East Suffolk Water Abstractors Group

Review of Irrigation Demand and Supply 2014

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1.0 REPORT SUMMARY

This report builds on the '2013 ESWAG Water Strategy' produced by Cranfield University. In contrast to the Cranfield University report, this review uses local abstraction returns rather than national data sets to calculate a supply and demand forecast for spray irrigation in the ESWAG area for the next 35 years.

Abstraction demand in the short term (up to 2030) is extrapolated from recent local data (adjusted for climatic variations). This shows an increasing trend of 2.3% per annum in contrast to the national (England and Wales) data, which shows a decline of 1.4%. Long term demand (to 2050) is calculated using the Cranfield University methodology and shows a forecast increase of between 42% and 167% on existing abstraction rates, depending on prevailing socio-economic conditions.

The volume of water authorised for abstraction has remained largely stable for the past 13 years at about 14,856 Ml/a. This masks a slight reduction in direct summer abstraction licences and a comparable increase in reservoir storage abstractions which now account for 18% of SI licences.

Current annual abstraction demand for spray irrigation in the ESWAG area is about 6,225 Ml/a (2012 figures adjusted for seasonal variation). This is comfortably within the authorised licensed abstraction volumes. At the forecast growth rate of 2.3%, abstraction demand continues to remain within authorised volumes until beyond 2050, although localised supply and demand deficits are likely to become more pronounced over this period.

Abstraction demand in dry years requires further investigation. Estimates, using a gross water balance methodology (adapted from Environment Agency work on justification of demand) indicate that the design dry year demand could currently be as high as 22,500 Ml. This is not dissimilar to the Cranfield University estimate (based on the Irriguide model) of 17,000 Ml/a. Although these rates of abstraction are unlikely to be realised due to on farm economics and operational constraints, they provide an indication of the potential maximum SI demand in the catchment. This significantly exceeds the licensed supply.

This review does not extend to a detailed analysis of the potential impact of drought, however, it is clear that extended periods of dry weather will become more frequent as a result of climate change. Although the Environment Agency is moving away from the use of S.57 drought restrictions, it is likely that licences will increasingly become restricted by individual flow cessation conditions which will potentially restrict abstraction when it is most needed. Drought represents a major threat to irrigated crop production in the area and further investigation into its potential economic impact and the costs and benefits of mitigation strategies (such as reservoir construction) is recommended.

Although future water resource regulation and SI licences will be impacted by both the Water Framework Directive (WFD) and Abstraction Reform, the overall supply of water (abstraction licences) is likely to remain largely unchanged. The Abstraction Reform process is, however, likely to rely in part on historic consumption data as a means of assessing reasonable requirements for the new permits so it is important that ESWAG can provide evidence to justify the high headroom required for dry years.

Although no additional water is available for direct summer abstraction, significant resources are still available at high flows for reservoir storage.

2.0 Background and Purpose of The Review

Water resources in East Anglia are under increasing pressure with irrigation users in competition for water, both from other abstractors and environmental demands. These pressures are likely to increase in the foreseeable future as a result population growth and climate change. The regulatory framework provides a further challenge, with the Environment Agency subject to stringent Water Framework Directive (WFD) obligations and abstraction licence holders subject to uncertainties arising from the Government's ongoing Abstraction Reform (AR) programme.

In the context of this challenging environment this review of irrigation supply and demand aims to:

- Justify the demand for abstraction for irrigation in the ESWAG area both now and up to 35 years in the future.
- Identify potential surpluses and deficits in supply, helping ESWAG develop strategies to meet future abstraction requirements.
- Identify knowledge gaps and prioritise areas for further investigation

3.0 Limitations

This review is based on abstraction data for the East Suffolk CAMS as a whole. Individual use patterns, based on local operational decisions and constraints along with 'on farm' economics, are not accounted for. Supply and demand forecasts are also based on the assumption that water can be supplied to the areas of demand within the East Suffolk catchment irrespective of precise geographical location.

The demand for UK produced irrigated crops is influenced a wide range of factors relating to supply and demand both in the UK and overseas. Although an attempt has been made to address these factors in Cranfield University's long term forecasts, sensitivity analysis shows that even minor economic changes can have significant impacts on the forecast long term irrigation demand.

4.0 Irrigation Demand Forecast

4.1 Demand Forecast Overview

Irrigation demand in East Suffolk has been estimated using two methodologies:

- The short term forecast (to 2030) is calculated using trends (regression analysis) based on recent local abstraction data.
- The Long term forecast (to 2050) uses industry feedback from workshops developed by Cranfield University based on socio economic demand scenarios used by the Environment Agency for Water Resources planning.

The methodology for calculating the short term demand forecast differs from the 2013 ESWAG Water Resource Strategy, because rather than using abstraction returns for the whole of England and Wales, data relates to East Suffolk only. Unlike the national data set which forecasts a significant decline in abstraction (1.4%/year) for the next 15 years, abstraction returns for East Suffolk show an increase (adjusted for annual climatic variations) of 2.3%/year. (See S 4.3).

This increase is consistent with anecdotal evidence from growers in the area and also with the trends predicted by the long term forecast.

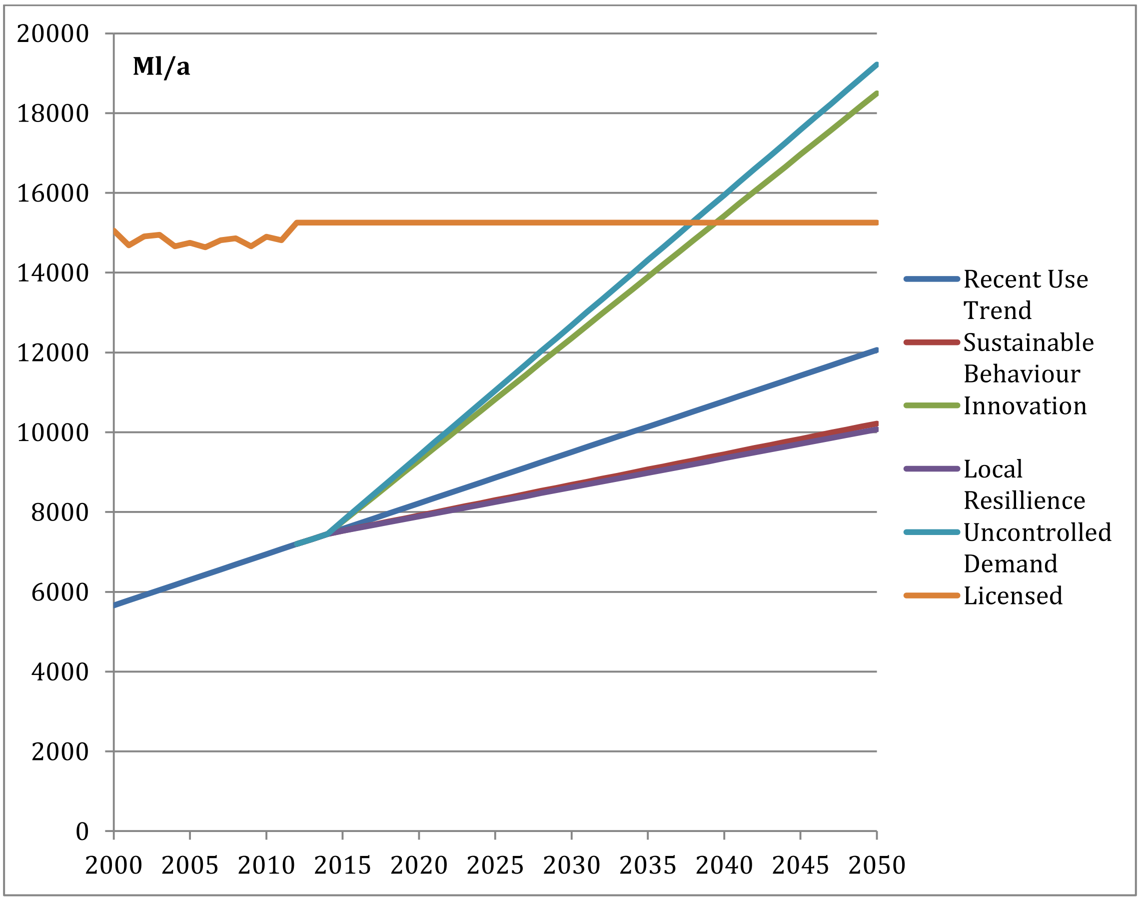

Figure 1. Forecast Irrigation Abstraction Demand (E Suffolk 2000 - 2050)

