



US Army Corps
of Engineers ®

Huntington District

Formerly Used Defense Sites Newsletter

Summer 2015 Edition

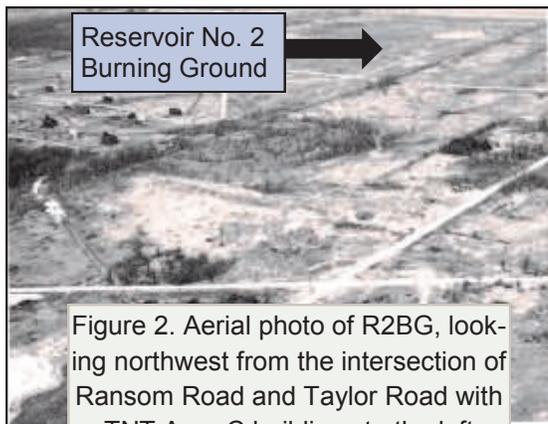


USACE HUNTINGTON DISTRICT BEGINS REMEDIATION IN RESERVOIR NO. 2 BURNING GROUND AT THE FORMER PBOW IN SANDUSKY, OHIO

The US Army Corps of Engineers (USACE) Huntington District continues the environmental restoration at the former Plum Brook Ordnance Works (PBOW) located in Sandusky, Ohio. The Formerly Used Defense Site (FUDS) Program environmental restoration initiated another project in October 2014. The project is a Remedial Action -Construction (RA-C) effort in Reservoir No. 2 Burning Ground (R2BG). Figure 1 depicts the location of R2BG.



Figure 1. Location of R2BG RA-C project (Bing Maps)



Reservoir No. 2
Burning Ground

Figure 2. Aerial photo of R2BG, looking northwest from the intersection of Ransom Road and Taylor Road with TNT Area C buildings to the left



Figure 3. Heavy vegetation in R2BG



Figure 4. Placing the new liner in Sump 2

R2BG is one of the five known burning grounds at PBOW. It is located in the western portion of PBOW, approximately 400 feet south of Reservoir No. 2, between Ransom Road and Campbell Street. R2BG was used for destruction of process wastes (off-specification explosives, acids, solvents, asbestos, and waste oil) and other refuse that would burn. The area to be excavated and treated at R2BG is a total volume of 7,395 cubic yards (cy) of contaminated soil. The contaminants of concern consist of nitroaromatics, lead, polychlorinated biphenyls (PCBs) and dioxins (TCDD TEQ).

During the production years at PBOW, there were buildings in the manufacturing areas (Figure 2), but there were no buildings associated with R2BG. At the start of the remediation activities, R2BG site was a grass-covered open field bordered with young hardwood trees and brush with mature cottonwood trees surrounding the area (Figure 3).

The soil remediation in R2BG is planned to be completed in two phases due to the volume of soil that is expected to be hazardous and require treatment. Each phase will consist of excavation followed by remediation using alkaline hydrolysis (AH). This technology was used successfully to remediate the hazardous, nitroaromatic-contaminated soil on the TNT Area A and Area C RA-C projects.

Before starting any of the remediation activities, preparation of the on-site remediation pad had to be completed before the onset of extreme temperatures. Additional stone was placed in low-lying areas, the sump liners were replaced (Figures 4 & 5), silt fence

USACE HUNTINGTON DISTRICT BEGINS REMEDIATION IN RESERVOIR NO. 2 BURNING GROUND AT THE FORMER PBOW IN SANDUSKY, OHIO (continued)

was erected, and straw bales were placed around the sumps. The sumps are used to collect the run-off water from the pad during remediation activities. The sump water can then be used to maintain the moisture in the windrows during remediation.

To date, Phase I is complete with the excavation of over half (approximately 4,000 cy) of the total volume excavated from the pit. Phase I consisted of excavation of the top two feet of the entire area, stockpiling and characterizing the soil, off-site disposal of non-hazardous soil. All of the non-hazardous soil was disposed of off-site at the Erie County Landfill (ECL) where it was used for daily cover.

After the characterization of the stockpiled soil, there were approximately 1,800 cy of soil that were hazardous for nitroaromatics and lead. This soil was transported to the on-site remediation pad and staged in windrows in preparation for AH and stabilization. The nitroaromat-



Figure 5. Completed sump upgrades



Figure 6. Adding the alkaline hydrolysis reagent to the soil (strapping shown in inset)



Figure 7. Windrow turner used to mix the alkaline hydrolysis reagent with the soil

ics were reduced using AH (Figures 6 & 7). After AH remediation, approximately 1,000 cy of soil exceeded the Toxicity Characteristic Leaching Procedure (TCLP) for lead. The lead was stabilized by applying Severson Environmental Services' Maectite® reagent to the soil. The soil was analyzed to confirm that it was below the TCLP for lead (5.0 mg/kg) prior to disposing of the non-hazardous soil at the ECL for use as daily cover.

After all of the soil is removed from the remediation pad, soil samples from the windrow footprints will be collected to assess if the underlying soil was impacted by the contaminated soil in the windrows. If the windrow footprint sample results indicate that there are detectable concentrations of contaminants, the soil will be scraped to remove the top few inches of soil and resampled. This process of scraping and sampling will be repeated until the sample results are below detectable concentrations. The results of the final windrow footprint analysis from the previous remediation event (TNT-A) will be used to make the assessment.

With Phase I of this RA-C in the final stages, the crew will next prepare for Phase II. Phase II will follow the same process as Phase I, with excavation, stockpiling, characterization of the stockpiled soil, off-site disposal of non-hazardous soil, on-site treatment of hazardous soil, and off-site disposal of remediated soil. Phase II will begin in the fall of 2015 with all the field efforts completed by the end of October 2016 and the Final Construction Completion Report submitted in March 2017.

