APPENDIX C

A SUMMARY OF SITE INFRASTRUCTURE AND SERVICES ON THE HANFORD SITE

The U.S. Department of Energy (DOE) maintains a number of infrastructure elements and services throughout the Hanford Site, including but not limited to roads and transportation services, electrical and water services, facility maintenance, emergency response (fire and patrol) services, network and software engineering, cyber security and records management, and environmental compliance and clean energy solutions.[1] Hanford Site missions, including decommissioning, legacy site remediation, groundwater remediation, tank farm remediation and Waste Treatment and Immobilization Plant (WTP) operations, will continue to rely on Hanford's infrastructure systems for at least the next 40 to 60 years.

These systems are spread throughout each evaluation unit, but are generally not directly included in the risk analysis methodology, as they are assumed to be ever present throughout all evaluation periods, representing the same relative risks, and same relative costs to maintain. However, it is recognized that some infrastructure changes will take place as old systems are taken out of service, the Hanford Site is downsized, and new infrastructure is needed.[2]

Background

Much of the Hanford Site's infrastructure has its roots in the Manhattan Project. Railroads, utilities, roads, and buildings were constructed during the 1940s as part of the wartime effort. Over the years, varying levels of programmatic activity and a lack of dedicated funding for maintenance and upgrades allowed many infrastructure systems to deteriorate. In the 1980s, a $92 million program was undertaken to restore deteriorated systems and replace technologically obsolete equipment with newer state of the art systems (DOE 1990). Some of the main targets of this program included the rail system, transportation system/equipment, building maintenance and roofing, electrical distribution system, road system, and telecommunications system.

Many Hanford Site infrastructure systems are operating outside the original design purposes (with outdated technology and lack of vendors) and well beyond their original design life, experiencing failures (e.g., water line leaks) and straining operational budgets. Today, the Hanford Site infrastructure is managed, in part, through the Infrastructure and Services Alignment Plan, ISAP (Mathes 2014). The ISAP works in conjunction with baseline operations and maintenance of the infrastructure to ensure that reliable, on time, and cost effective services are provided at the required capacities for the Hanford stakeholders (Mathes 2014). Examples of key projects included in the 2014 ISAP are:

- 200 East Area electrical distribution system capacity upgrades to support waste feed and delivery needs
- Fire station relocation and consolidation projects to align with the shrinking cleanup footprint and needs of the River Protection Project
- Export water system piping upgrades to improve reliability of water delivery to critical Central Plateau facilities
- Roadway refurbishment of primary access roads to the Central Plateau facilities, including Route 4S, 1st Street, and Akron Avenue
- Electrical power pole replacement for improved reliability of power delivery to Central Plateau facilities, including tank farms, Waste Encapsulation and Storage Facility, Central Waste Complex, Effluent Treatment Facility, and Canister Storage Building

[1] Mission Support Alliance. Accessed at http://www.hanford.gov/page.cfm/MSA on January 26, 2015.
[2] 2014 Limited Update of the Hanford Ten-Year Site Plan. 14-AMMS-0017_Attachment_HQ_FINAL_Deliverable_R0_(2)2.docx received in an email forwarded by Wayne Johnson to George Last on January 22, 2015, from Mark Triplett, originally from Dickie Ortiz, on September 26, 2014.

Hanford's 60-year-old infrastructure needs to last at least another 60 years. Mission Support Alliance, LLC, (MSA) provides site services and maintains critical infrastructure for DOE and Hanford Site cleanup contractors. Future challenges will be to modernize water lines/pipes and facilities, upgrade electrical power system for capacity and reliability, right-size the transportation system by focusing resources on arterial and core roads that will serve the Central Plateau, and integrate information technology (IT) infrastructure for more accessibility and mobilization of work on the site (Armijo 2014).

Infrastructure Elements

The Hanford Site infrastructure can be divided into several distinct systems (modified from DOE 1990 and Mathes 2014). Offsite, an extensive network of highways, rail lines, navigable river routes, and electric power grids serve the area for transportation of raw materials and finished products, and support major industrial development in the region.[3]

Electrical System

Electrical transmission and distribution services not only service the Hanford Site, but also other businesses and communities beyond the site boundary with 200,000 MWh of electricity per year.[4] The core system has a peak demand of 39 MW with various components owned and/or managed by a number of entities, including DOE-Richland Operations Office (DOE-RL), Bonneville Power Administration, and the City of Richland. These systems include substations and miles of transmission lines, power poles, and street/security light poles.

