The Minworth SMP – Initial Steps

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Synopsis

The extensive and considerably complex sewerage network draining to Minworth STW has been an area of significant investment by Severn Trent Water (ST) throughout AMP3 and AMP4, with the main focuses being on the delivery of the vast number of UID projects over the last 10 years, as well as providing InfoWorks model coverage for the catchment though the DAP programme.

Although the significant investment over the last 10 years has met the requirements of catchment drivers and regulatory obligations, analysis of the performance of the system on a strategic level, using a high confidence catchment wide model has historically not been possible. For AMP5, through the delivery vehicle of the Minworth SMP and Strategy, it is the ambition of ST to utilise the modelling building blocks created over the previous 10 years to establish a full catchment model which will be used to provide further understanding of the Minworth sewer system as a whole, and develop a catchment strategy for the management of the system over the next 25 years.

This paper outlines work undertaken thus far for the Minworth SMP and discusses the modelling and management strategies planned for the next four years.

Modelling History

Due to the size of the catchment, Minworth was historically separated into 53 DAP catchments as indicated on Figure 1. Each of these catchments have been modelled in turn through the DAP programme in AMP3 and AMP4, providing Type II models across the catchment.

In addition to the DAPs, the Tame UPM was undertaken in AMP3 and identified a considerable number of UIDs for delivery through AMP3 and AMP4. Although the modelling work for a percentage of the UIDs was undertaken as part of the DAPs, a number of other individual UID scheme models were also produced due to programme conflicts. Moreover, during AMP4, many of the remaining UIDs to be assessed were located along the trunk sewers within the catchment and as such required model combination exercises to be undertaken. Although a number of the DAPs were combined and modelled as a single network, these were generally limited to 2-4 DAP regions as assigned to the various framework consultants. In order to correctly model inflows into the larger trunk sewer overflows, as well the associated surcharge and reverse flows known to occur in the catchment, the DAP models were joined to create two modelled areas, known as the 'Northern Tame' and 'Southern Tame as illustrated in Figure 1. These two combined models were used for additional investigation and model upgrade carried out during the UID scheme programmes. The extent of the model upgrades differed in these areas. The Northern Tame model was developed based on all the latest DAP models available (approximately 50/50 split between AMP3 and AMP4), with some DAP modelling programmes accelerated in order to be included in the combined model (further details of this model combination exercise is documented in Austin et al (2007)). With regard to the Southern Tame, due to the UID programme requiring projects to be delivered during AMP3, a number of the DAPs had not been completed at the time of the model combination. Due to this, a Southern Tame model was constructed based on the models available at the time of the combination, which were a mixture of AMP3 DAP models in InfoWorks together with AMP2 HydroWorks and Wallrus models. This model was further updated

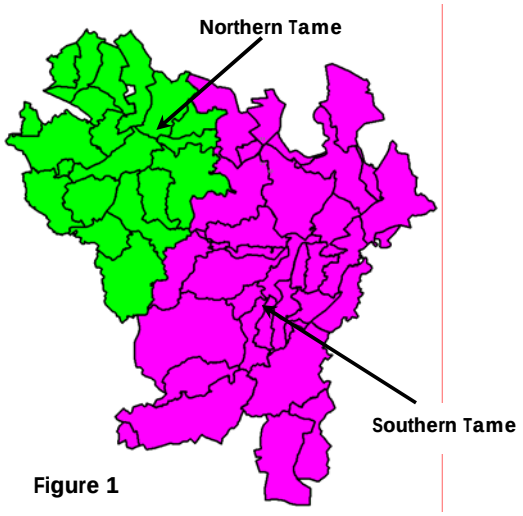

Figure 1

throughout AMPs 3 and 4, however, no AMP4 DAPs were completed in time for addition to the combined model.

SMP Scoping Stage

Due to the vast array of DAP, UID and UPM models available for the Minworth catchment, it was agreed with ST that a scoping stage would be completed prior to the commencement of the SMP in order to collect the existing model data, undertake consultations with all stakeholders for the catchment, and then propose a modelling strategy for undertaking model upgrade deemed necessary for the catchment.

The collection and assessment of the existing model stock proved a time consuming task, with each model collected being assessed for the extent of surveys and verification undertaken together with reviews of their limitations. All key useful data from each of the models was compiled into the scoping report and used to determine the most appropriate models to use as the AMP5 baseline model. The completed scoping report is considered a key document within Clear and is to be added to ST internal systems in order to provide information for ST engineers working in the catchment.

In addition to the assessment of the models, the consultation process was completed in order to provide direction to the SMP through confirmation of the key deliverables of the study to meet stakeholders' expectations. Although this highlighted considerable serviceability deficiencies across the catchment (as would be expected for a catchment on the scale of Minworth), it was also identified that the provision of a notional catchment strategy to provide input to ST's PR14 business plan submission by July 2012 was one of the single most important outputs for the SMP in order to indicate the magnitude of AMP6 investment requirements. Additionally there is a significant flooding project (linked to trunk sewer performance) requiring AMP5 delivery in the south of the catchment.

