Shetran Easy Setup

See video at https://youtu.be/zYrDnVq5iD8
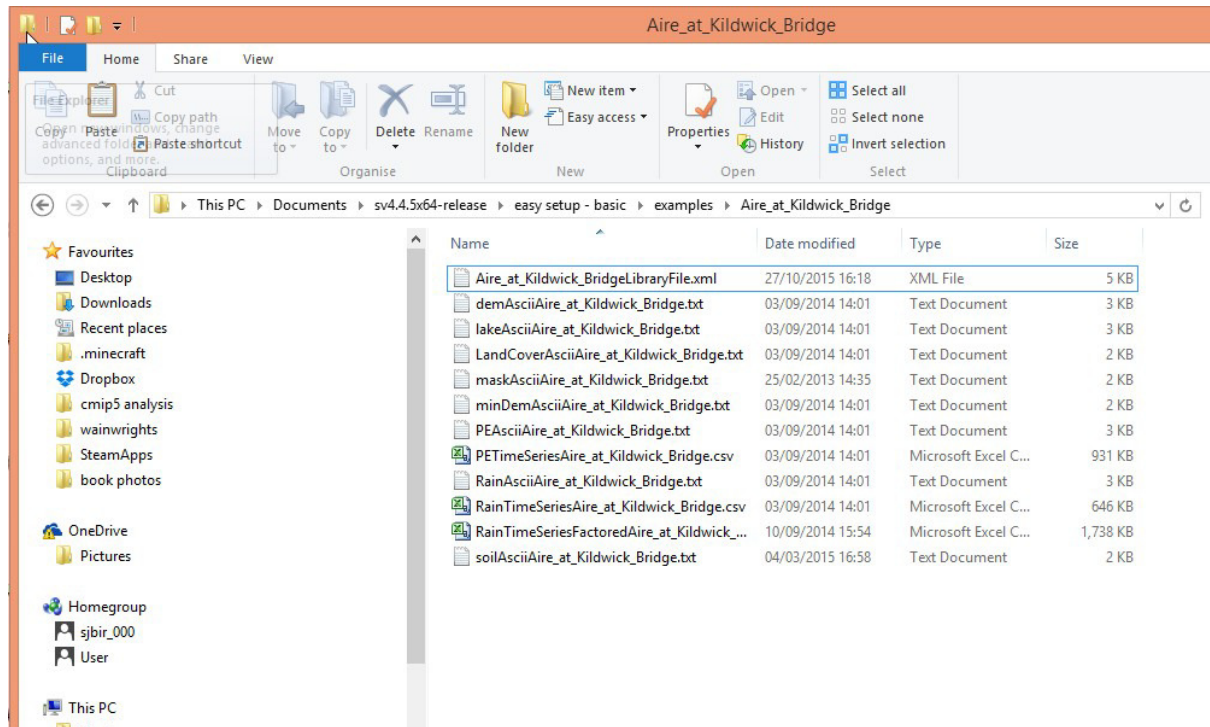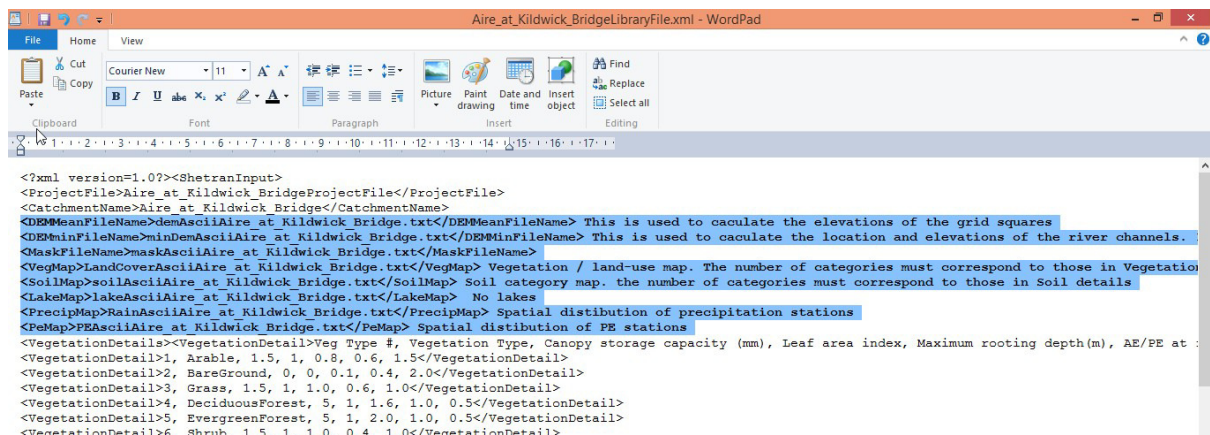
1. Go to folder "examples/Aire_at_Kildwick_Bridge"

