west virginia department of environmental protection

Office of Oil and Gas
601 57th Street
Charleston, WV 25304
(304) 926-0450 fax (304) 926-0452

Joe Manchin III, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

Buckeye Creek Discharge Final Report

By

The West Virginia Office of Oil and Gas

Spill Report, DEP Response and Clean-Up Efforts

August 25, 2009:

On Tuesday August 25, 2009 at approximately 8 AM, a caller identified as Louanne Fatora contacted the West Virginia Department of Environmental Protection's (DEP) Spill Hotline to report a discharge in Buckeye Run (a tributary of Buckeye Creek)[1] in Doddridge County.[2] She described the creek's condition as a "quarter inch thick gel on top of water which appears to be oil," noting the "oil" was reddish-orange in color. She also reported drilling activity near her location, with Dominion and Dennis Powell having wells in the vicinity, and that dead animals have been found in the creek in the past months.

Information pertaining to the incident was relayed to the DEP's Office of Oil and Gas (OOG), which in turn contacted David Scranage at 8:19 AM, who reported to the site shortly after. David Scranage is the Oil and Gas Inspector for the area which includes Doddridge County. After Inspector Scranage arrived on site, he immediately began to determine both the length and source of the spill. He saw no evidence of fish kill or harm to other aquatic life. David Cowan, also an Oil and Gas Inspector, went to the site to assist. After determining the potential source and entry point to be the drilling location[3] for Tapo Energy's Powell # 7 well, Scranage contacted Tapo Energy's designated agent. The designated agent, Jerry Poling, worked with Scranage to coordinate the response to the discharge and to determine the best possible manner to begin clean-up.

Inspectors Scranage and Cowan inspected the downstream area and determined that the spill was contained in Buckeye Creek and had not entered Middle Island Creek. The crew for Tapo's designated agent set successive booms in place across the creek in various locations to contain the discharge and prevent it from traveling further downstream. As a precautionary measure, another containment boom was set up beyond the contaminated area. During the process of establishing the containment booms, Tapo's crew utilized a vacuum truck to remove the bulk of the material upstream of the first containment site.

Inspector Scranage, in his report[4] prepared at the request of the OOG Chief James A. Martin, indicated that the material in the creek appeared to be petroleum based, and that the majority of the contaminant would need to be removed from the first containment area, and then captured in the second containment area. That evening, the vacuum truck was moved to the second containment area. Additional hoses were needed to reach the area and were provided the following morning. Reclamation Specialist Rick Campbell's separate report[5], also prepared at the request of the OOG Chief, indicated that Inspectors Scranage and Cowan had "tracked the material back to well site 017-5814," operated by Tapo Energy.

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[1] Buckeye Creek is a tributary of Middle Island Creek. The public water treatment facility for West Union is located on Middle Island Creek.

[2] A copy of the email that was disseminated in response to Louanne Fatora's spill notification report is attached Appendix A. Louanne Fatora was mistakenly identified as "Louanne Feroa" in the notification email.

[3] Tapo Energy's Powell #7 well was previously drilled, and the site had recently undergone reclamation.

[4] Inspector Scranage's report is attached as Appendix B.

[5] Reclamation Specialist Rick Campbell's report is attached as Appendix C.

August 26, 2009:

Inspector Scranage made morning and afternoon inspections of the site. That morning, Tapo's clean-up crew was utilizing the vacuum truck to remove the contaminant from the second containment area. Scranage commented in his report that the crew had "an all day job ahead of them." His afternoon inspection found the crew making clean-up progress. He also inspected the containment booms for breaches, and found none.

August 27, 2009:

Scranage, along with fellow Oil and Gas Inspector Dave Gilbert, made several inspections along the creek. Scranage and Gilbert discussed possible additional activities that were needed to clean the creek. The clean-up crew had begun work on residual contaminant, which involved the use of absorbent material to trap residual contaminant, and water to flush residual contaminant into a collection area. The Inspectors made the determination to install an under flow dam below the first containment site, to be installed the next morning.

