Memorandum

To: *South Carolina Department of Natural Resources (DNR)*
South Carolina Department of Health and Environmental Control (DHEC)

From: *CDM Smith*

Date: *March 2015*

Subject: *Saluda River Basin SWAM Model Framework*

This memorandum presents the SWAM model framework for the Saluda River Basin (Figure 1). Additional tables and maps are provided to help understand how the tributaries, water users, and discharges are being represented in the SWAM modeling environment. The figure, tables and map attachments include:

Figure 1 **Saluda River Basin SWAM Model Framework**

Table 1 **Permitted and registered water users included in the Saluda Basin model framework.**

Table 2 **NPDES discharges included in the Saluda Basin model framework.**

Table 3 **Interbasin transfers included in the Saluda Basin model framework.**

Map 1 **Overview Map**
This map consolidates and presents all active permitted and registered water users; significant discharge locations, including those outside of the Saluda basin which represent the export of water withdrawn from the Saluda basin; USGS stream gage locations; and tributaries (the "higher order tributaries" are not represented explicitly in the model, but their contributions to flow are included in the flows of larger, modeled tributaries). Significant discharge locations generally include NPDES discharges that average over 3 million gallons per month.

Map 2 **Model Tributaries and USGS Gages**
This map presents the Saluda River Basin hydrography including the mainstem of the Saluda and Congaree Rivers, major branches, primary tributaries, secondary tributaries, and higher order tributaries. The contributions of many of the secondary and higher order tributaries are accounted for in the aggregate flow in the larger

tributaries that are modeled explicitly. Both active and inactive USGS streamflow gages are displayed.

Map 3 Surface Water Users
This map presents the location of permitted surface water users.

Map 4 Agricultural Users
This map presents the location of registered agriculture surface water users with withdrawals that exceed 3 million gallons per month.

Map 5 All Discharge Points
This map presents the location of all significant NPDES discharge locations, including those outside of the Saluda basin which represent the export of water withdrawn from the Saluda basin. Significant discharge locations generally include NPDES discharges that average over 3 million gallons per month.

Map 6 User and Associated Discharged
This map presents the location of all significant NPDES discharge locations and their associated water withdrawal location.

This framework was developed in collaboration with South Carolina DNR and DHEC during discussions coinciding with progress meetings in December 2014 and January 2015. The proposed framework is submitted with the understanding that it is malleable – that is, we may find that additional tributaries are warranted as explicit model objects (to support simulation of future withdrawals or discharges) rather than implicit flow additions, or that further simplifications are possible without compromising model utility. One of the primary purposes of this pilot study is to experiment with tradeoffs associated with detail and functionality.

The guiding principles in determining what elements of the Saluda River Basin to simulate explicitly were:

1. Begin with a simple representation, with the understanding that it is easier to add additional details in the future than to remove unnecessary detail to make the model more efficient.

2. Any tributary with current uses (permitted or registered withdrawals or significant discharge) will be represented explicitly. This includes most primary tributaries to the Saluda and its major branches, and some secondary tributaries.

3. Generally, tributaries that are unused are not included explicitly, but the hydrologic contributions from these tributaries is embedded in the unimpaired flows (or reach gains) in downstream locations. As unimpaired flows (UIFs) are developed throughout the Saluda,

some additional tributaries may be added explicitly if warranted as candidates to support future use (or these can be easily added at any time in the future as permit applications are received).

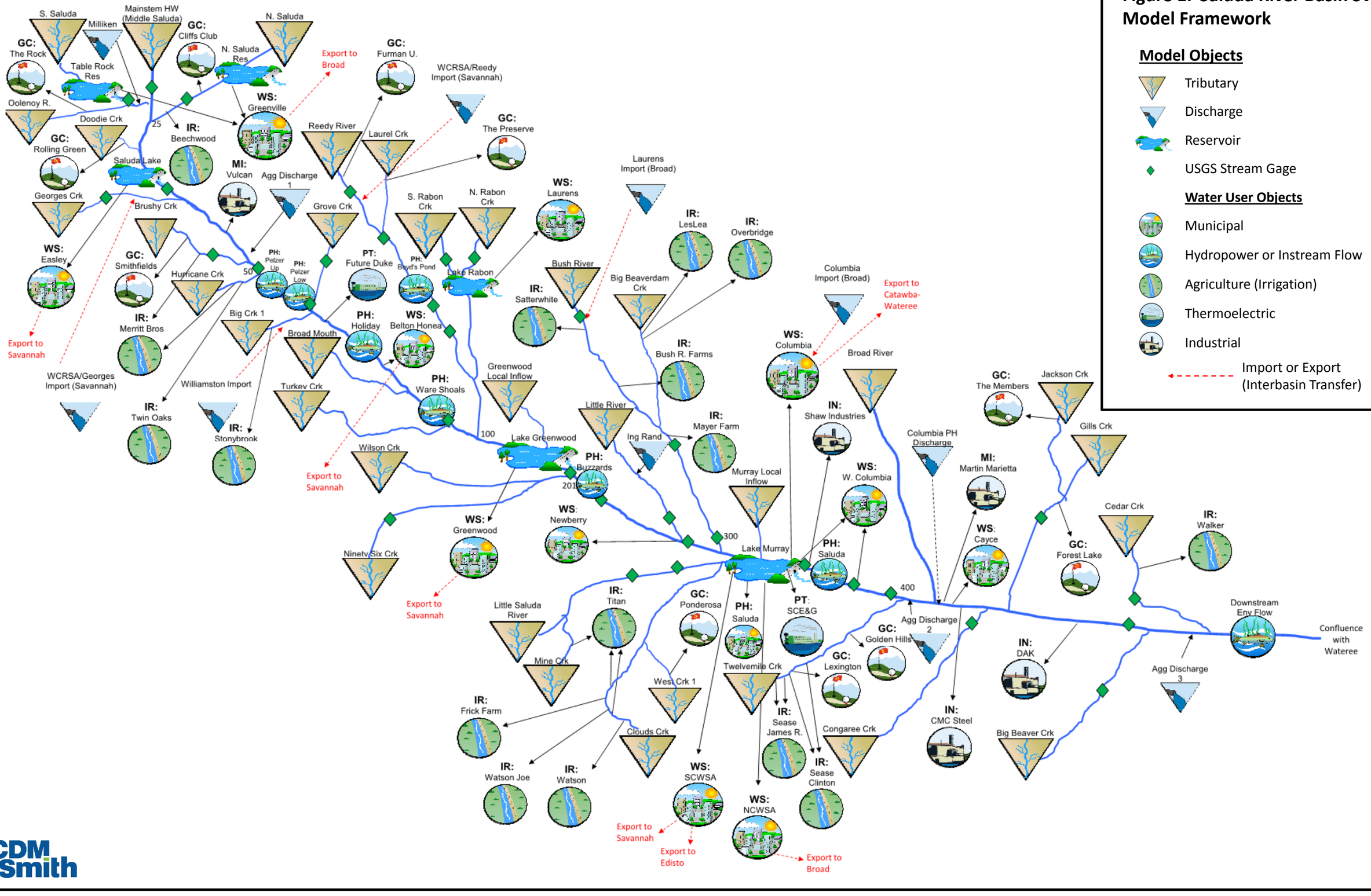
SWAM includes built-in flexibility for two key functions relevant to the South Carolina models, and some experimentation with these options will be necessary before recommending an approach that is best suited to the anticipated needs and uses of these models. Additionally, decisions on specific methodologies may be site-specific within a basin, and may vary between basins, based on prevailing anticipated needs for planning and/or permitting. The two key areas with which we will experiment within the current proposed framework in the pilot model include:

