Lockheed Martin Hanford Corporation Systems Engineering and Project Management

Prepared for the U.S. Department of Energy

Fluor Daniel Hanford, Inc.
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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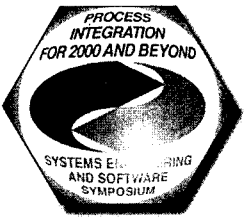

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Lockheed Martin Hanford Corporation Systems Engineering and Program Management

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Abstract

Lockheed Martin Hanford Corporation is developing and implementing an integrated technical baseline for cleaning up environmental contamination at the Hanford Site in Washington State.

The Hanford Site is located in Washington State and has been referred to as one of the largest Environmental Cleanup challenges in the United States. It became contaminated with radioactive and dangerous wastes during the 40+ years it was being used to produce weapons grade plutonium in support of the United States nuclear weapons program (See Figure 1). The U.S. Department of Energy (USDOE) is responsible for cleanup of the Hanford Site with the Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) both providing regulatory oversight.

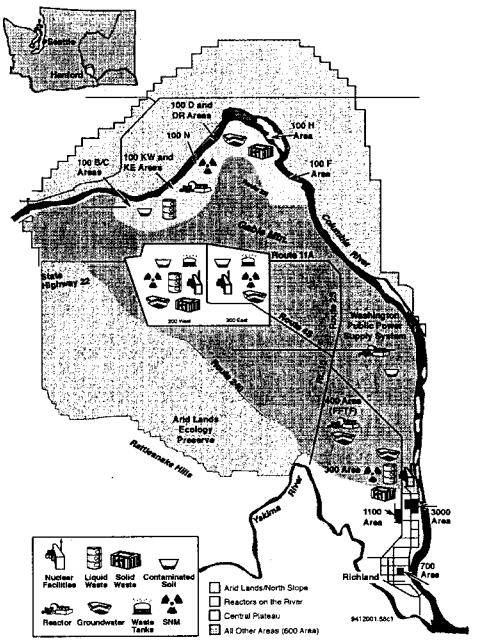

Figure 1. Hanford Site Map

The USDOE, EPA and Ecology entered into an agreement in 1989 (Hanford Federal Facility Agreement and Consent Order, commonly referred to as the Tri-Party Agreement) that provides the framework for cleanup of the Hanford Site.

However, since the inception of the Tri-Party Agreement, there have been numerous changes due to technical issues, funding issues, and priority changes within the cleanup mission. As a result, progress on the definition and execution of the cleanup work has been slower than anticipated and has resulted in some false starts, missed milestones, and milestones that have been completed that did not further the Site cleanup. The absence of a clearly defined mission resulted in a high percentage of projects that were canceled during construction or abandoned after completion and approximately $900 million spent on projects that brought us no closer to cleanup or disposal.

Some of the factors that contribute to this situation include:

There are 8 major environmental management projects with approximately 60 sub-projects and over 2000 facilities that are either contaminated with radioactive and dangerous wastes or are needed to support safe management of the waste and nuclear materials that remain onsite.

Each of the 8 major projects has independent program management, different funding sources, different budget guidance, and different customers, stakeholders and regulators.

The interfaces between the projects and the facilities that they have responsibility for were not systematically defined, documented or controlled.

The DOE program management environment revolves around an annual funding, budgeting, and baseline updating cycle. This has historically resulted in a "new baseline" each year.

In an effort to improve mission performance, the USDOE recently established a new contract at the Hanford Site, the Project Hanford Management Contract (PHMC). The contractors are required to utilize the systems engineering process and products to improve management of the mission.

The customer is adamant that the PHMC:

1) Keep the site level systems engineering effort very small and focused;
2) Maximize the use of existing project level data;
3) Minimize disturbances to the projects; and
4) Produce something that the projects will use.

Figure 2 captures the customer's expectations relative to Site Systems Engineering.

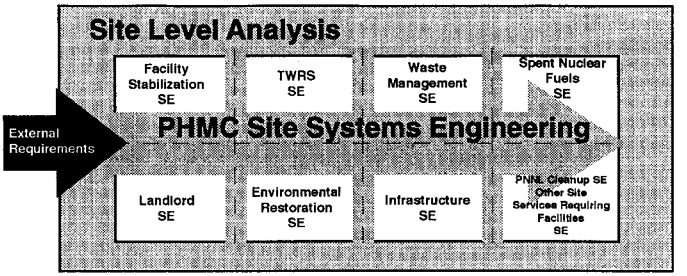

Figure 2. Site Systems Engineering

Lockheed Martin Hanford Corporation (LMHC) was included in the PHMC team because of its world class systems engineering reputation. When the PHMC was established, there was no clear path for LMHC Systems Engineering to influence program management (no requirement for "specifications," no clearly defined and universally accepted hierarchy of project technical baseline documents). With the intent to improve the annual planning and execution of this very complex environmental management mission, the PHMC developed an Integrated Site Baseline (ISB) that includes the technical, schedule, and cost components. The USDOE and the PHMC are using disciplined processes, procedures and software to support the ISB (See Figure 3). The challenge that faces the PHMC is both the vertical and horizontal integration of the Site Baseline.