WEST VIRGINIA MANEUVER AREA FORMERLY USED DEFENSE SITE (FUDS) PROJECT 05 – 11: MUNITION RESPONSE SITES (MRS) 01 - 07

Site Investigations in accordance with the DOD FUDS Program were previously completed for the Munition Response Sites (MRS 01 - MRS 07) at WVMA. As part of the investigative process, a Quality Assurance (QA) review of the Munitions Response Sites Prioritization Protocol (MRSP) scores was conducted for the MRS sites by USACE. The DOD MRSP scoring system prioritizes MRS sites between 1 and 8 (1 is highest priority and 8 is lowest priority). As a matter of DOD policy, an MRS with higher risks (i.e., higher priority scoring) will be addressed before an MRS with lower risks (i.e., lower priority scoring). Occasionally, other factors, such as environmental justice, economic development, and programmatic concerns can influence sequencing decisions.

As a result, the overall MRSP scores for the following sites were MRS01 Dailey Infiltration Camp at 5, MRS04 Fore Knobs/Bears Rocks Firing Ranges at 2 as well as MRS06 Brown Mountain/Cabin Mountain Firing Ranges at 2. These three sites will require further investigation. Munition Response Sites 2, 3, 5, and 7 were closed out because they did not require any further action.

USACE HUNTINGTON DISTRICT UTILIZES SOIL SCREENING ANALYSIS DURING THE REMEDIAL ACTION-CONSTRUCTION PROJECTS IN ACID AREAS 2 AND 3 AT THE FORMER PBOW IN SANDUSKY, OHIO

The 2014 edition of the USACE Huntington District's Formerly Used Defense Site (FUDS) Newsletter, presented Acid Area 2 (AA2) and Acid Area 3 (AA3) as the next two areas targeted for soil remediation at the former Plum Brook Ordnance Works (PBOW). AA2 remediation activities are already underway and activities in Acid Area 3 (AA3) are planned to begin in December 2015. Remediation activities in these two areas will be very similar to other remediation projects that USACE has completed in TNT Areas A, Area B and Area C with respect to excavation, stockpiling (Figure 1) and characterizing the soil. However, in these two areas, the only contaminants of concern are Polychlorinated Biphenyls (PCBs), specifically Aroclor 1254 and 1260, and after the stockpiled soil is characterized, the soil will go directly to an off-site disposal facility. Essentially, these are "dig and haul" projects.

There are 14,189 cubic yards (cy) of contaminated soil in AA2 to be excavated, characterized and disposed of off-site. At AA3, there are 16,809 cy to be excavated, characterized and disposed of off-site, including 140 cy of soil that may contain PCBs over 50 mg/kg which will require disposal at a TSCA-regulated facility.

PCBs are not very mobile in soil and, as a result, contamination is usually limited to shallow depths. The scoped depth of each of the excavations is 36-inches. If clean soil (or soil <RG) is encountered at a shallower depth, then further excavation to the 36-inch depth will not be necessary.

At AA2 and AA3, USACE will be using soil screening analysis to evaluate concentrations of PCBs with respect to the remedial goals (RG) and to determine the depth of each excavation. Screening the PCB concentrations in the soil may eliminate the need for additional excavation to reach clean soil, or soil that is below the RG for Aroclor 1254 of <1 milligrams per kilogram (mg/kg) and a combined Aroclor 1254/1260 of <2 mg/kg. Additionally, in the event the concentrations of PCBs in the walls of the excavation exceed the RG, then expanding the excavation in a horizontal direction may be required. The soil screening analysis would allow USACE to expand the excavation horizontally, if necessary, at no additional cost if the excavation does not reach the scoped depth of 36 inches.

The cost for excavation in both areas to a depth of 36" was based on the findings from the Remedial Investigation / Feasibility Study phase; however, excavation is initially being conducted to 18-inches (Figure 2) in hopes of reducing soil volumes and other associated costs (i.e., disposal of soil and purchase of backfill). Screening samples will be collected at 18 inches and used to compare the concentrations of Aroclor 1254 and Aroclor 1260 to the RGs. If the screening samples indicate the Aroclor concentrations are below the RGs (Aroclor 1254 <1 mg/kg and combined Aroclor 1254 and 1260 <2 mg/kg), the excavation will be considered



Figure 1. Preparing the stockpile pad to receive contaminated soil



Figure 2. Acid Area 2, Excavation C was excavated to the 18-inch depth

USACE HUNTINGTON DISTRICT UTILIZES SOIL SCREENING ANALYSIS DURING THE REMEDIAL ACTION-CONSTRUCTION PROJECTS IN ACID AREAS 2 AND 3 AT THE FORMER PBOW IN SANDUSKY, OHIO (continued)

complete and confirmation soil samples will be collected from the soil along the floor (Figure 3) and walls of the excavation and submitted to the laboratory for analysis.

Screening the PCB concentrations in the soil before proceeding to confirmation sampling is an effective tool used to determine if the soil is potentially (1) below the RG, (2) has met the clean-up requirements as well as (3) being an efficient use of project funding. The soil screening samples do not require the extensive review or validation process that confirmation soil samples require. The screening samples are simply a tool to indicate if confirmation samples should be collected for definitive analysis. The confirmation samples are subject to extensive review and validation processes because the sample results are the basis for decision-making about the excavation, including if the excavation can be backfilled (or closed), and that it no longer presents a risk to human health or the environment. Currently in AA2, USACE is utilizing the soil screening analysis and will use the same process when AA3 gets underway.



