

## **OAK RIDGE NATIONAL LABORATORY RADIATION CONTROL PROGRAM—PARTNERS IN SITE RESTORATION\***

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### **ABSTRACT**

In 1998, the U.S. Department of Energy (DOE) awarded the Management and Integration (M&I) contract for all five of the Oak Ridge Operations (ORO) facilities to Bechtel Jacobs Company LLC (BJC). At Oak Ridge National Laboratory (ORNL), a world renowned national laboratory and research and development facility, the BJC mission involves executing the DOE Environmental Management (EM) program. In addition to BJC's M&I contract, UT-Battelle, LLC, a not-for-profit company, is the Management and Operating (M&O) contractor for DOE on the ORNL site.

As part of ORNL's EM program, legacy inactive facilities (i.e., reactors, nuclear material research facilities, burial grounds, and underground storage tanks) are transferred to BJC and are designated as remediation, decontamination and decommissioning (D&D), or long-term surveillance and maintenance (S&M) facilities. Facilities operated by both UT-Battelle and BJC are interspersed throughout the site and are usually in close proximity. Both UT-Battelle and BJC have DOE-approved Radiation Protection Programs established in accordance with 10 CFR 835. The BJC Radiological Control (RADCON) Program adapts to the M&I framework and is comprised of a combination of subcontracted program responsibilities with BJC oversight. This paper focuses on the successes and challenges of executing the BJC RADCON Program for BJC's ORNL Project through a joint M&I contractor relationship, while maintaining a positive working relationship and partnership with UT-Battelle's Radiation Protection organization.

### **INTRODUCTION**

In 1996, as a part of contract reform, DOE–ORO initiated a restructuring of the contracting mechanisms for the EM Program work. At the time, work was being performed under an M&O contract. The ORO vision was to replace the M&O contract with an M&I concept to expedite cleanup, reduce costs, and perform needed integration work. After the M&I contract award, BJC decided to extend the M&I model to its Radiation Protection Program and issued a subcontract to Safety and Ecology Corporation's RADCON Alliance (SECRA). The former BJC RADCON organization transitioned the operations and support personnel from its workforce to SECRA and retained oversight responsibility in areas of program technical management and subcontract administration.

The M&I contract model posed several radiation protection challenges. The initial work during the M&I transition focused on revising the BJC Radiation Protection Program-level procedures and developing a framework for delegating responsibilities to various multi-tiered organizations to accomplish subcontracted EM work. The procedures needed to clearly define which radiation protection responsibilities would be

delegated to subcontractor organizations and how BJC Radiation Protection Program oversight functional roles should interface with the multi-tiered organizations.

Several points of interface with the UT-Battelle Radiation Protection organization also were necessary throughout the M&I transition process at ORNL. For example, the M&I approach involved the transition of a portion of the existing ORNL workforce to various subcontract organizations who were awarded contracts to operate distinct aspects of the EM mission. The workforce transition process required close coordination with UT-Battelle so that prior radiation exposure histories for workers were retained, and routinely scheduled bioassay frequencies and analytical regimens were accurately transferred to the BJC RADCON Program. UT-Battelle also provided BJC with historical and current radiological survey data for newly acquired deactivated facilities. Work authorizations were developed for UT-Battelle to provide dosimetry support functions such as thermoluminescence dosimeter processing and urinalysis for radionuclides.

Accomplishing radiological work in an M&I framework also created new challenges in several areas that radiation protection organizations at other DOE sites may typically take for granted. The new M&I subcontract strategy blended the formerly established workforce with new workers and supervisors that had varying degrees of ORNL site experience. Verifying conformance with training requirements became a complicated process. Tracking and maintaining radiation exposure records for workers became more difficult since workers began to move between different subcontractors and projects across multiple sites. Fixed-price subcontracts for remediation and D&D projects placed RADCON operations in a delicate position when prescribing radiological controls that may affect the cost and schedule for a project. As complex, high-risk remediation work began to get under way, RADCON needed to be flexible in operating in a volatile radiological work culture. The following list provides some key ingredients of a successful Radiation Protection Program that were realized by the BJC ORNL Project after many lessons-learned:

- Maintain an open and honest working relationship with the Senior BJC Project Management Team to nourish and protect commitment to radiation protection excellence.
- Ensure that functional roles and responsibilities are clearly defined and unambiguous.
- Manage a SECRA work release/subcontract that implements the RADCON Program with clearly defined and attainable objectives.
- Commit to maintaining a close teamwork relationship between the BJC ORNL Project RADCON Program oversight elements, the SECRA radiation protection program operations team, and the UT-Battelle Radiation Protection organization.
- Work hard to infuse the ORNL Project teamwork culture into each subcontracted EM remediation, D&D, and S&M project in accordance with Integrated Safety Management (ISM) principles.

