ER Site No. 227: Bunker 904 Outfall (SouthEast of TA-II)

ADS: 1309
Operable Unit: Tijeras Arroyo

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Site History

Site 227 is one of a pair of inactive Technical Area II (TA-II) waste-water outfalls for the Site 48 high explosive (HE) drain system. Piping for the HE drain system was constructed of cement pipe and was connected to Buildings 904, 913, and 914. The piping discharged waste-water into a shallow ditch that is still visible today in its entirety approximately 80 feet east of the southern TA-II apex. The site covers a mere 0.08 acres on the northern rim of Tijeras Arroyo. The site is 270 feet long and extends eastward from Site 48, down the steep arroyo rim, and on to the floodplain. The outfall ditch is about 130-feet long, 20-feet wide, and ranges in depth from about 3 to 10 feet. The discharge of waste water began in about 1947, but was substantially reduced after the early 1960s. Waste water may have discharged at the site until 1992. The area surrounding Site 227 has historically been sloped so that storm water was not directed into the outfall ditch. No stained soil has been identified at ER Site 227.

ER Site 227 received an unspecified amount of floor washdown water from two buildings. Building 904 was built in 1948 and was used for weapons assembly, HE research, photo processing, and various types of environmental testing. Buildings 913 and 914 were built in 1951 and used for component assembly and pressure testing. Floors in the rooms where HE compounds were machined or assembled were washed down with water to avoid the hazard of static electricity induced by dry sweeping. Water also was used to flush a variety of chemicals and possibly radionuclides into the drain system. In addition to discharging at the ER Site 227 outfall ditch, the ER Site 48 HE drain system also was connected to the nearby ER Site 229 outfall. A catch box upstream of ER Site 227 prevented HE particulates from reaching either outfall. Neither sanitary (sewer) waste nor storm water were directed to ER Site 227.

The waste water contained:

- organic compounds including acetone, methylene chloride, trichloroethylene (TCE), methyl ethyl ketone (MEK), nitromethane, carbon tetrachloride, toluene, xylenes, FreonTM compounds, hexane
- various alcohols (methanol and isopropyl)
- metals (barium, cadmium, chromium, lead, silver, and titanium)
- HE compounds such as Baratol, Compound B, HMX, RDX, and black powder
- inorganic compounds including ammonium hydroxide and cyanide
- petroleum distillates such as kerosene
- and possibly traces of radionuclides such as cesium-137, uranium-235/238, plutonium-239, and tritium.

In 1992, the ER Project began conducting groundwater studies at TA-II. These studies along with other Solid Waste Management Unit related investigations were eventually incorporated into the Tijeras Arroyo Groundwater (TAG) Investigation. TA-II is located in the central part of the TAG study area. The hydrogeologic setting of the study area is dominated by two water-bearing zones, the perched system and the regional aquifer, both of which are present within the upper Santa Fe Group. The perched system is not used for water supply. However, the COA, Kirtland Air Force Base (KAFB), and the Veterans Administration (VA) utilize the regional aquifer for water-supply purposes. At TA-II, the depth to the perched system is approximately 320 ft below ground surface (bgs). The perched system covers approximately 3.5 square miles in the central part of the TAG study area and may extend across the northern boundary of KAFB. The direction of groundwater flow in the perched system is to the southeast. Discontinuous, yet overlapping multiple lenses of unsaturated alluvial-fan sediments serve as a perching horizon beneath the perched system and above the regional aquifer. At TA-II, the depth to the regional aquifer is approximately 520 ft bgs. The direction of groundwater flow in the regional aquifer is principally to the northwest towards the KAFB, COA, and VA water-supply wells. Groundwater from the perched system merges with the regional aquifer southeast of Tijeras Arroyo. The regional aquifer extends across the entire TAG study area and the Albuquerque Basin.

Several groundwater monitor wells are located in the vicinity of ER Site 227. The nearest monitor well, TA2-W-19, is located 500 feet east of the site. The nearest downgradient water-supply well is KAFB-1, which is located approximately 1.4 miles northwest of the site. Low levels of TCE and nitrate have been detected in perched-system groundwater samples collected at nearby TA-II. The regional aquifer is not contaminated.

The soil is poorly developed with high akalinity. The subsurface geology consists of unconsolidated alluvial and colluvial deposits derived from the Sandia and Manzanita Mountains. These upper Santa Fe Group deposits consist of sediments ranging from clay to gravel derived from the granitic rocks of the Sandia Mountains and greenstone, limestone, and quartzite derived from the Manzanita Mountains. The depth to Precambrian basement beneath TA-II is approximatley 3,000 ft.