4.2 Long Term Forecast (2050)

The long term demand forecast remains unchanged from that calculated for 2013 Water Strategy. It uses the methodology adopted by Knox et al (2013) based on the four socio-economic scenarios developed by the EA for their Water Resource Strategy (EA, 2008) but with rates of change modelled using independent industry feedback provided at stakeholder workshops. The modelled rate of increase in demand for spray irrigation by 2050 for each of the scenarios is set out below:

- Sustainable behaviour 42%
- Innovation 157%
- Local Resilience 40%
- Uncontrolled Demand 167%

4.3 Short Term Forecast (2030)

The short term forecast is based on the assumption that the recent local abstraction trend is a reasonably accurate indicator of irrigation demand for the next 10 to 15 years. This trend is calculated using spray irrigation abstraction returns for the East Suffolk LEAP (Local Environmental Action Plan) area from the Environment Agency's 'Abstat' database. The East Suffolk LEAP area is almost identical to the East Suffolk CAMS area and provides a continuous record of abstraction from 1999 to the present (2012)[1]. Regression analysis of the raw data shows that there is an upward trend in abstraction of 36% over the whole period, equivalent to an increase of 2.8%/year.

The volume of water authorised (licensed) for abstraction has remained relatively stable, with a small decline (of about 4%) from 1999 to 2007/08 reflecting the continued downward pressure on direct abstraction licences and a small increase in recent years reflecting the increase in new reservoir storage licences.

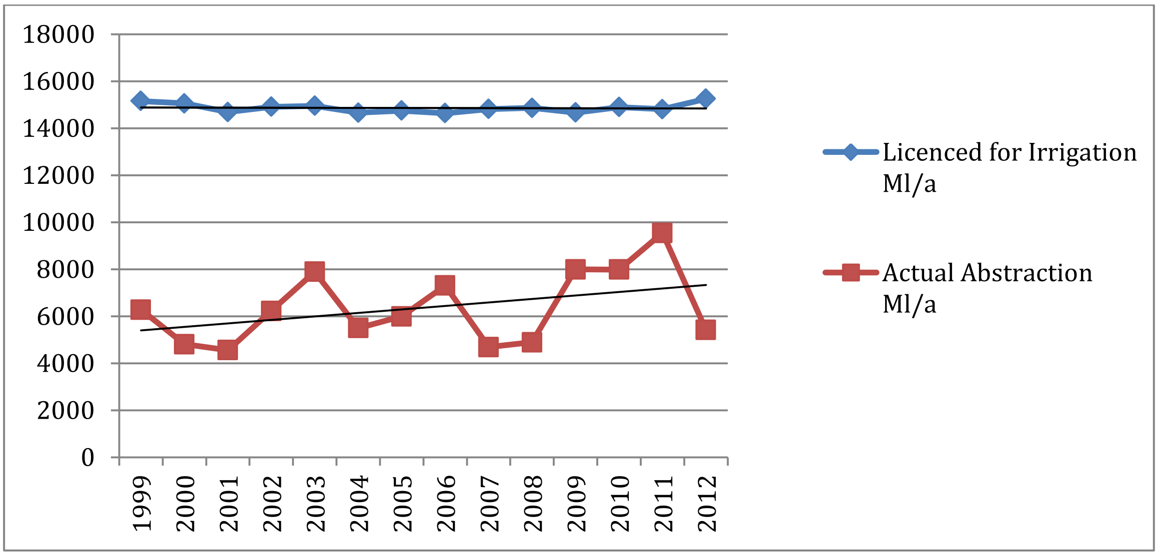

Figure 2. Actual and Licensed SI Abstraction (E Suffolk 1999 - 2012)

4.4 Adjustment for Annual Climatic Variation

Irrigation use in any one year is a function of the following two factors:

- Planned demand, determined by the grower on the basis of area planted, crop type, local agro-climatic conditions and soil type.
- Actual crop water demand, largely determined by climatic conditions occurring during that particular growing season.

Annual variations in abstraction volume caused by short term climatic fluctuations obscure the underlying trends in planned demand, so, the abstraction returns have been adjusted to account for and remove this 'noise'.

[1] Abstraction data is available over a longer period but, returns prior to 1999 cover a different area and are not directly comparable.

The Environment Agency has identified that there is a good correlation between the volume of water abstracted for irrigation and summer rainfall (May to August). (Pers com. P Bradford - P. Willett 2013). This is illustrated in Figure 3 below, which shows, unsurprisingly, that as summer rainfall increases, irrigation in East Suffolk declines. Rainfall data for this period is therefore used to adjust historic abstraction for climatic variations.

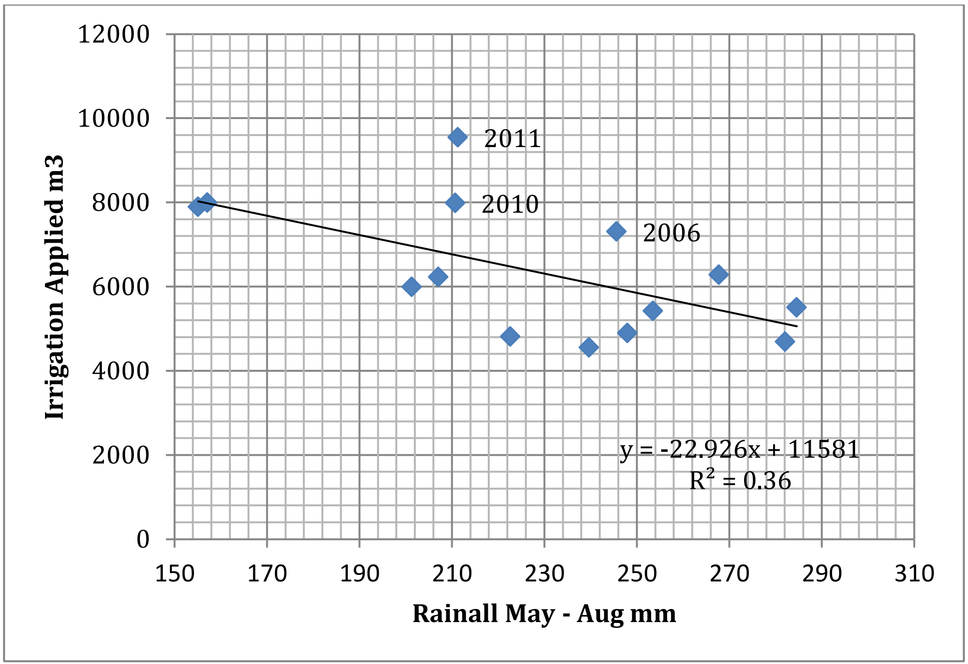

Figure 3. Summer Rainfall vs Abstraction (E Suffolk 1999 -2012)

Using the relationship between summer rainfall and abstraction it is possible to estimate the expected irrigation in any one year given its summer rainfall. The abstraction data can then be adjusted for climatic fluctuations by comparing ‘expected’ and ‘actual’ irrigation in any one year. The difference between ‘expected’ and ‘actual’ irrigation (summed with the mean actual irrigation value for the period) is shown in Figure 4, overleaf. This provides the adjusted demand for irrigation irrespective of short term climatic fluctuations. Over the 13 year record of abstraction the adjusted demand shows an increase of 30.2%, equivalent to a growth of 2.3 %/year. This trend is used to forecast the short term (15 years) increase in irrigation demand.