## **A JOINT RESPONSIBILITY FOR RADCON**

The BJC Radiation Protection Manager (RPM) has overall responsibility for the BJC RADCON Program at the five ORO sites. The SECRA counterpart to the RPM is the SECRA Program Manager. Because BJC EM work is subdivided into logical groupings (i.e., watersheds), the RPM deploys Project Health Physicists (PHPs) to provide oversight and technical support to the respective EM Program areas. One PHP is deployed to the ORNL Project to oversee the technical and compliance aspects of the BJC

radiological work activities at ORNL. Other PHPs are responsible for waste disposition and liquid waste operations activities at ORNL.

The SECRA counterpart to the PHP is the Site Manager. The SECRA Program Manager deploys Site Managers to provide overall direction and management of the RADCON Program operations team for a grouping of sites or watersheds. One Site Manager may oversee the operations at multiple sites and have more than one PHP counterpart. Because PHPs have technical program and compliance oversight responsibility, BJC assigns the contract management portion to Subcontract Technical Representatives (STRs), who are also BJC employees. The primary STR for the SECRA subcontract works closely with the RPM and the SECRA Program Manager. Secondary STRs are deployed to work closely with the PHPs and SECRA Site Managers. The secondary STR also provides an oversight function for the RADCON Program in non-technical areas and ensures that provisions in the work release/subcontract are maintained by SECRA.

The primary work control document for executing the SECRA subcontract is the work release. The work release contains direct references to RADCON procedures and itemizes specific tasks and deliverables for SECRA to accomplish within prescribed timeframes. The activities and tasks in the work release are designed to create a mechanism that maintains compliance with the RADCON Program requirements and ensures a measure of consistency across the five ORO sites and several watersheds. The RPM and the primary STR have joint responsibility for maintaining the work release with input from the PHPs and secondary STRs. The SECRA Program Manager and Site Managers have responsibility for executing the applicable provisions in the work release.

The SECRA work release contains all aspects of the operational radiation protection program, including dosimetry, bioassay, instrumentation, radiological engineering, records, and field radiological control technicians (RCTs). The distribution of RADCON Program elements is shown in Table I.

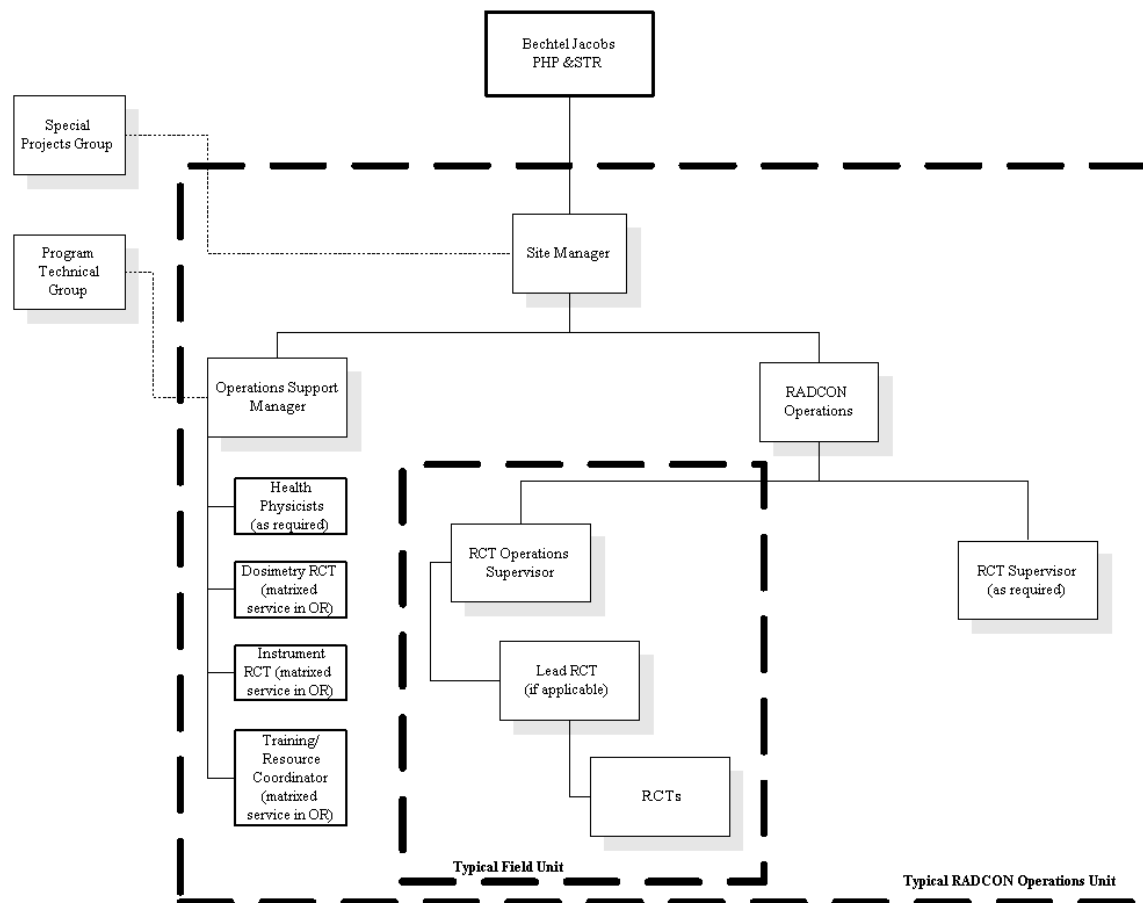
Radiological work is planned and executed through an association between several organizational interfaces. The PHP, Site Manager, and secondary STR work directly with the BJC Project Management Team and subcontractor site supervision to define the RADCON staffing needs and obtain the necessary work releases to run the RADCON operations necessary to support the project. The BJC PHP also interfaces directly with the Project Management Team to technically justify staffing and funding necessary to support those operations. The BJC project planners also consult directly with the secondary STR on staffing projections to forecast project budget needs. The PHP provides technical input to the procurement process by supporting preparation of requests for proposals, reviewing proposals, consulting with the Project Management Team on technical approach alternatives, and reviewing subcontractor submittals.