Model Delivery Methodology

The balancing of the risks of model limitations against the need for delivering catchment strategy outputs and a flooding scheme model has provided one of the largest challenges thus far for the Minworth SMP; however, it has also highlighted one of the biggest benefits of the fluidity of the SMP process against the out-dated DAP process. Under the traditional DAP process the consultant's approach to providing strategic outputs would often require model upgrade as a prerequisite to any strategy development, which in the case of Minworth would necessitate Clear locking its doors on a team of 12 modellers for 18 months in order to undertake full model upgrade and verification prior to the model being deemed suitable for strategic outputs being delivered. Through the risk based approach of the SMP and the associated tools to quantify these risks (such as indication of model uncertainty through MICAS), an approach of parallel programmes of modelling was agreed with ST. As such, it was agreed that a programme of model upgrade should be commenced in order to improve confidence in the model in key driver areas such as the flooding scheme area, with a simultaneous programme of catchment strategy development

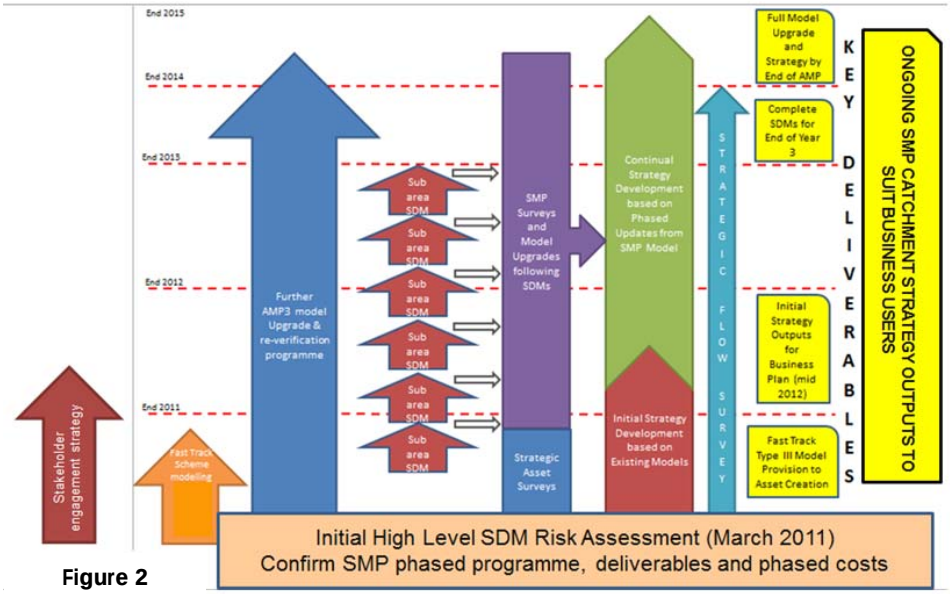

Figure 2

undertaken in order to start providing strategy outputs for incorporation in the PR14 business plan submission. These programmes are illustrated in Figure 2 and are discussed in turn below.

Initial Strategic Model Development (April 2011 – June 2012)

Although the current model stock could be utilised for strategic model development immediately, it was agreed that the various existing models should be utilised wherever possible in order to provide the best baseline for the strategic model. As discussed previously, two current combined models exist of the Northern and Southern Tame catchments and so the first step towards a full catchment model is the combination of these two models. As the Northern Tame model was combined and strategically verified by ST during AMP4, the Northern Tame model is considered the latest available modelling tool within this part of the catchment. As the UID programme required the Southern Tame model is being prepared ahead of the DAP programme, the same processing was not possible in this section of the catchment. Therefore, although the Southern Tame model provides a sensible base to modelling in the Southern Tame area, the AMP4 DAPs and other scheme models which were not included in the combined model also provide significant additional detail particularly in the upstream catchments. Therefore the second stage of the model combination process will be to combine the Northern and Southern Tame model with the DAP and scheme models. This has been identified to incorporate approximately 50% of the catchment (as illustrated in Figure 3) and so will significantly raise model confidence within the Southern Tame area and make maximum use of the existing model stock, with minimal wastage of historic modelling investment.