- ***Incremental Flows***: Hydrologic inflow in between UIF inputs or uses (model nodes) can be added in two ways, as explained in a previous memorandum dated January 2015 ("Options for Adding User Nodes in a SWAM Network"). They can be added with an embedded methodology in which incremental flow gains or losses can be added proportionally by river mile in relation to the upstream headwater UIF. Alternatively, they can be added as aggregated tributaries (calculated, for example, as the difference between upstream and downstream UIFs) just upstream of the downstream end of a reach. The methods have both advantages and disadvantages. For example, the embedded method of linearly proportional flow increase/decrease will adjust automatically with the addition of new nodes in the future, but requires calibration to long-term trends. On the other hand, adding incremental flows with calculated aggregate tributary flow would be more accurate on a day-to-day basis in the model, but would require manual re-distribution if new nodes are added in the future.
- ***Discharge:*** Water and wastewater discharges can be simulated two ways in SWAM. First, they can be associated with a water withdrawal object, each of which may specify five points of discharge anywhere in the river network. These discharges are not represented with visual model objects, but are identified within the dialogue box for the associated withdrawal object. Alternatively, discharges can be specified with explicit model objects (the Tributary object, modified visually to represent either a natural stream tributary or a controlled discharge, each of which will have identical functionality). Again, there are advantages and disadvantages with both methods. Associating discharges with withdrawals helps to automatically maintain a reasonable water balance because discharges are specified as seasonally-variable percentage of the withdrawal. However, it may be more difficult to test a maximum discharge permit level using this approach. Alternatively, using a tributary object to specify outflows allows for more precise representation of discharge variability, but does not automatically preserve the water balance (the user will need to adjust withdrawals to match simulated discharge). This second approach is also appropriate for interbasin transfers, in which source water resides in another basin but is discharged in the basin in the model.

The pilot model of the Saluda Basin provides an excellent experimental framework in which to test the various ways of simulating flows and discharges so that the balance of model functionality and

detail can be customized specifically for use in South Carolina. The proposed model framework is a starting point based on discussions with DNR and DHEC, and on CDM Smith's initial estimate of an appropriate framework for planning and permitting in South Carolina. It will likely evolve as the pilot model is developed.

Figure 1. Saluda River Basin SWAM Model Framework



Model Objects

- Tributary
- Discharge
- Reservoir
- USGS Stream Gage

Water User Objects

- Municipal
- Hydropower or Instream Flow
- Agriculture (Irrigation)
- Thermoelectric
- Industrial
- Import or Export (Interbasin Transfer)

CDM Smith

Table 1. Permitted and registered water users included in the Saluda Basin model framework.

ID	Type	Facility Name	Withdrawal Tributary	Model Object ID
02IR011S09	IR	WATSON JERROLD & SONS	Clouds Creek	IR: Watson
04IR001S01	IR	TWIN OAKS FARM	Hurricane Creek	IR: Twin Oaks
04IR002S01	IR	STONEYBROOK	Big Creek	IR: Stoneybrook
04MI001S01	MI	VULCAN MATERIALS	Saluda River	MI: Vulcan
04PH001S01	PH	PELZER - UPPER HYDRO	Saluda River	PH: Pelzer Upper
04PH002S01	PH	PELZER - LOWER HYDRO	Saluda River	PH: Pelzer Lower
NA	PT	FUTURE DUKE ENERGY NATURAL GAS PLANT[1]	Saluda River	PT: Future Duke
04WS005S01	WS	BELTON-HONEA PATH WTP	Saluda River	WS: Belton Honea
09IN001S01	IN	DAK (EASTMAN CHEMICAL/SC OPERATIONS)	Congaree River	IN: DAK
23GC004S01	GC	FURMAN UNIVERSITY GOLF CLUB	Reedy River	GC: Furman U.
23GC004S02	GC	FURMAN UNIVERSITY GOLF CLUB	Reedy River	GC: Furman U.
23GC013S01	GC	CLIFFS CLUB AT VALLEY	Beaverdam Creek/Terry Creek	GC: Cliffs Club
23GC014S01	GC	THE PRESERVE AT VERDAE	Laurel Creek	GC: The Preserve
23IR026S01	IR	BEECHWOOD FARM	North Saluda River	IR: Beechwood
23PH001S01	PH	HOLIDAY BRIDGE HYDRO	Saluda River	PH: Holiday
23WS002S01	WS	GREENVILLE WATER L.B. STOVALL PLANT	North Saluda River	WS: Greenville
23WS002S02	WS	GREENVILLE WATER L.B. STOVALL PLANT	South Saluda River	WS: Greenville
23WS002S03	WS	GREENVILLE WATER L.B. STOVALL PLANT	South Saluda River	WS: Greenville
24PH001S01	PH	BUZZARDS ROOST HYDRO (NORTHBROOK)	Saluda River/Lake Greenwood	PH: Buzzards
24PH001S02	PH	SALUDA HYDRO (NORTHBROOK)	Saluda Lake	Saluda Lake
24WS001S01	WS	CITY OF GREENWOOD (WISE PLANT)	Saluda River/Lake Greenwood	WS: Greenwood
24WS001S02	WS	CITY OF GREENWOOD (WISE PLANT)	Saluda River/Lake Greenwood	WS: Greenwood
30PH002S01	PH	WARE SHOALS HYDRO	Saluda River	PH: Ware
30PH002S01	PH	BOYD'S MILL HYDRO (NORTHBROOK)	Boyd's Mill Pond	PH: Boyd's Mill
30WS002S02	WS	LAURENS WTP	Rabon Creek	WS: Laurens
30WS002S03	WS	LAURENS WTP	Rabon Creek	WS: Laurens
32GC004S01	GC	COUNTRY CLUB OF LEXINGTON	Twelvemile Creek	GC: Lexington
32GC007S01	GC	GOLDEN HILLS GOLF & COUNTRY CLUB	Twelvemile Creek	GC: Golden Hills
32GC010S01	GC	PONDEROSA COUNTRY CLUB	Gin Branch	GC: Ponderosa
32IN006S01	IN	SHAW INDUSTRIES GROUP PLANT 8S	Saluda River	IN: Shaw
32IN051S01	IN	CMC STEEL SOUTH CAROLINA	Congaree River	IN: CMC Steel
32IR005S01	IR	SEASE CLINTON FARMS	Twelvemile Creek	IR: Sease Clinton
32IR005S02	IR	SEASE CLINTON FARMS	Twelvemile Creek	IR: Sease Clinton
32IR005S03	IR	SEASE CLINTON FARMS	Twelvemile Creek	IR: Sease Clinton
32IR021S01	IR	SEASE JAMES R FARMS INC	Twelvemile Creek	IR: Sease James
32IR021S02	IR	SEASE JAMES R FARMS INC	Twelvemile Creek	IR: Sease James
32IR021S03	IR	SEASE JAMES R FARMS INC	Twelvemile Creek	IR: Sease James
32IR021S04	IR	SEASE JAMES R FARMS INC	Twelvemile Creek	IR: Sease James
32IR021S06	IR	SEASE JAMES R FARMS INC	Twelvemile Creek	IR: Sease James
32MI001S01	MI	MARTIN MARIETTA MATERIALS - CAYCE QUARRY	Congaree River	MI: Martin Marietta
32PH001S01	PH	SALUDA HYDRO	Saluda River/Lake Murray	PH: Saluda
32PT001S01	PT	SCE&G - MCMEEKIN STATION	Saluda River/Lake Murray	PT: SCE&G
32WS004S02	WS	CITY OF CAYCE WTP	Congaree River	WS: Cayce
32WS008S01	WS	WEST COLUMBIA WTP	Saluda River	WS: West Columbia
32WS052S01	WS	WEST COLUMBIA WTP	Saluda River/Lake Murray	WS: West Columbia
36IR002S01	IR	OVERBIRDGE FARM LLC	Big Beaverdam Creek	IR: Overbridge
36IR004S01	IR	SATTERWHITE FARMS	Bush River	IR: Satterwhite
36IR009S01	IR	MAYER FARM	Bush River	IR: Mayer
36IR009S02	IR	MAYER FARM	Bush River	IR: Mayer
36IR035S01	IR	BUSH RIVER FARMS	Bush River	IR: Bush R. Farms
36IR037S02	IR	LESLEA FARMS	Big Beaverdam Creek	IR: LesLea
36IR037S03	IR	LESLEA FARMS	Bush River	IR: LesLea
36WS001S01	WS	CITY OF NEWBERRY WTP	Saluda River	WS: Newberry
36WS002S01	WS	NCWSA - LAKE MURRAY WTP	Saluda River/Lake Murray	WS: NCWSA
37IR017S01	IR	MERRITT BROS INC	Brushy Creek	IR: Merritt Bros
37IR017S02	IR	MERRITT BROS INC	Little Brushy Creek	IR: Merritt Bros
37IR017S03	IR	MERRITT BROS INC	Hurricane Creek	IR: Merritt Bros
37IR017S04	IR	MERRITT BROS INC	Hurricane Creek	IR: Merritt Bros
39GC002S01	GC	ROLLING GREEN GOLF CLUB	Doddies Creek	GC: Rolling Green
39GC003S01	GC	SMITHFIELDS COUNTRY CLUB	Middle Branch/Brushy Creek	GC: Smithfields
39GC006S01	GC	THE ROCK AT JOCASSEE GC	South Saluda River	GC: The Rock
39WS001S01	WS	EASLEY COMBINED UTILITIES - D.L. MOORE WTP	Saluda River	WS: Easley
40GC002S01	GC	FOREST LAKE CLUB	Gills Creek	GC: Forest Lake
40GC005S03	GC	THE MEMBERS CLUB AT WILDEWOOD	Jackson Creek	GC: The Members
40GC005S05	GC	THE MEMBERS CLUB AT WILDEWOOD	Jackson Creek	GC: The Members
40GC005S06	GC	THE MEMBERS CLUB AT WILDEWOOD	Jackson Creek	GC: The Members
40IR001S01	IR	WALKER FARM	Cedar Creek	IR: Walker
40PH001S01	PH	COLUMBIA HYDRO	Congaree River	PH: Columbia
40WS002S02	WS	CITY OF COLUMBIA - LAKE MURRAY WATER PLANT	Saluda River/Lake Murray	WS: Columbia
40WS054S01	WS	CITY OF COLUMBIA - CANAL WATER PLANT	Saluda River/Broad River	WS: Columbia
41IR014S01	IR	TITAN FARMS	Peters Creek	IR: Titan
41IR014S03	IR	TITAN FARMS	Peters Creek	IR: Titan
41IR014S04	IR	TITAN FARMS	Clouds Creek	IR: Titan
41IR014S08	IR	TITAN FARMS	Dry Creek	IR: Titan
41IR010s03	IR	FRICK FARM	Clouds Creek	IR: Frick
41WS003S01	WS	SCWSA - RAW WATER INTAKE	Saluda River/Lake Murray	WS: SCWSA