The Site Manager ensures that a project will be staffed with a team of qualified RCTs, necessary equipment and materials are available, and Radiological Work Permits (RWPs) and As-Low-As Reasonably-Achievable (ALARA) Reviews are prepared. Another key aspect of radiological work planning and execution is in implementing the ISM process for all applicable field activity. RADCON staff, including RCTs, participate in task scope development, review of activity hazard analyses and fieldwork planning documents, and pre-job and post-job briefings. A RADCON policy requires activity hazard analysis documents to be provided to RCTs before an RWP is prepared and issued. The Site Manager (or designee) approves RWPs, developed by the RCTs, before they are presented to the BJC field representatives and the subcontractor site supervisor for concurrence. Draft RWPs are often prepared for complex operations to allow for a review and comment process to improve accuracy and effectiveness. Figure 1 illustrates the SECRA RADCON operations support organization structure for the ORNL Project.

Table I. Division of Shared BJC RADCON Program Responsibilities

Program Element	Responsibility		
	BJC	SECRA	Other
<b>Technical Support Elements</b>			
Internal Dosimetry	○	●	○
External Dosimetry	◐	●	◐
Instrumentation		●	○
Training		●	
Health Physics Records			
Technical Basis Documents	◐	●	
Characterization Technology	◐	●	
Procedure Development & Maintenance	◐	●	
Price Anderson Amendment Act Compliance Assessments	●	○	
Sample Management & Analysis		◐	◐
Technical Support for RADCON Operations		●	○
Technical Support for Project Management	●	◐	
<b>Operations Elements</b>			
• RWPs		●	
• Workplace Surveys		●	
• Sample Analysis		●	◐
• Emergency Response	◐	●	
• Incident Response	○	●	
• Internal Dosimetry	○	●	◐
• External Dosimetry	○	●	◐
• Instrumentation		●	
• ALARA Program	◐	●	
RADCON Project Support Operations		●	○
<b>Program Support Elements</b>			
Work Release Management	◐	●	
Property Management		●	
Information Management	○	●	●
Quality Verification Management	○	●	
Staff & Resource Planning	○	●	
Staff Development		●	
Subcontract Management	●	◐	

- – Full Participation
- ◐ – Partial Participation
- – Minimum Participation



**Fig. 1. The ORNL Project RADCON Operations Support Organization.**

## ORNL PROJECT TEAMWORK CULTURE

The initial challenges of executing a Radiation Protection Program according to the M&I model are primarily organizational and require a great deal of focus to ensure that networks of communication are continuously open, functional roles and responsibilities are clearly defined, and program requirements are unambiguous. However, the success of the model depends on how well the organization performs when supporting complex, high-risk radiological work. The ORNL Project team was tasked with supporting more than \$100M of work during FY 2001. More than 20 separate major field projects (i.e., a combination of remediation, D&D, waste operations/disposition, and S&M activities) were active during the year. ORNL's radiological work represents some of the most challenging in the DOE complex, with a unique and sometimes unpredictable blend of radionuclides and other inherent hazards. ORNL Project work accounted for the majority of the worker radiation exposure under the BJC M&I contract for ORO sites, with 10.6 person-rem of exposure recorded during the first three quarters of 2001.