ER Site 227 is situated on the steep, northern rim of Tijeras Arroyo but outside the 100-year floodplain. The site is located approximately 1,500 ft west of the active channel of Tijeras Arroyo. Water flows in the active channel near TA-II several times per year.

Constituents of Concern

The COCs for ER Site 227 are volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), HE compounds, cyanide, RCRA metals, and radionuclides (gamma emitters and tritium).

Current Hazards

No chemical or radioactive hazards are present in surface or subsurface soil at ER Site 227.

Current Status of Work

In 1994, unexploded ordnance/high explosive (UXO/HE) and radiological surveys were conducted at ER Site 227. No UXO/HE material or radioactive anomalies were detected. Eight soil samples (227-01-A/B through 227-04-A/B) were collected in 1994. Four samples each were collected at the upper and lower ends of the outfall ditch. The sampling interval extended from the ground surface to 3 feet below ground surface (bgs). The samples were analyzed for VOCs, SVOCs, cyanide, total petroleum hydrocarbons (TPH), HE compounds, target analyte list (TAL) metals, chromium-VI, total Kjeldahl nitrogen (TKN), nitrate/nitrite, tritium, uranium-235/238, plutonium-239, and other gamma-emitting radionuclides. No VOCs, SVOCs, TPH, or cyanide were detected in the soil samples. All metals, radionuclides, and nitrate results were within background.

Both passive and active soil-vapor samples were collected at ER Site 227. The passive soil-vapor surveys were conducted in 1993, 1995, and 1999. The active soil-vapor samples were collected in 1998 and 1999.

Of the several hundred PetrexTM soil-vapor collectors that were used in 1993 and 1995 during TA-II and ER Site 45 investigations, analytical results from 15 of collectors are applicable to ER Site 227. These 15 soil-vapor collectors had been installed near the western end of ER Site 227. Each collector was buried at a depth of about 1.5 feet bgs for approximately three weeks before being retrieved and shipped to an analytical laboratory. No SVOCs, or VOCs such as TCE or perchloroethylene, were detected in any of the 15 soil-vapor collectors.

In November 1996, TA-II Operable Unit (OU) personnel drilled three boreholes for the purpose of collecting active soil-vapor samples at various TA-II locations. One of the boreholes, T2-BH-021, was installed approximately 110 ft northwest of ER Site 227. During drilling, soil-vapor samples were collected at 10-foot intervals with a SimulprobeTM sampler driven ahead of the augers. Soil-vapor samples were collected from 10 to 110 feet bgs. Low to moderate levels of 33 VOCs were detected. Acetone had the maximum VOC concentration at 2,500 parts per billion by volume (ppbv) at a depth of 50 feet bgs. The maximum TCE concentration was 1,100 ppbv at 40 feet bgs. The highest value for total VOCs was 6,590 ppbv, which was encountered at a depth of 50 feet bgs. In December 1996, the borehole was converted to a soil-vapor monitor well (TA2-VW-21) with sampling ports set at 50 and 92 ft bgs. After the initial sampling in September 1997, quarterly sampling began in May 1998. Low to moderate levels of VOCs in soil vapor have been routinely detected using SummaTM sampling canisters. From September 1998

through June 2000, the TCE concentrations from 50 ft bgs averaged 470 ppbv, while the TCE concentrations from 92 ft bgs averaged 1,100 ppbv.

In August 1998, two active soil-vapor samples were collected by the DOE at GeoProbeTM location EPA-ERTA2/4-BH4, which was located about 85 feet southeast of ER Site 227. The samples were collected at depths of 10 and 30 feet bgs using a TedlarTM bag system. The samples were analyzed using EPA method TO14. Low levels of eleven VOCs were detected. Acetone had the maximum VOC concentration at 14 ppbv. The maximum TCE concentration was 5.7 ppbv. No trends in soil-vapor concentrations versus depth were apparent.

In October 1999, passive soil-vapor samples were collected using VaporTecTM collectors. Four collectors (TJAOU-227-SVX-01 thorough TJAOU-227-SVX-04) were installed along the south side of the outfall ditch at a depth of approximately 0.5 feet bgs. After being buried for 30 days, the collectors were analyzed for VOCs and gasoline/diesel range organics using EPA methods 8021M and 8015M, respectively. Each detected value for the VaporTecTM collectors was reported in nanograms (ng) of contaminant that had sorbed onto the activated carbon sampling media. Low levels of six VOCs, including 1,1-dichloroethylene, were detected. TCE was not detected. Vinyl chloride had the maximum VOC value at 51.9 ng. The maximum value for total gasoline/diesel range organics was 1.2 ng.