[1] *The Duke Power Lee Steam Station came off-line in late 2014. A Duke Energy Natural Gas Plant may come online near the former steam station and a model objec has been included to represent this future facility.*

Blue and gray shading represents water users with multiple permitted withdrawal locations. These are represented by one model object.

Table 2. NPDES discharges included in the Saluda Basin model framework.

NPDES Pipe ID	Facility Name	Discharge Tributary	Associated Water Permit	Model Object ID
SCG730245-000	VULCAN CONST MAT/LAKESIDE	Saluda River	04MI001	MI: Vulcan
SC0002291-001	DUKE ENERGY/LEE STEAM STATION	Saluda River	04PT001	PT: Lee Steam Sta
SC0002291-002	DUKE ENERGY/LEE STEAM STATION	Saluda River	04PT001	PT: Lee Steam Sta
SC0002291-003	DUKE ENERGY/LEE STEAM STATION	Saluda River	04PT001	PT: Lee Steam Sta
SC0002291-004	DUKE ENERGY/LEE STEAM STATION	Saluda River	04PT001	PT: Lee Steam Sta
SC0020214-001	WARE SHOALS/DAIRY STREET	Saluda River	04WS005	WS: Belton Honea
SC0045896-001	BELTON/DUCWORTH (SALUDA)	Saluda River	04WS005	WS: Belton Honea
SC0045896-002	BELTON/DUCWORTH (SALUDA)	Broad Mouth Creek	04WS005	WS: Belton Honea
SC0045896-003	BELTON/DUCWORTH (SALUDA)	Broad Mouth Creek	04WS005	WS: Belton Honea
SC0001333-001	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0001333-01A	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0001333-01D	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0001333-01E	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0001333-01F	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0001333-01G	EASTMAN CHEMICAL/SC OPERATIONS	Congaree River	09IN001	IN: DAK
SC0026883-001	WCRSA/MARIETTA WWTP	North Saluda River	23WS002	WS: Greenville
SC0041211-001	WCRSA/MAULDIN ROAD	Reedy River	23WS002	WS: Greenville
SC0021709-001	GREENWOOD/WILSON CREEK WWTF	Wilson Creek	24WS001	WS: Greenwood
SC0036048-001	NINETY SIX WWTF	Ninety Six Creek	24WS001	WS: Greenwood
SC0042706-001	NINETY SIX CPW (PIER 96) WWTP	Ninety Six Creek	24WS001	WS: Greenwood
SC0020702-001	LAURENS COMM OF PW/LAURENS	Little River	30WS002	WS: Laurens
SC0003557-001	SHAW INDUSTRIES GROUP/COLUMBIA	Congaree River	32IN006	IN: Shaw Industries
SC0003557-002	SHAW INDUSTRIES GROUP/COLUMBIA	Kinley Creek/Congaree River	32IN006	IN: Shaw Industries
SC0003557-003	SHAW INDUSTRIES GROUP/COLUMBIA	Congaree River	32IN006	IN: Shaw Industries
SCG730263-000	MARTIN MARIETTA/CAYCE QUARRY	Congaree River	32MI001	MI: Martin Marietta
SC0002046-001	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0002046-002	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0002046-003	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0002046-004	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0002046-005	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0002046-02A	SCE&G/MCMEEKIN STEAM STATION	Saluda River	32PT001	PT: SCE&G
SC0024147-001	CAYCE WWTF	Congaree River	32WS004	WS: Cayce
SC0022381-001	SALUDA, TOWN OF	Little Saluda River	36WS001	WS: Newberry
SC0024490-001	NEWBERRY/BUSH RIVER WWTF	Bush River	36WS001	WS: Newberry
SC0023043-001	EASLEY/GEORGES CREEK LAGOON	Georges Creek	39WS001	WS: Easley
SC0039853-001	EASLEY/MIDDLE BRANCH WWTP	Middle Branch/Big Brushy Creek	39WS001	WS: Easley
SC0020940-001	COLUMBIA/METRO PLANT	Congaree River	40WS002	WS: Columbia
SC0029483-001	ALPINE UTILITIES/STOOP CREEK	Saluda River	40WS002	WS: Columbia
SC0038865-001	EAST RICH CO PSD/GILLS CREEK	Congaree River	40WS002	WS: Columbia
SC0001848-001	WESTINGHOUSE ELEC LLC/COLUMBIA	Congaree River	*none*	Agg Discharge 3
SC0002071-005	SCE&G/SALUDA HYDRO STATION	Saluda River	*none*	PT: SCG&E
SC0002071-008	SCE&G/SALUDA HYDRO STATION	Saluda River	*none*	PH: Saluda
SC0003191-001	MILLIKEN/GAYLEY PLANT	South Saluda River	*none*	Milliken
SC0003191-T11	MILLIKEN/GAYLEY PLANT	South Saluda River	*none*	Milliken
SC0026735-001	LEXINGTON/COVENTRY WOODS SD	Twelvemile Creek	*none*	Agg Discharge 2
SC0027162-001	CWS/WATERGATE DEVELOPMENT	Fourteenmile Creek	*none*	Agg Discharge 2
SC0029475-001	WOODLAND HILLS WEST SD	Saluda River	*none*	Agg Discharge 2
SC0032743-001	BUSH RIVER UTILITIES	Saluda River	*none*	Agg Discharge 2
SC0033367-001	DEVRO INC/CORIA DIVISION	Congaree River	*none*	Agg Discharge 3
SC0035564-001	CWS/I-20 REGIONAL	Saluda River	*none*	Agg Discharge 2
SC0036137-001	CWS/FRIARSGATE SD	Saluda River	*none*	Agg Discharge 2
SC0045110-001	LEXINGTON CO/EDMUND LANDFILL	Bear Creek/Second Creek/ First Creek/Congaree Creek	*none*	Agg Discharge 3
SC0048429-001	AIR PRODUCTS & CHEMICALS, INC	Saluda River or Grove Creek	*none*	Agg Discharge 1
SC0048470-001	WCRSA/PIEDMONT REGIONAL WWTP	Saluda River	*none*	Agg Discharge 1
SC0048534-001	INGERSOLL RAND/G.W. RECOVERY SYS	North Creek/Little River	*none*	Ing Rand