August 28, 2009:

Inspectors Scranage and Gilbert, together with Oil and Gas Inspector Ed Gainer, visited the site. As directed, the clean-up crew had installed the under flow dam below the first containment area. The crew used absorbent material where heavy residual contaminant existed. Workers used leaf blowers to move the absorbent material along the surface and to capture residual contaminant as it was released along the banks of the creek. The crew used a fresh water pump to flush residue in shallow areas, and absorbent material was again used to capture the released contaminant. Workers picked up and bagged contaminated debris from the creek and banks. The extent of the contamination, compounded by the low flow of the creek due to lack of rainfall, made many of these additional measures necessary.

Tapo Energy retained the consulting services of Ryan Environmental. Scranage assisted the Ryan Environmental consultant in taking four water samples for analysis. One sample was collected to purposely capture a composite of the contaminant. Another sample was taken above the spill site to determine pre-spill conditions, and the last two were taken above and below the lowest containment boom set up on the creek.

August 29, 2009:

Inspector Scranage returned to the site. He noticed that the onsite crew was comprised of different employees, presumably because of the weekend. After realizing that the crews were improperly using absorbent material that day, he instructed them to re-clean the area.

August 31, 2009:

Inspector Scranage and Reclamation Specialist Richard Campbell inspected both the site and the ongoing downstream clean-up efforts. By that evening, the crew had cleaned approximately one mile from the suspected source, and approximately one-half mile from the upper containment structure. Both Scranage and Campbell estimated the length of the spill at approximately three miles. Neither witnessed any evidence of fish kill, nor evidence of

contamination below the lowest containment boom. Rick Campbell commented in his report that Tapo's personnel were doing a "very good job of clean up," and that the crew was using a vacuum truck, leaf blowers, a water pump to wash the creek edge, and absorbent material to trap residue.

September 2009:

Inspector Scranage continued to regularly inspect the site and clean-up efforts. He instructed the clean-up crew to monitor the site, remove absorbent material, and vacuum trapped material behind the containment booms. At the direction of OOG personnel, the booms were required to be kept in place until OOG was satisfied with the condition of the creek, including replacing the soiled booms multiple times. Through mid-September, the majority of the contaminant was removed, with an estimate of between 50 and 70 barrels along with nine industrial bags of additional debris. The volume is merely an approximation based upon visible levels in the holding tanks on the vacuum trucks. The accuracy of this estimation cannot be quantified to any degree justifying a claim as the volume of contaminant that entered the creek. Scranage found no indication that the spill was the deliberate act of the operator, Tapo Energy, and further commended them for their swift and cooperative response to isolate the discharge and restore the creek.

Analyses

The water in Buckeye Creek has been tested on four occasions, and an assessment of macroinvertebrate life was also performed. These water tests were crucial in aiding OOG in determining the progress and completion of clean-up activities. As will be explained below, the tests performed indicate the creek meets all applicable water quality standards, and based upon reliable data, the creek has been substantially restored to pre-spill conditions. Unfortunately, it would be nearly impossible to declare the creek completely restored due to the insufficient pre-spill data and the vagaries of determining what are the ideal conditions in a body of water that is constantly changing.

August 28, 2009:

Tapo Energy hired Ryan Environmental, which collected four samples from Buckeye Creek on August 28, 2009.[6] Ryan submitted the samples for testing to REI Consultants, Inc. on September 2, 2009. REIC returned its analysis on September 15, 2009. The first sample (WS-1) was taken above the discharge area in order to determine pre-spill conditions. The second sample (WS-2) was collected in the discharge area, and in a manner to purposely capture the contaminant.[7] The third and fourth samples (WS-3 and WS-4) were collected above and below the lowest containment boom.