Figure 3. The project Environmental Technician (ET) collects screening samples from the floor of the excavation

USACE INITIATES WELL ABANDONMENT PROGRAM AT PLUM BROOK ORDNANCE WORKS

The US Army Corps of Engineers (USACE) Huntington and Nashville Districts installed and maintained a network of 122 groundwater monitoring wells (Figure 1) at Plum Brook Ordnance Works (PBO) located in Sandusky, Ohio. The wells were installed beginning in 1989 through 2011 as part of the environmental remediation efforts at the former explosives manufacturing facility. The signing of the No Further Action Decision Document for Groundwater in July 2014 led to USACE's decision to initiate the abandonment efforts which began in the fall of 2014.

The monitoring wells included overburden (shallow) wells and bedrock wells (Figure 2) with average installation depths of approximately 20 feet and 66 feet, respectively. The overburden wells were abandoned by one of two methods. If possible the monitoring well was removed by attaching a nylon tow strap around the casing and using a mini-excavator to pull up the casing out of the ground using the excavator arm. The open borehole was then sealed with bentonite from the bottom of the borehole to the ground surface (Figure 3). Bentonite is a type of clay that swells when hydrated, providing a low-permeability



Figure 1. This is a typical well installation at PBO

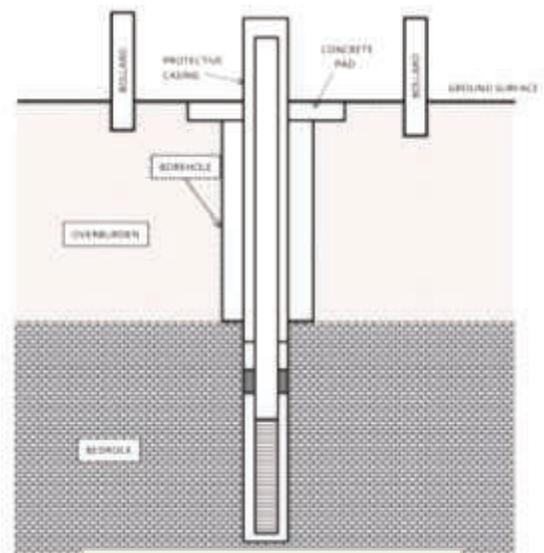


Figure 2. This is a typical bedrock well installation at PBO

USACE INITIATES WELL ABANDONMENT PROGRAM AT PLUM BROOK ORDNANCE WORKS (continued)

barrier. This method was effective for overburden monitoring wells installed at shallow depths (12 feet or less). For deeper overburden monitoring wells, removal of the well was not possible without damaging or breaking the well casing. These wells were abandoned in place by filling the monitoring well casing with bentonite to the ground surface. Using a mini-excavator, surface components of the monitoring wells (concrete pad, bollards) were then removed the soil surrounding the well was excavated to a depth of approximately 4 feet below ground surface (bgs) to allow access to the well casing. The PVC well casing was cutoff using a reciprocating saw and the excavation was backfilled with the excavated soil.

Because of the greater depths bedrock wells were installed and the fact they have steel outer casing cemented into the bedrock, these monitoring wells were abandoned in place by filling the well screen with clean silica sand (typically the lower 15 feet of the well) followed by a 1-foot layer of hydrated bentonite chips. The remainder of the well was filled with bentonite slurry. Filling the screened interval with sand allows groundwater flow to continue to occur in the fractured bedrock; because of the permeable nature of the unconsolidated overburden, this step was not required for the overburden monitoring wells. After the surface features were removed, the surrounding soil was excavated to approximately 4 feet bgs (Figure 4). A "hot work" permit was obtained from NASA to allow use of a torch to cut the steel casings. The outer casing was cut, then the concrete was chipped off (Figure 5) and the inner steel casing was cut. The PVC well pipe was then cut with a reciprocating saw and the excavation was backfilled with the excavated soil.



Figure 5. The outer steel casing has been cut and concrete chipped away, exposing the inner casing to be cut and removed

Before and during the abandonment operations at each location, ambient air monitoring was conducted with a photoionization detector (PID) to verify the absence of potentially explosive gases from around the sealed well.

In the spring of 2015, after the snow had melted and the initial backfill had settled, each well abandonment site was topped-off with additional soil, graded to prevent ponding of water on the abandonment site and then seeded with prairie grass. Straw was placed over the grass seed to prevent erosion, help retain soil moisture, and prevent birds from eating the grass seed (Figure 6).

In the fall of 2015, USACE is planning to abandon the remaining 69 groundwater monitoring wells. The abandonment activities will be consistent with the first round of well abandonment. Upon completion, a monitoring well abandonment report detailing the two rounds of field abandonment efforts including site photographs, and well abandonment forms. The monitoring well abandonment reported will be submitted to Ohio EPA for review and approval. In addition, monitoring well abandonment forms will be submitted to Ohio Department of Natural Resources which has authority over groundwater well installation and abandonment. All report documentation will be retained in the PBOW administrative record.



Figure 3. The operator is pumping the bentonite slurry into an overburden well in TNT Area C



Figure 4. The soil from around the bedrock well was excavated to expose the steel casing



Figure 6. This is a typical abandonment site after well removal, backfilling and seeding

WEST VIRGINIA MANEUVER AREA FORMERLY USED DEFENSE SITE (FUDS)

PROJECT 04: DOLLY SODS WILDERNESS AREA, LONG-TERM MANAGEMENT

A non-intrusive site inspection of the Dolly Sods trails was conducted in May 2015 by the U.S. Army Corps of Engineers (USACE), Huntington District as part of the third Five-Year Review process to ensure the 1997-1998 ordnance removal remedy remains protective.