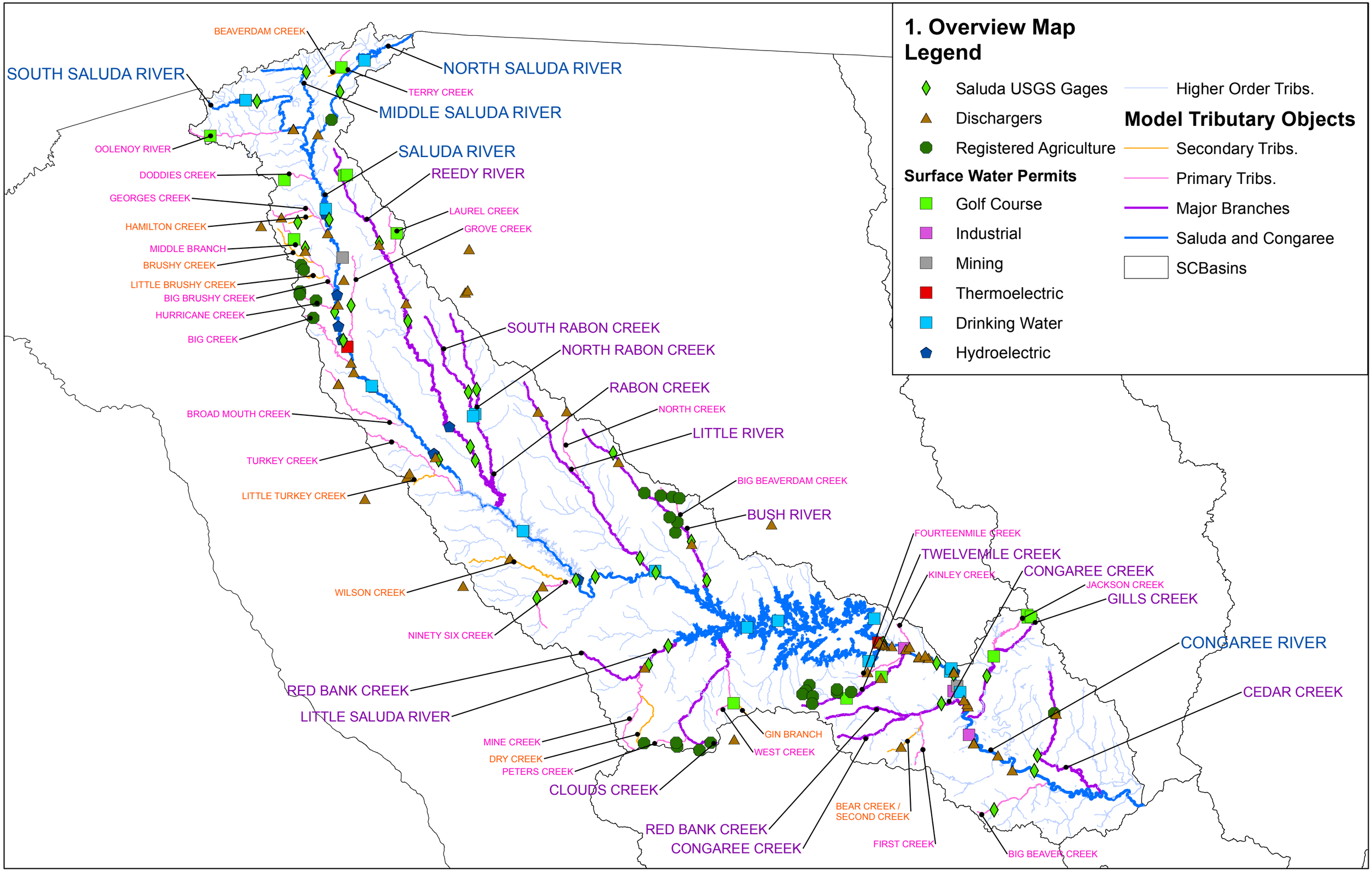
Gray shading represents discharges represented by a Discharge object. All other discharges can be associated with a water permit, and will be represented in the associated Water User object.

