Chapter 7

Groundwater

Dan Wells
Environmental Services Section

Bob Hiergesell
Savannah River National Laboratory
Environmental Analysis and Performance Modeling

Groundwater protection at the Savannah River Site (SRS) has evolved into a program with the following primary components:

- Protect groundwater by good practices in managing chemicals and work.
- Monitor groundwater to identify areas of contamination.
- Remediate contamination as needed.
- Use groundwater wisely to conserve.

SRS operations have contaminated groundwater around certain waste disposal facilities. Extensive monitoring and remediation programs are tracking and cleaning up the contamination. Remediation includes (1) the closing of waste sites to reduce the migration of contaminants into groundwater and (2) the active treatment of contaminated water.

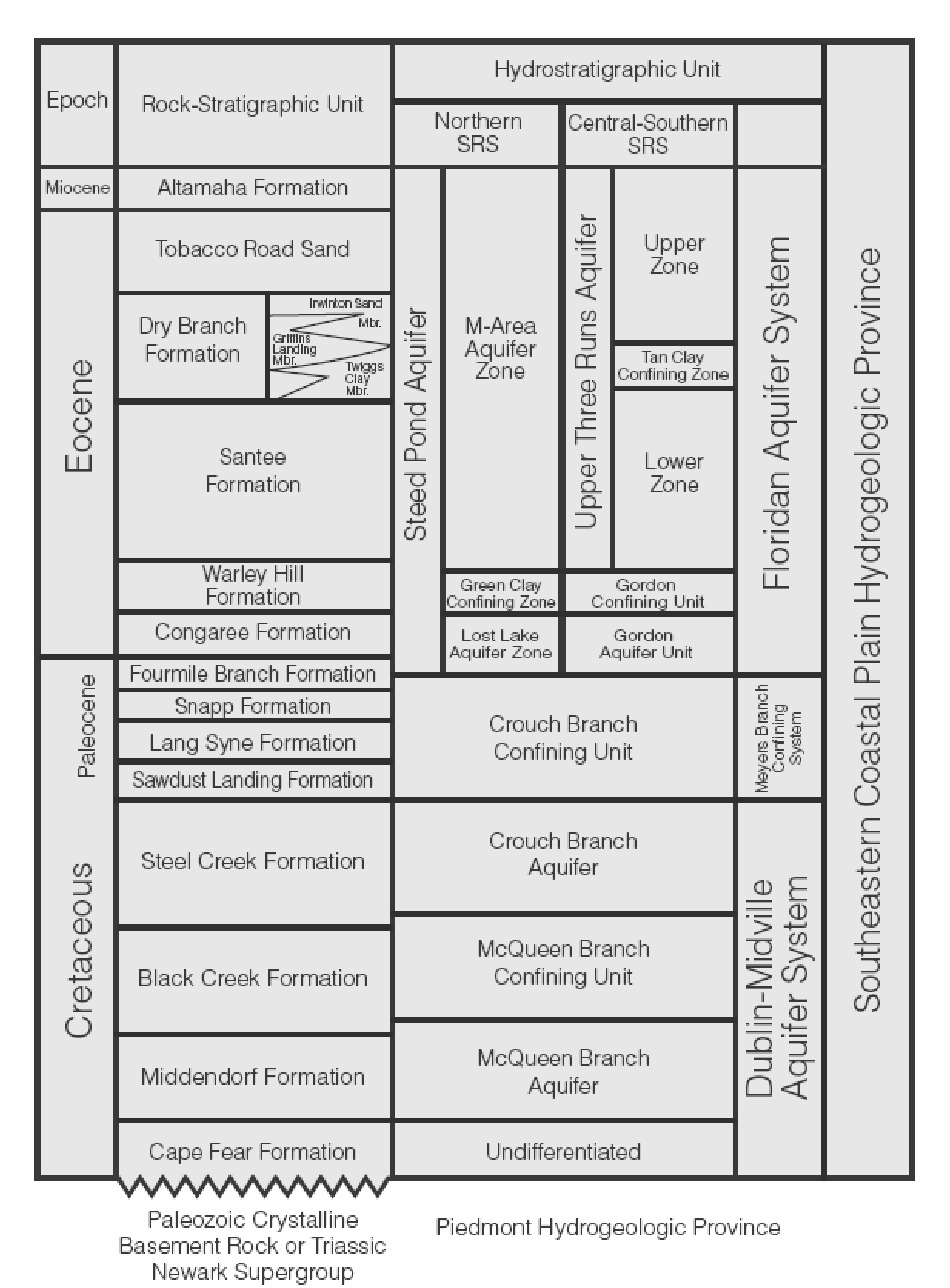
No offsite wells have been contaminated by the migration of SRS groundwater.

