

**GOYDER INSTITUTE FOR WATER RESEARCH MODEL METADATA TEMPLATE**

METADATA REQUIRED	DETAILS
Model Name and version	River Murray Floodplain Groundwater Model 2015
Date of lodgement of Metadata Template.	August 2015
Name of Metadata Provider	Juliette Woods
Goyder Institute Project Number and Name	<b>GOYDER INSTITUTE FOR WATER RESEARCH Project No. E1.11</b> Salinity dynamics of the River Murray floodplain in South Australia
Project Team	Project Leader: Dr Juliette Woods, <a href="mailto:juliette.woods@flinders.edu.au">juliette.woods@flinders.edu.au</a> Project Team Members: Tariq Laattoe, <a href="mailto:tariq.laatoe@flinders.edu.au">tariq.laatoe@flinders.edu.au</a> Virginia Riches, <a href="mailto:Virginia.riches@sa.gov.au">Virginia.riches@sa.gov.au</a> Professor Adrian Werner, <a href="mailto:adrian.werner@flinders.edu.au">adrian.werner@flinders.edu.au</a>
Creator/Developer	Tariq Laattoe, Virginia Riches, Juliette Woods, Carl Purczel
Owner/Contact Person and contact details	DR JULIETTE WOODS School of the Environment, Flinders University Room 105b Earth Sciences Building Sturt Road, Bedford Park   South Australia   5042 P: +61 8 8201 2213   M: +61 423 151 970 E: <a href="mailto:juliette.woods@flinders.edu.au">juliette.woods@flinders.edu.au</a>
Model Location	The models are archived at the School of the Environment at Flinders University at: <a href="https://sharefiles.isd.ad.flinders.edu.au/share/SOTEGoyderMDB/7%20Handover/">sharefiles.isd.ad.flinders.edu.au/share/SOTEGoyderMDB/7 Handover/</a> .  Some model scenarios are under active development at this site. Contact: Dr Juliette Woods, <a href="mailto:juliette.woods@flinders.edu.au">juliette.woods@flinders.edu.au</a> .  The models will also be archived at the DEWNR Model Warehouse. Contact: Dr Graham Green, <a href="mailto:graham.green@sa.gov.au">graham.green@sa.gov.au</a> . Science, Monitoring and Knowledge, DEWNR
IP or other permission requirements	None required
Licences associated with model and/or dependencies	The models were developed using Groundwater Vistas software, for which a license is required. Some data-processing scripts were written in Python. However, the models can be run without using Groundwater Vistas (which requires a license) or Python (which is Open Source).
Confidentiality agreements associated with model and/or dependencies	None

METADATA REQUIRED	DETAILS
Brief outline of model	<p>A series of numerical groundwater models have been designed to represent generic floodplain conditions that exist along the River Murray in SA, from the border to Lock 1. Multiple base case scenarios are considered, varying by floodplain topography, the presence or local absence of a lock, and whether the river conditions are gaining, throughflow or losing.</p> <p>The aim is to improve understanding and modelling capability of flow and salinity dynamics, to assist with management and engineering decisions. Model variants were developed to investigate how results depended on the methods used to simulate key processes, including river level changes, floodplain inundation, groundwater evapotranspiration, and solute transport.</p>
Area/region covered	The models simulate a generic domain representing conditions in the River Murray floodplain between the SA Border and Lock 1. Conditions are similar upstream of the SA Border as far as Nangiloc-Colignan.
Platform and language and version	MODFLOW 2005 with NWT solver for groundwater flow. MT3DMS for solute transport.
Dependencies upon: <ul style="list-style-type: none"> <li>i) other models and/or platforms (including version) and location</li> <li>ii) essential data and data sources and location</li> </ul>	<p>i) The MODFLOW and MT3DMS files were developed using Groundwater Vistas version 6. Some data inputs were pre-processed using scripts in Python 2.7.6.0. Post-processing was done with both Groundwater Vistas and Python.</p> <p>ii) Datasets incorporated into the model are river stage and evapotranspiration. These are stored with the models: see “Model Location”.</p> <p>River stage below Lock 5 was sourced from DEWNR’s WaterConnect website: <a href="http://www.waterconnect.sa.gov.au">www.waterconnect.sa.gov.au</a></p> <p>Evapotranspiration data was sourced from DEWNR’s SILO records, ultimately sourced from the Bureau of Meteorology. The data are for the Loxton Research Centre, Station number 24024.</p>