There are three sorts of files: xml (library) file, ASCII grids, time series data

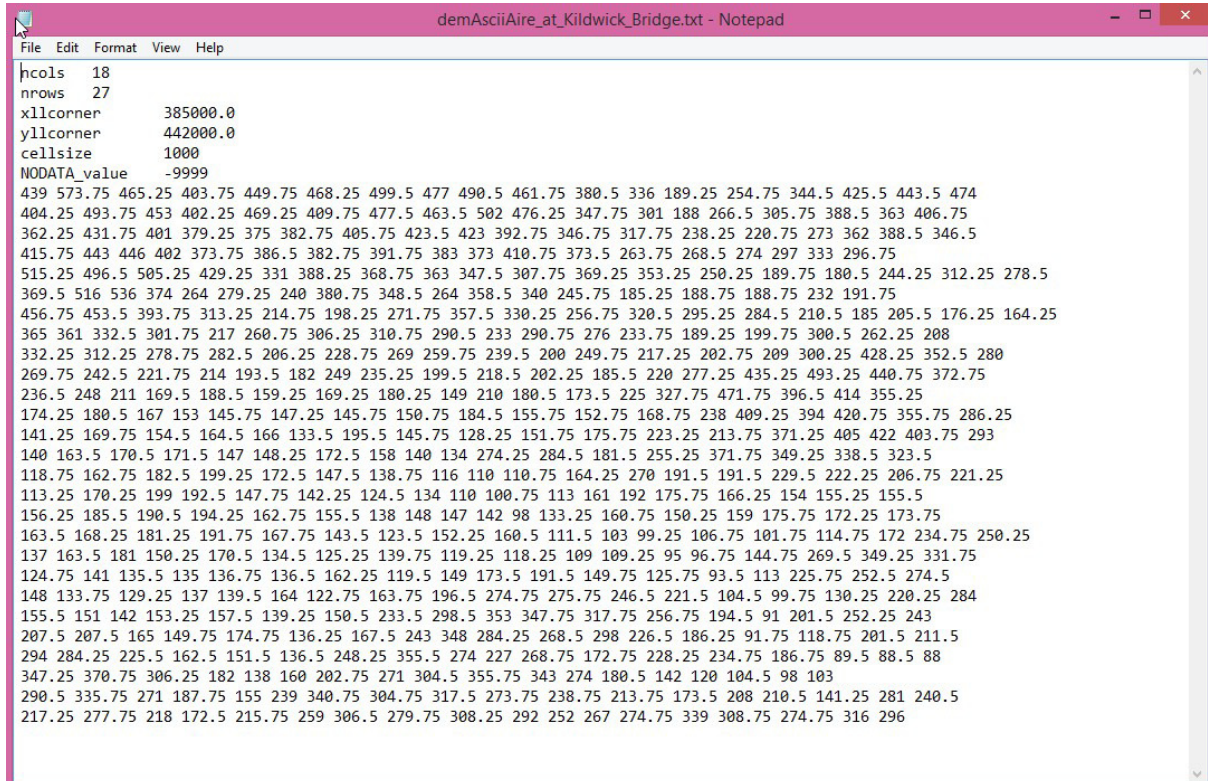### 2. Open xml(library) file in text editor (e.g. WordPad or NotePad)