This chapter describes SRS's groundwater environment and the programs in place for investigating, monitoring, remediating, and using the groundwater.

Groundwater at SRS

SRS is underlain by sediment of the Atlantic Coastal Plain. The Atlantic Coastal Plain consists of a southeast-dipping wedge of unconsolidated sediment that extends from its contact with the Piedmont Province at the Fall Line to the edge of the continental shelf. The sediment ranges from Late Cretaceous to Miocene in age and comprises layers of sand, muddy sand, and clay with subordinate calcareous sediments. It rests on crystalline and sedimentary basement rock.

Water flows easily through the sand layers but is retarded by less permeable clay beds, creating a complex system of aquifers. Operations during the life of SRS have resulted in contamination migrating into groundwater at various site locations, predominantly in the central areas of the site. The ongoing movement of water into the ground, through the aquifer system, and then into streams and lakes—or even into deeper aquifers—continues to carry contamination along with it, resulting in spreading plumes.



Modified from Aadland et al., 1995, and Fallaw and Price, 1995

Figure 7–1 Hydrostratigraphic Units at SRS

The hydrostratigraphy of SRS has been subject to several classifications. The hydrostratigraphic classification established in Aadland et al., 1995, and in Smits et al., 1996, is widely used at SRS and is regarded as the current SRS standard. This system is consistent with the one used by the U.S. Geological Survey (USGS) in regional studies that include the area surrounding SRS [Clarke and West, 1998]. Figure 7–1 is a chart that indicates the relative position of hydrostratigraphic units and relates hydrostratigraphic units to corresponding lithologic units at SRS and to the geologic time scale. This chart was modified from Aadland et al., 1995, and Fallaw and Price, 1995.

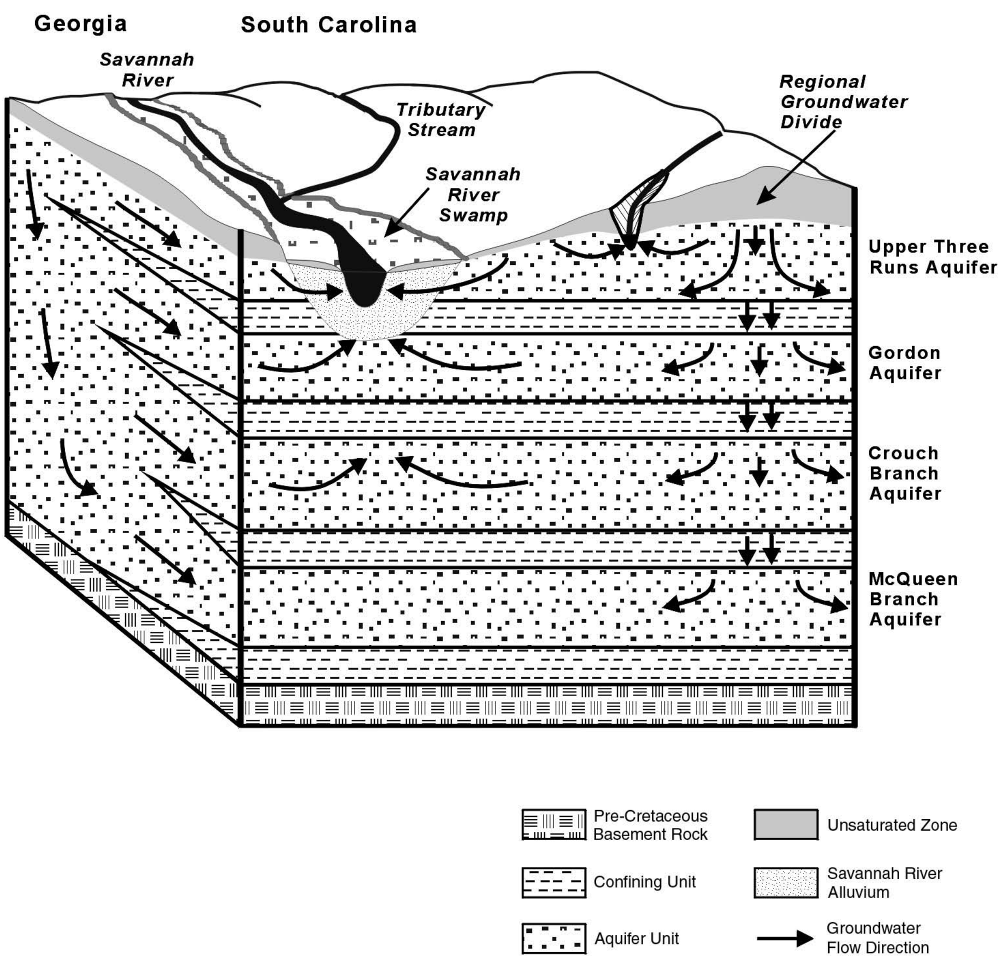
The hydrostratigraphic units of primary interest beneath SRS are part of the Southeastern Coastal Plain Hydrogeologic Province. Within this sequence of aquifers and confining units are two principal subcategories, the overlying Floridan Aquifer System and the underlying Dublin-Midville Aquifer System. These systems are separated from one another by the Meyers Branch Confining System. In turn, each of the systems is subdivided into two aquifers, which are separated by a confining unit.