The Dolly Sods Wilderness (Figure 1) - a 17,371-acre U.S. Forest Service-managed (and quite popular) hiking and camping area in Grant, Tucker, and Randolph counties in northeastern West Virginia (WV) is a part of the West Virginia Maneuver Area (WVMA) as has been reported in previous FUDS newsletters).

Let me explain that I am a USACE employee. I came to know the Dolly Sods Wilderness from the general public's perspective. I attained my first understanding by experiencing

"the Sods" as a camper and a hiker. Only later did I come to know, from conversations with coworkers (one of them my wife), that Dolly Sods has this unique history associated with the U.S. Army and the vast, five-county training ground known as the WVMA. Previous FUDS newsletters have reported that this World War II-era troop training area was located in northeastern WV for its similarity to mountainous regions in the European Theater of Operations. Training at WVMA included necessary tent cities in Elkins, WV, assault climbing instruction at nearby Seneca Rocks, pack mule school, improvised river crossing training, and artillery and mortar unit training at firing ranges that included Dolly Sods. U.S. Army troop numbers swelled to 16,000 at times at WVMA during the 8-week training. More than 100,000 soldiers passed through WVMA between July 1943 and July 1944.

I had been told by friends that Dolly Sods was some of the best hiking in the eastern U.S. and was a "not to be missed" experience. I certainly agree with that. I've come to understand that the Sods is a unique place in terms of biology, geology, fauna and history. It is that history that defines everything about what the place is today. Let me explain.

Imagine, as best you can, a pristine, mature spruce-hemlock-black cherry forest in the early 19th century situated on an elevated plateau in the Allegheny Mountains. Dolly Sods was described, in an 1852 Harper's Monthly as "... so savage and inaccessible that it has rarely been penetrated even by the most adventurous. The settlers on its borders speak of it with a sort of dread, and regard it as an ill-omened region...". Continue to imagine a great stand of red spruce so dense that there was no room for a tree to even fall nor a break in the canopy for sunlight to penetrate to the ground. Imagine a region with trees, some perhaps over 1,000 years old, that are 54-feet in circumference - not at the base, mind you - but 16 feet above the ground (as was once recorded) and some species reaching 140 feet into the air (Figure 2). The ground itself, by the way, consisting of centuries of accumulated needles and mature forest floor material anywhere from 2' to 9' deep. Got it? Huge, impressive trees like you've never perhaps seen with the first branch sometimes 80 feet off the ground. These were towering ancient life forms but they did not survive the invention of the band saw, the Shay locomotive, and the 40 or so years (about 1880-1920) of clear-cutting that that fed, for a time, America's industrialization and urban growth.

The extent of the forest clear-cutting in West Virginia is actually hard to fathom (Figure 3). Here's West Virginia

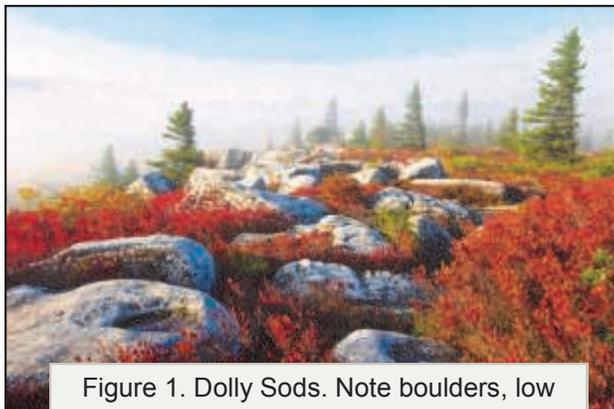


Figure 1. Dolly Sods. Note boulders, low shrubs, and wind-flagged spruce – exceptionally beautiful with unique fauna



Figure 2. Loggers pose on a sector cut, Tucker County, 1913. The tree was likely alive when the Mongols began taking over in China in 913 AD



Figure 3. Right Fork of Red Creek, Dolly Sods. This picture shows Dolly Sods was completely clear-cut by 1913

WEST VIRGINIA MANEUVER AREA FORMERLY USED DEFENSE SITE (FUDES)

PROJECT 04: DOLLY SODS WILDERNESS AREA, LONG-TERM MANAGEMENT (continued)

clear-cutting in summary equation form: at peak, 83 band saw mills consuming over 1400 acres a day of forest “plus” over 200 Shays (a type of geared locomotive) transporting logs to sawmills “plus” at one point, over 1400 lumbering operations in WV “plus” uncounted lumbermen producing nearly 1.5 billion board feet of lumber in a peak year “plus” 40 years of unbridled devastation “equals” 10,000,000 acres of clear-cutting! Keep in mind that the whole of West Virginia is only 16,640,000 acres.

Now, remember the 2-9 feet of needles and other forest floor material that accumulated over thousands of years at the Sods? With no forest canopy it dried and became fuel for massive fires that burned the Sods down to the underlying rock leaving an odd landscape of bizarre appearance – remnant tree trunks atop broken boulder fields (Figure 4).