The process knowledge for the ER Site 227 outfall is partially based on other ER investigations beside the work of the Tijeras Arroyo OU. During March 2000, TA-II OU personnel excavated the septic and drain systems located within the TA-II boundary. This work identified the locations of the systems and the effluent-release points. A review of historic and current SNL/NM Facilities Engineering drawings showed that Buildings 904 and 913 had been connected to the ER Site 48 HE drain system that discharged at ER Sites 227 and 229. Except for scattered pieces of cement pipe on the ground surface, the outfall pipe from ER Site 48 has not been found outside the TA-II boundary. No TA-II disposal records have been found that identify the volume of waste-water discharged at ER Site 227.

Historic aerial photographs were reviewed in February 2001. Twenty-five years of photographs were available for the period of 1951 to 1999. Even though the discharge of waste water began in about 1947, the 1951 photograph does not show much soil erosion. The depth and width of the outfall ditch varies little between the 1951 and 1999 photographs. Not much erosion is evident. Vegetation visible in the photographs suggests that the volume of waste water declined substantially after the early 1960s. Waste water may have discharged at the site until 1993 before the HE drain system was replaced with polyvinyl-chloride (PVC) piping that is presently connected to the City of Albuquerque sanitary-sewer system. The photographs also show that construction and trenching of various sanitary-sewer and water lines in 1963, 1979, and 1993 disturbed the area immediately west of ER Site 227. However, the outfall ditch was not disturbed by the nearby construction.

Exploratory work was conducted on February 23, 2001 in an attempt to find the outfall pipe at Site 227. Except for scattered pieces of cement pipe on the ground surface, the ER Site 48 piping has not been found outside the TA-II fence. A backhoe was used to dig an exploratory trench on the western end of the outfall ditch at the only location outside the TA-II fence where the pipe was likely to remain buried. The exploratory trench was cut perpendicular to the orientation of

the ditch and the suspected alignment of the pipe. The exploratory trench was 30-feet long, 2-feet wide, and had a maximum depth of 6 feet. No stained soil was found in the exploratory trench or along the outfall ditch. If present, the outfall pipe would have been at a depth of 3 feet or less. However, the outfall pipe was not found. This was not too surprising because historical aerial photographs show that the westernmost end of the site near the TA-II fence was disturbed during the installation of sewer and water lines in 1963, 1979, and 1993.

On February 27, 2001 three hand-auguring locations (TJAOU-227-GR-05, TJAOU-227-GR-06, and TJAOU-227-GR-07) were sampled to a maximum depth of seven feet bgs. The shallow-soil samples consisted of native soil and were collected from the exploratory trench and along the outfall ditch. The analytes consisted of VOCs, SVOCs, HE compounds, metals, and radionuclides. Following the sampling work, the exploratory trench was backfilled. No significant contamination was detected in the soil samples.

In late March 2001, deep-soil samples were collected to a depth of 275 feet bgs during the drilling for soil-vapor monitor well 227-VW-01. The analytes for the borehole samples consisted of VOCs, SVOCs, HE compounds, metals, and radionuclides. The well was installed near the eastern end of Site 227 with sampling ports set at depths of 25, 75, 125, 175, 225, and 275 feet bgs. Soil-vapor samples were collected on a quarterly basis (April, June, September, December 2001 and March 2002) and analyzed for VOCs. The maximum TCE concentration was 14,000 ppbv.

In June 1995, the ER Project submitted a risk-based no further action (NFA) proposal to the New Mexico Environment Department (NMED) for ER Site 227. After receiving the June 1996 Notice of Deficiency (NOD) comments from NMED, SNL/NM submitted a NOD response in October 1996, which included a risk assessment using the 1994 analytical results. No significant contamination was apparent; however, some of the detection limits were too high for a definitive conclusion to be made by NMED. In October 1999, NMED issued a second set of NOD comments that requested several types of sample collection. SNL/NM submitted a second NOD response in December 1999, which confirmed the need for additional field work. The February and March 2001 sampling completed the field-work request.

Future Work Planned

The ER Site 227 NOD response will be submitted in 2003 in tandem with the ER Site 229 NOD response. The ER Site 227 NOD response will include four sets of analytical results: shallow-soil data for the March 2001 hand augering, deep-soil data for the March 2001 borehole, four quarters of soil-vapor results from monitor well 227-VW-01, and reformatted data tables for the results previously submitted in the June 1995 NFA Proposal and the October 1996 NOD Response.

Waste Volume Estimated/Generated

No waste was generated at ER Site 227.

Information for ER Site 227 was last updated Jan 31, 2003.