In the central to southern portion of SRS, the Floridan Aquifer System is divided into the overlying Upper Three Runs Aquifer and the underlying Gordon Aquifer, which are separated by the Gordon Confining Unit. North of Upper Three Runs Creek, these units are collectively referred to as the Steed Pond Aquifer, in which the Upper Three Runs Aquifer is called the M-Area Aquifer zone, the Gordon Aquifer is referred to as the Lost Lake Aquifer zone, and the aquitard that separates them is referred to as the Green Clay confining zone unit within which the water table usually occurs at SRS; hence, it is referred to informally as the “water table” aquifer. The water table surface can be as deep as 160 feet below ground surface (bgs), but intersects the ground surface in seeps along site streams. The top of the Gordon Aquifer typically is encountered at depths of 150–250 feet bgs. The Dublin-Midville Aquifer System is divided into the overlying Crouch Branch Aquifer and the underlying McQueen Branch Aquifer, which are separated by the McQueen Branch Confining Unit. The Crouch Branch Aquifer and McQueen Branch Aquifer are names that originated at SRS [Aadland et al., 1995]. These units are equivalent to the Dublin Aquifer and the Midville Aquifer, which are names originating with the USGS [Clarke and West, 1998]. The top of the Crouch Branch Aquifer typically is encountered at depths of 350–500 feet bgs. The top of the McQueen’s Branch Aquifer typically is encountered at depths of 650–750 feet bgs.

Figure 7–2 is a three-dimensional block diagram of the hydrogeologic units at SRS and the generalized groundwater flow patterns within those units. These units are from shallowest to deepest: the Upper Three Runs/Steed Pond Aquifer (or water table aquifer), the Gordon/Lost Lake Aquifer, the Crouch Branch Aquifer, and the McQueen Branch Aquifer.

Groundwater recharge is a result of the infiltration of precipitation at the land surface; the precipitation moves vertically downward through the unsaturated zone to the water table. Upon entering the saturated zone at the water table, water moves predominantly in a horizontal direction toward local discharge zones along the headwaters and midsections of streams, while some of the water moves into successively deeper aquifers. The water lost to successively deeper aquifers also migrates laterally within those units toward the more distant regional discharge zones. These typically are located along the major streams and rivers in the area, such as the Savannah River. Groundwater movement within these units is extremely slow when compared to surface water flow rates. Groundwater velocities also are quite different between aquitards and aquifers, ranging at SRS from several inches to several feet per year in aquitards and from tens to hundreds of feet per year in aquifers.

Monitoring wells are used extensively at SRS to assess the effect of site activities on groundwater quality. Most of the wells monitor the upper groundwater zone, although wells in lower zones are present at the sites with the larger groundwater contamination plumes. Groundwater in some areas contains one or more constituents at or above the levels of the drinking water standards of the U.S. Environmental Protection Agency (EPA). These areas can be seen in figure 15 of the "SRS Maps" appendix on the CD accompanying this report.



Modified from Clarke and West, 1998

Figure 7–2 Groundwater at SRS

The groundwater flow system as SRS consists of four major aquifers separated by confining unit. Flow in recharge areas generally migrates downward as well as laterally—eventually either discharging into the Savannah River and its tributaries or migrating into the deeper regional flow system.