Water System

The Hanford Site water system consists of numerous buildings, pumps, valve houses, reservoirs, wells, and distribution piping that deliver water to all areas of the site (Figure C-1). The largest of these, the export water system, extracts water from the Columbia River near the 100 B and 100 D Areas and transports it via underground pipelines to points within the 100, 200, and 600 Areas (DOE 1990).

[3] Hanford Site Assets and Attributes. U.S. Department of Energy. Accessed at http://energy.gov/ari/downloads/hanford-ari-overview on January 22, 2015.
[4] Hanford Site Assets and Attributes. U.S. Department of Energy. Accessed at http://energy.gov/ari/downloads/hanford-ari-overview on January 22, 2015.

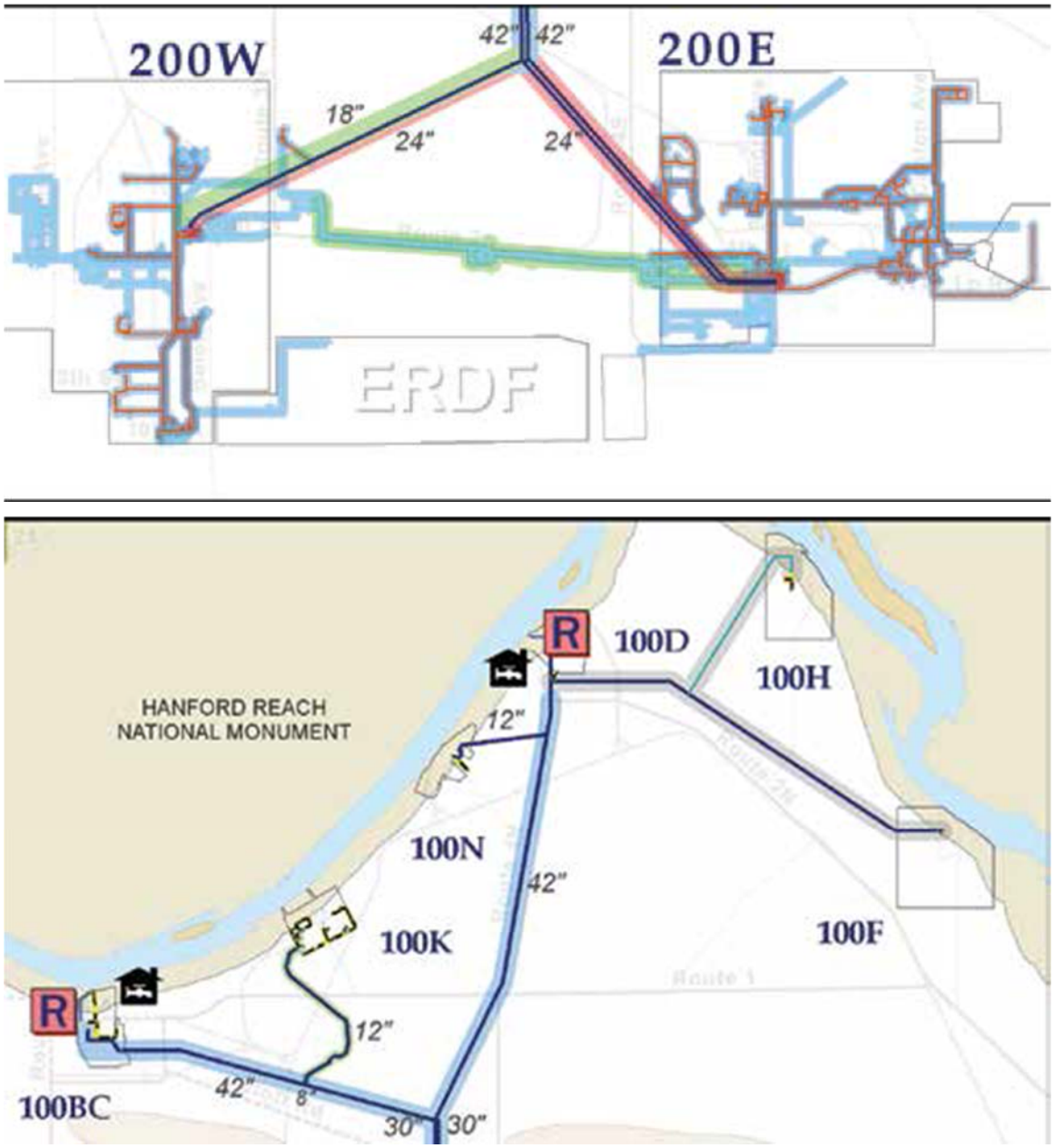

Figure C-1. Major components of Hanford's Export, Raw, and Potable Water Supply System (from Mathes 2014).

Sanitary Sewer System

Sanitary sewer systems service over 4000 workers and consist of many pipelines, 60 drain fields, 18 holding tanks, and miscellaneous lagoons (Mathes 2014). In addition, the Hanford Site contractors employ a large number of portable toilets.

Natural Gas Pipeline

A natural gas pipeline has been proposed to service the WTP. Construction is expected to be completed by June 2015 (Mathes 2014).

Information Technology Systems and Business Services

In 2013, the Hanford Site upgraded its core data center switches and routers along with a majority of the distribution layer switches all supporting the Hanford Federal Cloud (Eckman et al. 2013). This provides Hanford with a more reliable and resilient network architecture to support bandwidth-intense applications, such as video teleconferencing. Some of the key services include Core Network (backbone, firewall, load balancers); Voicemail; Voice over IP (VoIP); Emergency Notification; Virtual desktops; and, numerous production applications and data. IT systems manage more than 6.5 million electronic records, and include more than 500 miles of secure wireless transmission (Armijo 2014).

IT support includes 7 WiMAX microwave links, 369 miles of WiMAX coverage, support to 10,000 desktop computers, and 12,000 telephone lines.[5] These systems include a number of telecommunications buildings that are underutilized because legacy systems are still in place (Mathes 2014). Other elements of the IT systems include radio towers and emergency notification sirens (Mathes 2014).

