GOYDER INSTITUTE FOR WATER RESEARCH MODEL METADATA TEMPLATE

METADATA REQUIRED	DETAILS
Model Name and version	Cox Creek Catchment Groundwater Model 2014
Date of lodgement of Metadata. Name of Metadata Provider	16 February 2015 Dr Danica Jakovovic, danica.jakovovic@flinders.edu.au School of the Environment, Flinders University
Goyder Institute Project Number and Name	**GOYDER INSTITUTE FOR WATER RESEARCH** Project No. C.1.1 Development of an agreed set of climate change projections for South Australia
Project Team	Project Leader Professor Simon Beecham, simon.beecham@unisa.edu.au Flinders University, DEWNR and SARDI Task 4 Team Task 4 Leader Dr Graham Green, Graham.Green@sa.gov.au Project Team Flinders University Members: Prof. Adrian Werner, adrian.werner@flinders.edu.au Dr Juliette Woods, juliette.woods@flinders.edu.au Dr Danica Jakovovic, danica.jakovovic@flinders.edu.au Dr Carlos Miraldo, carlos.miraldo@flinders.edu.au
Creator/Developer	Dr Danica Jakovovic, danica.jakovovic@flinders.edu.au Dr Juliette Woods, juliette.woods@flinders.edu.au Prof. Adrian Werner, adrian.werner@flinders.edu.au
Owner/Contact Person and contact details	*Provide contact details of individual and unit/group within designated organisation* Prof. Adrian Werner, adrian.werner@flinders.edu.au School of the Environment, Flinders University
Model Location	*Where is the model archived?* Archived at DEWNR Model Warehouse. *Provide contact details of individual and unit/group within designated organisation* Dr Graham Green, Graham.Green@sa.gov.au Science, Monitoring and Knowledge, DEWNR *Is there a version of the model in active further development?* NO *Where is this active version located?* Not applicable
IP or other permission requirements	********* **REFER TO GOYDER INSTITUTE FOR WATER RESEARCH AGREEMENT** ******* *Are there any IP issues associated with the model and/or the dependencies that future users need to be aware of?* NO
Licences associated with model and/or dependencies	********* **REFER TO GOYDER INSTITUTE FOR WATER RESEARCH AGREEMENT** ******* *Are there any licenses associated with the model and/or the dependencies that future users need to be aware of?* NO

METADATA REQUIRED	DETAILS
Confidentiality agreements associated with model and/or dependencies	*Are there any confidentiality agreements associated with the model and/or the dependencies that future users need to be aware of?* NO
Brief outline of model	A MODFLOW groundwater model that serves as a test bed for the downscaled climate change projections.
Area/region covered	Cox Creek Catchment, Mount Lofty Ranges, South Australia
Platform and language and version	MODFLOW-2000 (Harbaugh et al., 2000) Groundwater Vistas Version 6.4 (Environmental Simulation Systems, Inc., 2010)
Dependencies upon: i) other models and/or platforms (including version) and location ii) essential data and data sources and location	The model used outputs from LEACHM (Hutson et al., 1997) and SOURCE (Delgado et al., 2012) as inputs For LEACHM and SOURCE outputs contact Dr Graham Green, Graham.Green@sa.gov.au Science, Monitoring and Knowledge, DEWNR The model was constructed using a DEM provided by DEWNR and the climate forward projections provided by the CSIRO Task 3 team. Details available in Goyder Institute Technical Report 15/1.