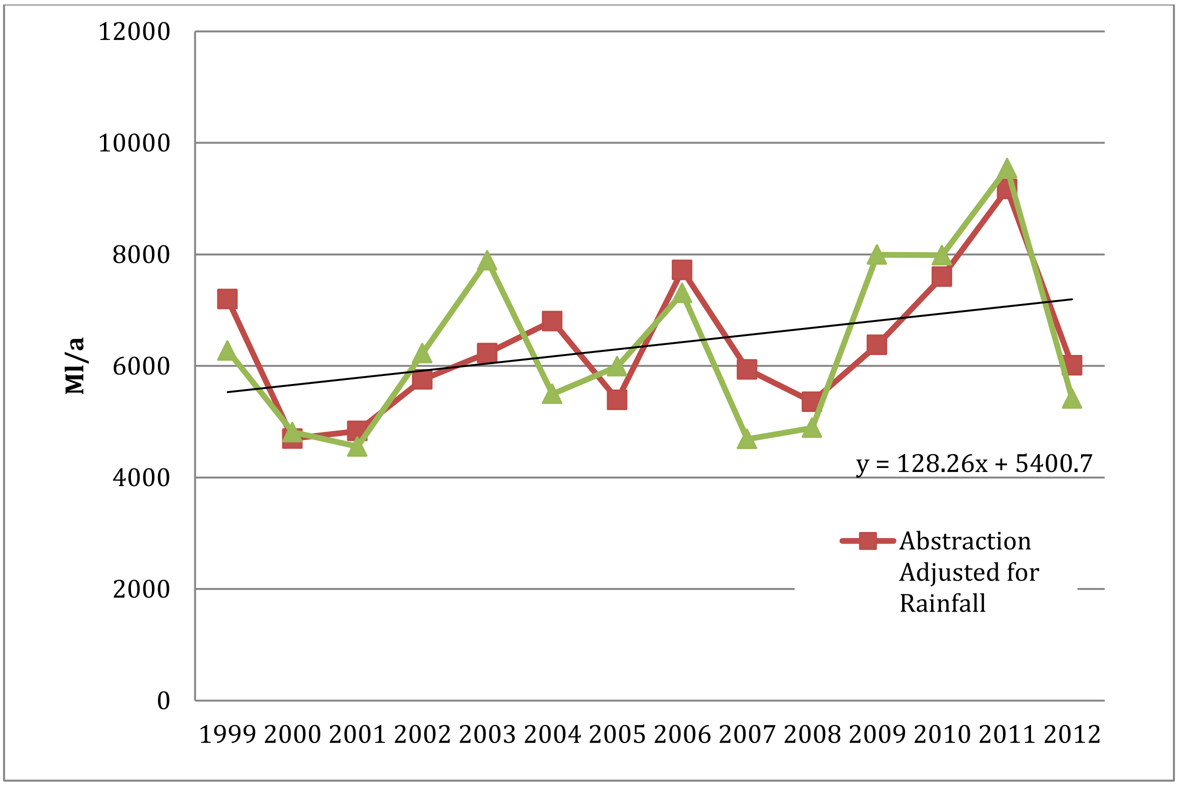

Figure 4. Irrigation Adjusted for Rainfall (E Suffolk 1999 - 2012)

Although this method produces reasonable results, it incorporates a number of limitations, potentially affecting its accuracy:

- Antecedent soil moisture conditions are not considered. This affects irrigation demand from the start of the irrigation season.
- Rainfall patterns are not considered. Regular low intensity rainfall will generate a different response to occasional summer storm events.
- The effects of ET are not considered. Irrigation demand will be suppressed in low ET conditions even if rainfall is low.
- A significant and increasing proportion (18%) of abstraction in East Suffolk is derived from stored water. Part of this is likely to be taken in the year following the demand.

In an average year, the short term forecast suggests that abstraction volumes remain comfortably within existing licenced volumes to well beyond 2050. Even in the highest socio economic growth scenario, abstraction in an average year remains within licensed volumes until 2037.

4.5 Dry Year Demand

Irrigation systems (reservoirs, equipment, abstraction licences, etc.) are planned to provide sufficient water for a 'design dry year'. The industry generally defines this as a year when the unconstrained demand has an 80% probability of non-exceedance. This would provide adequate water for 80 years in 100 (or 4 years in 5) but the grower would have to under-irrigate in the other 20% of drier years. This level of planned headroom is considerably lower than accepted by most industries (water companies for example plan for the 99th driest year in 100) and the Environment Agency assesses spray irrigation licence applications on the 19th driest year in 20 demand (1:20 return period).

Average summer rainfall (May to August) in East Suffolk between 1999 and 2012 was 228mm, (significantly wetter than the long term average of 199mm). During this period licence holders abstracted about 43% of their licensed quantity. Dry year demand would obviously be expected to be significantly higher than this.

Dry year irrigation demand is estimated by adapting a methodology under development by the Environment Agency for assessing the reasonable requirements of licence holders based on past use at specific summer rainfall, annual return periods. (P Willett, Environment Agency, 2013).

Met Office data collated by the Environment Agency for Suffolk (from 1914 to 2012) shows that the average summer (May to August) precipitation is 199mm. Summer rainfall for the 1:5 return period design dry year is 180mm and for the 1:20 return period, 130 mm. Dry year, summer rainfall return periods are shown in Figure 5 below.