Business Services provided at the Hanford Site include Publications and Information/Word Processing, Graphics Services, Mail Services, Reproduction Services, Photography/Audiovisual Services, Records Management (DOE 1990), and Library services (e.g., Administrative Record and Public Information Repository). Records Management systems include various records storage areas (e.g. the DOE-RL Public Reading Room). Other related systems include sample archive facilities (e.g. geotechnical library), and electronic database management systems (e.g., the Hanford Environmental Information System and the Hanford Geographic Information System).

Fire and Emergency Response Systems

Fire and emergency response systems include three fire stations (note that the 400 fire station has already been closed), two of which (100 Area and 300 Area) are planned for closure, while the existing 200 Area fire station is planned for upgrades, and a new fire station planned to support WTP operations (Mathes 2014). These facilities also include a number of fire engines and ambulances, and the Radio Fire Alert and Reporting system (which has been noted as obsolete, with replacement parts no longer manufactured) (Mathes 2014).

Safeguards and Security

Safeguards functions are responsible for controlling inventories and records of special nuclear materials at the site (DOE 1990; Mathes 2014). Security functions refer mainly to the operations of the Hanford Patrol, including information and physical security systems (DOE 1990; Mathes 2014). The Hanford Patrol provides round-the-clock security for the Hanford Site to prevent unauthorized access, acts of sabotage, and theft or loss of classified matter and government property. The highly trained staff includes officers, including a special response team and canine handlers. Physical security systems include three main barricade/guard house facilities and miles of security fencing. Specialized equipment and training facilities includes patrol cars, four-wheel drive vehicles, vans, trucks, etc. The patrol training academy includes general facilities, a live fire shoot house, and a firing range complex.

Transportation

MSA is responsible for maintaining 1200 vehicles, 1500 heavy-duty vehicles, 25 mobile cranes, and 630 fuel-efficient vehicles (Armijo 2014).

[5] Hanford Site Assets and Attributes. U.S. Department of Energy. Accessed at http://energy.gov/ari/downloads/hanford-ari-overview on January 22, 2015.