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How was model used	○ *Parameterisation/Validation (if applicable; provide a brief summary and include time period of calibration/simulation)* Groundwater flow was simulated using MODFLOW, which adopted recharge and pumping predictions from LEACHM, and hydrogeological knowledge of the study area to simulate groundwater changes during 1975-2004. MODFLOW calibration involved both steady-state and transient models, which were compared to observed groundwater heads. ○ *Scenarios and outputs from various runs (provide a brief summary and indicate where these are stored)* Downscaled climate projections from 2 GCMs (global-scale models) under future medium- and high-emission scenarios were tested. ○ *Assumptions behind model (provide a brief summary and indicate where these are stored)* The groundwater flow model of the Cox Creek catchment is an update of a previously developed model by Stewart and Green (2010). The model consists of two layers and a uniform grid size of 50 m in both horizontal directions. The top layer represents the unconfined fractured rock zone and the bottom layer a zone of reduced fracture pervasiveness. Both layers are 200 m thick. The model adopts an equivalent porous medium approach to simulating fractured rock aquifer. The model is divided into five hydrogeological zones based on geological data from borehole information. ○ *Limitations of model(provide a brief summary)* Individual models of surface water runoff, groundwater recharge and groundwater flow have been developed to assess climate change impacts for the Cox Creek catchment. The results highlight that inconsistencies between the different models can be expected if careful interrogation is not undertaken. For example, internal flux calculations need to be extracted from the models and compared to corresponding processes in complementary models if consistency in the internal fluxes is required across the modelling suite. ○ *Peer review process (if applicable)* Reviewed by two external reviewers. ○ *Extensibility of model (can it be run for different time periods)* The model can be extended depending on data availability. Information about all the above points can be found in Goyder Institute Technical Report 14/28 available at http://goyderinstitute.org/

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Specificity of data	*Was data sourced from local field sites or literature* Data was mainly sourced from local field sites; these include rainfall, groundwater levels, geology.
Datasets/data products produced	*Include details of where datasets/products are located and contact details in the storage location* Datasets are stored together with the model at DEWNR Model Warehouse. Contact Dr Graham Green, Graham.Green@sa.gov.au
Other Information	
Publications (papers and technical reports)	Goyder Institute for Water Research Technical Report: Werner, A.D., Jakovovic, D., Ordens, C.M., Green G., Woods J., Fleming N. and Alcoe, D. 2014, *Developing an application test bed for hydrological modelling of climate change impacts: Cox Creek Catchment, Mount Lofty Ranges,* Goyder Institute for Water Research Technical Report Series No. 14/28, Adelaide, South Australia. Conference Proceedings: Woods, J., Jakovovic, D., Green, G., Alcoe, D., Werner, A.D., Fleming, N. 2013, *Reconciling surface and groundwater models in a climate change context,* 20th International Congress in Modelling and Simulation (MODSIM), Adelaide, South Australia, 1-6 December 2013. Werner, A.D. 2014, *Predicting climate change impacts on catchment hydrology: Are we balancing the books on the surface water-groundwater budget?*, SA NRM Science Conference, Adelaide, South Australia, 15-16 April, 2014.
Collaborations and acknowledgements	Task 4 was collaboration between Flinders University, DEWNR and SARDI. We acknowledge Dr John Hutson for assistance with LEACHM modelling and Matthew Knowling for guidance on the MODFLOW calibration methodology.
Keywords	Climate change, MODFLOW groundwater model, Cox Creek catchment

References	Delgado P., Kelley P., Murray N., Satheesh A., 2012. SOURCE User Guide, eWater Cooperative Research Centre, Canberra, Australia. Environmental Simulations, Inc., 2010. Guide to using Groundwater Vistas, Version 6. http://www.groundwatermodels.com/ Harbaugh A.W., Banta E.R., Hill M.C., McDonald M.G., 2000. MODFLOW-2000, the U.S. Geological Survey modular groundwater model user guide to modularisation concepts and groundwater flow process. Denver, CO, Reston, VA: U.S. Geological Survey. Hutson J.L., Waganet R.J., Niederhofer M.E., 1997. LEACHM, Leaching Estimation and Chemistry Model. A process-based model of water and solute movement, transformations, plant uptake and chemical reactions in the unsaturated zone. Versions LEACHF and LEACHG. Research Series No. R97-1, January 1997. Department of Soil, Crop and Atmospheric Sciences, Cornell University, Ithaca, New York. Stewart S., Green G., 2010. Groundwater flow model of Cox Creek Catchment, Mount Lofty Ranges, South Australia. DWLBC report 2010/14, Government of South Australia, through Department for Water, Adelaide.