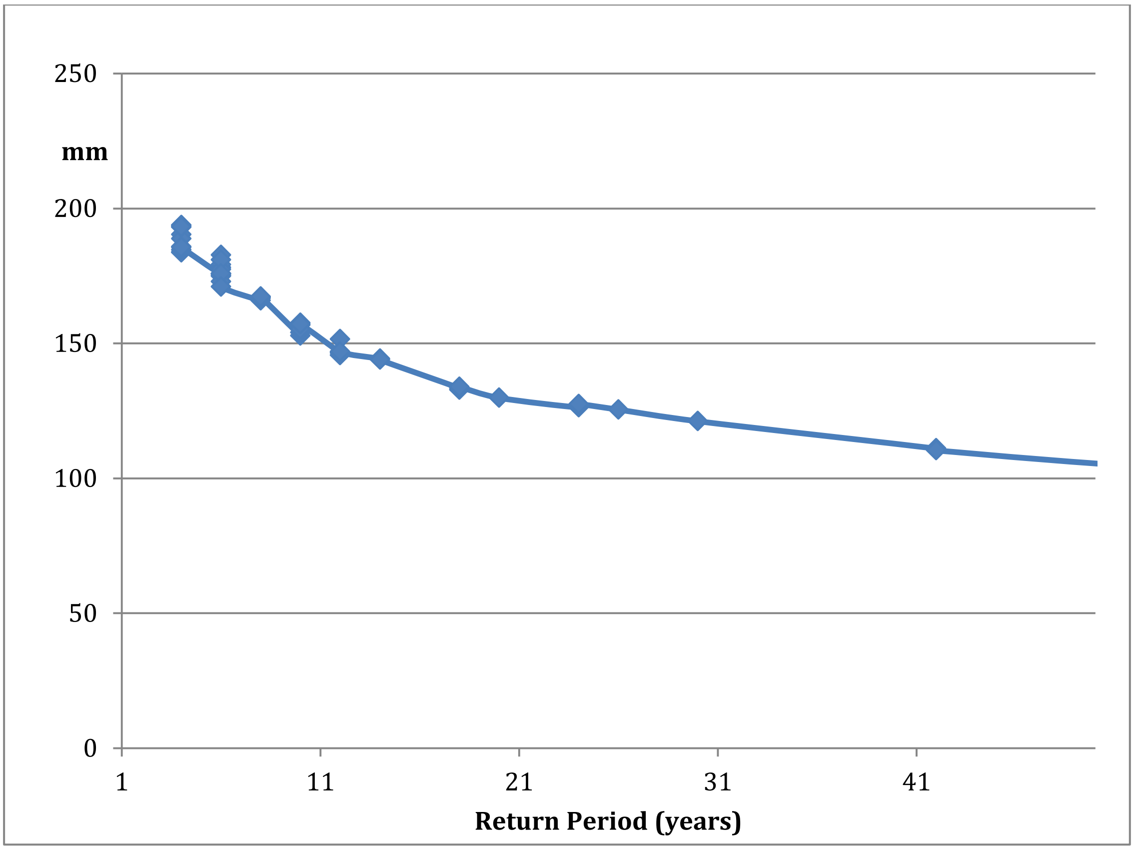

Figure 5. Dry Year Summer Rainfall Return Periods

Average summer rainfall during the period of irrigation records (1999 - 2012) was 228 mm, significantly wetter than the long term average. Much of East Suffolk lies in Agro climatic zone 7 on light sandy soils with a low Available Water Content AWC where the typical summer crop water requirement is 250mm. The crop water deficit in the sample period was therefore 22mm. It is assumed that irrigation was used to make up this deficit. The summer rainfall in a 1:5 return period dry year is 180mm. Assuming that the crop requires 250mm, this gives a crop water deficit of 70mm. The ratio between the mean deficit in the (wet) sample period and the 1:5 dry year is 22:70 or 313%. This gives us the potential uplift on the recent and predicted abstraction trend which would be required in a 1:5 year return period, dry year. This would give a maximum dry year current irrigation demand of 22,500 Ml/a in the East Suffolk catchment (based on 2012 irrigation figures adjusted for rainfall). It is unlikely, however, that actual demand would reach this level for the reasons set out below.

- Most growers are unlikely to have the staff or equipment required to provide irrigation to the required dry year level.
- The methodology assumes that irrigators have not over-abstracted in the recent wetter years.

Analysis of individual abstraction returns shows that these issues are real. A significant number of irrigators already choose to use a large proportion (up to 80%) of their abstraction licence, even in wet to average rainfall years. These growers would not, therefore, have the licence capacity available to increase irrigation to the required level in the design dry year. This will be a rational economic decision based on the cost of holding 'spare' irrigation capacity, including staff and equipment, for use in the event of a dry year against the potential losses associated with under irrigating in these years.

Further potentials error is introduced by the following technical assumptions:

- The methodology uses summer rainfall as an indicator of potential crop water deficit. This is unlikely to fully represent field conditions for the reasons set out earlier (section 3.4).
- Demand estimates are based on an average irrigated crop water requirement of 250mm across the whole East Suffolk area. The actual distribution of crops and soil types is likely to have a different mean requirement.

In practice, the increase in abstraction demand in a dry year is likely to be significantly lower than predicted by the 3.1 ratio (22,500 Ml/a). This figure is, however, not incompatible with the maximum theoretical demand of 17,000 Ml/a calculated by Cranfield University using the Irriguide model which uses existing datasets of land use, soils and agro-climatic zones. The figure therefore provides an indication of upper limit of the potential dry year requirement. This is important for the following reasons:

- The dry year demand significantly exceeds the volume currently licensed for abstraction (see Section 5.0, Supply Demand Balance, below). This is the case even if the increase required for a dry year is limited to only twice average current abstraction rates.
- The Government's Abstraction Reform process is likely to consider recent historic use as an indicator of future licence requirements. Recent years have been wet and irrigation use will have been significantly lower than dry year demand.

Due to the uncertainties involved and the significance of the dry year demand, we recommend that further investigation is carried out into this area.

4.6 Spatial Distribution of Demand

The use of irrigation in the ESWAG area is currently limited in geographical extent to the light sandy soils to the East of the catchment. This is because these soils are suitable for growing high value, irrigated root crops unlike the heavier soils to the west which are more suitable for cereal production. Although, under some socio economic scenarios, cereal irrigation could become commercially viable, this would be limited to growers with existing irrigation systems because the low marginal benefits of irrigating cereals is unlikely to be offset by the high capital cost of installing a new irrigation system. The demand for new irrigation is likely therefore to remain concentrated on the sands and sandy loams of to the East of the Catchment shown in figure 6 below.

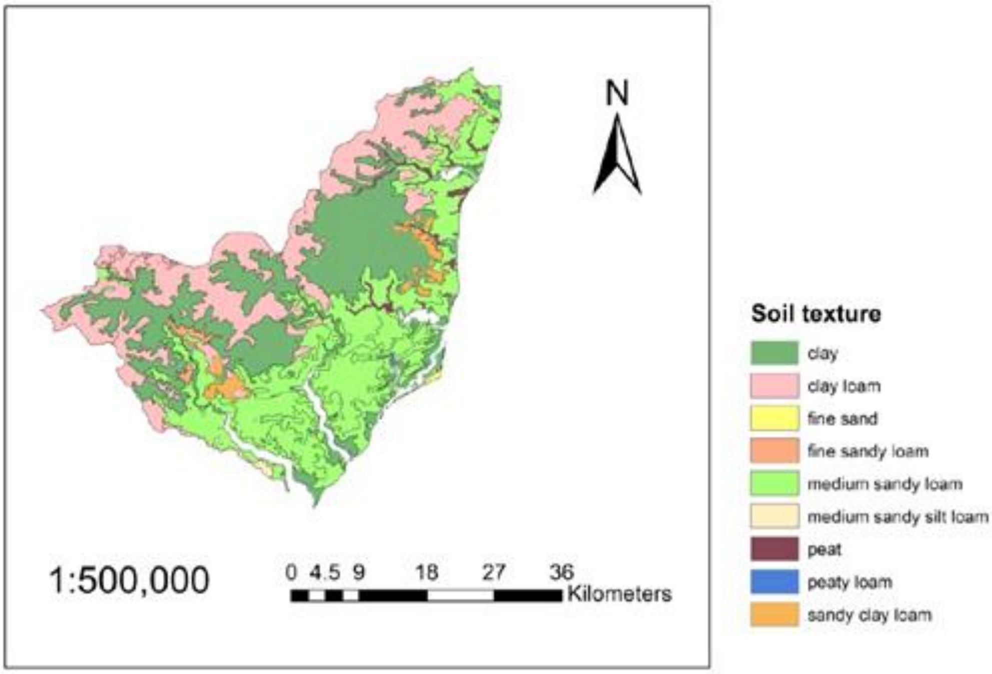

Figure 6. Spatial Variation in Soil Texture in East Suffolk (NSRI, 2013, Hosea 2013)

On a farm scale, the spatial distribution of licences (supply) and abstraction demand is significant. Abstraction licences are authorised for a fixed location so demand can only be met if, i), the licence is adjacent to the point of abstraction or, ii), the water can be moved (piped) to the area of demand. In practice, it is often not economically feasible to move the water to the point of demand and as a result localised supply demand deficits result in the suppression of potential demand.

5.0 Irrigation Supply Forecast

5.1 Supply Forecast Overview

The supply of water is determined by the availability of abstraction licences. Figure 7, overleaf, shows that this has remained relatively stable in East Suffolk for the past 15 years at approximately 15,000 Ml/a. The slight decline from 1999 to 2009 reflects the downward pressure on licences exerted by environmental concerns (particularly Habitats Regulations). The increase in recent years reflects the introduction of new winter storage licences.