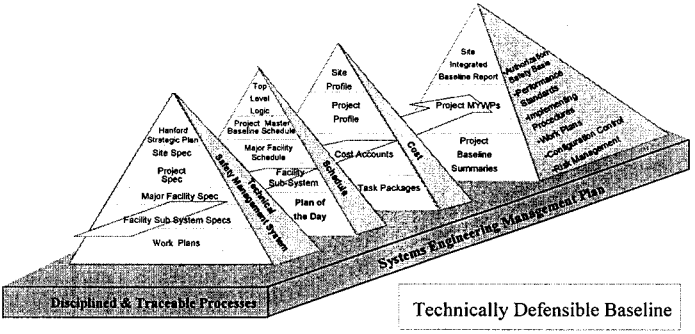

Figure 3. Integrated Site Baseline

Building on work that was initiated by the prior contractor, LMHC used the Hanford Site Technical Baseline Database (HSTD) to capture the requirements, functions, components (facilities), life-cycle responsibilities, interfaces (including forecasts), and the technical logic (See Figure 4). LMHC is using Ascent Logic's RDD-100 software suite for modeling and simulation to verify the project level baseline plans.

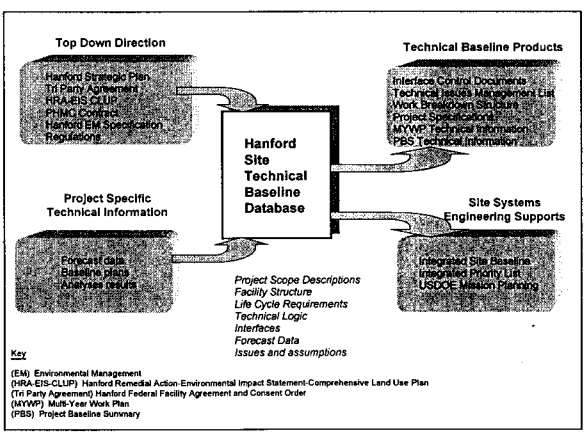

Figure 4. Hanford Site Technical Baseline

The static models represent various hierarchies (requirements, functions, components, organizations) With appropriate relationships established and attributes defined (See Figure 5).

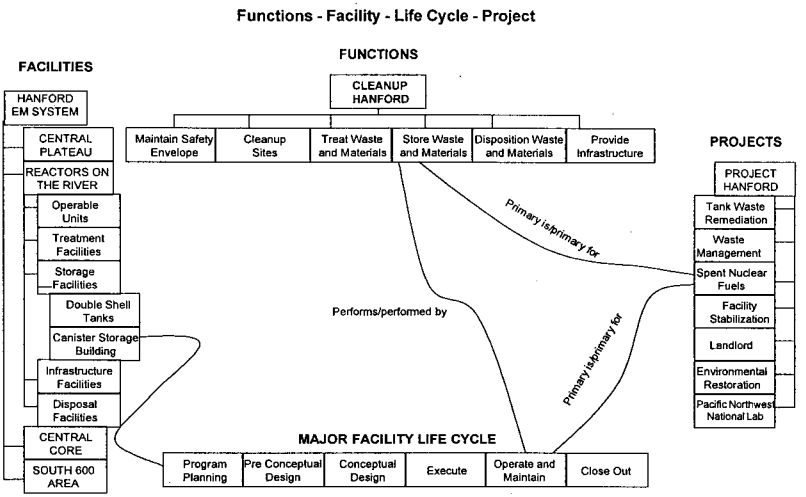

Figure 5. Allocations

The process for defining the Technical Baseline that LMHC implemented began with the compilation of mission driving requirements from five key source documents, including the PHMC Contract and the Tri-Party Agreement. Then the functions necessary to achieve the requirements were defined and the requirements were allocated to the functions. LMHC established the technical logic (functional flow block diagrams) for the Site environmental management mission and used it to drive the schedules. This logic has been used to develop a dynamic simulation (operational scenario) for the site cleanup.

The functions were decomposed to the point where an entire function could be associated with just one major facility. The Hanford Projects have defined over 100 major facilities that either exist today or are included for construction in the Project Baseline Plans. These major facilities are where the work that is necessary to achieve the mission driving requirements will be performed. LMHC clearly defined the

life-cycle phases for each major facility (consistent with the USDOE's Life Cycle Asset Management Order, DOE 430.1) including interfaces and waste, material and infrastructure forecasts. The responsibility for performing the work in each major facility through each life cycle phase was assigned to one of the Hanford Projects.

As this work progressed, several technical issues that affected multiple projects were identified. A formal issues management process has been implemented to track and resolve these issues. The key components of the process are the Technical Issues Management List (published monthly) and the Site Integration Group (meets weekly).

These efforts have resulted in the "Vertical Integration" of the technical baseline to the Project Level. The "Horizontal Integration" to the Schedule Baseline is being achieved through the following:

The HSTD is being used to generate the technical sections for the planning documents in lieu of the more traditional technical specification structure. The technical requirements, functions, and logic are included in the technical sections of the annual planning documents.

The Project Level Schedule Activities have manually been aligned with the Major Facility Life Cycle Phases.

The Dynamic Verification Facility of RDD-100 is being used to introduce the element of time to the static models for developing operational scenarios to further validate the schedules against the waste and material forecast data. Volumes, dates and facility capacities are being validated.

This has provided a preliminary view of the integration needs between the Projects.

The "Horizontal Integration" to the cost baseline is currently being achieved through the resource-loaded schedules and financial data system. Further, as the Hanford Site deploys Enterprise Resource Planning Software across the entire PHMC family, the functions will become a central integrating point for the technical, schedule and cost baselines.

This effort has resulted in a dramatic improvement in the integration of the various Hanford project plans. It has provided consistent technical and schedule data across all of the Projects. It has provided defendable and traceable project scope, requirements, waste, material, and facilities data. It is being

used to validate the technical approach by testing that schedules, capacities, and capabilities fit together. It provides the ability to analyze impacts from the technical and schedule changes as well as a consistent method of finding and fixing disconnects. As it matures, it will be used to ensure all of the work necessary to cleanup the Hanford Site is identified, integrated, and assigned to a project.

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