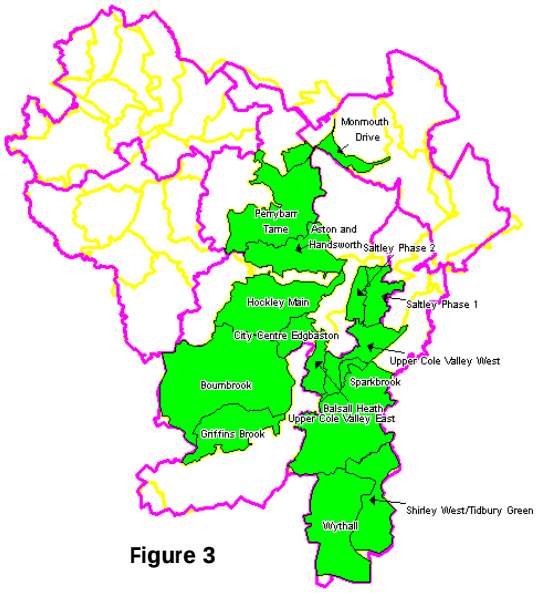

Figure 3

In tandem to the model combination exercise, asset surveys of key penstocks, bifurcations and other flow controls are to be planned and undertaken across the catchment with the results utilised to update the fully combined model. Additionally, although a multitude of flow surveys have been historically undertaken in the catchment, none have ever been undertaken along the entirety of the trunk sewers in a single phase (with particular regard to the Black Country Trunk Sewer (BCTS). In order to improve confidence in the model for strategic analyses, such a flow survey is proposed to be undertaken by ST for a minimum of a year in order to obtain sufficient data to understand the general performance of the trunk sewers throughout the seasons.

SMP and Final Strategy Model Development (by End of AMP5)

With the strategy model being developed along its own programme based on the new fully combined model and associated strategic verification and upgrade, catchment risks outside of those being addressed by the strategy i.e. away from the trunk sewers are to be addressed through a parallel programme of model upgrade. The catchment has been divided into seven hydraulic sub-areas as illustrated in Figure 4, which have been prioritised based on current drivers within the catchment. Of these, the Rea Main area model upgrade (sub-area A) has already commenced in order to deliver the flooding scheme model previously described by the end of 2011. Additionally, the sub-area B model upgrade (Oldbury and Tipton) is scheduled to commence in June 2011 again based on current drivers. Therefore it is currently planned for both these upgraded areas to be

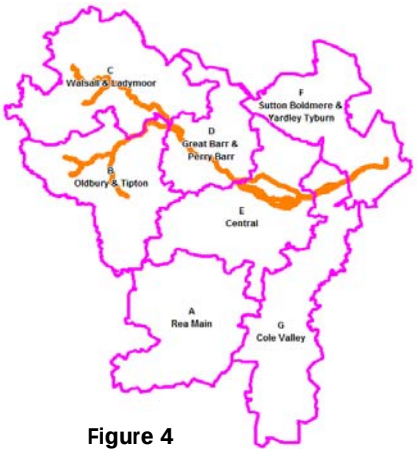

Figure 4

incorporated into the strategy model prior to the PR14 submission in order to improve the overall model confidence.

It is proposed that these steps in improved model confidence will continue throughout AMP5 with the various sub-area models used to update the full combined strategy model as they are completed. The completion of the seven sub-area models, coupled with the continual verification assessments against the long term strategic flow survey will enable a fully updated complete catchment model to be completed by the end of AMP5 and thus provide much higher confidence modelling tool to be used for the assessment of intervention strategies to meet stakeholder requirements into AMP6 and beyond.

Live Status

Although the flexibility of the SMP process has enabled parallel modelling programmes to be set in place to meet core short term output deadlines for the SMP, a second important difference between SMPs and the superseded DAPs is the catchment ownership given to consultants and the need to respond to changes in catchment risks and the consequent changing output requirements of stakeholders. This is where achieving 'live' status (as defined by Terry et al (2011)) is very important. The tracking of catchment risks enables the SMP to evolve, capture, prioritise and deliver timely outputs and could change the currently planned programme of sub-area upgrades or even require further modelling to be done in previously addressed sub-areas as new drivers come to light. This process requires internal and also external stakeholder engagement at its heart and pushes communication to the forefront, making the 'locked doors' two year model build approach of the DAPs a thing of the past within ST.

Integrated Urban Drainage

It is highlighted that the stakeholder engagement strategy is not limited to internal parties. In order to produce a sustainable catchment strategy, it is important that buy-in is achieved with all stakeholders. As such, the Minworth SMP team are collaboratively working with the Environment Agency as well as local councils on projects such as the EA River Tame Strategy and the Birmingham and Sandwell SWMPs. The external relationships are once again a significant deviation from the previous DAP process, with comments such as "what a shame the EA and ST Tame Strategies are not one and the same" being heard from EA representatives showing that the SMPs are moving in the right direction to provide holistic and sustainable management of the entire urban water cycle into the future.

Conclusion

AMP5 will be an exciting time for the Minworth catchment, with a full combined model of the entire network being established within the coming months, enabling analysis on a catchment level to finally be achieved. This modelling tool will be utilised to develop a catchment strategy meeting the expectations of all stakeholders for the Minworth catchment for the next 25 years, with model confidence being increased throughout the AMP period through the sub-area upgrades coupled with the parallel additional strategic verification. However, it has also been highlighted that the actual modelling element is only half the story, and that engagement with both internal and external stakeholders will be the most important element in managing the urban water cycle within the Minworth catchment.

References

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