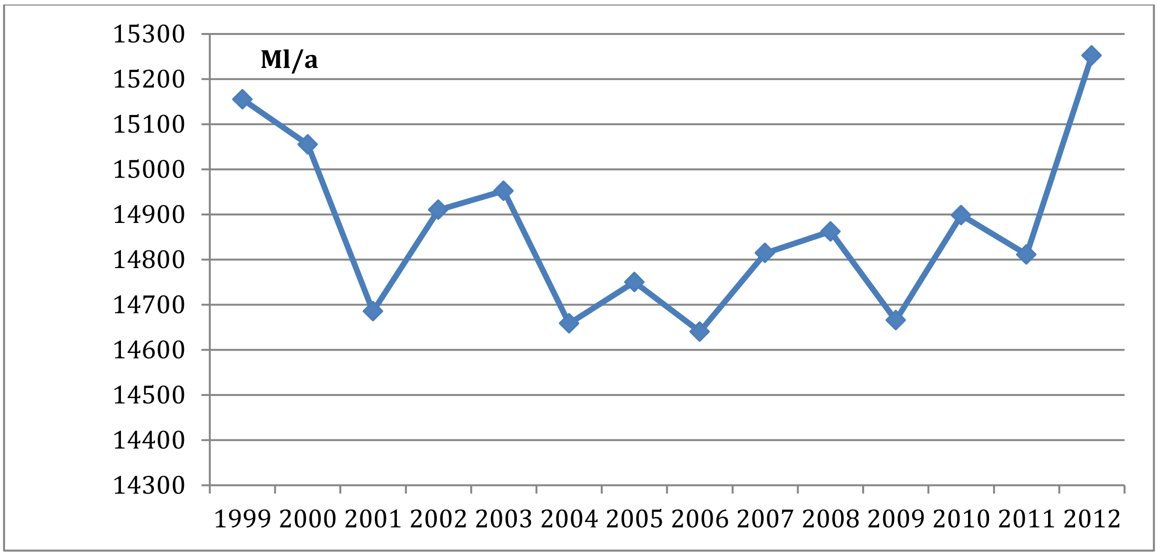

Figure 7. Licensed SI Abstraction Volume (East Suffolk)

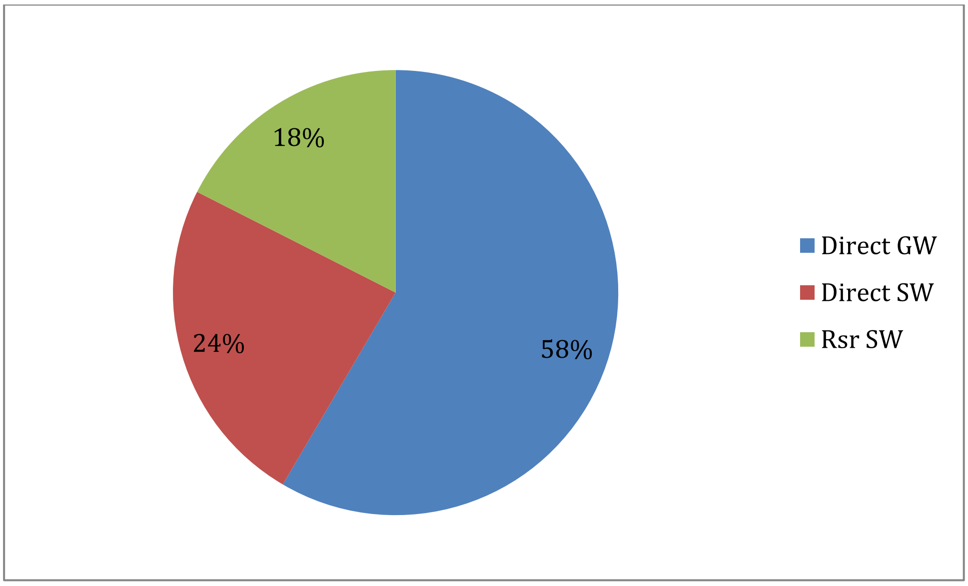

Figure 8. Volumetric Distribution of Abstraction Licences by Source (E Suffolk)

Figure 8, above, shows that although the volume of water licensed for storage for SI abstraction has increased recently the majority of water licensed (82%) is still for direct abstraction.

5.2 Potential Licence Restrictions

In recent years a limited number of abstraction licences in the area were reduced or restricted as a result of the Habitats Directive Review of Consents. This process is now complete and the Environment Agency has not given notice of any further licence reductions required as a result of the Review of Consents. The regulatory framework however remains uncertain with abstraction licences likely to be subject to further consideration under both the Water Framework Directive (WFD) and the Government's Abstraction Reform (AR) programme.

5.2.1 *Water Framework Directive*

The WFD obliges the Environment Agency to ensure that:

- There is no deterioration in the ecological status of water bodies.
- All water bodies reach 'Good Ecological Status' by 2027.

Any future restrictions on supply are likely to be focussed on water bodies where there is a risk that low flows could result in the Environment Agency failing to meet its WFD obligations.

The Environment Agency's WFD assessment of water bodies in East Suffolk shows that whilst a number fail for reasons relating to water quality, morphology or biology, only one (the River Deben) fails due to low flows. The Environment Agency has been aware of this issue for a number of years and has constructed river support boreholes which successfully alleviate the problem. Whilst new licences for direct summer abstraction would not be issued, the efficacy of the Deben support boreholes means that existing abstractions are unlikely to be targeted for reduction in the foreseeable future.

In addition to identifying water bodies that are actually failing, the Environment Agency has assessed water bodies for the risk of failure as a result of abstraction (June 2013). This assessment found that none of the water bodies in East Suffolk were at 'high risk' of deterioration and only one; the Bucklesham Mill River, was at 'medium risk'. Six other water bodies were considered to be at 'low risk' of deterioration. Public water supply licences in the Bucklesham Mill River are currently subject to review which is likely to alleviate this issue.

Fourteen water bodies were assessed as being at medium risk of not meeting 'good ecological status by 2027'. These were predominantly small Crag fed streams but also included some upper river tributaries. A full list of East Suffolk WFD water bodies and their risk category is set out in appendix 1.

Because none of the water bodies in East Suffolk (with the exception of the Deben) fail or are at high risk of WFD failure due to low flows, it is unlikely that licences in the catchment will be targeted for reduction prior to the CAMS 'Common End Date' (licence renewal date) in 2026. At this date, reductions may be imposed on abstraction licences in water bodies at greatest risk, however, recent experience shows that the Environment Agency's preferred method for implementing restrictions is to introduce them as flow cessation (hands off flow) conditions rather than quantity reductions. The Environment Agency is also likely to seek the voluntary revocation of unreliable direct summer abstractions in favour of storage licences in 'at risk' water bodies.

5.2.2 *Abstraction Reform*

The Government is currently working on a programme of reforms to the abstraction licensing system. Although still under review, it appears likely that existing licences will be re-issued (where they are sustainable) as abstraction permits. Permit quantities are likely to be based on recent historic abstraction volumes. Again, whilst timescales have not been confirmed, Defra has indicated that this programme is likely to be implemented over the next 10 to 20 years.

Because recent actual abstraction volumes are likely to be used to assess quantities for the new permits, it is important that ESWAG spray irrigators continue to protect their interests by presenting clear evidence to show that the 'dry year' abstraction demand is significantly greater than the average recent historic demand.

Licences which have not been used or where only a small fraction of the authorised abstraction has been used, will be most at risk of non-issue under the reform process. These 'sleeper licences' are relatively rare. The 2013 CAMS (RAM) ledger for East Suffolk shows that only 37 of the 296 SI licenses issued in the catchment consistently submit a zero return. These licences only account for about 6% of the total volume licenced.