METADATA REQUIRED	DETAILS
How was model used	<ul style="list-style-type: none"> <li>○ <i>Parameterisation:</i> See “specificity of data” below for comments on how parameters were selected.</li> <li>○ <i>Validation:</i> As the Goyder Floodplain Model is a synthetic model, in that it does not model a specific location, no detailed calibration was possible. However, the models were constrained based on the current knowledge of floodplains along the SA River Murray, including: <ul style="list-style-type: none"> <li>▪ Representing gaining floodplains and river conditions which may be gaining, throughflow, or losing</li> <li>▪ Actual evapotranspiration out of the model consistent with estimates of floodplain evapotranspiration</li> <li>▪ Salt load to river less than 10 tonnes/day/km</li> </ul> </li> <li>○ <i>Scenarios and outputs from various runs:</i> <ul style="list-style-type: none"> <li>▪ Case A (losing river, Case B (throughflow river) or Case C (gaining river)</li> <li>▪ With or without a lock within the model domain (i.e. change in weirpool level)</li> <li>▪ Scenario group 1 (river levels change yearly, monthly or adaptively using river cells or reservoir cells), Scenario group 2 (evapotranspiration is simulated yearly or monthly, with varying extinction depths, spatial distributions and MODFLOW packages), and Scenario group 3 (inundation is simulated over the floodplain and/or a wetland). See the model report for further details.</li> </ul> </li> <li>○ <i>Structure of archive (examples):</i> <ul style="list-style-type: none"> <li>Folder name: A_L Description: Basecase A model with lock represented</li>   <li>Folder name: A_NL Description: Basecase A model without lock represented</li>   <li>Folder name: Scen1A_yr_A_L Description: Scenario 1 A river package with yearly temporal discretisation using basecase model A with lock Naming convention: &lt;scenario alphanumeric&gt;_&lt;detail specific&gt;_&lt;basecase model&gt;</li> </ul> </li> <li>○ <i>Assumptions behind model:</i> <ul style="list-style-type: none"> <li>▪ 4 stratigraphic units in and under the floodplain (Coonambidgal Formation, Monoman Formation, aquitard and Murray Group)</li> <li>▪ Domain includes a section of the River Murray, a wetland, and in some scenarios, a river lock</li> <li>▪ Regional groundwater flows into the floodplain sediments</li> </ul> </li> </ul>

	<p>laterally and from below</p> <ul style="list-style-type: none"> <li>▪ Key hydrogeological processes within the floodplain include: change in river level over time, evapotranspiration, and flood inundation</li> <li>▪ Regional groundwater is highly saline</li> </ul> <p>○ <i>Limitations of model:</i></p> <ul style="list-style-type: none"> <li>▪ Simulates a generic floodplain with simplified geometry, rather than a specific site</li> <li>▪ Limited calibration possible</li> <li>▪ Does not include aquifer heterogeneity</li> </ul> <p>○ <i>Peer review process:</i> Preliminary model results were presented at a workshop attended by model experts and stakeholders, to solicit feedback (see Acknowledgements below). The reports were peer-reviewed by Anthony Knpton and Glen Walker. Danni Oliver of the Goyder Office provided additional editorial comments. The report was then submitted to the Goyder Research Advisory Committee.</p> <p>○ <i>Extensibility of model:</i> The model is designed to be a generic section of floodplain so that modelling approaches can be tested. The model could be adapted to represent specific areas and time periods, and to further test processes. Recommendations for straightforward extensions to the models are given in the model report. That said, the aim of the project was to develop recommendations to apply to site-specific models, e.g. regarding stress period length for different applications.</p>
Specificity of data	<p>Model parameters are informed by an amalgamation of data from the study area, but are not specific to any one location. Where there is a wide range of possible parameters, values from the Pike Floodplain have been adopted. Where no local field data exists, values were used from the literature and/or from DEWNR’s Salinity Register regional models.</p>
Datasets/data products produced	<p>Outputs stored in location given in ‘Model Location’ above.</p>
Other Information	

