

RGDSS Memorandum

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Project: RGDSS Support Services
Subject: Commands to Include and Distribute Metered Pumping in StateCU Analysis

Introduction

Previous StateCU analyses estimated ground water pumping based on available surface water and crop irrigation requirements. Additional information is now available, including annual metered pumping records and information from water users regarding specific pumping irrigation practices for some ditches. To represent this information, the following procedure has been developed:

1. Run StateCU and allow ground water pumping to be estimated based on previous algorithms
2. Run a post-processor command file created for TSTool that “overwrites” pumping estimates based on metered data and user-supplied information to create a pumping volume (*.pvh) input file for StateCU
3. Re-run StateCU with new pumping volume input file to create the necessary output for the RGDSS MODFLOW analyses

This memorandum documents the development of the TSTool command file used in step 2 above.

Approach

The command file (RG_GWPump_AdjAllStr.TSTool) includes detailed step-by-step description of each command in header lines. Three separate processes are defined in the TSTool command file.

Limit StateCU Estimated Pumping Based on Surface Water Availability

Recent interviews with water users indicate that a subset of ditches in the Rio Grande do not begin pumping until surface water is no longer available. Therefore, StateCU estimated pumping should be set to 0 as long as surface water diversions continue. Historical monthly surface water diversions have been filled as necessary and formatted for use in StateCU analyses. Because filled daily diversions have not been developed, it is necessary to identify a “threshold” volume of monthly diversions to trigger pumping. The current input file uses 25 percent of historical average monthly diversions as that threshold. When diversions for any month are less than 25 percent of historical average diversions for the same month, pumping is estimated to occur.

Note that the TSTool commands for this operation automatically determine average monthly diversions and allow the 25 percent value to be adjusted to reflect additional information. Two

sample ditches, provided by DWR, are included in the current TSTool command file (220541 and 220627). Commands can be duplicated if additional ditches are known to only pump ground water when surface water is no longer available.

The following general steps are used to limit StateCU estimated pumping based on surface water availability:

1. Read filled surface water diversions from the historical diversion file (*.ddh) for specific ditches (220541 and 220627)
2. Determine average monthly diversions by ditch using the “NewStatisticTimeSeries” command
3. Scale average monthly diversions by factor to represent months with minimal daily diversions, therefore months when pumping could occur. (0.25 factor currently used)
4. Subtract monthly diversions from average monthly scaled time series to get positive and negative values
 - a. Positive values indicate pumping should occur
 - b. Negative values indicate no pumping should occur
5. Set negatives to 0 and positives to 1 using “SetToMin” and “SetToMax” commands, creating a threshold pumping time-series
6. Multiply the threshold time-series by StateCU generated ground water diversions. StateCU estimated pumping is set to 0 if there is surface water available, and is not adjusted when surface water is not available.

Limit StateCU Estimated Pumping In Specified Months

Recent interviews with water users indicate that a subset of ditches in the Rio Grande do not pump early in the irrigation season. To reflect this, StateCU estimated pumping should be set to 0 during specified months.

Note that the TSTool commands for this operation set StateCU estimated pumping to 0 from January through April. These monthly switches can be revised as additional information is known. Two sample ditches are included in the current TSTool command file (35MS03 and 270604). Note that these ditches ***have not*** been specifically identified, and are only used as a placeholder. The commands can be revised and duplicated as specific ditches are identified as not pumping until a certain date.

The following general steps are used to limit StateCU estimated pumping in specified months:

1. Create monthly time series of 0 and 1 values, where 0 values represent months when StateCU estimated pumping should be set to 0
2. Multiply the monthly time series of 0 and 1 values by StateCU estimated ground water pumping

Replace StateCU Estimated Pumping with Metered Pumping Data

Annual metered pumping data in the Rio Grande is available for 2009, and will continue to be available in the future. StateCU estimated pumping data for 2009 and future years should be

replaced with metered data. Because metered data is only provided on an annual time-step, StateCU monthly estimates will be used to distribute the metered data to estimated monthly values.

The annual metered pumping data is originally stored in a Microsoft Excel workbook with annual pumping for individual wells summed and recorded by structure ID. The data needs to be formatted and saved as a standard monthly *.stm file in order to be read and manipulated in TSTool. Annual metered pumping data is repeated to monthly values based on the following general process:

1. Create a new worksheet within metered pumping workbook
2. Copy metered pumping data, by structure, into new worksheet with annual value set for each month in the year
3. Sort data first by Year and then by ID
4. Save formatted worksheet to MeteredPumping.prn using standard *.stm column widths
5. Add standard *.stm date and unit header in a text editor to reflect period of actual pumping data
6. Save standard *.stm formatted file as MeteredPumping.stm

The following general steps are used in the TSTool command file to distribute annual metered pumping data to monthly estimates and overwrite StateCU estimated pumping:

1. Read StateCU estimated monthly pumping from StateCU Binary file
2. Change interval to sum StateCU estimated monthly pumping to annual values
3. Change interval to set annual values to each month
4. Divide original monthly time-series by annual values to create annual monthly distributions, i.e. months for each year add up to 1.0
5. Read metered data time-series (MeteredPumping.stm)
6. Multiply by monthly distributions from step 4
7. Save as pumping volume (*.pvh) input file for StateCU

Note that commands to distribute metered pumping only replace StateCU estimated pumping for structures and years when metered data is available. The commands are created in a manner that specific structures and available years do not need to be specified for the process to work correctly.

Results

The documented TSTool command file (RG_GWPump_AdjAllStr.TSTool) is submitted with this memorandum.