The ORNL Project awarded several fixed-price remediation and D&D projects to different subcontractors with varying levels of ORNL site experience. Each subcontractor was responsible for instituting its own Environment, Health, and Safety program to govern its field activities in accordance with BJC-prescribed requirements. The subcontractors were also required to be accountable for recognizing the radiological hazards for performing the work and instituting ALARA provisions in their job planning and execution. The PHP was responsible for reviewing and commenting on the formal document submittals to ensure

that the proper planning and work controls were evident in the associated technical work documents. SECRA interfaced with each subcontractor in the later stages of work planning, providing RWPs to prescribe radiological controls and personal protective equipment (PPE), job coverage requirements for fieldwork, and workplace/worker monitoring. It should be noted that the RADCON–remediation subcontractor relationship was often quite different from the relationship subcontractors generally expected and this relationship reflected a paradigm shift from the radiation protection culture in M&O contract work environments.

Exhibits in each fixed-price subcontract prescribed the requirements for submittals and generally described the RADCON–remediation subcontractor relationship. RADCON was responsible for workplace monitoring, including the conduct of pre-job and post-job surveys, air sampling, equipment and material release surveys, Department of Transportation shipment surveys, dosimetry support services, and providing supplemental dosimeters. The most significant area of responsibility was the development of RWPs that governed radiological work. An RWP prescribes PPE requirements and establishes limiting conditions and radiological hold points. Because subcontractors are responsible for providing their own PPE (e.g., full-face respirators and cartridges), they bear the costs of RADCON decisions to require additional PPE. Subcontractors should identify PPE requirements in their associated activity hazard analysis. However, RADCON is authorized to require additional PPE for radiological control purposes. Limiting conditions written into RWPs may also have cost or schedule impacts. For example, an RWP may prohibit hands-on work where average surface contamination levels exceed threshold quantities. A subcontractor would then be required to apply strip coating or a fixative agent before work could proceed. The additional step requires materials and equipment to apply the fixative, labor for the application, and additional time for curing. As a rule, these provisions are discussed and agreed upon during the RWP preparation and approval steps.

Limited or unforeseen RCT staffing needs may also have project cost and schedule impacts. Subcontractors may want to perform simultaneous activities that require full-time RCT coverage. If a sufficient number of RCTs are not available within the established timeframe, the subcontractor may request cost reimbursement for the increased cost due to the schedule delay. Subcontractors are often impacted by the time necessary for RCTs to perform release surveys of potentially contaminated equipment. Good communication is necessary to help subcontractors plan in advance for the sometimes-lengthy demobilization process that includes release surveys of equipment and materials that are to be released for unrestricted use. Subcontractors often use rental equipment and are anxious to return the equipment to the vendor as quickly as possible while RCTs are performing thorough surveys to ensure compliance with the release requirements.

The potentially negative impact on cost and schedule sometimes places RADCON in a difficult position with the subcontractor and the BJC Project Management Team. However, use of controls and a conservatism approach often pays dividends in avoiding costly delays that may occur after personnel contamination events, personnel over-exposures, and liquid or airborne releases, for example. A subcontract project team usually needs a few weeks to develop a work rhythm and RADCON needs time to earn credibility with the subcontractor. Once the project passes the first phases of high-risk radiological work, the teamwork environment begins to prevail. The nature of the hazards and the complex work environment at ORNL have provided ample opportunities for RCTs to instinctively react to situations in a way that has saved subcontractors and BJC significant costs. Eventually, subcontractors begin to see the value of RADCON involvement in work planning and for advice in selective alternatives for performing work. The benefit of blending skills and experience in work scope development, hazards analysis, development of commensurate controls, and continuous feedback, *which is the full intent of the ISM process*, becomes tangible. The ORNL teamwork concept bridges multiple organizational boundaries in a way that worker safety and job performance is emphasized as a common objective.