REIC tested all four samples for Semi-Volatile Range Organics[8], Volatile Range Organics[9], and Volatile Organic Compounds[10], as well as iron and chloride levels. The presence

[6] The August 28, 2009 water sampling results are attached as Appendix D.
[7] This method, while ensuring the capture of the contaminant, would not reflect the total water quality.
[8] Semi-Volatile Range Organics analysis tested for the presence of Total Petroleum Hydrocarbons (TPH) in the Diesel and Oil Ranges.
[9] Volatile Range Organics analysis tested for the presence of Total Petroleum Hydrocarbons (TPH) in the Gasoline Range.

of Volatile Range Organics (TPH Gasoline Range) or Volatile Organic Compounds (BTEX) was not detected in any of the four samples. Only the second and third samples (WS-2 and WS-3) detected the presence of Semi-Volatile Range Organics (TPH Diesel and Oil Range). WS-2 returned expectedly higher results,[11] with results for TPH Diesel Range of 4,590 mg/L and TPH Oil Range of 4,560 mg/L. WS-3 results were considerably lower with TPH Diesel Range results of 1.10 mg/L and TPH Oil Range results of 2.88 mg/L.

As for iron, samples WS-3 and WS-4 were Non Detect[12] at the minimum detection level (mdl) of 0.1 mg/L. WS-1, the sample taken upstream of the discharge, showed an iron level at 0.105 mg/L, which is just above the minimum detection level. WS-2 showed the highest iron level at 0.424 mg/L. The EPA does not have a primary drinking water standard for iron, only a secondary standard of 0.3 mg/L.[13] West Virginia has a surface water standard for iron of 1.5 mg/L.[14] Iron levels in Buckeye Creek can vary dramatically. DEP's Watershed Assessment Branch has compiled data between 2002 and 2009[15], and seventy tests on Buckeye Creek and its tributaries in that time span yielded iron results from 0.03 mg/L to 15.3 mg/L, with an average of 1.14 mg/L.[16] Thus, the 0.424 mg/L result for WS-2 is still below the historical average.

The last testing parameter was chloride levels. The results for the water samples were 46 mg/L, 109 mg/L, 90.5 mg/L, and 91.5 mg/L, respectively. The EPA does not have a primary drinking water standard for chloride, only a secondary standard of 250 mg/L. West Virginia's surface water standard for chloride is 230 mg/L. All of the chloride levels were well below either of these standards.

September 2, 2009:

Louanne Fatora, who initially reported the spill to DEP's Spill Notification Hotline, acquired the services of Downstream Strategies, an environmental consultant.[17] Downstream Strategies reviewed the site on September 2, collected water samples[18], and produced a report.[19] The grab samples were delivered to Reliance Laboratories for testing, which produced its analysis of a single sample on September 24.[20] Reliance Laboratories tested the sample for BTEX (Benzene, Toluene, Ethylbenzene and Xylene) and MTBE[21], all of which were Non

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[10] Volatile Organic Compounds analysis tested for the presence of Benzene, Toluene, Etheylbenzene, m,p-Xylene, and o-Xylene. These compounds are commonly referred to by the acronym BTEX.

[11] This sample was taken in a manner to purposely collect the contaminant.

[12] Non Detect means that the tested parameter was not present at the Minimum Detection Level (MDL), which is the smallest level the testing process can detect.

[13] EPA drinking water standards can be found at http://www.epa.gov/safewater/contaminants. The EPA defines secondary drinking water standards as "non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water."

[14] West Virginia's surface water standards are found in 47 CSR § 2.

[15] The majority of the testing took place in 2008 and 2009, with the latest tests occurring in June 2009.

[16] Watershed Assessment Branch data is attached as Appendix E.

[17] Louanne Fatora, in addition to reporting the spill has also corresponded with the DEP and OOG as a concerned citizen, with a family connection to property downstream of the spill site.

[18] The only reference to the location where Downstream Strategies collected grab samples was an "embayment along the side of the creek" which was "partially covered by a thin, reddish film."

[19] Louanne Fatora has agreed to allow Downstream Strategies' report to be released as part of this investigation.

[20] Downstream Strategies' report refers to samples, but only a single analysis of a water sample was provided in the report. It is unclear if Downstream Strategies conducted additional analyses that were not included in the report. The analysis that was produced is attached as Appendix F.

[21] MTBE is a gasoline additive.

Detect. The analysis also tested for oil and grease, total aluminum and dissolved aluminum, all of which were also Non Detect.

