ABN: 76 151 119 792
PO Box 423
Fortitude Valley 4006
QLD
www.alluvium.com.au

4 August 2020

Daniel Connor
Director - Healthy Floodplains Project Delivery
26 Honeysuckle Drive
Newcastle
NSW 2300

Dear Dan

Review of floodplain harvesting modelling submissions process

Thank you for the opportunity to review the current submissions process that has been implemented as a result of our Independent Review into Floodplain Harvesting Policy Implementation.

As part of this process, I have reviewed a number of information sources provided both by the Department and industry stakeholders including:

- Recommendations to Review Committee – Water Balance Tools
- Recommendations to Review Committee – Other Modelling Issues
- Submission by Border Rivers Food and Fibre, and Gwydir Valley Irrigators Association – Re: Farm Water Balance and Other Modelling Themes reports
- Discussions with Department of Planning Industry and Environment staff on 22 July 2020
- Discussions with GVIA, BRFF and Namoi Water/TCS on 24 July 2020
- Submission by TCS Consulting Engineers - BR054 Floodplain Harvesting Water Balance Modelling
- Submission by OD Hydrology – Malagari Lagoon hydrologic assessment dated 7 June 2020
- Review of OD Hydrology submission by DPIE dated 22 July 2020

In all the above I have attempted to identify whether the processes being followed in the review of submissions was fair, equitable, considered the available evidence appropriately and considered industry issues appropriately.

Overall, my findings are that a proper systematic process was undertaken by the Department in reviewing the available information provided in submissions, and evaluating their merits based on the strength of the evidence supplied. Details of the findings are presented below.

1. Generally, the strength of the evidence supplied in submissions appeared to be less than that used for the lines of evidence in the relevant modelling. This may have been expected as the period of time to prepare submissions by industry stakeholders was relatively short, and they also noted that there wasn't clear guidance around the quality of evidence required.
2. The review approach adopted as listed on page 1 of the Water Balance Tools document is sound and equitable in terms of classifying the strength of evidence. However, I do note that this should not be the only criteria used for determining whether the highlighted issue requires action or not.

3. Industry stakeholders valued the process as it provided water users with an appropriate context for the modelling. It was also recommended that this process be implemented in other valleys where floodplain harvesting entitlements are being determined.
4. Industry stakeholders are all aligned in wanting an enduring, equitable outcome from the overall licensing process that withstands technical and legal challenges but also recognises the need to have confidence and acknowledge uncertainties that may be present.
5. I am of the opinion though that care needs to be taken around how much further time is devoted to resolving "outlier" or "edge" cases and the resources that might take, compared to that required simply to complete the process of issuing entitlements. From what I have viewed, there are a number of outlier cases but none of these indicate a systematic or inequitable approach to issuing of entitlements across the relevant river valleys, though there are a number of considerations to be made as detailed in point 6 below.
6. Within the process, decisions need to be drawn around whether the significance of the issues highlighted in submissions warrant:
    a. Changes to the current model prior to finalising entitlements
    b. No changes to the current model
    c. Future changes to the model as part of overall model improvements
    d. Other matters for future consideration.

    I have therefore examined the supplied information to determine which of these would be most relevant.
7. The most significant issue identified appears to relate to the access of a water user to local runoff and the accuracy (or not) of the estimates provided. Largely, this amount of water is not able to be properly accounted for in any current models (either in the Department or by industry) because:
    a. It is not able to be measured accurately because it is of a scale smaller than most gauged tributaries
    b. It is subject to high degrees of model uncertainty because of local scale issues such as rainfall heterogeneity, topography, drainage pathways and collections systems and that these are not resolved in any models to a high degree of rigour (again because of the fine scale nature compared to the "lumped" approach for the models)
    c. Access to this water would be highly variable for many of the areas in the Northern Basin and may only benefit a small number of users.

    It is therefore difficult to recommend that further changes be made to the current models to better account for this, but it is recommended that this be considered in more detail in future modelling.
8. Notwithstanding the above, from the OD Hydrology submission and subsequent data analysis by the Department, the local runoff catchment area for Warrendi and Mulala was 15% greater as calculated by OD Hydrology compared to the estimates used in the Border Rivers model. This would have a significant effect in the amount of local runoff accessible, however there remains a number of uncertainties in resolving this:
    a. The topography was noted as being relatively flat, and for those reasons the catchment boundaries can be quite arbitrary
    b. The assumptions made around rainfall runoff as used in the AWBM models are reasonable for a broad scale catchment, but claims regarding local scale variations (e.g. differences in soil runoff yields) do not appear to be supported.