## **GOOD NEIGHBORS WITHOUT FENCES**

The significant level of remediation work at ORNL during FY 2001 has also affected the UT-Battelle work environment. Several BJC EM projects are located at facilities that are near UT-Battelle occupied facilities, take place in a portion of a building connected to an active UT-Battelle operation, or are adjacent to high-traffic thoroughfares. The UT-Battelle Radiation Protection organization has responsibility for ensuring that the UT-Battelle employee population is monitored properly for potential internal and external radiation hazards. This organization also is responsible for being first-responders in emergency response circumstances. The importance of having a close association with UT-Battelle cannot be overstated. This partnership is paramount to achieving the common goal of cleaning up contaminated ORNL sites and facilities to expedite options for future use. The association with UT-Battelle has been close since the beginning of the BJC M&I transition until present. There are multiple ways in which the BJC and UT-Battelle radiation protection programs touch the same borders, use the same resources, and provide support to one another.

Work at ORNL sometimes requires the use of a shared workforce where radiological workers may receive radiological exposure from UT-Battelle activities in addition to exposure received from BJC radiological work activity. The prospect of multiple sources of a radiation exposure needs to be recognized and managed. When monitoring internal dose rates, consideration needs to be given to the potential for various sources that may originate from either UT-Battelle or BJC work. Thus, bioassay analysis regimens and frequencies need to be coordinated between the two groups. BJC tracks cumulative worker exposures for UT-Battelle employees who work on BJC projects, and the PHP will notify the UT-Battelle Radiation Protection Manager when a worker approaches a UT-Battelle ALARA goal. One convenient mechanism for tracking exposures for both BJC project workers and UT-Battelle employees has been the use of a shared web-based RWP system. The system maintains external dose projections collected from RWP sign-in records and can distinguish workers from either organization. Bioassay frequency and analytical regimen requirements contained in RWPs are also transmitted to UT-Battelle for workers who sign in on BJC RWPs. UT-Battelle maintains the dosimetry responsibility for its workforce.

In addition to providing a common system for generating and managing RWPs, UT-Battelle also shares WebSurvey, a web-based system for writing and managing radiological surveys. BJC provides funding to UT-Battelle under a work authorization to maintain and implement enhancements to both systems. Recent enhancements to the system include the ability to accept direct data transfers of air sampling results from the low-background alpha/beta counter and link the results with worker log-ins on associated RWPs. The combination of information can be used for derived air concentration-hour estimates to confirm projected worker exposure levels for the radiological work activity.

The DOE-controlled properties within the ORNL site contain radiological facilities that are managed by either UT-Battelle or BJC. Because radiological postings are virtually identical, to conform to regulatory requirements, a method for determining responsibility for a radiologically controlled area needs to be in place. The RADCON organization has added a BJC logo to the lower edge of its radiological signs to help distinguish the locations under BJC control. BJC facility responsibility generally includes the area in a footprint five feet around its structures. However, the dimensions and complexity of the site occasionally lead to brief confusion over the ownership of a radiological problem. For example, sometimes a tree planted outside radiological facilities may drop leaves that indicate elevated radioactivity levels. The source of subsurface contamination may not be clearly discernable and the contaminated leaves may also disperse in areas controlled by either organization.

It is also important to keep UT-Battelle informed of BJC remediation and D&D projects across the site. Daily progress reports are sent via e-mail to UT-Battelle Radiation Protection program representatives for most projects. UT-Battelle is also notified when BJC work activities may affect the adjacent plant

population with higher-than-normal ambient radiation levels. For example, an underground storage tank extraction and excavation project, located across the street from the ORNL cafeteria, had the potential for causing significant increases in radiological exposure rates around the perimeter of the site. Close communication with UT-Battelle on work progress and flexible scheduling of work that was expected to affect the general area dose rates around the project site helped to maintain a good working relationship throughout the project. Another situation involved an inactive radioactive material recovery facility that was being demolished causing concern for potential airborne radioactivity to spread during the process. UT-Battelle was invited to place air sampling equipment to operate in concert with the BJC equipment placed around the perimeter of the project site.

## **CONCLUSION**

The BJC ORNL Project has successfully overcome the organizational and radiation protection challenges realized in the M&I model for EM work. Success can be tangibly measured in the practical application of the BJC RADCON Program to support several successful risk-intensive projects during FY 2001. All projects were accomplished with worker exposures below the established collective and maximum exposed individual dose ALARA goals. Impacts on UT-Battelle were manageable and a positive partnership has prevailed. The BJC ORNL Project Senior Management Team's commitment to radiation protection excellence has had a significant influence in fostering a teamwork attitude where organizational barriers are bridged and functional roles are unambiguously defined. The RADCON organization has been an instrument for infusing this teamwork culture with subcontractors responsible for executing the EM work.

## **FOOTNOTE**

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