METADATA REQUIRED	DETAILS
Publications (papers and technical reports)	<p><b>Goyder Institute for Water Research Technical Reports</b></p> <p>Woods, J (ed.). 2015, <i>Modelling salt dynamics on the River Murray in South Australia: Conceptual model, data review and salinity risk approaches</i>. Goyder Institute for Water Research Technical Report Series No. 15/9, Adelaide, South Australia.</p> <p>Woods J (ed.). 2015, <i>Modelling salt dynamics on the River Murray in South Australia: Modelling approaches</i>, Goyder Institute for Water Research Technical Report Series No. 15/10, Adelaide, South Australia.</p> <p>Woods J (ed.). 2015, <i>Modelling salt dynamics on the River Murray in South Australia: Modelling approaches – Appendices</i>, Goyder Institute for Water Research Technical Report Series No. 15/11, Adelaide, South Australia.</p> <p>Goyder Institute Technical Reports available at:  <a href="http://goyderinstitute.org/">http://goyderinstitute.org/</a></p> <p><b>Conference Proceedings</b></p> <p>Woods, J. A., Laattoe, T., Riches, V., Werner, A. and Purczel, C. 2015. <i>Simulating Saline Floodplains, MODFLOW and More 2015: Modeling a Complex World – Proceedings</i>, Integrated Groundwater Modeling Center, Golden CO, June 2015, 58-63. <a href="http://igwmc.mines.edu/conference/Mod2015/MM15_Proceedings.pdf">http://igwmc.mines.edu/conference/Mod2015/MM15_Proceedings.pdf</a></p>

METADATA REQUIRED	DETAILS
Collaborations and acknowledgements	<p>This project was funded by the Goyder Institute for Water Research and supported by the SA Department of Environment, Water and Natural Resources (DEWNR) and the National Centre for Groundwater research and Training (NCGRT).</p> <p>The project scope was developed by the project team with input from Judith Kirk (DEWNR), Neil Power (DEWNR/Goyder), Wei Yan (DEWNR), Kate Holland (CSIRO), Glen Walker (CSIRO), and Paul Dalby (In Fusion Consulting).</p> <p>The groundwater modelling study was influenced by a Project Management Team, a Policy Advisory Committee and a model workshop.</p> <p>The Project Management Team consisted of: Juliette Woods and Tariq Laattoe of Flinders University, Kate Holland and Peter Cook of CSIRO, and Wei Yan, Matt Gibbs, Linda Vears, and Graham Green of DEWNR.</p> <p>The Policy Advisory Committee was chaired by Judith Kirk with Linda Vears as Executive Officer, both from DEWNR. Other members were Danni Oliver of the Goyder Institute, Okke Batelaan of Flinders University, and Tony Herbert, Chris Wright, Dragana Zulfic, Tumi Bjornsson and Whendee Young of DEWNR.</p> <p>The following people contributed to the model review workshop: Steve Barnett (DEWNR), Okke Batelaan (Flinders), Kittiya Bushaway (DEWNR), Alison Charles (AWE), Matt Gibbs (DEWNR), Graham Green (DEWNR), Nikki Harrington (Flinders), Kate Holland (CSIRO), Chris Li (DEWNR), Dan McCullough (DEWNR), Hugh Middlemis (HydroGeoLogic), Leanne Morgan (Flinders), Dan Partington (Flinders), Carl Purczel (DEWNR), Lieke van Roosmalen (DEWNR), and Linda Vears (DEWNR).</p> <p>The principal external reviewers were Glen Walker (NCGRT) and Anthony Knapton (CloudGMS).</p> <p>Le Dang (AWE) assisted with post-processing.</p>
Keywords	groundwater salinity Murray floodplain