Groundwater Protection Program at SRS

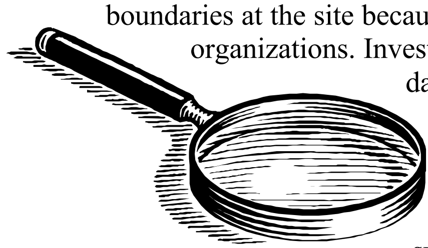
The SRS groundwater program was audited by both the U.S. Department of Energy (DOE) and WSRC in 2000 and 2001. Findings of these assessments have resulted in an ongoing evaluation of the site groundwater program's goals and priorities. It has been determined that a groundwater protection program designed to meet federal and state laws/regulations, DOE orders, and site policies/procedures should contain the following elements:

- investigating site groundwater
- using site groundwater
- protecting site groundwater
- remediating contaminated site groundwater
- monitoring site groundwater

SRS identified specific program goals in each of these areas to maintain its commitment to a groundwater program that protects human health and the environment. Groundwater monitoring is a key tool used in each of the first four elements, and monitoring results form the basis for evaluations that are reported to site stakeholders.

Investigating SRS Groundwater

An extensive program is in place at SRS to acquire new data and information on the groundwater system. This program is multifaceted and is conducted across departmental boundaries at the site because of the different charters and mandates of these organizations. Investigations include both the collection and analysis of data to understand groundwater conditions on regional and local scales at SRS. Research efforts at the site generally are conducted to obtain a better understanding of subsurface processes and mechanisms or to define new approaches to subsurface remediation.



Investigative efforts focus on the collection and analysis of data to characterize the groundwater flow system. Characterization efforts at SRS include the following activities:

- collection of geologic core material and performance of seismic profiles to better delineate subsurface structural features
- installation of wells to allow periodic collection of both water levels and groundwater samples at strategic locations
- development of water table and potentiometric maps to delineate the direction of groundwater movement in the subsurface
- performance of various types of tests to obtain in situ estimates of hydraulic parameters needed to estimate groundwater velocities

Analysis of data on the regional scale is needed to provide a broad understanding of groundwater movement patterns at SRS that can be used as a framework to better understand the migration of contaminants at the local scale near individual waste units. Surface water flow characteristics also are defined at the site on the regional scale and are significant to risk analyses because perennial streams are the receptors of groundwater discharge—some of which contains contaminants from SRS waste units. Because the site boundary does not represent a groundwater boundary, regional studies are helpful in understanding the movement of groundwater both onto the site from the surrounding area and vice versa.

The collection and analysis of data describing subsurface hydrogeologic conditions at or near individual waste units are needed to design effective remediation systems. Characterization embraces both traditional and innovative technologies to accomplish this goal. The installation of monitoring wells and piezometers is a traditional investigative method to allow the collection of (1) water levels, which are used to define flow directions, and (2) groundwater samples, which are analyzed to monitor contaminant plume migration within the groundwater flow system. Geophysical data acquired during well installation are used to delineate the subsurface hydrostratigraphy. Examples of newer technologies include the use of

- direct-push technology, such as the cone penetrometer, to collect one-time groundwater samples at investigation sites and to help establish hydrostratigraphic contacts
- the “rotosonic” method for bore holes to collect cores and install wells

Models have been used extensively as analytical tools at SRS for both regional and local investigations. Models have been utilized for a variety of reasons, but primarily to (1) define the regional groundwater movement patterns at SRS and the surrounding areas, (2) enhance the understanding of contaminant migration in the subsurface, and (3) support the design of remediation systems. At SRS, major groundwater modeling efforts have focused on A/M-Area, F-Area, H-Area, the Burial Ground Complex, and several of the reactor areas where the most extensive subsurface contamination is known to exist.

Research on groundwater issues is conducted at SRS to obtain a better understanding of subsurface mechanisms, such as (1) the interaction of contaminants with the porous media matrix and (2) the factors that impact the rate of migration of contaminants within the groundwater flow system. Research to address relevant issues often is conducted through cooperative studies with investigators at various public universities and private companies, while other efforts are conducted exclusively by SRS employees.

Special Groundwater Study

A part of the SRS perimeter that has received special monitoring attention is across the Savannah River in Georgia’s Burke and Screven counties. Since 1988, it has been speculated that tritiated groundwater from SRS could flow under the river and find its way into Georgia wells. Considerable effort has been directed at assessing the likelihood of transriver flow, and the USGS and the Georgia Department of Natural Resources have drilled 44 wells (figure 21 in “SRS Maps” appendix on CD accompanying this report).

As part of the data collection and analysis, the USGS developed a numerical model in 1997–98 to assess the possibility for such transriver flow to occur. Development of the model—and the resulting analyses—is documented in Clarke and West, 1998.