    This is characteristic of most rainfall runoff modelling in that it is typically only able to be calibrated and validated to longer term gauged data. When moving to ungauged catchments there can be significant differences between runoff that may be anecdotally observed and that which is generated by models. There is no way around this in the short term and there needs to be acceptance that the variations noted in the submissions are likely to be due largely to the model uncertainty at these farm scales.
9. The issue of what is an appropriate level of runoff converted from rainfall (both in terms of local catchment runoff and farm scale rainfall runoff) appears to still be contested between industry consultants and the Department. In the end, the concessions made around how to provide exemptions in accounting for rainfall runoff on farm in different situations should have concluded the matter for the time being. The discussions around that should also have highlighted that this issue cannot be sufficiently resolved by ongoing arguments around relevant runoff coefficients, soil types etc., as there simply is insufficient data to support further deviations from that which has been adopted. With regards to point 6 above, this falls into the "other matters for consideration" category

as it will not be resolved to anyone's satisfaction until better, high quality data is collected and verified for a range of cases.

10. From discussions with industry stakeholders, there are a number of other matters for consideration in this process. These include:
    a. Undertaking a whole of valley calibration, where a scenario of current operations in the valley are simulated to identify whether the model allows for the level of productivity observed in a river valley through other sources (e.g. gin records). This is seen as a key missing link in the Border Rivers modelling when compared to the Gwydir. Even so, I note that the reliability of ginning records may not be sufficient to allow this to occur. Current modelling is established such that it is not showing necessarily the "current - actual" scenario but more that it is showing the "current - eligible" scenario. For that reason, it is likely there will always be differences between the water actually recorded as used on farm and that which is predicted from the model. Whether a model scenario of "current – actual" needs to be run is a difficult one to argue, as while it might provide a closer estimate of what is actually occurring, it is not relevant from a farm scale entitlement determination or bulk water allocation process, which is the primary reason for development of the models.
    b. There is a new uncertainty about unregulated access and floodplain harvesting eligibility which is dependent on decisions by NRAR. I note that in reviewing a number of submissions that resolution of the issues identified requires decisions to be made by NRAR. It is recommended that these decisions be prioritised to provide greater certainty both in the modelling and for water users.
    c. There is an acceptance that the modelling overall is generally useful, however it is noted that simplifications and generalisations are necessary in that modelling and that these may not be applicable to all farms. From what I have observed in the whole Independent Review process, this is always going to be the case, and is a result of using models that are more applicable to whole of valley scale than individual farm scale. There has to be simplifications and generalisations made, but overall I find that this has been done as equitably as possible and that there will always be "winners" and "losers" out of any process. What is most important here though is that this farm scale submissions process has provided the opportunity for those issues to be raised, and in relevant cases, changes to the models made.
    d. Providing valley wide estimates of water use and production has been used by GVIA as an ongoing tool in evaluating water use. In the Border Rivers this has not been completed, making it challenging to present the modelling as being representative of valley wide operations. It is therefore recommended that presentation and communication of a valley wide verification process against productivity be made in future modelling across all relevant valleys, noting the issues and challenges raised in point 10.a. above.
    e. There is an ongoing need to test some broadscale modelling parameters and assumptions, especially around planting risk and irrigation efficiency, as these can be both locally variable and changing over time. I note that through analysis undertaken by the Department, it would be beneficial to develop this further in consultation with industry to agree on more relevant figures in future modelling.
    f. Documentation remains an ongoing issue in that it has not been available to stakeholders during this farm scale process. I note that this may be difficult to resolve, as changes made to the models as a result of the process need to be reflected in the model reports. A possible approach could see public drafts made available at the time of the review process.
    g. I have attached notes of my meeting with industry stakeholders to highlight other key points raised (refer to Appendix A).
11. Communication of the results of this farm scale process need to be done in a way that demonstrates the value of the process both to Departmental staff and all relevant stakeholders. It also needs to be done in a way that demonstrates the process was transparent, equitable and robust. I therefore recommend that presentations of the results of modelling "before" and "after" the process be made, and discussion around the process used to evaluate submissions be clearly articulated. Discussions around how the process has identified issues to be incorporated into further model improvement or other issues to be resolved should also be made clear.

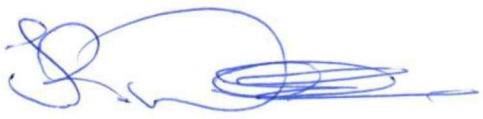
It was noted by stakeholders that it appeared the concerns raised seemed to be easily dismissed by Department staff. My review of the process however, shows that the issues raised in the submission were equitably evaluated for the strength of evidence. Even for instances where that strength wasn't of the same standard as the lines of evidence in the modelling, the Department modellers still considered it and made changes to the models where they felt the issue was relevant.

