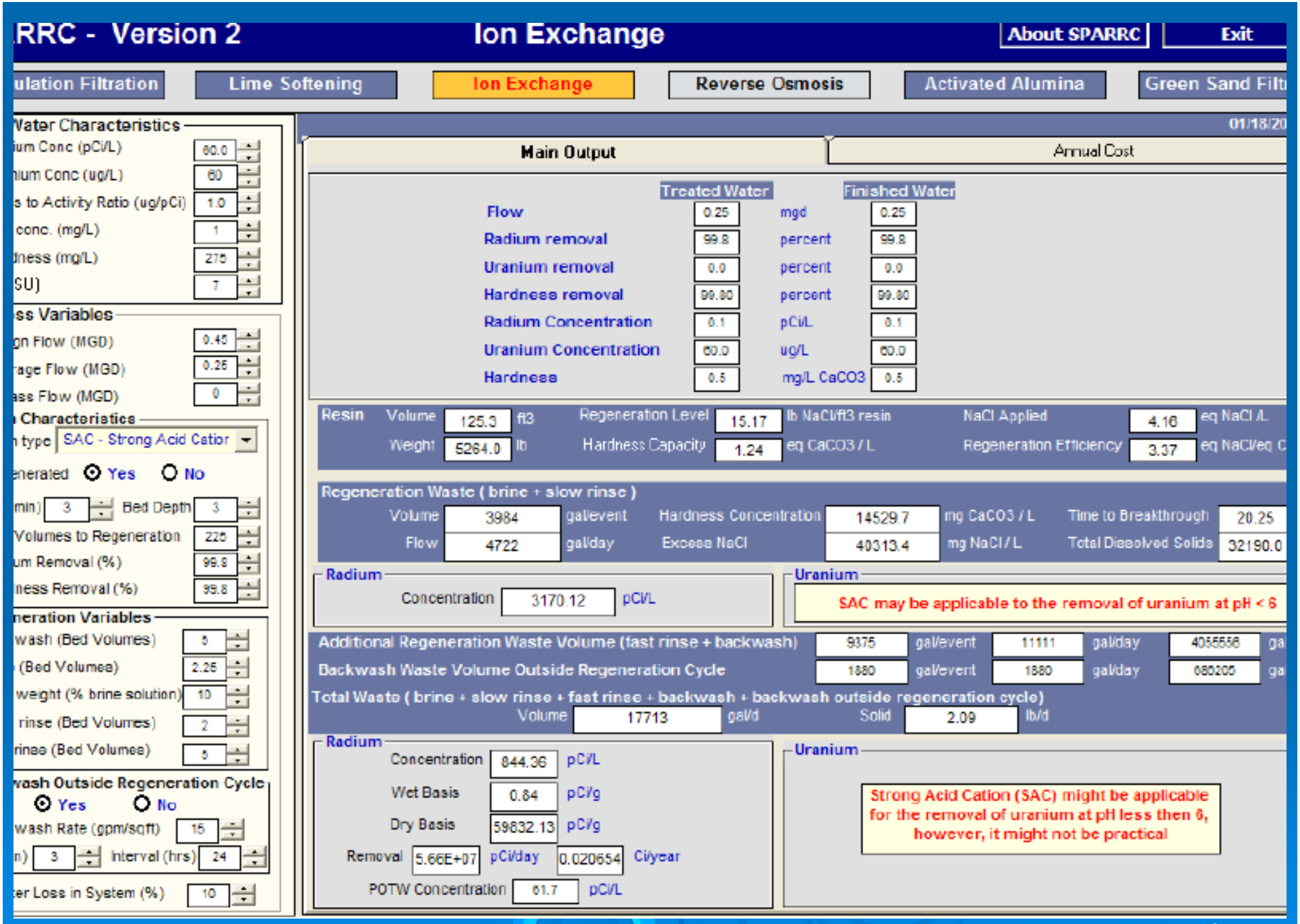
Software Program to Ascertain Radionuclide Residual Concentrations (SPARRC) Model