It is unlikely that the Environment Agency will 'call in' licences in East Suffolk for review before the CAMS common end date (2026) unless they are demonstrably causing significant environmental damage. Similarly, the abstraction reform process is unlikely to have significant impacts on licences until the mid 2020's. Even at this date, given the recent downward trend in the volume of direct abstraction licences, the fact that there are no WFD sites at 'high risk' due to low flows and there are only a limited number of sleeper licences in the catchment, it is considered unlikely that the volume of water licensed for direct abstraction will be reduced by more than 10%. The impact of this estimated reduction in supply is shown in Fig 9. below.

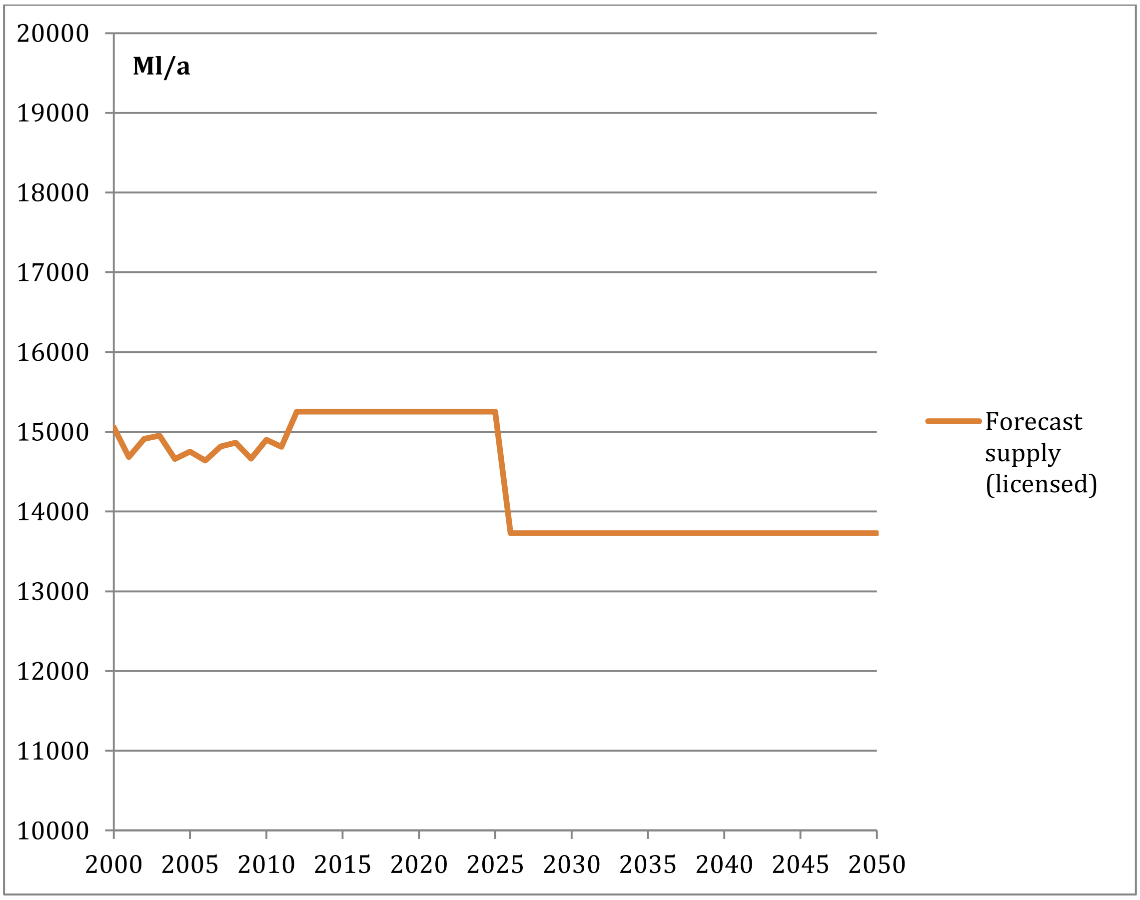

Figure 9. Forecast Supply (SI licenced volume).

5.3 Drought

The Water Resources Act 1991, S.57, allows the Environment Agency to restrict spray irrigation abstractions during periods of drought. Water for other purposes, including reservoir stored irrigation water, is exempt from restrictions. Surface water SI abstractions are at most risk but restrictions can also be applied to groundwater abstractions if the water environment is considered to be at risk. Although the Environment Agency seeks to avoid implementing S57 restrictions, these measures have been applied in East Suffolk on five occasions since 1990. The potential threat of an interruption in supply is almost as damaging as restrictions themselves. This was particularly the case in 2011/12, when warnings of potential drought restrictions were issued for East Suffolk, prior to the 2012 spring planting season. Anecdotal evidence suggests that buyers were reluctant to issue contracts for irrigated crops and that as a consequence, the area planted with irrigable crops was reduced.

The Environment Agency is moving away from the use of S57 drought restrictions and instead, applying low flow (hands off) cessation conditions. This move is likely to be formalised in the abstraction reform process. In practice, these cessation conditions have a similar impact to drought restrictions and offer little added protection to irrigators.

Increased seasonal variability is a feature of climate change and it is increasingly likely that East Suffolk will experience longer and more intense droughts in the future. Although a single dry season is unlikely to cause significant problems, multiple dry seasons could result in restrictions on abstraction licences. An obvious solution is to store water during high flow periods for subsequent irrigation, however further work is required to assess the likely impact of multiple drought years on water supply and the costs and benefits of constructing storage reservoirs to cover these events.

6.0 Demand Supply Balance

Under normal conditions, there is sufficient water licensed within the East Suffolk CAMS to satisfy irrigation demand until beyond 2050 although licences may not always be located where they are required. Even under the highest socio-economic abstraction scenario (uncontrolled demand) forecast irrigation demand remains within the existing licensed supply under average year conditions until after 2030. See Figure 10 overleaf.

In dry years, the supply demand balance rapidly falls into deficit. Although it is difficult to estimate potential dry year demand, the worst case scenario shows the current potential deficit in supply to be 7,000 Ml/a. This could potentially rise to about 16,000 Ml/a by 2030 and 24,000 Ml/a by 2050. In practice, due to ‘on farm’ operational limits, dry year irrigation demand is unlikely to reach these levels, however even a conservative estimate of a 50% dry year increase causes the system to fall into deficit by 2035 and an increase of 100% causes a demand supply deficit by 2016. The impact of these deficits is likely to be initially felt as a partial reduction in some abstractors’ ability to meet full irrigation requirements in particularly dry years. This is likely to occur incrementally over a period of years and may allow abstractors to plan their operations and licences to meet this demand.