This contains links to the ASCII grid files and time series files and also parameter values

Highlighted are the seven ASCII grid files. These come from a GIS. The lake map is optional if there are no lakes type put nothing between the start and end tags: "`<LakeMap></LakeMap>   No lakes`"

3. Look at DEM ASCII grid

ASCII grids are just text files from a GIS. Open Dem ASCII grid in the text editor. The catchment has 18 columns and 27 rows. All the grids must be the same. There are 6 header lines and then the data.

```
demAsciiAire_at_Kildwick_Bridge.txt - Notepad
File  Edit  Format  View  Help
ncols        18
nrows        27
xllcorner         385000.0
yllcorner         442000.0
cellsize          1000
NODATA_value      -9999
439 573.75 465.25 403.75 449.75 468.25 499.5 477 490.5 461.75 380.5 336 189.25 254.75 344.5 425.5 443.5 474
404.25 493.75 453 402.25 469.25 409.75 477.5 463.5 502 476.25 347.75 301 188 266.5 305.75 388.5 363 406.75
362.25 431.75 401 379.25 375 382.75 405.75 423.5 423 392.75 346.75 317.75 238.25 220.75 273 362 388.5 346.5
415.75 443 446 402 373.75 386.5 382.75 391.75 383 373 410.75 373.5 263.75 268.5 274 297 333 296.75
515.25 496.5 505.25 429.25 331 388.25 368.75 363 347.5 307.75 369.25 353.25 250.25 189.75 180.5 244.25 312.25 278.5
369.5 516 536 374 264 279.25 240 380.75 348.5 264 358.5 340 245.75 185.25 188.75 188.75 232 191.75
456.75 453.5 393.75 313.25 214.75 198.25 271.75 357.5 330.25 256.75 320.5 295.25 284.5 210.5 185 205.5 176.25 164.25
365 361 332.5 301.75 217 260.75 306.25 310.75 290.5 233 290.75 276 233.75 189.25 199.75 300.5 262.25 208
332.25 312.25 278.75 282.5 206.25 228.75 269 259.75 239.5 200 249.75 217.25 202.75 209 300.25 428.25 352.5 280
269.75 242.5 221.75 214 193.5 182 249 235.25 199.5 218.5 202.25 185.5 220 277.25 435.25 493.25 440.75 372.75
236.5 248 211 169.5 188.5 159.25 169.25 180.25 149 210 180.5 173.5 225 327.75 471.75 396.5 414 355.25
174.25 180.5 167 153 145.75 147.25 145.75 150.75 184.5 155.75 152.75 168.75 238 409.25 394 420.75 355.75 286.25
141.25 169.75 154.5 164.5 166 133.5 195.5 145.75 128.25 151.75 175.75 223.25 213.75 371.25 405 422 403.75 293
140 163.5 170.5 171.5 147 148.25 172.5 158 140 134 274.25 284.5 181.5 255.25 371.75 349.25 338.5 323.5
118.75 162.75 182.5 199.25 172.5 147.5 138.75 116 110 110.75 164.25 270 191.5 191.5 229.5 222.25 206.75 221.25
113.25 170.25 199 192.5 147.75 142.25 124.5 134 110 100.75 113 161 192 175.75 166.25 154 155.25 155.5
156.25 185.5 190.5 194.25 162.75 155.5 138 148 147 142 98 133.25 160.75 150.25 159 175.75 172.25 173.75
163.5 168.25 181.25 191.75 167.75 143.5 123.5 152.25 160.5 111.5 103 99.25 106.75 101.75 114.75 172 234.75 250.25
137 163.5 181 150.25 170.5 134.5 125.25 139.75 119.25 118.25 109 109.25 95 96.75 144.75 269.5 349.25 331.75
124.75 141 135.5 135 136.75 136.5 162.25 119.5 149 173.5 191.5 149.75 125.75 93.5 113 225.75 252.5 274.5
148 133.75 129.25 137 139.5 164 122.75 163.75 196.5 274.75 275.75 246.5 221.5 104.5 99.75 130.25 220.25 284
155.5 151 142 153.25 157.5 139.25 150.5 233.5 298.5 353 347.75 317.75 256.75 194.5 91 201.5 252.25 243
207.5 207.5 165 149.75 174.75 136.25 167.5 243 348 284.25 268.5 298 226.5 186.25 91.75 118.75 201.5 211.5
294 284.25 225.5 162.5 151.5 136.5 248.25 355.5 274 227 268.75 172.75 228.25 234.75 186.75 89.5 88.5 88
347.25 370.75 306.25 182 138 160 202.75 271 304.5 355.75 343 274 180.5 142 120 104.5 98 103
290.5 335.75 271 187.75 155 239 340.75 304.75 317.5 273.75 238.75 213.75 173.5 208 210.5 141.25 281 240.5
217.25 277.75 218 172.5 215.75 259 306.5 279.75 308.25 292 252 267 274.75 339 308.75 274.75 316 296
```