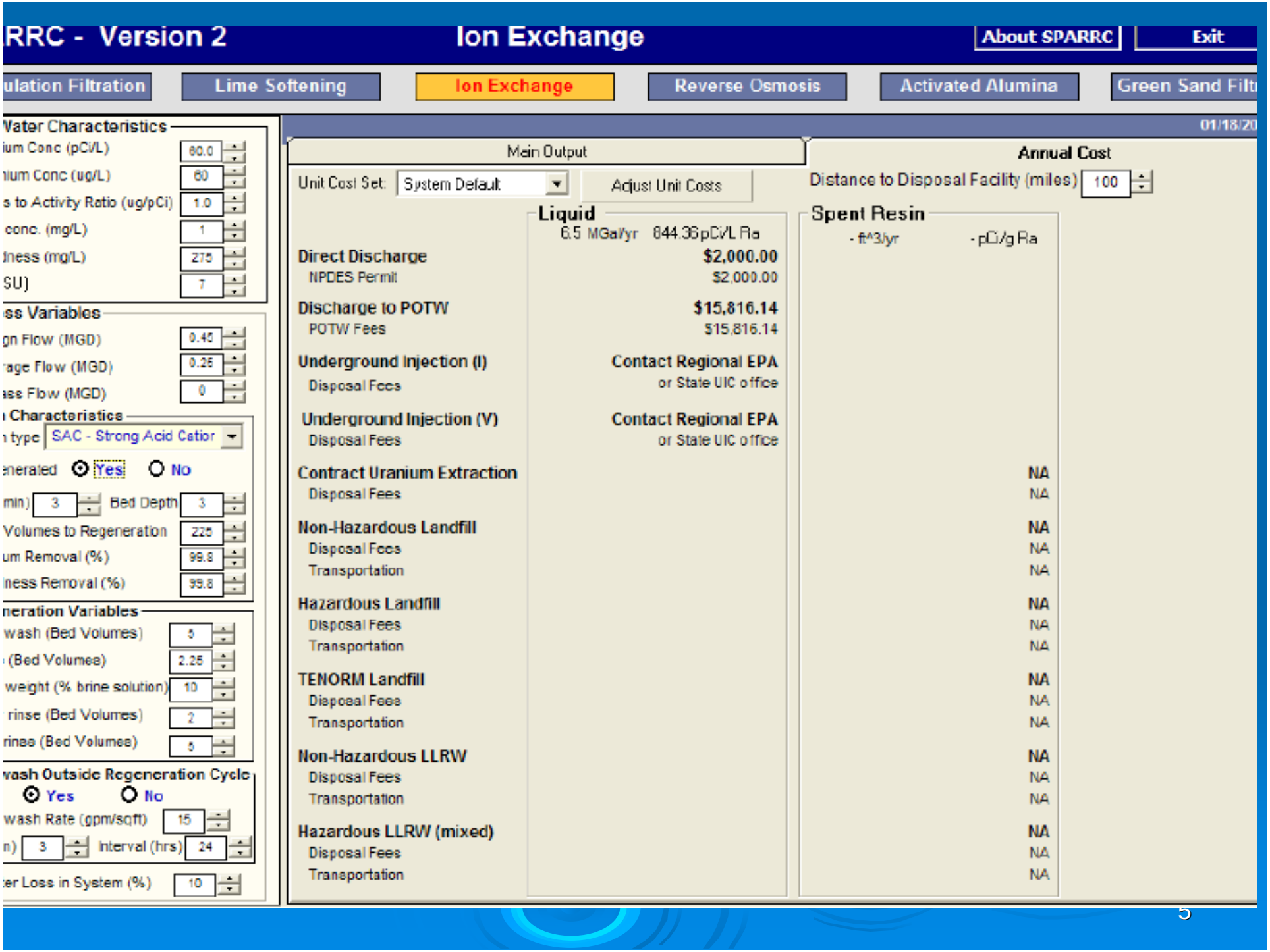
SPARRC Model Overview

- **Input influent water quality and treatment information to estimate:**
  - Quantity & concentrations of radium and uranium in residuals
  - Disposal costs
    - Complete for IX, RO, AA, green sand
    - Not complete for coagulation/filtration and lime softening

SPARRC Model Overview, cont.

