system, i.e. £8M for all the allocated and additional properties in the study area.

The treatment of rainwater, greywater or black water to potable standards, at a domestic level, has not been considered due to the current public health and regulatory concerns associated with this.

District level rainwater harvesting (potable/ non-potable)

An alternative option for capturing and using local water resources would be the collection of rainwater via a separate drainage network, treatment at a local centre, and then return via a dedicated network if non-potable (or integration with the incoming potable supply to the area).

Centralised treatment and distribution allows better management of technical risks and future process upgrades than domestic level systems, and eradicates the risk that homeowners may let their domestic systems deteriorate, until the failsafe connection of potable water replaces any non-potable supply from their RWH. However, centralised treatment lacks the educational and behavioural change benefits of domestic level RWH, as the association between local rainfall and household water use is less clear to occupants.

There would be a favourable comparison between the potential yield of rainwater from roofs if harvested at the domestic level, and the non-potable demand within the new efficient homes. This roof drainage could be conveyed to a neighbourhood treatment works near the proposed sites, but this would then require pumping for both collection, and then subsequent resupply. Given that the proposed sites within each settlement are often separated by existing properties, this may only be economically viable for large individual sites.

To ensure a reliable supply, and protect against any pollution which may jeopardise the treatment process, a separate piped network would be needed to convey the rainwater from the roofs, reducing the opportunity for integrating SuDS throughout the developments, and the associated water quality and biodiversity benefits. If such an option were proposed, opportunities should be explored to use any surplus rainwater collected to supply local agricultural users, and educational initiatives/ projects within the study area.

Domestic level greywater recycling

Domestic level GWR would involve the installation of a self-contained storage and treatment unit for each property. This system would collect and treat water drained from showers, baths and wash/ hand basins, and then pump this supply of non-potable water for use in toilets and washing machines.

Greywater must be collected separately to wastewater from the toilets or kitchen sink (high levels of grease and food particles make this unsuitable for local recycling). As with RWH, the GWR must be returned to the toilet and washing machine via non-potable plumbing, separate to other potable water plumbing in the house.

The higher biological content of greywater as opposed to rainwater means that long term storage should be avoided, to reduce the risk of bacterial growth. It is assumed that a GWR unit would be sized to treat and store a volume of water equivalent to the daily non-potable demand, and a separate header tank would not be used (the unit would store the required volume to allow better control of quality). Any additional greywater collected would overflow to the conventional wastewater sewers serving the house.

Package systems exist for the domestic markets which utilise a combination of filtration, chemical/ UV disinfection or biological processes to achieve the required treatment.

The EA estimate[iii] that a package MBR GWR system unit would typically cost £3,000 to supply and install i.e. £10M for all the allocated and additional properties in the study area. Developer discounts for mass purchases may not be as apparent as for RWH systems, due to the integrated nature of package systems, more specialised installation, and the smaller marketplace for components.

In addition, the treatment used in GWR systems can be susceptible to shock changes in chemical and biological loading from changes in user behaviour. BS8525-1:2010 gives the example of wash basins in the bathroom being used for hair colouring, or disinfection of cotton nappies, as potential problems if treatment processes are not sufficiently robust. It can therefore be concluded that domestic GWR is more sensitive than domestic RWH in terms of the behavioural changes demanded from occupiers.

Domestic GWR for non-potable use reduces the volume of wastewater received at the WwTW, by around 31 l/p/d, which theoretically allows more properties to be served within the same hydraulic capacity and volumetric discharge consent. However, the wastewater received by the WwTW will be proportionately stronger, as it will be less diluted. The WwTW process will still have to remove the same mass of pollutants to achieve the consent standards (as per Section 10), so savings in terms of process energy are negligible.

District level greywater recycling (potable/ non-potable)

As with District level RWH, this potential solution offers the benefit of centralised control of treatment and redistribution, but incurs the additional costs of providing a separate collection network (and a separate resupply network if only non-potable use is proposed).

Whilst theoretically this option allows more properties to be connected to a WwTW within a given hydraulic capacity and volumetric discharge consent; the same concerns apply as above. A future change in the consenting philosophy of the EA would be required to allow any real advantage, in terms of the numbers of properties which could be accommodated by such a system.

As discussed in above, 67 l/p/d of greywater may be available from the new dwellings. Assuming 90% efficiency in collection, treatment and resupply equates to a possible resource of 60 l/p/d. This exceeds the projected non-potable demand in the proposed houses by 100%; hence there would be no requirement for approximately half of the water collected. Additional separate greywater and distribution networks (with pumping) would be required to collect the greywater and redistribute the non-potable water; with no discernible benefit in water savings versus a domestic GWR system.

Therefore, greywater must be treated and returned as potable water to show any improvement in water efficiency over the domestic RWH or GWR options. This would likely require the installation of an MBR followed by chemical disinfection, and would be unlikely to be economically viable at present on all but the largest of proposed sites.

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[i] Environment Agency, *Assessing the cost of compliance with the code for sustainable homes,* 2007

[ii] Department for Environment Food and Rural Affairs, *UK Climate Projections , East of England - Summer Precipitation – Medium emissions map*, 2009

[iii] Environment Agency, *Greywater for domestic users: an information guide,* 2011

BRE Tool Sensitivity Test

Due to the nature of available plans for the proposed development areas within Uttlesford it has not been possible to measure roof areas to inform the water efficiency calculations. Therefore, an average roof area of 70m² has been used in the calculations, the roof area is based on a typical 3 bedroom Barrett Homes house.

The plans were detailed enough at the villages of Little Canfied and Great Chesterford to calculate the plan roof areas. The average roof size for Little Canfied was 66m² and the average size for Great Chesterford was 51m². However, it is considered that the value of 70m² is suitable for the use in the assessment and a series of sensitivity calculations have been undertaken to test the parameters of the BRE tool.

Roof Area

The below calculations show the variation in daily rainwater collection for different sizes of roof.

- 60m² = 77 litres
- 70m² = 89 litres
- 80m² = 102 litres

The test shows that an increase/decrease in area of 10 m² results in a **difference of about 12 litres.** The test shows that an increase/decrease in area of 20 m² results in a **difference of about 25 litres.**

Rainfall

Inputting different rainfall parameters but leaving all other parameters the same (*collection area 70m², yield coefficient 0.80 and filter efficiency 0.90*).

- 547 mm/yr = 75 litres
- 647 mm/yr = 89 litres (actual data from Arkesden gauge)
- 747mm/yr = 103 litres

The test shows that an increase/decrease in rainfall of 100mm results in a **difference of about 13 litres.** The test shows that an increase/decrease in rainfall of 200mm results in a **difference of about 28 litres.**

Coefficients

Final check was to test the yield coefficient (the loss of volume from rainfall through to stored run-off from wetting of the surface), by keeping all other parameters the same (*collection area 70m², rainfall 647mm and filter efficiency 0.90*) and altering the yield coefficient to 0.7 resulted in the daily rainwater collection reducing to 78 litres (**difference of 11 litres** when compared to using a yield coefficient of 0.8).

Conclusion

All of the parameters used in the BRE water efficiency calculator seem equally sensitive to changes. Due to the relative uncertainty in the other parameters and due to the unavailability of detailed plans at this stage there is sufficient justification for using an average roof area of 70m².