4. Look at parameter values in the xml(library) file

7 vegetation types are defined. The locations of each are in LandCoverAsciiAire_at_Kildwick_Bridge.txt.

Each vegetation types has the following parameters:

Canopy Storage capacity (mm)
Leaf area index
Maximum rooting depth (m)
Actual/potential evaporation at filed capacity
Strickler overland flow coefficient

```
<PrecipMap>RainAsciiAire_at_Kildwick_Bridge.txt</PrecipMap> Spatial distibution of precipitation stations
<PeMap>PEAsciiAire_at_Kildwick_Bridge.txt</PeMap> Spatial distibution of PE stations
<VegetationDetails><VegetationDetail>Veg Type #, Vegetation Type, Canopy storage capacity (mm), Leaf area index, Maximum rooting depth(m), AE/PE at
<VegetationDetail>1, Arable, 1.5, 1, 0.8, 0.6, 1.5</VegetationDetail>
<VegetationDetail>2, BareGround, 0, 0, 0.1, 0.4, 2.0</VegetationDetail>
<VegetationDetail>3, Grass, 1.5, 1, 1.0, 0.6, 1.0</VegetationDetail>
<VegetationDetail>4, DeciduousForest, 5, 1, 1.6, 1.0, 0.5</VegetationDetail>
<VegetationDetail>5, EvergreenForest, 5, 1, 2.0, 1.0, 0.5</VegetationDetail>
<VegetationDetail>6, Shrub, 1.5, 1, 1.0, 0.4, 1.0</VegetationDetail>
<VegetationDetail>7, Urban, 0.3, 0.3, 0.5, 0.4, 5.0</VegetationDetail>
</VegetationDetails>
<SoilProperties>
<SoilProperty>Soil Number,Soil Type, Saturated Water Content, Residual Water Content, Saturated Conductivity (m/day), vanGenuchten- alpha (cm-1), v
```

Four soil category types are defined. The locations of each are in soilAsciiAire_at_Kildwick_Bridge.txt.

Each category type is defined in SoilDetails. For example Category 3 has two soils. Soil 3 (defined in SoilProperties) to a depth of 1.2m and Soil 4 to a depth of 6.2m. Soil 3 is a medium Fine soil and soil 4 a highly productive aquifer. The SoilProperty parameters are:

Saturated water content (porosity)
Residual water content
Saturated conductivity (m/day)
vanGenuchten alpha (cm-1)
VanGenuchten n

```
</VegetationDetails>
<SoilProperties>
<SoilProperty>Soil Number,Soil Type, Saturated Water Content, Residual Water Content, Saturated Conductivity (m/day), vanGenuchten- alpha (cm-1), va
<SoilProperty>1,Coarse(18%:clayAnd:65%sand), 0.403, 0.025, 60.000, 0.0383, 1.3774</SoilProperty>
<SoilProperty>2,LowProductivityAquiferThroughPores, 0.3, 0.2, 0.001, 0.01, 5</SoilProperty>
<SoilProperty>3,MediumFine(:35%clayand:15%sand), 0.430, 0.010, 2.272, 0.0083, 1.2539</SoilProperty>
<SoilProperty>4,HighlyProductiveAquiferThroughCracks, 0.3, 0.2, 41.5, 0.001, 6</SoilProperty>
</SoilProperties>
<SoilDetails>
<SoilDetail>Soil Category, Soil Layer, Soil Type, Depth at base of layer (m)</SoilDetail>
<SoilDetail>1, 1, 1, 1.0 </SoilDetail>
<SoilDetail>1, 2, 2, 6.0 </SoilDetail>
<SoilDetail>2, 1, 1, 1.0 </SoilDetail>
<SoilDetail>2, 2, 2, 5.0 </SoilDetail>
<SoilDetail>3, 1, 3, 1.2 </SoilDetail>
<SoilDetail>3, 2, 4, 6.2 </SoilDetail>
<SoilDetail>4, 1, 3, 1.2 </SoilDetail>
<SoilDetail>4, 2, 2, 6.2 </SoilDetail>
</SoilDetails>
<InitialConditions>0</InitialConditions> Initial water table depth below ground
<PrecipitationTimeSeriesData>RainTimeSeriesFactoredAire_at_Kildwick_Bridge.csv</PrecipitationTimeSeriesData> Precipitation time series. Units are in
```

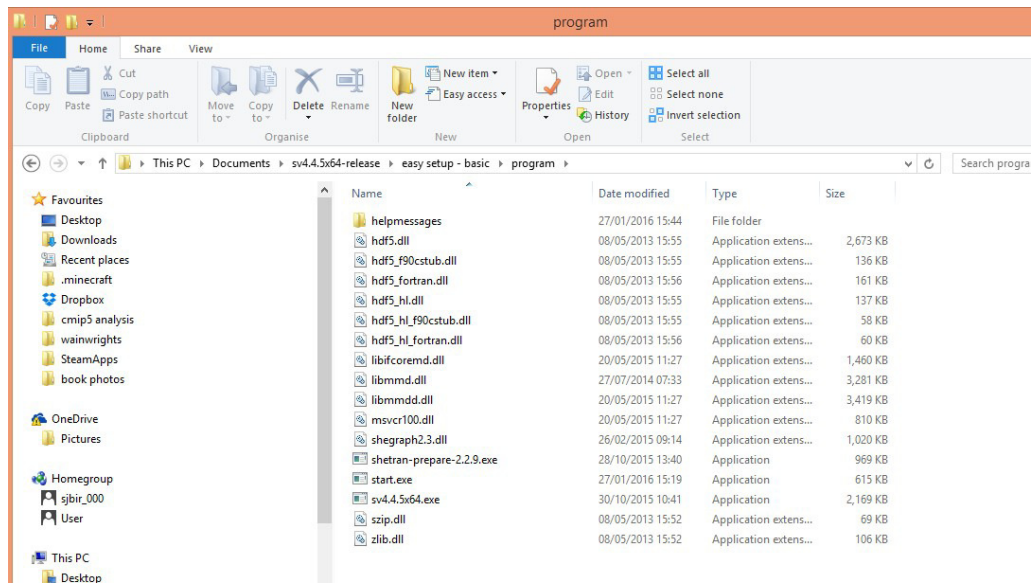Initial conditions, links to time series files (including timestep) and start and end times of the simulation can also be seen.

```
<SoilDetail>4, 2, 2, 6.2 </SoilDetail>
</SoilDetails>
<InitialConditions>0</InitialConditions> Initial water table depth below ground
<PrecipitationTimeSeriesData>RainTimeSeriesFactoredAire_at_Kildwick_Bridge.csv</PrecipitationTimeSeriesData> Precipitation time series. Units are in
<PrecipitationTimeStep>24</PrecipitationTimeStep> >  Timestep in hours
<EvaporationTimeSeriesData>PETimeSeriesAire_at_Kildwick_Bridge.csv</EvaporationTimeSeriesData> PE  time series. Units are in mm in the timestep leng
<EvaporationTimeStep>24</EvaporationTimeStep> >  Timestep in hours
<StartDay>01</StartDay>
<StartMonth>01</StartMonth>
<StartYear>1980</StartYear>
<EndDay>01</EndDay>
<EndMonth>01</EndMonth>
<EndYear>1981</EndYear>
<RiverGridSquaresAccumulated>2</RiverGridSquaresAccumulated> Number of upstream grid squares needed to produce a river channel. A larger number will
<DropFromGridToChannelDepth>2</DropFromGridToChannelDepth> The standard and minimum value is 2 if there are numerical problems with error 1060 this
```

Other parameters values are defined at the end of the file.