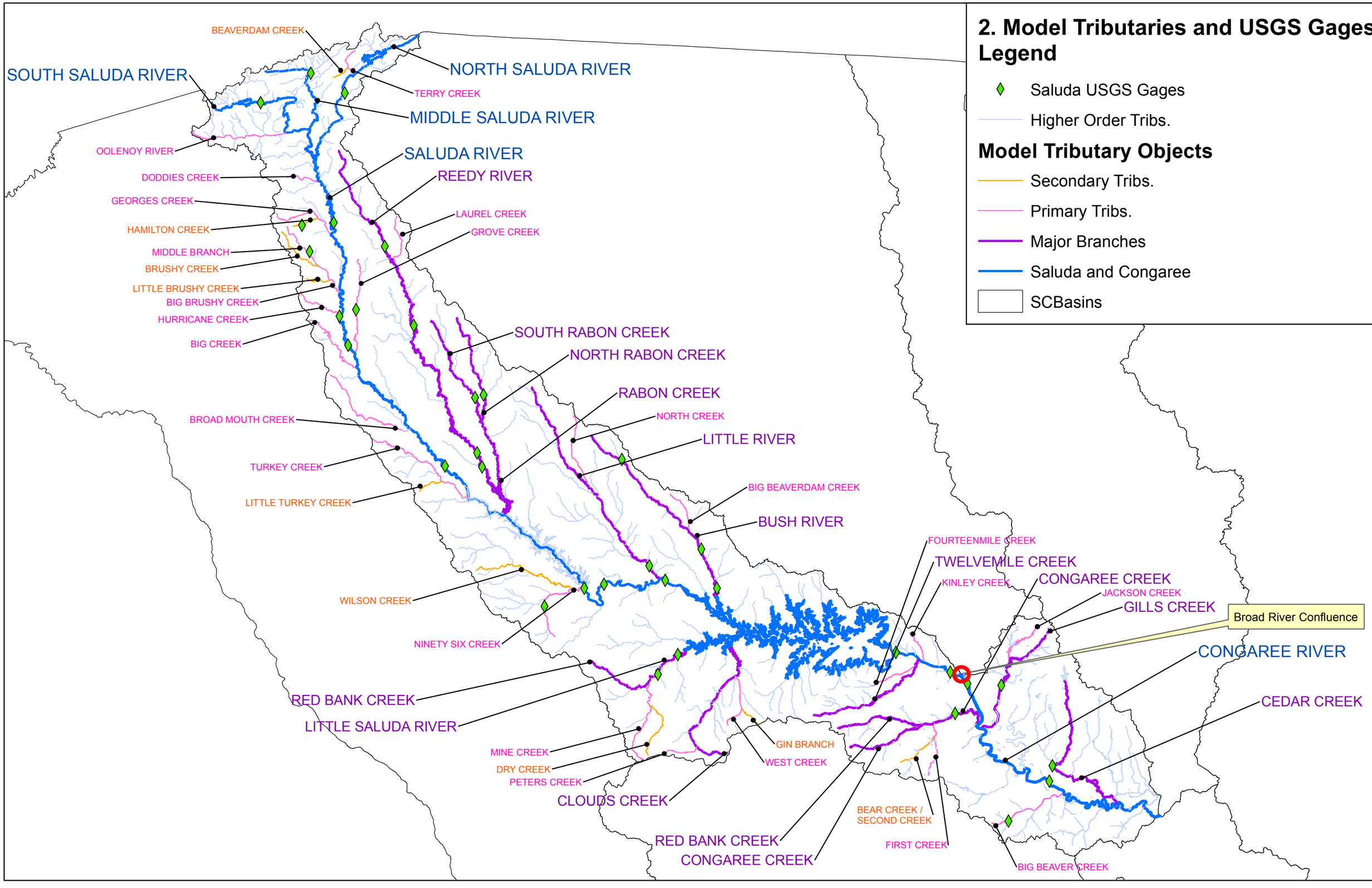
Table 3. Interbasin transfers included in the Saluda Basin model framework.

NPDES Pipe ID	NPDES Facility Name	Associated Water Permit ID	Associated Water Permit Facility Name	Intake Basin	Discharge Basin	Location of Discharge in Saluda Basin	Model Object ID
SC0020940-001	COLUMBIA/METRO PLANT	40WS054	CITY OF COLUMBIA - CANAL WATER PLANT	Broad	Saluda	Congaree River	WS: Columbia
NA	NA	40WS054	CITY OF COLUMBIA - CANAL WATER PLANT	Saluda	Catawba-Wateree	--	WS: Columbia
SC0022403-001	DUE WEST WWTF	04WS005	BELTON-HONEA PATH WTP	Saluda	Savannah	--	WS: Belton Honea
SC0022870-001	GREENWOOD/WEST ALEXANDER WWTF	24WS001	CITY OF GREENWOOD (WISE PLANT)	Saluda	Savannah	--	WS: Greenwood
SC0023035-001	EASLEY/GOLDEN CREEK LAGOON	39WS001	EASLEY COMBINED UTILITIES - D.L. MOORE WTP	Saluda	Savannah	--	WS: Easley
SC0024261-001	WCRSA/LOWER REEDY RIVER PLANT	23WS007	GREENVILLE WATER SYSTEM ADKINS TREATMENT PLANT	Savannah	Saluda	Reedy River	WCRSA/Reedy Import
SC0024465-001	BATESBURG-LEESVILLE WWTF	41WS003	SCWSA - RAW WATER INTAKE	Saluda	Edisto	--	WS: SCWSA
SC0024457-001	AIKEN PSA/HORSE CREEK WWTF[1]	41WS003	SCWSA - RAW WATER INTAKE	Saluda	Savannah	--	WS: SCWSA
SC0037974-001	LAURENS CO W&S/CLINTON-JOANNA	30WS001	CITY OF CLINTON WTP	Broad	Saluda	Bush River	Laurens Import
SC0040002-002	WCRSA/DURBIN CREEK	23WS002	GREENVILE WATER L.B. STOVALL PLANT	Saluda	Broad	--	WS: Greenville
SC0040002-001	WCRSA/DURBIN CREEK	23WS002	GREENVILE WATER L.B. STOVALL PLANT	Saluda	Broad	--	WS: Greenville
SC0040525-001	WCRSA/GILDER CREEK	23WS002	GREENVILE WATER L.B. STOVALL PLANT	Saluda	Broad	--	WS: Greenville
SC0046841-001	WILLIAMSTON/BIG CRK EAST WWTP	04WS006	ANDERSON REGIONAL JWS	Savannah	Saluda	Saluda River	Williamston Import
SC0047309-001	WCRSA/GEORGES CREEK	23WS007	GREENVILLE WATER SYSTEM ADKINS TREATMENT PLANT	Savannah	Saluda	Saluda River	WCRSA/Georges Import
SC0048313-001	NCW&SA/CANNONS CREEK WWTP[1]	36WS002	NCWSA - LAKE MURRAY WTP	Saluda	Broad	--	WS: NCWSA

Gray shading represents Saluda Basin discharges that are imports from either the Broad or the Savannah basins. All others are exports from the Saluda Basin.

[1] *Water purchased from the City of Newberry by SCWSA and NCWSA is also discharged at this facility through IBT 3610001.*


BEAVERDAM CREEK
SOUTH SALUDA RIVER
NORTH SALUDA RIVER
TERRY CREEK
MIDDLE SALUDA RIVER
OOLENOY RIVER
SALUDA RIVER
DODDIES CREEK
REEDY RIVER
GEORGES CREEK
LAUREL CREEK
HAMILTON CREEK
GROVE CREEK
MIDDLE BRANCH
BRUSHY CREEK
LITTLE BRUSHY CREEK
BIG BRUSHY CREEK
HURRICANE CREEK
SOUTH RABON CREEK
BIG CREEK
NORTH RABON CREEK
RABON CREEK
BROAD MOUTH CREEK
NORTH CREEK
LITTLE RIVER
TURKEY CREEK
LITTLE TURKEY CREEK
BIG BEAVERDAM CREEK
BUSH RIVER
FOURTEENMILE CREEK
TWELVEMILE CREEK
KINLEY CREEK
CONGAREE CREEK
JACKSON CREEK
GILLS CREEK
WILSON CREEK
CONGAREE RIVER
NINETY SIX CREEK
CEDAR CREEK
RED BANK CREEK
LITTLE SALUDA RIVER
GIN BRANCH
WEST CREEK
MINE CREEK
DRY CREEK
PETERS CREEK
CLOUDS CREEK
BEAR CREEK /
SECOND CREEK
RED BANK CREEK
CONGAREE CREEK
FIRST CREEK
BIG BEAVER CREEK
1. Overview Map
Legend
Saluda USGS Gages
Dischargers
Registered Agriculture
Surface Water Permits
Golf Course
Industrial
Mining
Thermoelectric
Drinking Water
Hydroelectric
Higher Order Tribs.
Model Tributary Objects
Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
SCBasins