Additionally, Reliance also tested for Total Dissolved Solids (TDS)[22] and Specific Conductivity[23]. The TDS in the sample were 914 mg/L and the Specific Conductivity was 1385 µmhos. Neither the EPA nor the State has a primary drinking water or surface water standard for TDS, but there is a federal drinking water secondary standard of 500 mg/L, which the sample exceeded.[24] There are no federal primary or secondary drinking water standards, or State surface water standard for Specific Conductivity. These testing parameters indicate the level of dissolved constituents in the sample, but do not indicate what those constituents are or if they pose a health risk. Historical data for Buckeye Creek and its tributaries show that these results are higher than what has been seen before[25], but the implications of these results are unclear.

Lastly, Reliance tested the sample for total sulfate, total calcium, total sodium, total manganese and total iron. The result for total sulfate was 149 mg/L, which is below the federal secondary drinking water standard of 250 mg/L[26], but was higher than the historical average for Buckeye Creek and its tributaries of 19 mg/L[27]. The result for total calcium was 112 mg/L. There are no federal drinking water standards or State surface water standards for calcium, but the level was higher than the documented average of 32 mg/L. The total sodium result for the sample was 69.8 mg/L, and again there are no federal drinking water standards or State surface water standards for Sodium, but the result was higher than the historical average of 26.4 mg/L. The total manganese result for the sample was 1.49 mg/L, which is above the 0.05 mg/L federal secondary drinking water standard[28]. West Virginia's surface water standard for Manganese is 1.0 mg/L, but this standard only applies to the five-mile zone immediately upstream of a known public or private water supply used for public consumption. The historical average for Buckeye Creek and its tributaries is 0.05 mg/L. The result for total iron was 0.96 mg/L, which exceeds the federal secondary drinking water standard of 0.3 mg/L, but not the State surface water standard of 1.5 mg/L. This number is below the 1.14 mg/L average for Buckeye Creek and its tributaries.

This water test was important for OOG to establish the condition of the creek and the efforts needed to restore it. The location and manner in which the sample was taken may not indicate the total quality of the creek at the time. The August 28 water tests discussed above also provided one result that was dramatically different from the other three because of the manner and location of the sample. OOG appreciates Louanne Fatora's concerns and her efforts as a private citizen in helping determine the condition of the creek.

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[22] TDS is commonly defined as the measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular suspended form.

[23] Specific Conductivity is the measure of water's ability to conduct electricity, and therefore a measure of the water's ionic activity and content. The higher the concentration of ionic (dissolved) constituents, the higher the conductivity. Water temperature also highly affects conductivity, which means temperature is a variable.

[24] EPA drinking water standards can be found at http://www.epa.gov/safewater/contaminants, and West Virginia's surface water standards are found in 47 CSR § 2.

[25] Watershed Assessment Branch data. (Appendix E)

[26] There is no federal primary drinking water standard or State surface water standard for Sulfate.

[27] Watershed Assessment Branch data. (Appendix E)

[28] There is no federal primary drinking water standard for Manganese.

October 1, 2009:

Personnel from OOG collected two water samples on October 1, 2009, submitted them to REI Consultants for testing on October 2, and REI provided the results on October 13.[29] The first sample was collected upstream of the first containment boom, which would be an area where any existing contaminants would be captured. The second sample was collected downstream of all containment booms. The testing parameters (Semi-Volatile Range Organics, Volatile Range Organics, Volatile Organic Compounds, iron and chlorides) mirrored the August 28 samples.

In both samples, Semi-Volatile Range Organics and Volatile Range Organics were both Non Detect. In the first sample, Volatile Organic Compounds (or BTEX) were all Non Detect, but in the second sample Toluene, m,p-Xylene, and o-Xylene were all detected at minor levels. Toluene was found in the second sample at 0.8 µg/L, which is still below the 1.0 µg/L federal primary drinking water standard and the State surface water standard of 6.8 mg/L.[30] The second sample also detected m,p-Xylene and o-Xylene at 0.6 µg/L and 0.4 µg/L, respectively. Both results are well below the 10 µg/L primary federal drinking water standard. It is unclear why these results, even at low levels, were detected in a downstream sample when no Volatile Organic Compounds were detected in any previous sample. After consulting with technicians at REI, while the results are believed to still be valid, there may have been an anomaly.[31]