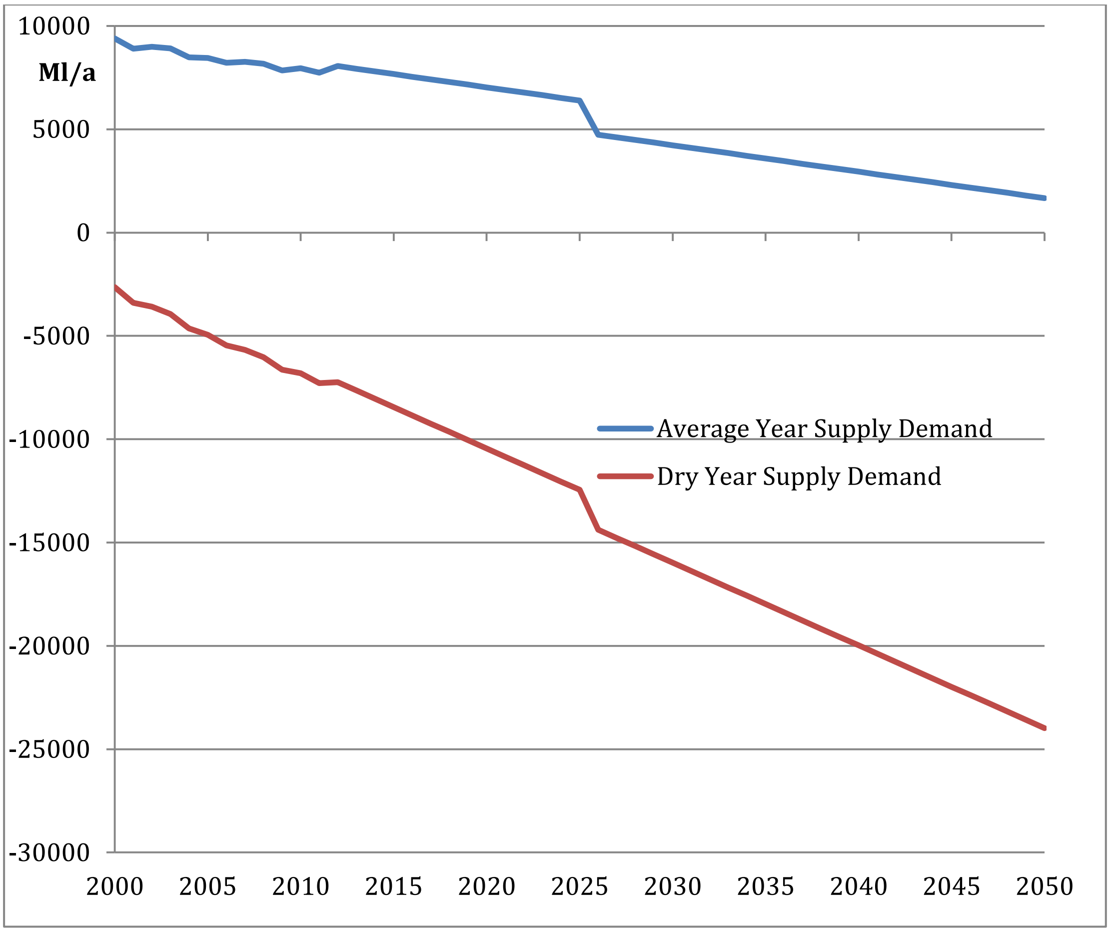

Figure 10. SI. Abstraction Supply Demand Balance 2000 to 2050.

Multiple year droughts present a more serious threat. Abstraction restrictions, either as a result of Section 57 restrictions or licence cessation conditions are likely to significantly curtail abstraction rates. These are likely to come into effect with only a few months warning and may afford insufficient time for irrigators to change their operational practices or to develop drought mitigations measures, leaving them vulnerable to significant financial risk.

7.0 Options for Maintaining the Supply Demand Balance

Alongside traditional reservoir construction, ESWAG members should consider other imaginative, and often lower cost, options, such as Aquifer Storage and Recovery (ASR) and making use of existing river support schemes. In the longer term, however, it is likely that larger, capital intensive, collaborative schemes will be required to meet future demand.

Increased Supply (quantity and reliability) strategies.		
Low Cost	Licence variation to extend 'winter only' abstractions to 'all year' with 'hands off flow' conditions.	Increases period available for abstraction and likelihood of complete fill. Requires licence variation approval by the Environment Agency
	Re-activate unused or partially used licences • Reconfigure existing licences (to maximise flexibility) • Apportionments (succession) • Trade	Re-configuring licences is mainly open to holdings with multiple licences with abstraction conditions. Whilst the Government promotes water trading, environmental considerations may mean that movement of water from one source to another may be restricted in the ESWAG area.
Medium Cost	Negotiate use of existing EA/Water Co. river support schemes, to support agriculture	A number of ESWAG water courses (Deben, Alde, Waveney) are supported by EA operated borehole discharges, operated for environmental purposes. There are precedents in the Region for negotiating river support for agricultural abstraction to allow additional quantities or mitigation against S.57 drought restrictions.
	Re-active unused/partially used licences (apportionment with water transfer/pipe)	The facility to transfer (pipe) water from one source to another, would allow trade in areas where environmental considerations prevent the relocation of abstraction. (Possibly high cost)
	Extend on-farm water distribution systems (pipelines) to maximise licence availability	Appropriate for holdings using multiple licences, particularly reservoir storage or 'hands off flow 'conditioned licences
	Aquifer storage and recovery (ASR). Abstraction and storage of high flows in Crag or Chalk aquifer for subsequent re-abstraction and use	ASR could provide a cost effective mechanism for water storage and limited water transfer. It could also boost environmental flows. The technology is widely used by Thames Water (London) but is unproven in the ESWAG area.
	Inter farm water transfer (pipes)	Constructed either with or without additional storage, inter farm transfers would allow maximum use of unused capacity.
High Cost	Reservoir construction (for new irrigation capacity or to allow multiple year storage). Either single farm or multiple ownership reservoirs with associated water transfer infrastructure (pipes)	Multiple ownership farm reservoirs are likely to be more cost effective per/m3 water stored. If combined with other features (eg. Flood risk management/environmental enhancements) reservoirs are more likely to attract external funding (eg. RDPE, Holistic Water Management or LEP funding).

Many of the options to increase supply, outlined above, provide opportunities for additional environmental services such as flood protection and environmental enhancements. There are a number of stakeholders in East Suffolk (eg. the Holistic Water Management project, led by the Environment Agency/Suffolk County Council) who are keen to work with farming groups to develop joint schemes along these lines.

7.1 Resource Availability

The Environment Agency CAMS for East Suffolk shows that there is a significant surplus resource (up to 60,000 Ml/a) available at high flows, from the main rivers within the catchment (with the exception of the Bucklesham Mill River) see Appendix 2 -Resource Availability Table.