The model represented the regional groundwater flow system in seven layers corresponding to the underlying hydrostratigraphic units, which was regarded as sufficiently detailed to evaluate whether groundwater originating at SRS could possibly flow beneath the Savannah River into Georgia. An extensive effort was undertaken to calibrate the model to water-level measurements obtained from wells on both sides of the Savannah River and screened in each of the hydrostratigraphic units represented in the model. The model concluded that groundwater movement in all hydrostratigraphic units proceeds laterally toward the Savannah River from both South Carolina and Georgia, and discharges into the river.

Once the model was calibrated, the USGS employed particle-track analysis to delineate areas of potential transriver flow, which can occur in either an eastward or westward direction. The model indicated that all locations of transriver flow are restricted to the Savannah River's floodplain, where groundwater passes immediately prior to discharging into the river. Whether the transriver flow is eastward or westward depends primarily on the position of the Savannah River as it meanders back and forth within the floodplain.

With respect to "westward" transriver flow, the USGS model indicates that it primarily occurs in locations south of SRS and within the deeper aquifers (Crouch Branch and McQueen Branch). Particle-tracking analysis of westward transriver flow in these aquifers indicates that the groundwater crossing from South Carolina into Georgia originates as recharge in upland areas well to the east and south of SRS.

One of the main purposes of the study was to identify whether groundwater originating at SRS could eventually flow into Georgia prior to discharging into the Savannah River. The model identified one area (less than one square mile) of westward transriver flow that has a recharge area located within SRS, and that conceivably could receive tritium or other contaminants from SRS as a result. The one-square-mile area occurs immediately adjacent to the Savannah River, where groundwater within the Gordon Aquifer flows immediately prior to discharging into the river.

Particle tracking indicates that recharge zones associated with the one square mile are located in the upland areas between D-Area and K-Area. There is no known subsurface contamination at these recharge zones. Travel times associated with the particles were calculated to range from 90 to 820 years; however, actual travel times are longer because the USGS study did not account for vertical downward groundwater movement from the water table to the Gordon Confining Unit at the recharge locations. It is important to note that the range of travel times represents seven to 66 half-lives of tritium (12.33 years), suggesting that even if tritium contamination existed at the recharge areas, it likely would decay away prior to discharging into the Savannah River.

The USGS, in cooperation with DOE, completed additional work in 2006 to determine the occurrence of transriver flow under 2002 and future hydrologic conditions. This work included an update to the original groundwater model to incorporate boundary conditions representative of 2002—a time of severe drought in the SRS vicinity—as well as conditions projected to occur in 2020. The models then were utilized to evaluate several hypothetical groundwater extraction scenarios to determine their impact on westward transriver flow that originates at SRS. Scenarios included groundwater extraction rates realized during droughts, as well as one in which groundwater extraction at SRS was discontinued. The year 2020 was selected to define a scenario that represented the maximum plausible groundwater extraction rate in the area. Projections of increased water use for municipal and agricultural purposes were extrapolated from the present time to 2020 for use in this scenario.

With respect to the only location of westward transriver flow that has a recharge area within SRS, the evaluations of the hypothetical pumping scenarios indicated that only a slight impact was incurred. While the updated model did not change the location of the recharge areas at SRS, the shortest travel time between the recharge area and the zone of transriver flow (as determined by reverse particle tracking) was reported to be 79 years. This is compared to the prior shortest estimate of 90 years. The median groundwater travel times for particles released under each of the four groundwater extraction scenarios was reported to range from 366 to 507 years. It should be emphasized that these transit times do not include the time required for groundwater to migrate vertically downward across the uppermost aquifer (i.e., at the recharge area), thus the actual groundwater travel times could be up to several decades longer than what is reported. The final results of this investigation are documented in a formal USGS report completed in 2006 [Cherry, 2006].

Despite the fact that the USGS groundwater model indicates there is no mechanism by which transriver flow could contaminate Georgia wells, SRS continues to maintain and sample the Georgia monitoring wells annually. In 2006, none of the tritium results exceeded 1,000 pCi/L. Levels this low are consistent with aquifer recharge from rainfall. EPA's maximum contaminant level for tritium is 20,000 pCi/L.