Rail

In 1990, the Hanford Site railroad system consisted of 127 miles of trackage and 139 pieces of HO-coded rolling stock and longer support equipment. The system was constructed during World War II for the Manhattan Project using predominately salvaged-rail of at least nine different weights (DOE 1990). In 1999, the railway system was taken over by the newly established Tri-City Railroad (TCRY), which is a Class III common carrier railroad.[6] The TCRY operates and maintains the railroad line owned by the Port of Benton, rarely operating on the Hanford Site. In 2010, 30 miles of the Hanford Site railroad track were removed miles from rail spurs that ran to the nine plutonium production reactors along the Columbia River and to the 300 Area.[7]

Roads

Hanford maintains a road system composed of 377 miles of paved roads (Figure C-2) and 122 miles of unpaved roads that is safe, compliant, and reliable for personnel and movement of materials and products.[8] Average daily traffic is estimated at 5700 vehicles per day (Mathes 2014).

[6] Tri-City Railroad Company. Accessed at www.tcry.com on January 23, 2015.
[7] Cary, A. 2010. Old Hanford railroad tracks safe to be reused. In *Tri-City Herald*, November 10, 2010. Accessed at http://seattletimes.com/html/localnews/2013394996_apwahanfordrailrecycling1stldwritethru.html on January 27, 2015.
[8] Hanford Site Assets and Attributes. U.S. Department of Energy. Accessed at http://energy.gov/ari/downloads/hanford-ari-overview on January 22, 2015.

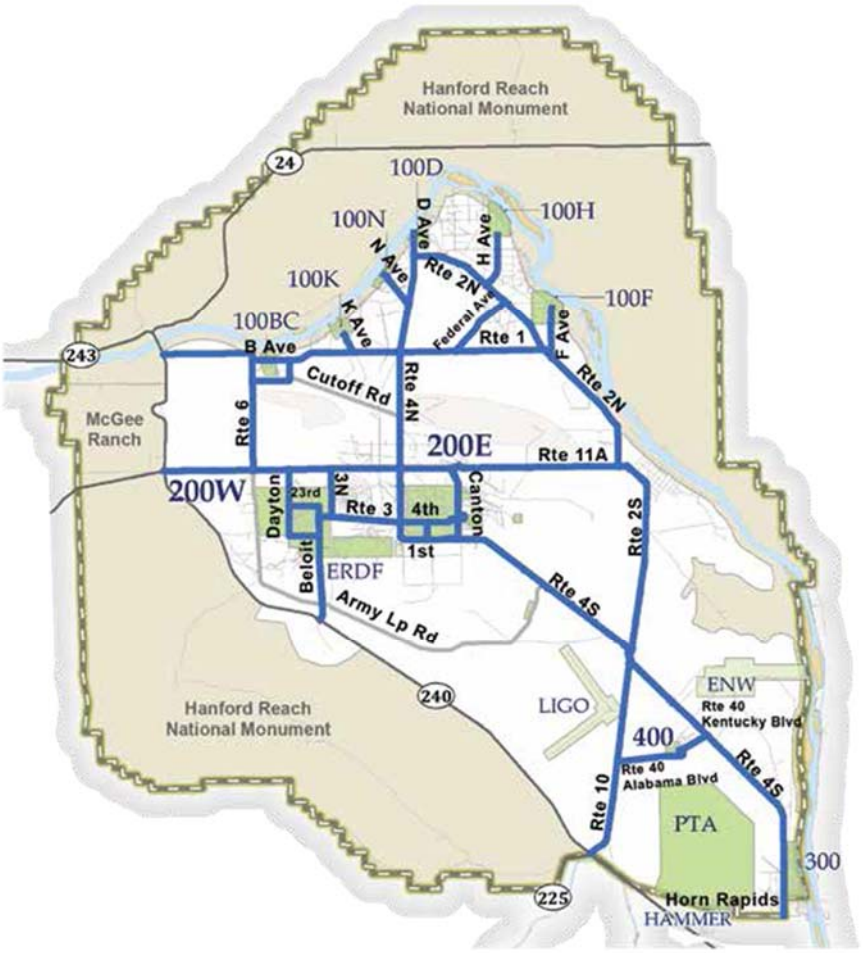

Figure C-2. Major roads on the Hanford Site (from Mathes 2014).