The iron levels were 0.125 mg/L in the first sample and 0.149 mg/L in the second. Both levels are below the federal secondary drinking water standard of 0.3 mg/L[32] and the State surface water standard of 1.5 mg/L. Additionally, these levels are below the 1.14 mg/L average for iron levels in Buckeye Creek and its tributaries. The chloride levels were 183 mg/L in the first sample and 186 mg/L in the second. Both levels are below the federal secondary drinking water standard of 250 mg/L and the State surface water standard of 230 mg/L. While these levels are higher than the average for Buckeye Creek and its tributaries, it is not higher than previous results.[33]

November 2, 2009:

The October 1 samples indicated that the clean-up efforts were succeeding in restoring the creek to pre-spill conditions. Clean-up crews were still monitoring the containment booms and removing residual trapped contaminants. On November 2, DEP personnel collected another four water samples for further analysis.[34] The samples were submitted to Sturm Environmental Services the same day. The testing parameters were more comprehensive, so in addition to Semi-Volatile Range Organics, Volatile Range Organics, Volatile Organic Compounds, iron and chloride, the samples were tested for manganese, Total Dissolved Solids (TDS), sulfate, calcium, sodium, Total Organic Carbon (TOC) and bacteria.[35] The four samples were collected (1)

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[29] The October 1, 2009 water sampling results are attached as Appendix F.

[30] EPA drinking water standards can be found at http://www.epa.gov/safewater/contaminants, and West Virginia's surface water standards are found in 47 CSR § 2.

[31] The detected results in the second sample were just above the Minimum Detection Level.

[32] There is no federal primary drinking water standard for Iron.

[33] Watershed Assessment Branch data. (Appendix E)

[34] The November 2, 2009 water sampling results are attached as Appendix G.

[35] Sturm's results were expressed in parts per million (ppm) which is the equivalent of milligrams per liter (mg/L).

upstream of the well site, (2) in the spill area (also known as the oxbow), (3) below the containment booms, and (4) where Buckeye Creek enters Middle Island Creek.

All four samples were Non Detect for Semi-Volatile Range Organics (TPH Diesel and Oil Range), Volatile Range Organics (TPH Gasoline Range), and Volatile Organic Compounds (BTEX).[36] Iron levels for all four samples were 0.32 mg/L, 0.43 mg/L, 0.37 mg/L, and 0.36 mg/L, respectively. These levels are above the 0.3 mg/L federal secondary drinking water standard, but below the State's 1.5 mg/L surface water standard, and below the 1.14 mg/L average seen for Buckeye Creek and its tributaries. Chloride levels were 44.8 mg/L, 47.9 mg/L, 39.2 mg/L and 8.3 mg/L, respectively. These levels are below the federal secondary drinking water standard of 250 mg/L and State surface water standard of 230 mg/L. Additionally, these levels are below the 61 mg/L average for Buckeye Creek and its tributaries.