Using SRS Groundwater

SRS derives its own drinking and process water supply from groundwater. The site ranks as South Carolina's largest self-supplied industrial consumer of groundwater, utilizing approximately 3.9 million gallons per day. SRS domestic and process water systems are supplied from a network of approximately 40 wells in widely scattered locations across the site, of which eight supply the primary drinking water system for the site. Treated well water is supplied to the larger site facilities by the A-Area, D-Area, and K-Area domestic water systems. Each system has wells, a treatment plant, elevated storage tanks, and distribution piping. The wells range in capacity from 200 to 1,500 gallons per minute.

The A-Area, D-Area, and K-Area systems supply an average of 1.1 million gallons per day of domestic water to customers in these areas. The domestic water systems supply site drinking fountains, lunchrooms, restrooms, and showering facilities with water meeting state and federal drinking water quality standards. Process water is used for equipment cooling and facility washdown water, and as makeup water for site cooling towers and production processes.

The South Carolina Department of Health and Environmental Control (SCDHEC) periodically samples the large- and small-system wells for Safe Drinking Water Act contaminants. An unscheduled biannual SCDHEC sanitary survey also is performed.

In 1983, SRS began reporting its water usage annually to the South Carolina Water Resources Commission (and later to SCDHEC). Since that time, the amount of groundwater pumped on site has dropped from 10.8 million gallons per day during 1983–1986 to 3.9 million gallons per day in 2006. The majority of this decrease is attributable to the consolidation of site domestic water systems, which was completed in 1997. Thirteen separate systems, each with its own high-capacity supply wells, were consolidated into three systems located in A-Area, D-Area, and K-Area. This greatly reduced the amount of excess water being pumped to waste. Site facility shutdowns and reductions in population also were contributing factors.

The three systems draw water from the Crouch Branch and McQueen's Branch Aquifers. The amount of groundwater pumped at SRS has had only localized effects on water levels in these aquifers, and it is unlikely that water usage at the site will cause drawdown problems that could impact surrounding communities.

The process water systems in A-Area, F-Area, H-Area, K-Area, L-Area, S-Area, and TNX-Area meet site demands for boiler feedwater, equipment cooling water, facility washdown water, and makeup water for cooling towers, fire storage tanks, chilled-water-piping loops, and site test facilities. These systems are supplied from dedicated process water wells ranging in capacity from 100 to 1,500 gallons per minute. In K-Area, the process water system is supplied from the domestic water wells. At some locations, the process water wells pump to ground-level storage tanks, where the water is treated for corrosion control. At other locations, the wells directly pressurize the process water distribution piping system without supplemental treatment.

The site groundwater protection program integrates information learned about the properties of SRS aquifers with site demand for drinking and process water. SRS ensures a high level of drinking water supply protection by (1) monitoring above and beyond SCDHEC requirements and (2) periodically evaluating production wells.

Protecting SRS Groundwater

SRS is committed to protecting the groundwater resource beneath the site. A variety of activities contribute to this goal, including

- construction, waste management, and monitoring efforts to prevent or control sources of groundwater contamination
- monitoring programs (both groundwater and surface water) to detect contamination
- a strong groundwater cleanup program through the Soil and Groundwater Closure Projects (SGCP) Department

Monitoring around known waste disposal sites and operating facilities provides the best means to detect and track groundwater contamination. To detect contamination from as-yet undiscovered sites, SRS depends on a sitewide groundwater monitoring and protection effort—the site Groundwater Surveillance Monitoring Program (GSMP). This program is an upgraded replacement of the site screening program.

Monitoring wells and production wells that no longer are needed should be properly abandoned. In 2006, SRS abandoned 30 monitoring wells, 35 remediation wells, and two production wells. Additional abandonments are planned for 2007.

One goal of the GSMP is to protect potential offsite receptors from contamination by detecting contamination in time to apply appropriate corrective actions. SRS is a large site, and most groundwater contamination is located in its central areas. However, the potential for offsite migration exists, and the consequences of such an outcome are serious enough to warrant a comprehensive prevention program.

SRS has evaluated flow in each aquifer and determined where there is potential for flow across the site boundary. This gives a conservative indication of where offsite contamination might be possible and allows for a focused monitoring effort in those few areas. Another pathway for existing groundwater contamination to flow offsite is by discharge into surface streams and subsequent transport into the Savannah River. SRS monitors site streams for contamination, and new wells have been installed in recent years along several site streams to (1) detect contamination before it enters the stream and (2) assess the contamination's concentration in groundwater.