2. Model Tributaries and USGS Gages Legend
Saluda USGS Gages
Higher Order Tribs.
Model Tributary Objects
Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
SCBasins
BEAVERDAM CREEK
SOUTH SALUDA RIVER
NORTH SALUDA RIVER
TERRY CREEK
MIDDLE SALUDA RIVER
OOLENOY RIVER
SALUDA RIVER
DODDIES CREEK
REEDY RIVER
GEORGES CREEK
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HAMILTON CREEK
GROVE CREEK
MIDDLE BRANCH
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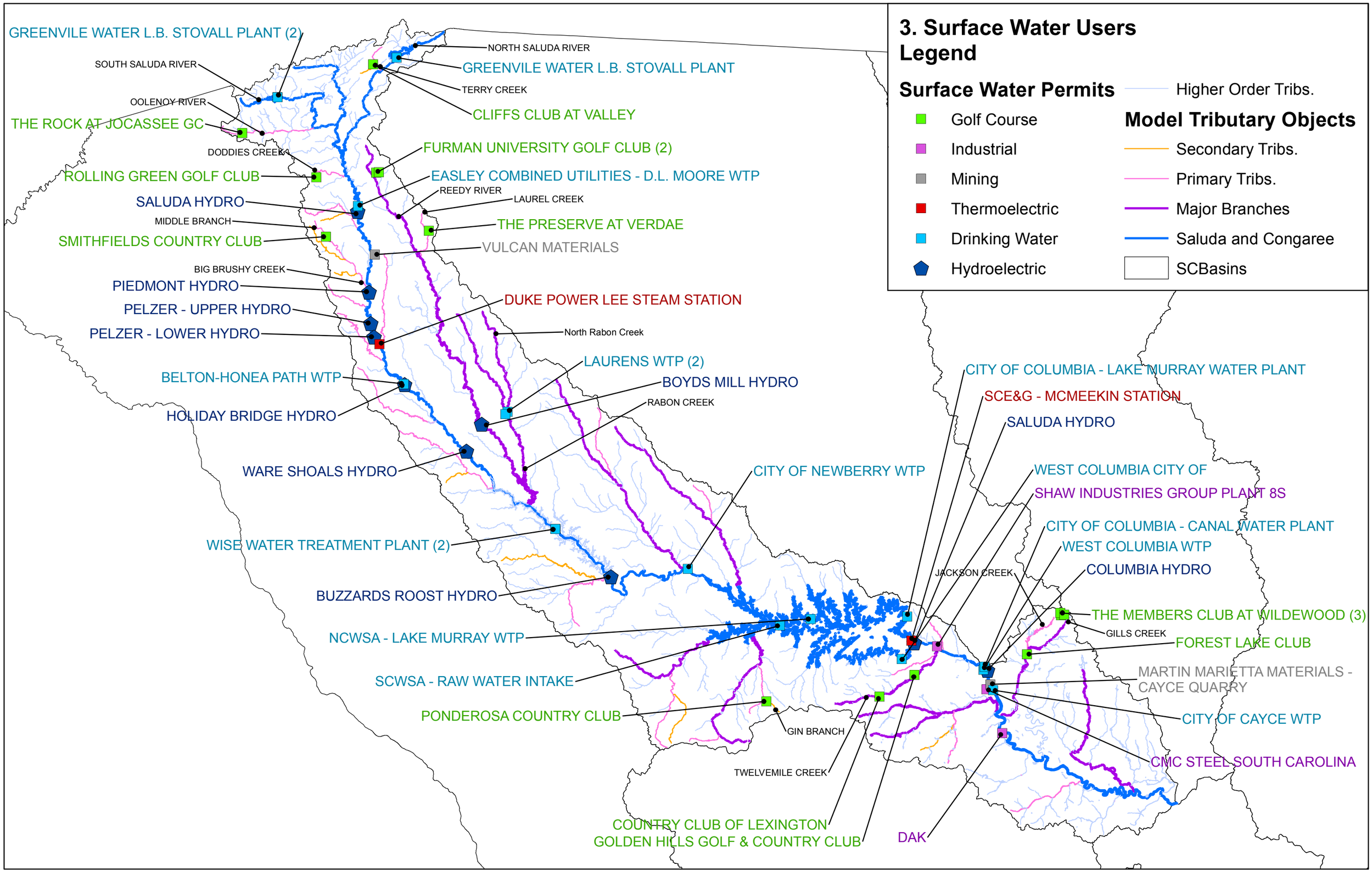
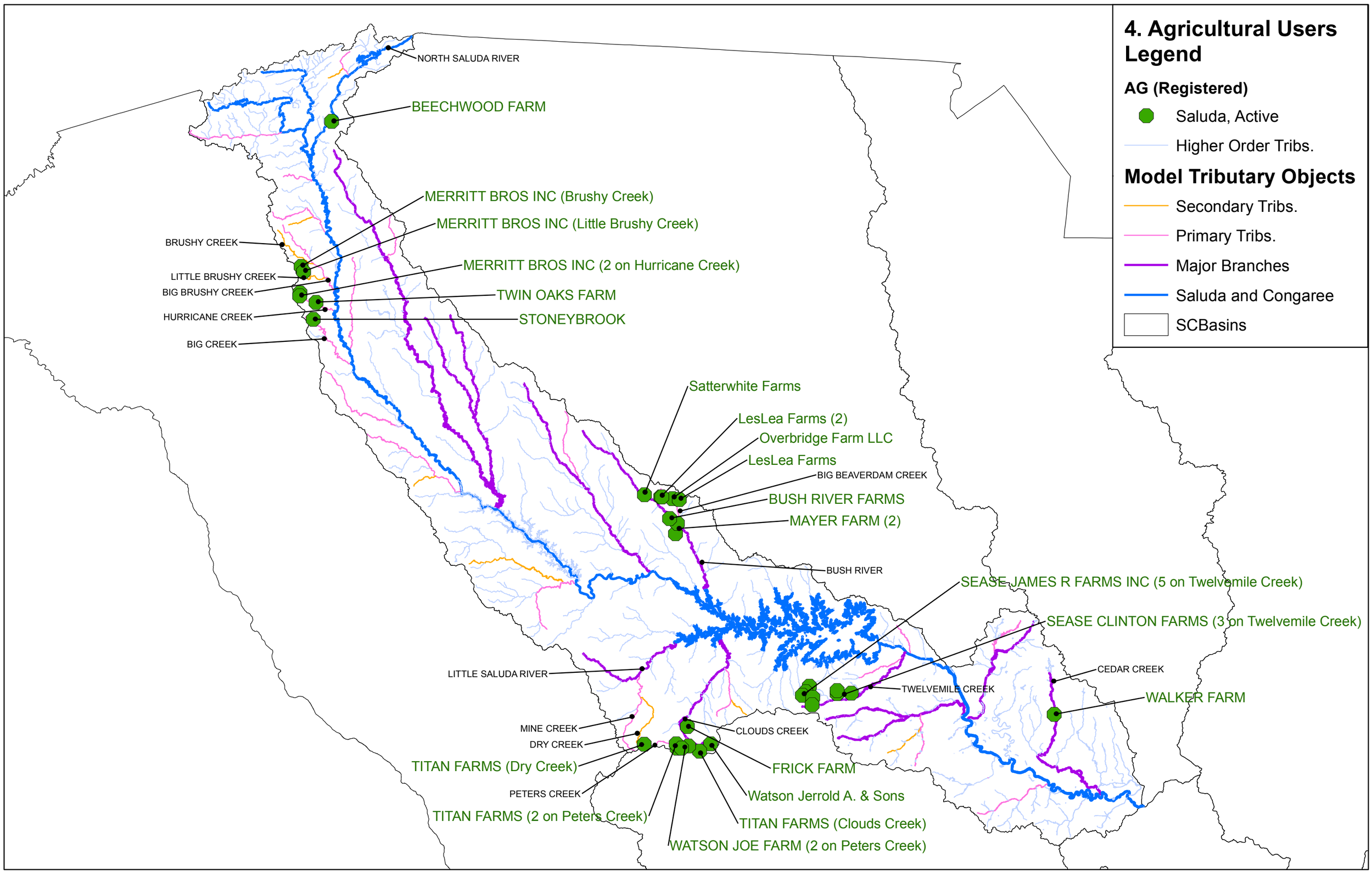
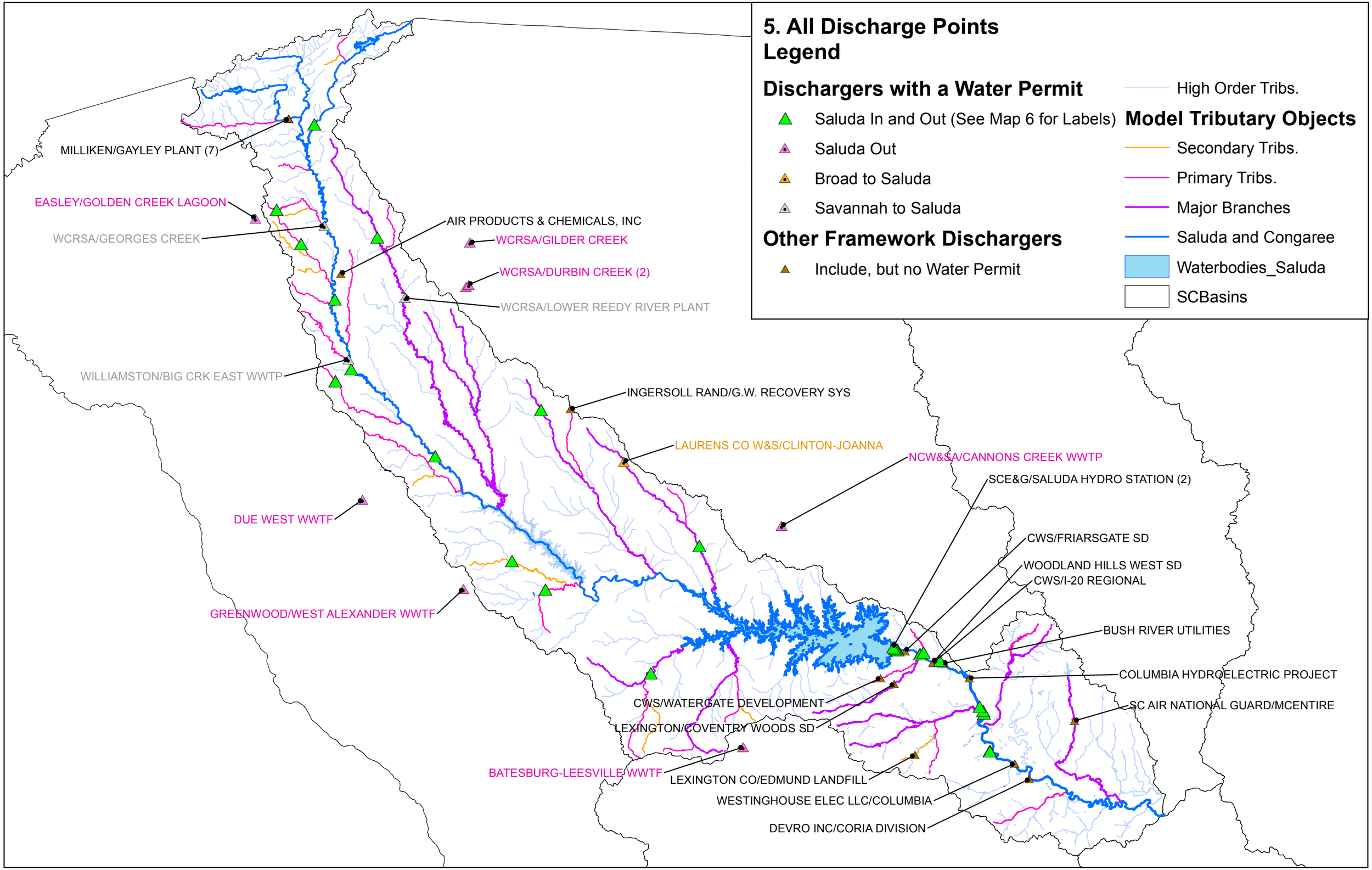
BIG BRUSHY CREEK
HURRICANE CREEK
SOUTH RABON CREEK
BIG CREEK
NORTH RABON CREEK
RABON CREEK
BROAD MOUTH CREEK
NORTH CREEK
LITTLE RIVER
TURKEY CREEK
LITTLE TURKEY CREEK
BIG BEAVERDAM CREEK
BUSH RIVER
FOURTEENMILE CREEK
TWELVEMILE CREEK
KINLEY CREEK
CONGAREE CREEK
JACKSON CREEK
GILLS CREEK
Broad River Confluence
WILSON CREEK
NINETY SIX CREEK
CONGAREE RIVER
CEDAR CREEK
RED BANK CREEK
LITTLE SALUDA RIVER
GIN BRANCH
MINE CREEK
WEST CREEK
DRY CREEK
PETERS CREEK
CLOUDS CREEK
BEAR CREEK / SECOND CREEK
RED BANK CREEK
FIRST CREEK
CONGAREE CREEK
BIG BEAVER CREEK