5. Run the Simulation

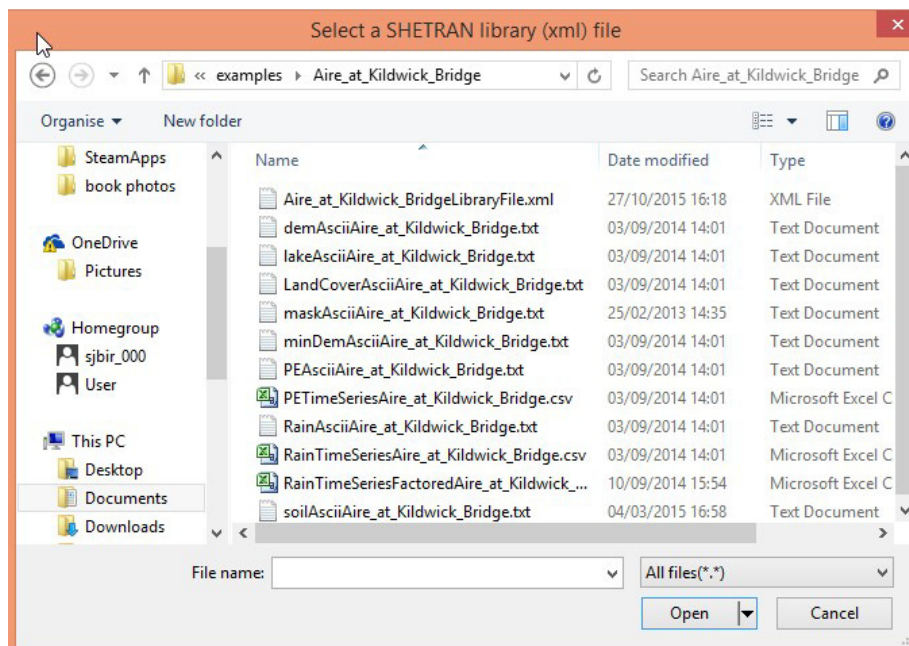Go to the program folder. There are 3 executables.

shetran-prepare-2.2.9.exe - This takes all the files in the example data set and produces the standard shetran input files. (e.g input_Aire_at_Kildwick_Bridge_frd.txt)

sv4.4.5x64.exe – standard Shetran executable. Takes the standard input files (e.g input_Aire_at_Kildwick_Bridge_frd.txt) and produces the standard shetran output files (output_Aire_at_Kildwick_Bridge_pri.txt).

start.exe – runs both the above executables. First shetran-prepare-2.2.9.exe then sv4.4.5x64.exe.

To run simulation double click on start.exe and select "Aire_at_Kildwick_BridgeLibraryFile.xml" from the examples/Aire_at_Kildwick_Bridge folder

After a few minutes the simulation will finish

```
C:\Users\sjbir_000\Documents\sv4.4.5x64-release\easy setup - basic\program\s...

Shetran Prepare 2.2.9
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This executable reads an XML file and the corresponding
ASC grids and produces the Shetran input files


Minimum catchment elevation is      88.00
At row    24 and column    16


 Normal completion

 SHETRAN Version 4.4.5 for PC - incorporating SHEGRAPH Version 2
 **************************************************************

 Length of Simulation =     8784.00 hours.

Simulation Timestep =     8784.43 hours    % Completed = 100.00

 Normal completion of SHETRAN run
Fortran Pause - Enter command<CR> or <CR> to continue.
```