The SRS groundwater monitoring program gathers information to determine the effect of site operations on groundwater quality. The program is designed to

- assist the site in complying with environmental regulations and DOE directives
- provide data to identify and monitor constituents in the groundwater
- permit characterization of new facility locations to ensure that they are suitable for the intended facilities
- support basic and applied research projects

Sample Scheduling and Collection

The Geochemical Monitoring group and the Environmental Services Section schedule groundwater sampling either in response to specific requests from SRS personnel or as part of their ongoing groundwater monitoring program. These groundwater samples provide data for reports required by federal and state regulations and for internal reports and research projects. The groundwater monitoring program schedules wells to be sampled at intervals ranging from quarterly to triennially.

Constituents that may be analyzed are commonly imposed by permit or work plan approval. These include metals, field parameters, and suites of herbicides, pesticides, volatile organics, and others. Radioactive constituents that may be analyzed by request include gross alpha and beta measurements, gamma emitters, iodine-129, strontium-90, radium isotopes, uranium isotopes, and other alpha and beta emitters.

Groundwater samples are collected from monitoring wells, generally with either pumps or bailers dedicated to the well to prevent cross-contamination among wells. Occasionally, portable sampling equipment is used; this equipment is decontaminated between wells.

Sampling and shipping equipment and procedures are consistent with EPA, SCDHEC, and U.S. Department of Transportation guidelines. EPA-recommended preservatives and sample-handling techniques are used during sample storage and transportation to both onsite and offsite analytical laboratories. Potentially radioactive samples are screened for total activity (alpha and beta emitters) prior to shipment to determine appropriate packaging and labeling requirements.

Deviations (caused by dry wells, inoperative pumps, etc.) from scheduled sampling and analysis for 2006 were entered into the site's groundwater database and issued in appropriate reports.

The groundwater monitoring program at SRS includes two primary components: (1) waste site/remediation groundwater monitoring, overseen by the Geochemical Monitoring group of SGCP, and (2) groundwater surveillance monitoring, conducted by the Environmental Services Section. To assist other departments in meeting their responsibilities, personnel of both organizations provide the services for installing monitoring wells, collecting and analyzing samples, and reporting results.

The *WSRC Environmental Compliance Manual* (WSRC 3Q) provides details about the following aspects of the groundwater monitoring program:

- well siting, construction, maintenance, and abandonment
- sample planning
- sample collection and field measurements
- analysis
- data management
- related publications, files, and databases

Monitoring data are evaluated each year to identify unexpected results in any site wells that might indicate new or changing groundwater contamination.

Remediating Contaminated SRS Groundwater

SRS has maintained an environmental remediation effort for many years. SGCP personnel manage the cleanup of contaminated groundwater associated with Resource Conservation and Recovery Act (RCRA) hazardous waste management facilities or Federal Facility Act units. Their mission is to aggressively manage the inactive waste site and groundwater cleanup program so that

- schedules for environmental agreements are consistently met
- the utilization of financial and technology resources is continually improved
- the overall risk posed by existing contaminated sites is continually reduced

The SGCP strategy revolves around developing an appropriate regulatory framework for each waste site, assessing the degree and extent of contamination, and remediating the contaminated groundwater to its original beneficial use. Remedial technologies being used include pump and treat, in situ pH adjustment, steam injection, phytoremediation, and barrier wall construction. In cases where remediation to background quality is impractical, the intent is to prevent plume migration and exposure and to evaluate alternate methods of risk reduction. Major 2006 accomplishments include the following:

- Work on a 75-acre low-permeability cover over the Old Radioactive Waste Burial Ground neared completion.
- Construction was completed on an electrical resistance heating/soil vapor extraction system that will clean up a trichloroethylene source in the vadose zone near C Reactor.

- The Dynamic Underground Stripping system at the M-Area Settling basin continued to heat the subsurface by injecting large volumes of steam, which strips solvents from subsurface sediments. Several parcels have been adequately heated, and extraction of the stripped solvents ranges from 2,400 to 9,400 pounds per week.

Monitoring SRS Groundwater

The first priority of the groundwater monitoring program at SRS is to ensure that contamination is not being transported from the site by groundwater flow. Contaminated groundwater at SRS discharges into site streams or the Savannah River. Nowhere have offsite wells been contaminated by groundwater from SRS, and only a few site locations have groundwater with even a remote chance of contaminating such wells.

One of these locations is near A-Area/M-Area, the site of a large chlorinated solvent plume. This area's groundwater monitoring program uses more than 200 wells, and some of the contaminated wells lie within a half-mile of the site's northeastern boundary. While it is believed that the major component of groundwater flow is not directly toward the site boundary, flow in the area is complex and difficult to predict. For this reason, particular attention is paid to data from wells along the site boundary and from those between A-Area/M-Area and the nearest population center, Jackson, South Carolina (figure 20 in the "SRS Maps" appendix on the CD accompanying this report). During 2006, no chlorinated organics were detected in any of these wells.

