GOYDER INSTITUTE FOR WATER RESEARCH MODEL METADATA TEMPLATE

METADATA REQUIRED	DETAILS
Model Name and version	HYDRUS 2D model
Date of lodgement of Metadata Template. Name of Metadata Provider	September 2015 Vinod Phogat, SARDI
Goyder Institute Project Number and Name	**GOYDER INSTITUTE FOR WATER RESEARCH** Project No. I.1.4 Integrated catchment water planning support for Adelaide Mount Lofty Ranges Water Allocation Planning
Project Team	Task 3: Nick Potter, CSIRO, Nick.Potter@csiro.au Justin Hughes, CSIRO, Justin.Hughes@csiro.au Vinod Phogat, SARDI, Vinod.Phogat@sa.gov.au
Creator/Developer	Vinod Phogat Vinod.Phogat@sa.gov.au
Owner/Contact Person and contact details	Vinod Phogat Vinod.Phogat@sa.gov.au
Model Location	SARDI G:\Water Resources - backed up daily – access only available to SARDI Water Resources staff who are nominated on the licence
IP or other permission requirements	No IP permission required
Licences associated with model and/or dependencies	License required to use HYDRUS 2/3D available from http://www.pc-progress.com/en/Default.aspx?h3d-pricing#k1
Confidentiality agreements associated with model and/or dependencies	No
Brief outline of model	**HYDRUS** is a Microsoft Windows based modelling environment for the analysis of water flow and solute transport in variably saturated porous media. The software package includes computational finite element models for simulating the two- and three-dimensional movement of water, heat, and multiple solutes in variably saturated media. The model includes a parameter optimization algorithm for inverse estimation of a variety of soil hydraulic and/or solute transport parameters. The model is supported by an interactive graphics-based interface for data-pre-processing, generation of structured and unstructured finite element mesh, and graphic presentation of the results. **HYDRUS-1D** is free download from the website (http://www.pc-progress.com/en/default.aspx). However, **HYDRUS 2D** and **3D** requires license. There is huge published literature on the software website and user's manual and technical manual available free download.
Area/region covered	Scott River catchment, Mt Lofty Ranges, South Australia
Platform and language and version	PC window based, system requirements: Windows XP or later version (32 or 64 bit), X86CPU with 2 GHz, 2 MB RAM, 10GB hard disk with 500 MB space for software installation, Graphic card. Program Language: FORTRAN 77. Version: HYDRUS 3D, version 2.04

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Dependencies upon: i) other models and/or platforms (including version) and location ii) essential data and data sources and location	i) No model dependencies ii) Data used: 1. SILO PET and rainfall (https://www.longpaddock.qld.gov.au/silo/ppd/index.php) 2. Groundwater data sourced from: Banks, E.W., Simmons, C.T., Love, A.J., Cranswick, R., Werner, A.D., Bestland, E.A., Wood, M., Wilson, T., 2009. Fractured bedrock and saprolite hydrogeologic controls on groundwater/surface-water interaction: a conceptual model (Australia). Hydrogeol. J. 17, 1969–1989. 3. Scott Creek gauged streamflow for infiltration estimates www.waterconnect.gov.au 4. Hydraulic parameters of the geological layers 5. Vegetation parameters, root depth, LAI for converting ET into potential transpiration and potential evaporation Data on hydraulic parameters and ET components are located at CSIRO server: \\wron\project\GWAP\DAP\Task3_HYDRUS_modelling

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How was model used	○ *Parameterisation/Validation (if applicable; provide a brief summary and include time period of calibration/simulation)* Domain 2D, 335m horizontal, vertical, 42m on left and 56m on right, nodes= 22528, elements= 44171, Discretization: 1m, refinement on stream surface= 0.3m, rest of the surface refinement= 0.5m. Calibration: 15th July, 2005 to 31st December, 2006, validation: 1st January to 31st December, 2007; backward run: 1st January, 2000, forward run: 31st December, 2012. Quantifies daily dynamics of water balance and flux exchange between surface and groundwater flows. ○ *Scenarios and outputs from various runs (provide a brief summary and indicate where these are stored)* Scenarios includes the impact of anisotropy of geological materials, width and conductivity of clogging layer, type of vegetation and depth of water table on the state of connection between creek and groundwater. Dynamics of connectivity under different land use scenarios are assessed. (Information stored at SARDI Water resources G: Drive). ○ *Assumptions behind model (provide a brief summary and indicate where these are stored)* Assumptions: no temperature effect on flow, no solute stress on water uptake, no hysteresis, passive root water uptake only, water content tolerance= 0.0001, pressure head tolerance = 0.002m, lower limit of tension interval = 1x10^{-6}, upper limit of tension interval= 150m, surface length for transpiration= 335m. ○ *Limitations of model(provide a brief summary)* Limitations: program terminates when water table reaches upper boundary. Program can't handle two boundaries on the same node, it terminates when water content extends the lower and upper limits. ○ *Peer review process (if applicable)* Peer reviewed by CSIRO internal review and research paper is under internal review. ○ *Extensibility of model (can it be run for different time periods)* It can run on extended time periods.

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Specificity of data	*Was data sourced from local field sites or literature* Domain characterization based on Banks et al. (2009). Hydraulic parameter values also obtained from Banks, et al. (2009), but final values were optimized to match water table and groundwater discharge measurements. Weather data sourced from SILO. Rooting depth/vegetation characteristics estimates, and evaporation/transpiration relationships taken from literature. Stress response function from literature and HYDRUS data base.
Datasets/data products produced	*Include details of where datasets/products are located and contact details in the storage location* Data set is located at CSIRO server: \\wron\project\GWAP\DAP\Task3_HYDRUS_modelling And also at SARDI drive G:\Water Resources
Other Information	
Publications (papers and technical reports)	Potter, N.J, J.D. Hughes, V. Phogat, D. King, and R. Bridgart, 2015, *Low flows hydrology in the Mount Lofty Ranges,* Goyder Institute for Water Research Technical Report Series No. 15/28, Adelaide, South Australia. Technical Reports are available from Goyder Institute website http://goyderinstitute.org/
Collaborations and acknowledgements	Eddie Banks, Graham Green, DEWNR, and others
Keywords	Hydrus;surface-groundwater connectivity;Scott Creek;land use