In summary, the overall farm scale submission process is seen to be valuable in the overall implementation process, and it has been conducted in an equitable and robust manner. The results of this process need to be clearly communicated, and commitment made to resolving outstanding issues for future modelling or policy development. The following recommendations have been made:

A. This process is seen as highly valuable by industry stakeholders and should be implemented in other valleys where floodplain harvesting entitlements are being determined.
B. For future modelling, further exploration is needed in how to better account for local scale runoff and the significance (or not) of the uncertainty in the processes currently adopted.
C. There is a very strong need to collect greater quality verifiable data on the rainfall runoff responses of a range of catchments at the finer scale. Currently, the flow gauging network provides suitable observed data to quantify this at the valley scale, but at the farm and local catchment scale this is sorely lacking. This was identified in the Independent Review and it is an ongoing point of contention which will only be resolved through a robust, independent and peer reviewed assessment of hydrologic responses at these fine scales.
D. Presentation and communication of a valley wide verification process against productivity needs to be made in future modelling across all appropriate valleys to demonstrate the robustness of the modelling in a context that is relevant to industry stakeholders.
E. Testing of some broadscale modelling parameters and assumptions, especially around planting risk and irrigation efficiency, should be undertaken in collaboration with industry stakeholders to understand and agree on both the level of variability and significance the chosen values have on model results.
F. Presentations of the results of modelling "before" and "after" this farm scale review process should be made, and discussion around the process used to evaluate submissions be clearly articulated. Discussions around how the process has identified issues to be incorporated into further model improvement or other issues to be resolved should also be made clear.

I hope that this helps to improve the overall process, to assure all stakeholders that the process itself is of value and leads to improvements in the modelling and entitlement process for Floodplain Harvesting. I have attempted to evaluate the evidence presented in as impartial a way as possible, although understand that some of what is presented here is my opinion based on that evaluation. I would therefore be more than happy to discuss any of the points raised and make changes or modifications if it is felt that I have not properly represented the evidence used.

Yours sincerely



Tony Weber
Independent Reviewer – Floodplain Harvesting
Policy Implementation &
National Lead – Water Modelling
m 0476 829 565
e tony.weber@alluvium.com.au

Attachment A – notes from discussions with industry stakeholders about the farm scale review process

Discussions were held with representatives from Border Rivers Food and Fibre, Gwydir Valley Irrigators Association and Namoi Water/TCS on 24th July 2020. The following points were raised and discussed.

- Documentation - It is hard to understand what is being asked for in terms of the level of evidence required for submissions when the model build documentation is not available
- Complex farms – Not all farms fit within the generic assumptions made for a valley
- The only real point of truth is production records as this shows the outcome from the water used
- Some water balance calculations show significant deviations, >100% in some cases. Based on the analyses that TCS have doen for 13 farms, max was 137% higher, one 24% lower, most differences around 40%.
- There are ongoing challenges with the rainfall used in the model not really representing what fell on farms
- Generally, there is commitment from industry to the proposed timeframes for implementation
- There is not too much issue with the modelling itself, but in the application of the model results
- There is also an understanding of the limitations of the modelling, however there needs to be an understanding by the department that the modelling won't always fit every farm
- In the review process the primary process seems to be to always discredit the evidence submitted rather than attempting to use it. There are many reasons given for discrediting the submissions but not many for attempting to include the evidence provided
- This process sis likely to be the only shot that industry has to get the farm by farm breakup of entitlements right
- Need to provide the process to adapt the model or model outputs (this is not clear at the moment)
- There doesn't appear to be enough movement of water in the model at fine scales. Flow gauge to flow gauge appears to give the right answers, but if local runoff is significant, this may mean a farm has additional water that is never seen by the river but needs to be accounted for in the entitlement
- Farm submissions have included cropping area and cropping yield, in addition to Landsat and Irrisat evidence, noting there are some discrepancies in the latter.
- Can provision be made for revision of rejected submissions to improve the evidence now industry knows (approximately) the quality of evidence required?
- Rainfall runoff from local catchments is never going to be right in the model because it occurs at a fine scale. That means that the calibration will never be right, so we need to look at the productivity numbers to get the most accurate estimate of what water has been used for the level of production obtained.
- Where are calls made around using productivity numbers to resolve local runoff issues
- The whole of valley model is being twisted around to examine bits and pieces of the model
- GVIA did the analysis based on whole of valley production so the whole of valley number is about right, and this has been a calibration process. This hasn't been done in the Border Rivers.
- Really need a "current conditions" scenario to see if the model results in the same level or productivity as has been measured. The challenge is that currently the model doesn't represent an actual "current" scenario, but a scenario given 2008 eligibility. That means it is difficult to compare apples with apples.
- There is a lack of clarity around what is FPH and what is unregulated access on some farms, particularly in the Border Rivers
- What should be classed as a "significant" difference where allowance needs to be made within the model. It would appear that this is dependent on climatic period, as lower differences in dry years could be more significant than in wet years
- Climate data – has the choice of climate data used in the model led to a systematic bias? This comes down to how planting risk is assumed, as the data will influence the crop planting decision so need to evaluate the impacts of the data on this parameter. Most issues will occur in dry years
- This process is a critical point in the overall implementation as it puts the results into context for the farmer and was felt to be necessary for other valleys, thought here will be some efficiencies, especially if there are some guidelines or checklists for data/evidence required, and the water balance method is agreed on.
- Modellers have done well to listen to all the concerns.