Medical Services

Basic occupational health care services are provided to the site by the Occupational Medical Services Contractor.[9] This includes:

- Providing occupational medical services to approximately 8000 employees working for Hanford Site contractors, DOE offices, or others working at the Hanford Site.
- Operating and maintain services at two clinical facilities, one in the 200 West Area, and one in Richland.[10]
- Providing support to epidemiological studies of current and former Hanford Site workers, the Chronic Beryllium Disease Prevention Program, and Energy Employees Occupational Injury Compensation Program Act.
- Maintaining and protecting the medical records of current and former Hanford workers.

[9] DOE Awards Hanford Site Occupational Medical Services Contract. Accessed at http://energy.gov/em/articles/doe-awards-hanford-site-occupational-medical-services-contract on January 23, 2014.

[10] HPM Corporation (HPMC). Accessed at http://www.hanford.gov/page.cfm/HPMCHanford on January 23, 2014.

Laundry Services

Laundry services in support of DOE-RL, the DOE Office of River Protection, and Hanford Site contractors include both regulated (i.e., radiological protective clothing) and non-regulated laundry services, as well as decontamination services for government-owned protective clothing, non-regulated items, and respirator face pieces.[11]

Laboratory and Test Facilities

Laboratory and test facilities that have supported Hanford Site missions include research and development laboratories (e.g., 325 Building), Standards Laboratory, Hanford Environmental Management Laboratories (e.g. 318 building, Meteorological Station), Personnel Dosimetry Laboratory, and Environmental Health Sciences Laboratory (DOE 1990). These laboratories and test facilities continue to change in response to Hanford Site mission needs.

Personnel Dosimetry Laboratory (including the whole body counter)

These services include the operation of the whole-body counting facilities located in the 747A Building, in downtown Richland.

Meteorological and Air Monitoring Stations

The Meteorological Station (formerly known as the Atmospheric Physics Laboratory) provides meteorological and climatological services. The facility includes the 622R Building and associated meteorology towers to monitor weather patterns on the Hanford Site.

Weather data is provided to the DOE and its Hanford Site contractors 24 hours per day, 365 days per year. It is a fully functional National Weather Service station providing meteorological support in the following areas: emergency response, general weather forecasts, severe weather forecasts, special wind forecasts, climatological data (monthly and annual summaries), and other specialized forecast and climatological services as requested (DOE 1990). Over 30 instrumented towers are strategically placed around the Hanford Site and the surrounding region (Figure C-3).

[11] UNITECH SERVICES GROUP, Regulated and Non-Regulated Laundry Services. Accessed at http://www.hanford.gov/files.cfm/Contracts_UniTech_Contract_Original_Part_I_Section_C.pdf on January 23, 2015.