GREENVILE WATER L.B. STOVALL PLANT (2)
SOUTH SALUDA RIVER
OOLENOY RIVER
THE ROCK AT JOCASSEE GC
DODDIES CREEK
ROLLING GREEN GOLF CLUB
SALUDA HYDRO
MIDDLE BRANCH
SMITHFIELDS COUNTRY CLUB
BIG BRUSHY CREEK
PIEDMONT HYDRO
PELZER - UPPER HYDRO
PELZER - LOWER HYDRO
BELTON-HONEA PATH WTP
HOLIDAY BRIDGE HYDRO
WARE SHOALS HYDRO
WISE WATER TREATMENT PLANT (2)
BUZZARDS ROOST HYDRO
NCWSA - LAKE MURRAY WTP
SCWSA - RAW WATER INTAKE
PONDEROSA COUNTRY CLUB
COUNTRY CLUB OF LEXINGTON
GOLDEN HILLS GOLF & COUNTRY CLUB
NORTH SALUDA RIVER
GREENVILE WATER L.B. STOVALL PLANT
TERRY CREEK
CLIFFS CLUB AT VALLEY
FURMAN UNIVERSITY GOLF CLUB (2)
EASLEY COMBINED UTILITIES - D.L. MOORE WTP
REEDY RIVER
LAUREL CREEK
THE PRESERVE AT VERDAE
VULCAN MATERIALS
DUKE POWER LEE STEAM STATION
North Rabon Creek
LAURENS WTP (2)
BOYDS MILL HYDRO
RABON CREEK
CITY OF NEWBERRY WTP
GIN BRANCH
TWELVEMILE CREEK
CITY OF COLUMBIA - LAKE MURRAY WATER PLANT
SCE&G - MCMEEKIN STATION
SALUDA HYDRO
WEST COLUMBIA CITY OF
SHAW INDUSTRIES GROUP PLANT 8S
CITY OF COLUMBIA - CANAL WATER PLANT
WEST COLUMBIA WTP
COLUMBIA HYDRO
JACKSON CREEK
THE MEMBERS CLUB AT WILDEWOOD (3)
GILLS CREEK
FOREST LAKE CLUB
MARTIN MARIETTA MATERIALS - CAYCE QUARRY
CITY OF CAYCE WTP
CMC STEEL SOUTH CAROLINA
DAK
3. Surface Water Users
Legend
Surface Water Permits
Golf Course
Industrial
Mining
Thermoelectric
Drinking Water
Hydroelectric
Model Tributary Objects
Higher Order Tribs.
Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
SCBasins