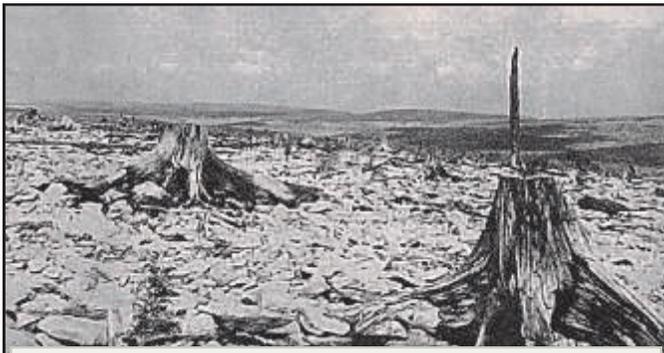


Figure 4. Clear-cut, and then burned to bedrock by fire, this old photograph looks from Cabin Mountain into the northern stretches of the Dolly Sods Wilderness

Such were the conditions at Dolly Sods in about 1913 or so. The unrelenting magic of nature’s recovery and the now-understood forest progression process began and continues today. The current diversity and plant life at the Sods makes it special and is a result of the catastrophe of ignorance that was clear-cutting. The Sods of 1880 would be beautiful, too, and it is a shame it was lost, but the panoramas and natural beauty there today are truly remarkable and are two of the reasons so many are drawn to the Sods 47 miles of hiking trails.

Army training (Figure 5) is known to leave an impact on the land. I doubt readers of this newsletter would argue that. In certain cases, I am sure, the temporary facilities that made up the WVMA were successfully and completely removed and/or remediated and the sites have returned to previous or new land use – forest, grassland, agriculture – and perhaps ownership, too. In the case of the Sods, however, unexploded ordnance (UXO) from the WVMA training years have been discovered and there have been USACE UXO detection/removal actions performed there (most notably 1997). Additionally, there have been public UXO discoveries reported to the U.S. Forest Service (the Sods landowner/responsible agency) that have resulted in UXO removals also.

Today, hikers and campers experiencing the plant variety of the natural “recovery” of the Sods from the late 19th and early 20th century clear-cutting could potentially encounter UXO remaining from the mid-20th century WVMA artillery and mortar activity. (That sentence deserves reading again, for it is a pillar of this article. Namely, the Sods history is inseparable from the Sods experience.)

Warning signage is present at the Sods trailheads instructing hikers to: “RECOGNIZE, RETREAT, and REPORT” any UXO they encounter (3R’s). Pictures of sample UXO are also shown to assist. In 1997, an ordnance disposal crew surveyed existing trails and campsites locating and detonating 15 UXO, some live. More UXO may exist.

As part of continuing assessment of the efficacy of the removal actions taken in 1997, USACE teams revisit the Sods trail system and collect geo-data sets (map features located by latitude/longitude using global positioning system satellites) of the previously-mapped (and UXO cleared) trails and any new trails or campsites that may have become established. With thousands of visitors every year, trails are going to undergo variations as trekkers and geo-cachers perhaps establish new trails to peaks or other points of interest within the Sods (Figure 6). Tree blow-downs, brush advance, or erosion may contribute to purposeful, democratic migration of the artery (heavily-traveled)

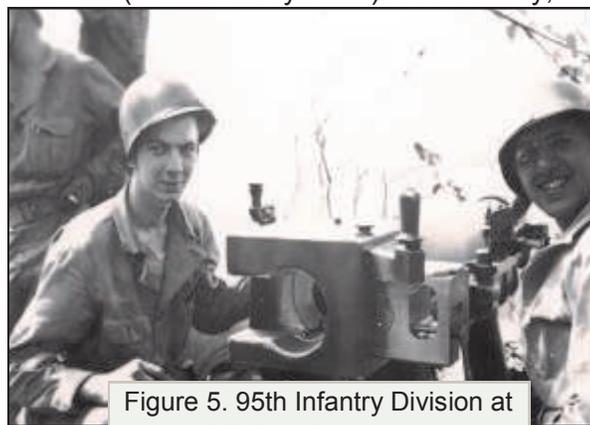


Figure 5. 95th Infantry Division at WVMA, date unknown



Figure 6. Example of hiker-initiated trail system expansion

WEST VIRGINIA MANEUVER AREA FORMERLY USED DEFENSE SITE (FUDS) PROJECT 04: DOLLY SODS WILDERNESS AREA, LONG-TERM MANAGEMENT (continued)



Figure 7. USACE teams prepare to hike Dolly Sods for trail assessments receiving radio and GPS communication training from a U.S. Forest Service representative



Figure 8. Team members debate the daily plan over a Sods trail map

trails (cleared in the 1997 effort) or creation of new “capillary” trails (apparent light use, short distance, and sometimes dead-ended). Also, the U.S. Forest Service may (and has) constructed re-routes of certain trail segments for terrain management.

Two teams were secured to investigate the current trail system at the Sods beginning May 11, 2015. A typical team was comprised of a UXO Safety Specialist, a senior USACE leader with trail and outdoor experience, an additional USACE member for safety purposes, and, in this particular Sods trail review, a survey contractor’s representative collecting the geo-data. The team members prepared the day’s scheduled hiking strategy (Figures 7 & 8), noting fords and other hardships, and planned the entry and exit points for the multi-day, 47-mile endeavor.

As was determined by the effort in hindsight, 47 miles was an under-estimation since some day’s treks required “back-tracking” to complete comparable coverage from previous efforts. The comparison of mapped features from one trail review to the next informs the FUDS program and project staff who, in turn, share data and findings with the U.S. Forest Service and with other stakeholders.

Encountered campsites not shown on historic geo-data sets were recorded and a UXO Safety Specialist swept the area for signs of UXO. In Figure 9, note the GPS (global positioning system) antenna on the right, the bent-down head of the field person adding data to the field Geographic Information System (GIS) device, and the two-sensor differential field magnetometer in use on the left by the UXO expert (the “yellow stick”). No suspected UXO were located during this trail assessment operation. UXO protocol only allowed removal of surface detritus if ferric metal was detected. Items such as pocket knives and tent stakes were recovered at or within

an inch of the surface. The piezo-electric speaker in the detector did not indicate a response signature for UXO and the recovered items were within the detritus zone (top, thin layer of forest debris).