Although contaminated groundwater in most SRS areas does not approach the site boundary, it does have the potential to impact site streams. For this reason—and because of the need to meet the requirements of various environmental regulations—extensive monitoring is conducted around SRS waste sites and operating facilities, regardless of their proximity to the boundary.

Table 7–1 presents a general summary of the most contaminated groundwater conditions at SRS, based on 2005 and 2006 monitoring data. The table shows the 2006 maximum concentrations for major constituents in the SRS areas that have contaminated groundwater—and how these concentrations compare to the drinking water standards and the 2005 maximums. As shown in the table, the two major contaminants of concern in groundwater are (1) common degreasers (trichloroethylene and perchloroethylene) and (2) radionuclides (tritium and gross alpha and nonvolatile beta emitters). In most cases, the maximum concentrations did not change significantly between 2005 and 2006.

Table 7–1 also shows where the contaminated water most likely will outcrop. By the time the groundwater reaches a stream, it generally is much less contaminated because of natural attenuation processes, such as dilution, biodegradation, and radioactive decay. As stated above, results in the table are maximum values generally associated with wells very close to contaminant source areas, where little attenuation has taken place.

For details about this monitoring and the conditions at individual sites, one should refer to site-specific documents, such as RCRA corrective action reports or RCRA/Comprehensive Environmental Response, Compensation, and Liability Act RCRA Facility Investigation/Remedial Investigation reports.

Table 7–1
Summary of Maximum Groundwater Monitoring Results for Major Areas Within SRS, 2005–2006

Location	Major Contaminants	Units	2005 Maximum	MCL[a]	2006 Maximum	Likely Outcrop Point
A-Area/ M-Area	TCE PCE	ppb ppb	28,400 127,000	5 5	33,000 93,300	Tims Branch/ Upper Three Runs Creek in Swamp in West
C-Area	TCE Tritium	ppb pCi/L	1,611 4,851,000	5 20,000	11,600 1,130,000	Tributaries of Fourmile Branch
D-Area	TCE Tritium	Ppb pCi/L	490 1,030,000	5 20,000	280 667,000	Savannah River Swamp
E-Area	Tritium TCE	pCi/L PPB	45,700,00 570	20,000 5	33,600,000 750	Upper Three Runs/Crouch Branch in North; Fourmile Branch in South
F-Area	TCe Tritium Gross alpha Beta	ppb pCi/L pCi/L pCi/L	55 435,000 103 359	5 20,000 15 4 mrem/yr[a]	78.9 91,500 2030 2620	Upper Three Runs/Crouch Branch in North; Fourmile Branch in South
F-Area Seepage Basin	Tritium Gross alpha Beta	pCi/L pCi/L pCi/L	7,660,000 781 3,030	20,000 15 4 mrem/hr[a]	7,140,000 627 2360	Fourmile Branch
H-Area	Tritium Gross alpha Beta	pCi/L 8.46 81.5	54,300 8.46 81.5	20,000 15 4 mrem/yr[a]	80,400 98 116	Upper Three Runs/Crouch Branch in North; Fourmile Branch in South
H-Area Seepage Basins	Tritium Gross alpha Beta	pCi/L pCi/L pCi/L	6,710,000 89 2,630	20,000 15 4 mrem/yr[a]	3,690,000 103 2840	Fourmile Branch
R-Area	Tritium	pCi/L	111,000	20,000	41,900	Mill Creek in Northwest; tributaries of PAR Pond elsewhere
K-Area	Tritium TCE[b]	pCi/L ppb	26,900,000 17	20,000 5	615,000 15.9	Indian Graves Branch
L-Area	Tritium	pCi/L	1,250,000	20,000	1,250,000	L Lake
P-Area	Tritium[b] TCE	pCi/L ppb	18,400,000 13,600	20,000 5	1,950,000 14,448	Steel Creek in North; Meyer's Branch in South
Sanitary Landfill	TCE Vinyl Chloride	Ppb ppb	16 30	5 2	17 121	Upper Three Runs Creek
TNX	TCE	ppb	566	5	520	Savannah River Swamp
CMP Pits	TCE	ppb	1.090	5	1300	Pen Branch

[a] MCL=Maximum contaminant level

[b] The activity (pCi/L) equivalent to 4 mrem/yr varies according to which specific beta emitters are present in the sample.