NORTH SALUDA RIVER
BEECHWOOD FARM
MERRITT BROS INC (Brushy Creek)
MERRITT BROS INC (Little Brushy Creek)
MERRITT BROS INC (2 on Hurricane Creek)
TWIN OAKS FARM
STONEYBROOK
BRUSHY CREEK
LITTLE BRUSHY CREEK
BIG BRUSHY CREEK
HURRICANE CREEK
BIG CREEK
Satterwhite Farms
LesLea Farms (2)
Overbridge Farm LLC
LesLea Farms
BIG BEAVERDAM CREEK
BUSH RIVER FARMS
MAYER FARM (2)
BUSH RIVER
SEASE JAMES R FARMS INC (5 on Twelvemile Creek)
SEASE CLINTON FARMS (3 on Twelvemile Creek)
CEDAR CREEK
TWELVEMILE CREEK
WALKER FARM
LITTLE SALUDA RIVER
MINE CREEK
DRY CREEK
CLOUDS CREEK
TITAN FARMS (Dry Creek)
FRICK FARM
PETERS CREEK
Watson Jerrold A. & Sons
TITAN FARMS (2 on Peters Creek)
TITAN FARMS (Clouds Creek)
WATSON JOE FARM (2 on Peters Creek)
4. Agricultural Users Legend
AG (Registered)
Saluda, Active
Higher Order Tribs.
Model Tributary Objects
Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
SCBasins


MILLIKEN/GAYLEY PLANT (7)
EASLEY/GOLDEN CREEK LAGOON
WCRSA/GEORGES CREEK
AIR PRODUCTS & CHEMICALS, INC
WCRSA/GILDER CREEK
WCRSA/DURBIN CREEK (2)
WCRSA/LOWER REEDY RIVER PLANT
WILLIAMSTON/BIG CRK EAST WWTP
INGERSOLL RAND/G.W. RECOVERY SYS
LAURENS CO W&S/CLINTON-JOANNA
NCW&SA/CANNONS CREEK WWTP
SCE&G/SALUDA HYDRO STATION (2)
DUE WEST WWTF
CWS/FRIARSGATE SD
WOODLAND HILLS WEST SD
CWS/I-20 REGIONAL
GREENWOOD/WEST ALEXANDER WWTF
BUSH RIVER UTILITIES
COLUMBIA HYDROELECTRIC PROJECT
CWS/WATERGATE DEVELOPMENT
SC AIR NATIONAL GUARD/MCENTIRE
LEXINGTON/COVENTRY WOODS SD
BATESBURG-LEESVILLE WWTF
LEXINGTON CO/EDMUND LANDFILL
WESTINGHOUSE ELEC LLC/COLUMBIA
DEVRO INC/CORIA DIVISION
5. All Discharge Points
Legend
Dischargers with a Water Permit
Saluda In and Out (See Map 6 for Labels)
Saluda Out
Broad to Saluda
Savannah to Saluda
Other Framework Dischargers
Include, but no Water Permit
High Order Tribs.
Model Tributary Objects
Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
Waterbodies_Saluda
SCBasins

6. Users and Associated Dischargers

Legend

Square = Withdrawal
Circle = Discharge

Higher Order Tribs

Model Tributary Objects

Secondary Tribs.
Primary Tribs.
Major Branches
Saluda and Congaree
Waterbodies_Saluda
SCBasins

Note: Some dischargers in this map are below the discharge threshold to require them to be modeled, but because they are associated with a significant water users they are shown here and can be added into the water user object.

GREENVILE WATER L.B. STOVALL PLANT, 23WS002
GREENVILE WATER L.B. STOVALL PLANT (2), 23WS002
WCRSA/MARIETTA WWTP, 23WS002
WCRSA/MAULDIN ROAD, 23WS002
WCRSA/PIEDMONT REGIONAL WWTP, 23WS002
WCRSA/GILDER CREEK, 23WS002
WCRSA/DURBIN CREEK (2), 23WS002
EASLEY COMBINED UTILITIES - D.L. MOORE WTP, 39WS001
EASLEY/GEORGES CREEK LAGOON, 39WS001
EASLEY/GOLDEN CREEK LAGOON, 39WS001
EASLEY/MIDDLE BRANCH WWTP, 39WS001
VULCAN MATERIALS, 04MI001
VULCAN CONST MAT/LAKESIDE, 04MI001
LAURENS WTP (2), 30WS002
LAURENS COMM OF PW/LAURENS, 30WS002
BELTON/DUCWORTH (SALUDA), 04WS005
BELTON/DUCWORTH (SALUDA) (2), 04WS005
BELTON-HONEA PATH WTP, 04WS005
WARE SHOALS/DAIRY STREET, 04WS005
DUE WEST WWTF, 04WS005
CITY OF NEWBERRY WTP, 36WS001
NEWBERRY/BUSH RIVER WWTF, 36WS001
SALUDA, TOWN OF, 36WS001
NCW&SA/CANNONS CREEK WWTP, 36WS002
NCWSA - LAKE MURRAY WTP, 36WS002
CITY OF COLUMBIA - LAKE MURRAY WATER PLANT, 40WS002
SCE&G - MCMEEKIN STATION, 32PT001
SCE&G/MCMEEKIN STEAM STATION (6), 32PT001
SHAW INDUSTRIES GROUP PLANT 8S, 32IN006
SHAW INDUSTRIES GROUP/COLUMBIA (3), 32IN006
ALPINE UTILITIES/STOOP CREEK, 40WS002
MARTIN MARIETTA MATERIALS - CAYCE QUARRY, 32MI001
MARTIN MARIETTA/CAYCE QUARRY, 32MI001
CITY OF CAYCE WTP, 32WS004
CAYCE WWTF, 32WS004
WISE WATER TREATMENT PLANT (2), 24WS001
GREENWOOD/WILSON CREEK WWTF, 24WS001
GREENWOOD/WEST ALEXANDER WWTF, 24WS001
NINETY SIX WWTF, 24WS001
NINETY SIX CPW (PIER 96) WWTP, 24WS001
SCWSA - RAW WATER INTAKE, 41WS003
BATESBURG-LEESVILLE WWTF, 41WS003
COLUMBIA/METRO PLANT, 40WS002
EAST RICH CO PSD/GILLS CREEK, 40WS002
DAK, 09IN001
EASTMAN CHEMICAL/SC OPERATIONS (8), 09IN001