Surveying contractor staff acquired satellite information on their GPS units and mapped the location of the Sods trailheads and trail intersections along with the “new” trail and “new” campsites that were encountered (“new” may mean aged 5 years since the last trail review). The trailhead information boards (Figure 10) include the UXO signage that, as noted above, advises hikers to “RECOGNIZE, RETREAT, and REPORT” (3 Rs).

During the trail review (Figure 11), members of the U.S. Forest Service assisted both USACE and contractor staff with their area knowledge and provided some useful communications equipment and safety reminders. Prior to the field efforts, the teams received Cardio Pulmonary Resuscitation (CPR) training and specialized outdoor exposure and field hazard training. An activity hazard analysis was prepared and briefed prior to the start of the field work by the UXO specialist. Daily tailgate safety meetings were also held. No injuries but only soreness from the hiked mileage was reported.



Figure 9. Geo-data is collected and the campsite area swept by UXO Safety Specialist with magnetometer



Figure 10. Trailhead information board at Blackbird Knob Trail

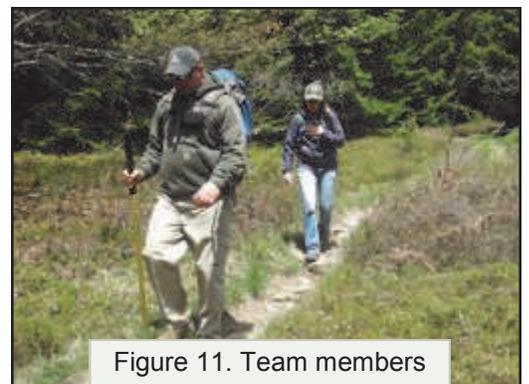


Figure 11. Team members hike the trails at Dolly Sods

WEST VIRGINIA MANEUVER AREA FORMERLY USED DEFENSE SITE (FUDS) PROJECT 04: DOLLY SODS WILDERNESS AREA, LONG-TERM MANAGEMENT (continued)



Figure 12. Trail assessment team takes a lunch break at Dolly Sods



Figure 13. Many necessary stream fords were conveniently prepared with stepping stones



Figure 14. Upper Red Creek

The mid-day meal was consumed in the field (Figure 12) and a day's worth of water had to be packed. Safety was always a concern and a daily "all is well" report via satellite communication at the lunch break was made. Days were sometimes long, but the scenery and the merit of the effort (public safety) made it all worth it. A number of "side" or "social" or "capillary" trails and campsites have come into being since data was last collected. Establishing a trail only requires repetitive use by a relatively small number of hikers. These side trails sometimes lead to nothing particularly interesting. It appears many hikers take them and simply turn around, doubling the wear and further securing their existence for the next unsuspecting hiker.

As would be expected, a number of new campsites were located along water courses (Figures 13 & 14) located in the southern portions of the Sods Wilderness area. The strenuousness of the hiking was markedly different from day to day as the Sods provides both gently rolling terrain and sharply stream-incised valley wall and prominence hiking. The inventory of campsites has apparently grown since teams experienced many necessary stops to log their location and size.

Trail reviews, where they can be found in the FUDS inventory, are an inarguable public safety necessity and, let me add, are good work when you can get them. The review teams, project and program staff, and contractors will all reduce and memorialize the collected data. Some of the archiving will be guidance for those that will perhaps perform this review 5 years in the future. More pertinent will be the geo-data sets that indicate the trail and campsite changes over time.

Dolly Sods represents a competing and, as I have claimed from the beginning of this piece, unique FUDS/Wilderness dichotomy. Inarguable recreational and scenic public benefit competes with remnant impacts from our national defense. Also, elevation and natural catastrophe have produced a unique combination of forest succession bio-diversity and rock outcrops that provide remarkable panoramas (Figure 15).



Figure 15. View down the Red Creek Valley from the Rohrbaugh Trail

Sources of Dolly Sods information:

Wikipedia entries referenced: Dolly Sods, U.S. Forest Service, Monongahela National Forest, West Virginia Maneuver Area, Shay engine, band saw.
U.S. Forest Service, Monongahela National Forest camping website: <http://www.forestcamping.com/dow/eastern/moninfo.htm>

Photo Credits in order of appearance in the document:

Figure 1: <http://images.fineartamerica.com/images-medium-large-5/the-fog-clears-at-dolly-sods-bill-swindaman.jpg>

Figures 2-4: "Logging the Virgin Forests of West Virginia" http://www.patc.us/history/archive/virg_fst.html compilation/written and permission to publish from author Andy Hiltz.

Figure 5: Historical photo from the National Archives.

Figures 6-15: Dave Humphreys' photographs of the USACE, Huntington District's May 2015 trail review.

MAINTAINING ENVIRONMENTAL REMEDIES AT THE FORMER WEST VIRGINIA ORDNANCE WORKS

The former West Virginia Ordnance Works (WVOW) site is located in Point Pleasant, Mason County, West Virginia. WVOW was constructed in 1942 as a government-owned, contractor-operated plant for the manufacture of explosives (TNT) for World War II (WWII). From 1942 to 1945, TNT production at WVOW resulted in contamination of soil surrounding the TNT manufacturing and process facilities, wastewater sewer lines, and wastewater holding and discharge holding reservoirs, with TNT and its by-products. Additionally, subsurface soil and groundwater in surrounding areas were contaminated by the TNT manufacturing.

Liquid wastes, referred to as Red and Yellow Water, were generated during TNT manufacturing. TNT Wastewater retention ponds, known as the Red and Yellow Water Reservoirs (RWR and YWR), were constructed to contain the TNT wastewater and regulate its discharge to the Ohio River. Surface and subsurface soils and groundwater in the vicinity of these reservoirs, subsequently became contaminated with TNT and its by-products. Off-specification TNT and asbestos were taken to an area of the site known as the Burning Grounds for burning and disposal.