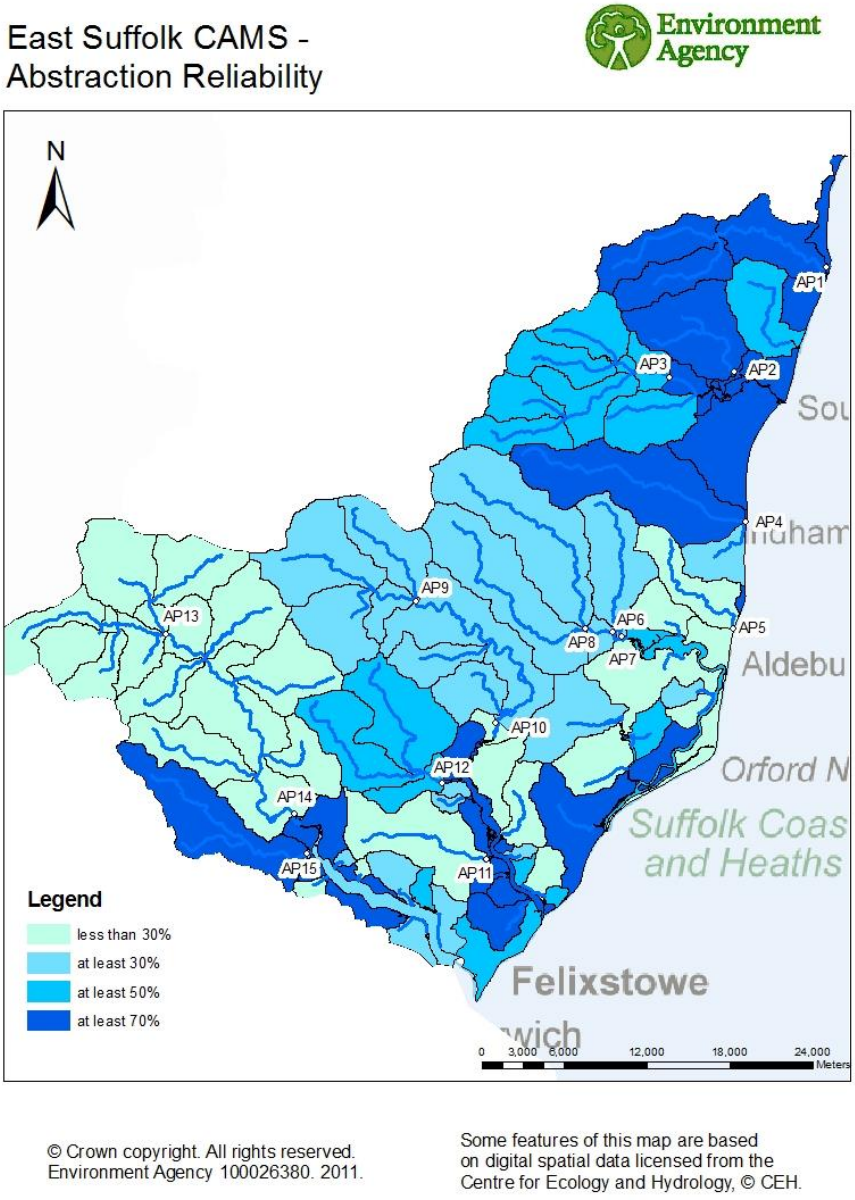

Figure 11. East Suffolk Water Availability

Much of this resource would, however only be available at very high flows and most of the larger rivers become tidal, and therefore unsuitable for irrigation, as they cross the irrigable light land. Further resources are available at high flows from the smaller Crag tributaries feeding the Estuaries. Although this resource is closer to the area of greatest demand, volumes are often limited and licence applications are generally subject to Habitats Regulations (SPA) appropriate assessment. A further resource is the drainage water discharged to tide by the IDB pumps to the south and north of the tidal Deben, at Shingle Street and at Aldeburgh. These sources are currently under investigation as part of the Holistic Water Management project.

Appendix 1. WFD Water Body Risk Assessment

Water Body Name	Water body number	Risk of Deterioration - BAU 2027	Risk of not supporting GES - 2027
Tang	GB105035040160	No Risk	Medium Risk
Tributary of Butley River	GB105035040170	No Risk	Low Risk
Alde and Ore (Tidal)	GB105035040180	No Risk	Low Risk
Butley River	GB105035040190	No Risk	Low Risk
King's Fleet	GB105035040200	No Risk	No Risk
Deben (Tidal)	GB105035040240	No Risk	No Risk
Deben (Tidal)	GB105035040250	No Risk	No Risk
Deben (Tidal)	GB105035040260	No Risk	Medium Risk
Deben (Tidal)	GB105035040270	No Risk	Low Risk
Bucklesham Mill River	GB105035040280	Medium Risk	Medium Risk
Shottisham Mill River	GB105035040290	No Risk	Medium Risk
Lark/Fynn	GB105035040300	No Risk	No Risk
Somersham Watercourse	GB105035040310	No Risk	Medium Risk
Tributary of Gipping	GB105035040320	Low Risk	Medium Risk
Fynn	GB105035040330	No Risk	Medium Risk
Tributary of Deben	GB105035040340	No Risk	No Risk
Wattisham Watercourse	GB105035040350	No Risk	No Risk
Lark	GB105035040360	No Risk	No Risk
Tributary of Deben	GB105035040370	No Risk	No Risk
Tributary of Deben	GB105035040370	No Risk	No Risk
Orwell (Tidal)	GB105035040380	No Risk	No Risk
Orwell (Tidal)	GB105035040390	No Risk	Low Risk
Orwell (Tidal)	GB105035040400	No Risk	Medium Risk
Orwell (Tidal)	GB105035040410	No Risk	Medium Risk
Orwell (Tidal)	GB105035040420	No Risk	Low Risk
Orwell (Tidal)	GB105035040430	No Risk	No Risk
Belstead Brook	GB105035040440	No Risk	No Risk
Alde	GB105035045950	No Risk	Low Risk
Alde and Ore (Tidal)	GB105035045960	No Risk	Low Risk
Ore	GB105035045970	Low Risk	Low Risk
Fromus	GB105035045980	No Risk	No Risk
Blyth (Suffk)	GB105035046000	No Risk	No Risk
Wenhaston Watercourse	GB105035046010	No Risk	No Risk
Blyth (Suffk)	GB105035046020	No Risk	No Risk
Blyth (Suffk)	GB105035046030	No Risk	Low Risk
Blyth	GB105035046040	No Risk	Low Risk
Chediston Watercourse	GB105035046050	No Risk	No Risk
Alde	GB105035046060	No Risk	Low Risk
Blyth	GB105035046070	No Risk	Low Risk
Great Finborough Watercourse	GB105035046080	No Risk	No Risk
Tributary of Rattlesden River	GB105035046090	No Risk	No Risk

Coddenham Watercourse	GB105035046100	No Risk	No Risk
Rattlesden River	GB105035046110	No Risk	No Risk
Rattlesden River	GB105035046120	No Risk	No Risk
Gipping	GB105035046130	No Risk	No Risk
Framsden Watercourse	GB105035046140	Low Risk	Medium Risk
Rattlesden River	GB105035046150	No Risk	No Risk
Deben	GB105035046160	Low Risk	Low Risk
Deben	GB105035046160	Low Risk	Low Risk
Jordan	GB105035046170	No Risk	No Risk
Gipping	GB105035046180	No Risk	No Risk
Gipping	GB105035046180	No Risk	No Risk
Haughley Watercourse	GB105035046190	No Risk	No Risk
Deben	GB105035046200	Low Risk	Low Risk
Earl Soham Watercourse	GB105035046210	No Risk	No Risk
Earl Soham Watercourse	GB105035046210	No Risk	No Risk
Easton Broad	GB105035046220	No Risk	No Risk
Lothingland Hundred	GB105035046230	No Risk	No Risk
Lothingland Hundred	GB105035046240	No Risk	No Risk
Lothingland Hundred	GB105035046250	No Risk	No Risk
Hundred River	GB105035046260	No Risk	Medium Risk
Leiston Beck and Minsmere Old River	GB105035046270	No Risk	Low Risk
River Gipping	GB105035046280	No Risk	Medium Risk
Blyth	GB105035046290	No Risk	No Risk
Wang	GB105035046300	No Risk	No Risk
Deben	GB105035046310	No Risk	Medium Risk
Deben	GB105035046310	No Risk	Medium Risk
Alde and Ore (Tidal)	GB105035077790	No Risk	Low Risk
Alde and Ore (Tidal)	GB105035077800	No Risk	Low Risk
Alde and Ore (Tidal)	GB105035077800	No Risk	Low Risk
Black Ditch	GB205035040150	No Risk	No Risk
BLYTH (S)	GB510503503700	No Risk	No Risk
ALDE & ORE	GB520503503800	No Risk	No Risk
DEBEN	GB520503503900	No Risk	No Risk
ORWELL	GB520503613601	No Risk	Low Risk

APPENDIX 2. EAST SUFFOLK RIVERS WATER RESOURCE AVAILABILITY

Assessment point	River name	Hands Off Flow (Ml/d)	Flow Duration Curve Percentile	Number of days/yr abstraction is available	Approximate Volume available (Ml/d)
1	Lothingland Hundred	5.5	Q95	347 (Override)	1.0
2	River Wang	5.1	Q86	314	0.3
3	River Blythe	10.4	Q81	296	0.8
4	River Yox	9.0	Q90	329	1.4
5	Hundred River	7.5	Q30	114	0.9
6	River Fromus	6.5	Q47	172	4.0
7	River Alde	27.3	Q47	172	0.8
8	River Ore	11.5	Q47	172	0.5
9	River Deben (Upper)	13.3	Q48	175	2.0
10	River Deben	26.9	Q48	175	3.0
11	Mill River	33.9	Q1		Catchment closed
12	River Fynn	10.5	Q58	212	0.8
13	River Gipping (Upper)	71.2	Q20	73	100.3
14	River Gipping	110.6	Q20	73	46.6
15	Belstead Brook	6.6	Q74	270	0.4

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