- **Version 2 developed in 2006**
  - Interim release (no external peer review)
- **Model is not intended to:**
  - Establish regulatory requirements
  - Assist with design of process equipment
  - Account for state or local restrictions on disposal


RRC - Version 2
Ion Exchange
About SPARRC
Exit
ulation Filtration
Lime Softening
Ion Exchange
Reverse Osmosis
Activated Alumina
Green Sand Filt
Water Characteristics
ium Conc (pCi/L) 60.0
nium Conc (ug/L) 60
s to Activity Ratio (ug/pCi) 1.0
conc. (mg/L) 1
dness (mg/L) 275
SU) 7
ss Variables
gn Flow (MGD) 0.45
rage Flow (MGD) 0.25
ass Flow (MGD) 0
Characteristics
n type SAC - Strong Acid Catior
enerated Yes No
min) 3 Bed Depth 3
Volumes to Regeneration 225
um Removal (%) 99.8
ness Removal (%) 99.8
neration Variables
wash (Bed Volumes) 5
(Bed Volumes) 2.25
weight (% brine solution) 10
rinse (Bed Volumes) 2
rinse (Bed Volumes) 5
wash Outside Regeneration Cycle
Yes No
wash Rate (gpm/sqft) 15
n) 3 Interval (hrs) 24
er Loss in System (%) 10
01/18/20
Main Output
Annual Cost
Treated Water
Finished Water
Flow 0.25 mgd 0.25
Radium removal 99.8 percent 99.8
Uranium removal 0.0 percent 0.0
Hardness removal 99.80 percent 99.80
Radium Concentration 0.1 pCi/L 0.1
Uranium Concentration 60.0 ug/L 60.0
Hardness 0.5 mg/L CaCO3 0.5
Resin Volume 125.3 ft3 Regeneration Level 15.17 lb NaCl/ft3 resin NaCl Applied 4.16 eq NaCl /L
Weight 5264.0 lb Hardness Capacity 1.24 eq CaCO3 / L Regeneration Efficiency 3.37 eq NaCl/eq C
Regeneration Waste (brine + slow rinse)
Volume 3984 gal/event Hardness Concentration 14529.7 mg CaCO3 / L Time to Breakthrough 20.25
Flow 4722 gal/day Excess NaCl 40313.4 mg NaCl / L Total Dissolved Solids 32190.0
Radium
Concentration 3170.12 pCi/L
Uranium
SAC may be applicable to the removal of uranium at pH < 6
Additional Regeneration Waste Volume (fast rinse + backwash) 9375 gal/event 11111 gal/day 4055556 ga
Backwash Waste Volume Outside Regeneration Cycle 1880 gal/event 1880 gal/day 680205 ga
Total Waste (brine + slow rinse + fast rinse + backwash + backwash outside regeneration cycle)
Volume 17713 gal/d Solid 2.09 lb/d
Radium
Concentration 844.36 pCi/L
Wet Basis 0.64 pCi/g
Dry Basis 59632.13 pCi/g
Removal 5.66E+07 pCi/day 0.020654 Ci/year
POTW Concentration 61.7 pCi/L
Uranium
Strong Acid Cation (SAC) might be applicable for the removal of uranium at pH less then 6, however, it might not be practical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wash Rate (gpm/sqft) 15
n) 3 Interval (hrs) 24
er Loss in System (%) 10
01/18/20
Main Output
Annual Cost
Unit Cost Set: System Default
Adjust Unit Costs
Distance to Disposal Facility (miles) 100
Liquid
6.5 MGal/yr 844.36 pCi/L Ra
Spent Resin
- ft^3/yr - pCi/g Ra
Direct Discharge $2,000.00
NPDES Permit $2,000.00
Discharge to POTW $15,816.14
POTW Fees $15,816.14
Underground Injection (I) Contact Regional EPA
Disposal Fees or State UIC office
Underground Injection (V) Contact Regional EPA
Disposal Fees or State UIC office
Contract Uranium Extraction NA
Disposal Fees NA
Non-Hazardous Landfill NA
Disposal Fees NA
Transportation NA
Hazardous Landfill NA
Disposal Fees NA
Transportation NA
TENORM Landfill NA
Disposal Fees NA
Transportation NA
Non-Hazardous LLRW NA
Disposal Fees NA
Transportation NA
Hazardous LLRW (mixed) NA
Disposal Fees NA
Transportation NA

For More Information

- Model and user's guide available at:
  - http://www.npdespermits.com/sparrc/
- Contact EPA