At the close of operations in 1945, the WVOW site was partially decontaminated, declared surplus, and the facilities salvaged or disposed. The Government deeded the industrial portion of the site to the State of West Virginia in October 1949, with the stipulation that it be used for wildlife management. The WV Department of Natural Resources now operates the Clifton F. McClintic Wildlife Management Area (MWMA) on a portion of the former WVOW while other portions are owned the US Army, private land holders, and state and local agencies.

During the period of environmental restoration (e.g., remediation) of the former WVOW, soil covers were installed over areas with total TNT compounds' concentrations greater than 50 parts per million in surface soil to protect human health and the environment, some contaminated ponds which had to be removed were replaced, TNT-contaminated soil was excavated and disposed offsite or capped with protective soil covers, wetlands' assessments were performed and two groundwater extraction and treatment systems were installed to remove and treat TNT-contaminated groundwater at the former Red and Yellow Water Reservoir Areas. These remediation activities are referred to as *Remedies*.

Specific Operations and Maintenance (O&M) activities are required to maintain the integrity of the Remedies, to ensure they remain protective of human health and the environment. These activities include (1) mowing of covers, caps, barricades, access roads and paths, including areas surrounding the groundwater treatment plants and around groundwater monitoring and extraction wells, (2) control of vegetative overgrowth along access roads and paths, (3) clearance and maintenance of drainage structures and ditches, (4) erosion control, (5) maintenance of access roads and entrance gates, (6) maintenance and installation of warning signs, and (6) repair of any observed damage.

The Huntington District USACE conducts quarterly inspections of the Remedies in accordance with the *2008 O&M Plan*, and will continue these inspections as long as the Remedies remain in place. Deficiencies are recorded and photographed during each inspection and the inspection reports are forwarded to the Huntington District's WVOW Project Manager. Deficiencies are addressed as soon as possible or during the next construction season through *Corrective Action Contracts* that are administered by the Huntington District. However, any deficiencies that compromise the integrity of the remedial measures are corrected immediately. Most corrective action contracts are awarded dependent upon the availability of funds in the 4th quarter of each fiscal year. Corrective Action repairs typically involve placement of stone protection, erosion repair, grading of access roads, placement of earth fill, seeding, removal of invasive species.

A *Corrective Action Contract* was awarded in August 2014 to Lyndco, Inc., Shadyside, Ohio. The *Corrective Action Contract* was solicited to repair deficiencies identified during the CY2014 and some deficiencies from the CY2013 quarterly inspections. Contract work began in August 2014.

The 2014 *Corrective Action Contract* included repair for the following: (1) reinstallation of warning signs and posts that were damaged or leaning (Figures 1 & 2); (2) clean up of the former TNT Cap 4 area that had undergone remediation; (3) paint and repair of guardrail gates that had been vandalized; (4) herbicide spraying of invasive knotweed in the TNT area (Figures 3 & 4); (5) reinstallation of loose bollards around monitoring wells;



Figure 1. Installation of new warning signs and posts



Figure 2. Newly installed warning sign and post

MAINTAINING ENVIRONMENTAL REMEDIES AT THE FORMER WEST VIRGINIA ORDNANCE WORKS (continued)

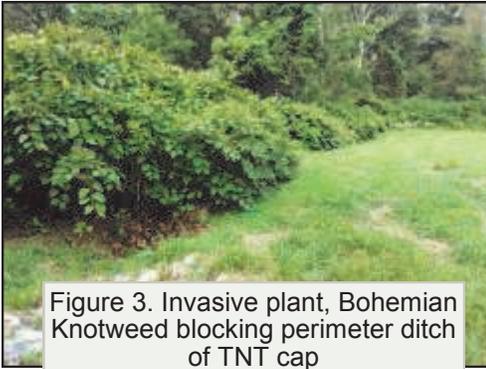


Figure 3. Invasive plant, Bohemian Knotweed blocking perimeter ditch of TNT cap

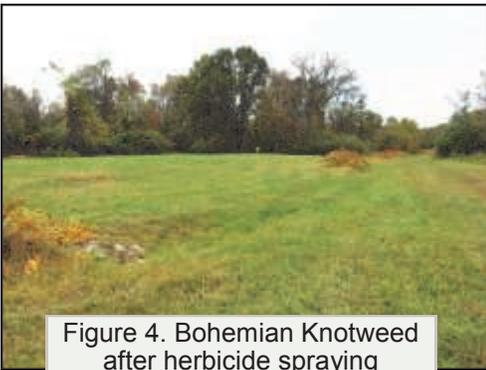


Figure 4. Bohemian Knotweed after herbicide spraying

During the O&M repairs it was found that muskrats located at the RWR were creating the holes and eroded areas along the levee. Although there are measures that can be taken to help eliminate the muskrats from tunneling into the levee, this contract contains the first repairs that were needed on the slope of the levee since its construction. The MWMA manages the muskrats in this area by annual trapping. No additional steps will be taken on future O&M contracts to prevent the muskrats along the levee unless more frequent and additional damage to the levee occurs.