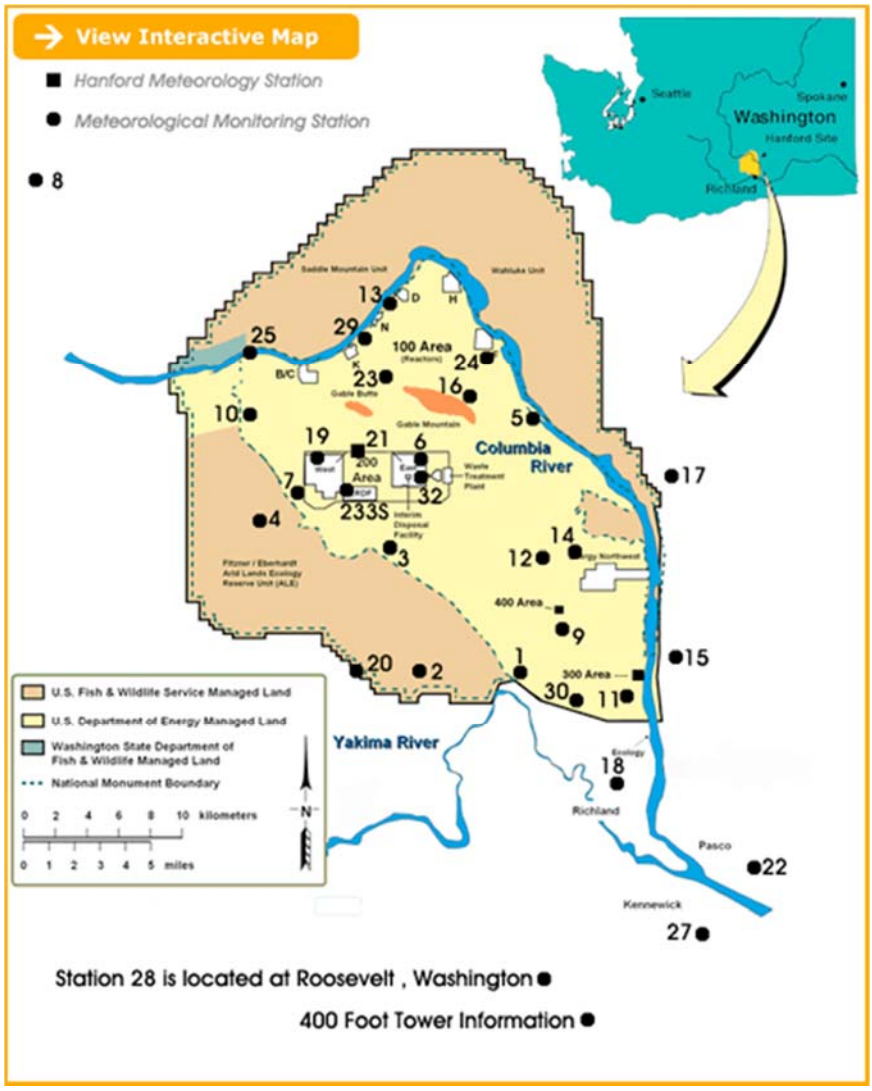

Figure C-3. Hanford Meteorological Monitoring Stations.

Monitoring Wells

DOE operates an extensive groundwater monitoring program on the Hanford Site, collecting thousands of samples from hundreds of groundwater wells each year (CH2M Hill 2014). Hundreds of vadose zone monitoring wells and past characterization boreholes are also present throughout the Hanford Site. While the numbers and locations of wells will continue to change in response to mission needs, many of these wells will be needed throughout the life of the Hanford Site.

Lysimeter and other Field Test Facilities

The Hanford Site contains a number of long-term field test facilities to support the Hanford Site mission. These include lysimeter/recharge testing facilities, surface barrier test facilities, and other site characterization and testing facilities, including but not limited to:

- The Grass Site
- 200E Lysimeter (in active)
- 300N Lysimeter

- Field Lysimeter Test Facility (near Meteorological Station)
- Solid Waste Landfill
- Cold Test Facility (near HAMMER)
- Mock Tank Facility (200 East)
- Above Ground Spent Fuel Storage Test Site (Inactive, 200 West)
- Sisson and Lu Field Test Site (200 East)

Seismic Monitoring Network

The Hanford Site seismic monitoring network provides an uninterrupted collection of high-quality raw seismic data in and around the Hanford Site and consists of two types of equipment; seismometers and strong motion accelerometers (Figure C-4).[12]

[12] Seismic Monitoring. Accessed at http://www.hanford.gov/page.cfm/SeismicMonitoring on January 26, 2015.