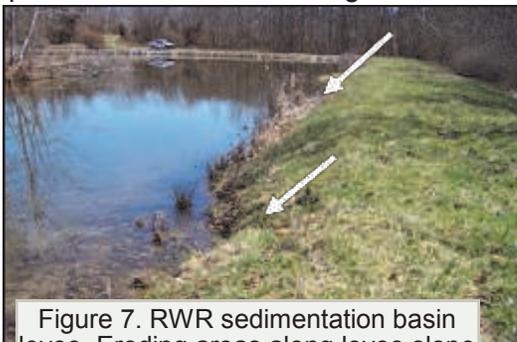


Figure 7. RWR sedimentation basin levee. Eroding areas along levee slope



Figure 8. Repairs to RWR sedimentation basin levee. Damaged soil removed, new soil compacted in place. Photo prior to seeding

(6) installation of bollards next to a guardrail entrance gate at Pond 30 to prevent ATV access into the Burning Grounds area; (7) cleaning the soil cap under drain of trees and brush at the RWR; (8) damaged drainage repaired at RWR (Figures 5 & 6); (9) replaced wire screens over culvert ends site-wide; (10) cleared vegetation at the perimeters of TNT Caps 2, 3, 6, 7, 9 and 10; (11) graded, added soil and aggregate at access roads located at TNT Cap's one and six; (12) graded drainage ditches for positive drainage at YWR Cap and Barren Area Cap; (13) repaired a small depression on the cover soil at the YWR Cap; (14) reseeded YWR access road adjacent outfall for areas of sparse vegetation; (15) repaired those monitoring and extraction well concrete foundations that were cracked; (16) fixed an area where wildlife burrowed into cap at ESI8; (17) added additional soil material to the RWR sedimentation levee to repair eroded areas (Figures 7 & 8); (18) placed aggregate on sections of access road at TNT WFH Cap 6 and Cap 1.



Figure 5. RWR sedimentation basin culvert. Stone washed away from culvert

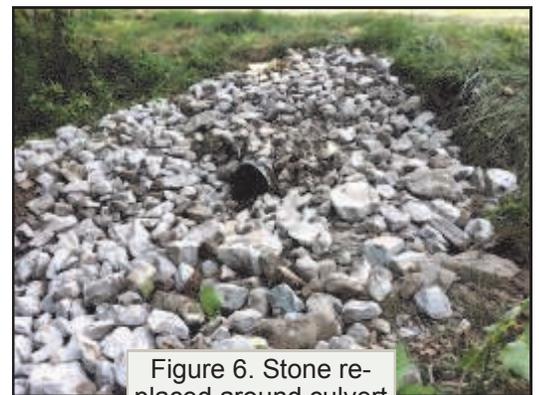


Figure 6. Stone replaced around culvert

In the past, the invasive knotweed had been limited to the ditches and culvert outlets at some TNT caps,

but had recently begun to show up on the top of the caps. Because of the aggressive nature of knotweed, it was decided to start eliminating the stands located at TNT Caps 6, 8, 9, and 10. The eradication of all the knotweed around these caps will likely be added to several future corrective action contracts to ensure complete removal and the integrity of the soil caps. Knotweed is a non-native invasive plant that can establish large monotypic stands and have negative impacts on native species, ecosystems, and building structures. Due to an extensive system of rhizomes it is difficult to control. The leaves and hollow bamboo-like stems die back at the end of the growing season and new shoots sprout from large system of rhizomes.

For questions or comments regarding the former WVOW FUDS project, contact the Huntington District, Environmental and Remediation Section at 800-822-8413 or Email at PBOW@USACE.army.mil.

GEOPHYSICAL INVESTIGATION FORMER NAVAL ORDNANCE PLANT (NOP) SOUTH CHARLESTON, WEST VIRGINIA

A geophysical investigation was conducted in April 2015 at the Former Naval Ordnance Plant (NOP), located in South Charleston, Kanawha County, West Virginia, by Dr. Janet Simms and Eric Smith. Both are from the Geotechnical Engineering and Geosciences Branch (GEGB), Geotechnical and Structures Laboratory (GSL), U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, Mississippi. The survey was conducted at the request of the Environmental & Remediation Section, U.S. Army Corps of Engineers (USACE), Huntington District (LRH). The purpose of the investigation was to determine the presence or absence of underground storage tanks (USTs) at two locations of the former site.

The NOP property is a formerly used defense site (FUDS). The gun manufacturing facility was constructed during World War I, but the war ended before the plant was extensively used. During WWII, the NOP experienced greater use as well as additional construction and plant expansion. WWII research documentation indicated there were ten (10) Underground Storage Tanks (UST) that were to be closed in place, but no closure documentation was found. Old drawings also depicted the location of a small UST in an area of the facility close to G Street, now an entrance road into the former facility. The property is currently owned by Clearon Corporation and is a manufacturing facility for pool water products. The facility houses infrastructure related to that production process. Some of the original NOP buildings are still standing and used by Clearon.

Three geophysical methods were used to survey the two UST sites: electromagnetic (EM; Figure 1), magnetic (Figure 2), and ground penetrating radar (GPR; Figures 3 & 4). The EM and magnetic surveys are complimentary because the EM sensor can detect metal, whereas the magnetometer detects ferrous-based material, such as steel. The GPR provides a higher resolution image, but usually has a shallower depth of investigation.

The results of the investigation indicated that no USTs are buried in the subsurface in the area of the ten USTs or the single smaller UST. Had a steel UST been present, the EM and magnetic data would likely exhibit relatively large spatial anomalies, while the GPR would detect a broad hyperbolic anomaly. No such features were observed in the three data sets at either of the two locations.

The UST projects are now in the process of being closed within the FUDS program.



Figure 1. Geonics EM61-MK2 EM induction sensor



Figure 2. Geometrics G-858 magnetometer



Figure 3. Sensors & Software PulseEKKO Pro GPR with 250 MHz transducer (antenna)



Figure 4. Dr. Simms operating the Sensors & Software PulseEKKO Pro GPR with 250 MHz transducer (antenna)



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