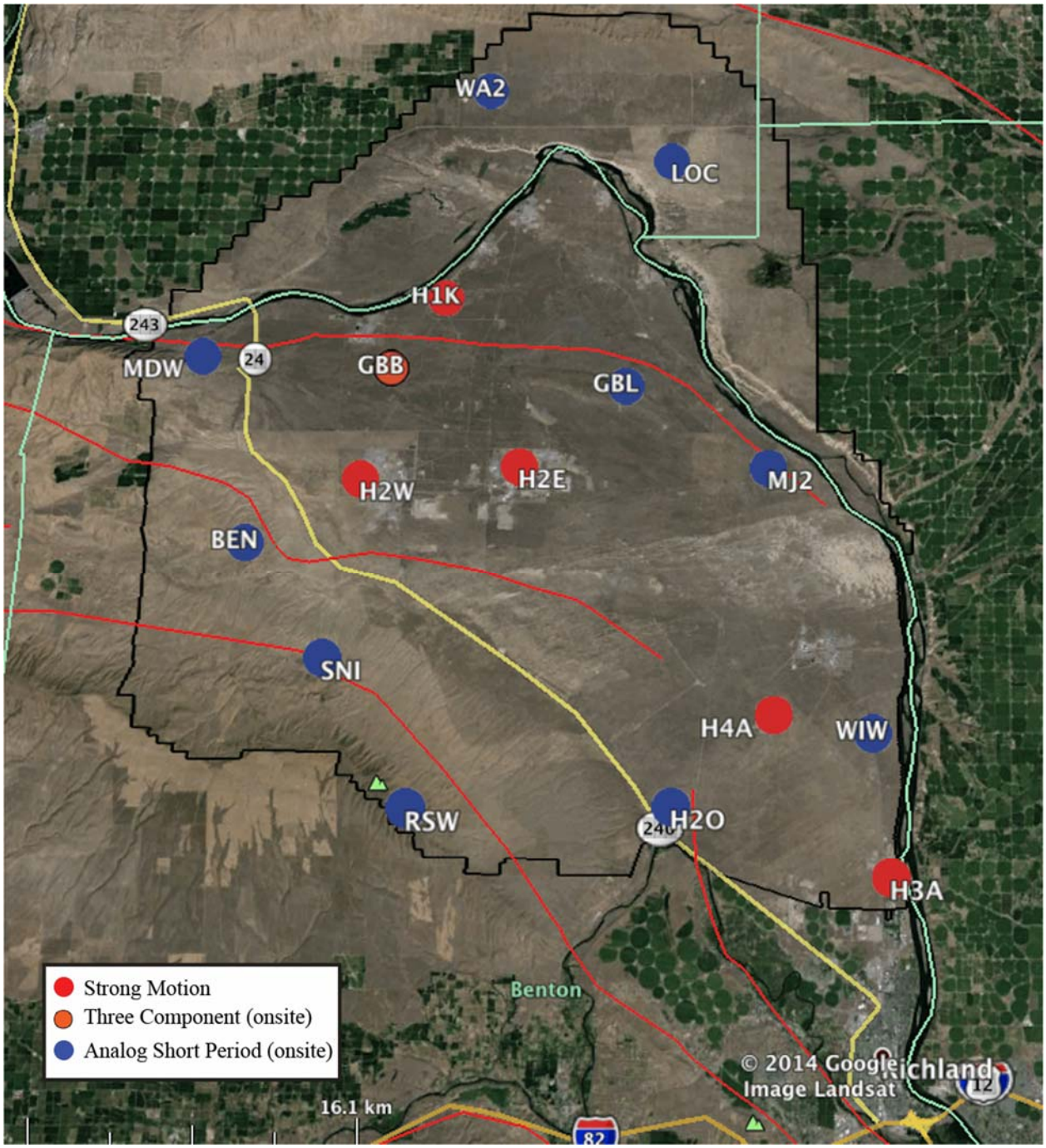

Figure C-4. Existing Hanford seismograph stations (after Integrated Science Solutions, Inc. 2014)

General Purpose Buildings

The Hanford Site has 592,000 ft^2 of warehouse storage and 122 buildings throughout the Hanford Site, with approximately 3.4 million gross square feet.[13]

Training Facilities - HAMMER

The Volpentest HAMMER Federal Training Center provides the training opportunities and facilities that support the Hanford Site missions and the Hanford workforce. The 88-acre facility includes realistic training props for hands-on training, and new technology deployment, plus 20 classrooms with state-of-the-art computers, projectors, and screens.[14]

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Integrated Science Solutions, Inc. April 30, 2014. Review and Recommendations for Network Reconfiguration. Accessed at http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&ved=0CGUQFjAF&url=http%3A%2F%2Fpnsn.org%2Foutreach%2Fanss%2Fadvisory_commitee%2Frac-meeting-minutes%2F2014-minutes%2F2014-04-30_Hanford_Seismic_Network_Review_a-final-.pdf&ei=ZInGVNHKJceQyATEyoGoCQ&usg=AFQjCNEMfE1ha7S87hd_ia58zR4VW0wNqw&bvm=bv.84349003,d.aWw on January 26, 2015.

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[13] Hanford Site Assets and Attributes. U.S. Department of Energy. Accessed at http://energy.gov/ari/downloads/hanford-ari-overview on January 22, 2015.
[14] Volpentest Hammer Federal Training Center. Accessed at http://www.hammertraining.com on January 23, 2014.