Manganese results were .01 mg/L, 0.03 mg/L, 0.02 mg/L, and <0.01 mg/L. These results are below the federal secondary drinking water standard of 0.05 mg/L and the State surface water standard of 1.0 mg/L, as well as the 0.05 mg/L average for Buckeye Creek and its tributaries, and far below the 1.49 mg/L result from the September 2 test. TDS levels were 294 mg/L, 186 mg/L, 160 mg/L, and 199 mg/L. The federal secondary drinking water standard for TDS is 500 mg/L, and the average for Buckeye Creek and its tributaries is 132 mg/L.[37] While this TDS level may be higher than the average, it was well below Downstream Strategies' September 2 sample result of 914 mg/L. Sulfate levels were 13 mg/L, 13 mg/L, 14 mg/L and 11 mg/L, which are below the 250 mg/L federal secondary drinking water standard[38], and in line with the 10 mg/L average for the creek. Also, this result was less than the 149 mg/L result from the September 2 sample. Calcium levels were 33 mg/L, 35.6 mg/L, 33.6 mg/L and 18.9 mg/L. There are no drinking or surface water standards for calcium, and the results are close to the average for Buckeye Creek and its tributaries. This result was also less than the September 2 result of 112 mg/L. Sodium levels were 22.3 mg/L, 24.2 mg/L, 19.6 mg/L, and 7.59 mg/L. There are no drinking or surface water standards for sodium, and these results are lower than the 26.4 mg/L average for Buckeye Creek and its tributaries, as well as lower than the 69.8 mg/L September 2 result. There are several noticeable consistencies with these November 2 results: (1) there are no dramatic differences in the results between the sample taken upstream of the spill site and those taken in the spill area and downstream[39], (2) these results are noticeably better than the September 2 analyses, and (3) a comparison to water standards and historical creek averages show that this creek is in a condition similar to what it was prior to the spill. Also, the variance in the sample results demonstrates the vagaries in testing and examining a water system that is continually moving and changing.

Lastly, the four samples were tested for bacteria. Total Coliform, which includes Fecal Coliform and E. Coli, were found in all four samples, as well as E. Coli specifically.[40] Fecal Coliform, which is expressed in colonies per 100 milliliters (COL/100ml) returned results of 850, 360, 169, and 40. Federal primary drinking water standards do not tolerate the presence of fecal coliform or E. Coli. State surface water standards for fecal coliform are expressed as "maximum allowable content for water contact recreation," and tests shall not exceed a monthly

[36] SVRO, VRO, and VOC testing were performed by REI Consultants.
[37] There is no State surface water standard for TDS.
[38] There is no State surface water standard for Sulfate.
[39] The one exception is TDS, which was significantly higher upstream of the spill site.
[40] Coliforms are naturally present in the environment, as well as feces; fecal coliforms and E. Coli only come from human and animal fecal waste. (http://www.epa.gov/safewater/contaminants)

average of 200 COL/100ml[41] or 400 COL/100ml in ten percent of any samples taken during a month.[42] The historical data for Buckeye Creek and its tributaries show bacteria levels that are significantly higher than the results of these samples. Nevertheless, these results indicate that there are high levels of bacteria in the creek, which means that there is organic content in the creek. OOG will not speculate on the origin of the organic content, but this organic content could possibly affect results for TDS and specific conductance as well as other testing parameters.

November 23, 2009:

Personnel with DEP's Watershed Assessment Branch (WAB) conducted a benthic macroinvertebrate survey on Buckeye Creek on November 23, 2009. The benthic macroinvertebrate survey analyzes the types and population of macroinvertebrates. The objective of the survey was to compare macroinvertebrate population above and below the spill site and determine if there was an impact to macroinvertebrate life. The survey results, which are publicly viewable as part of this report, concluded that both the upstream (above spill site) and downstream (below spill site) stations

> "seem to be comparable and no adverse effects of the spill were observed except obvious sediment odors and visible oil sheens at station 001. The downstream station also had an elevated conductivity measurement which is not likely attributable to the spill. The benthic community was not impaired at either station according to the WVSCI. The discharges from this spill do not appear to be causing a substantial negative impact to the benthic macroinvertebrate community in Buckeye Fork."

Finally, the report recommended a more complete biological assessment be conducted in the spring of 2010 to determine the health of the fish and benthic communities.[43]

West Union:

In late October 2009, Duane Reynolds, Chief of Water and Wastewater for the town of West Union, raised concerns over whether the material discharged into Buckeye Creek reached the water intakes at the West Union water treatment facility, which supplies public drinking water. Buckeye Creek is a tributary of Middle Island Creek, where the water treatment facility's intakes are located.[44] Mr. Reynolds' concerns were based upon elevated iron and manganese levels detected in the water treated at the facility in late August 2009, which was around the time the spill was reported. The facility tests for iron and manganese daily as part of its water treatment process.

Furthermore, Mr. Reynolds was concerned that the water treatment facility was not notified of the spill. OOG inspectors on site determined that the spill had not exited Buckeye Creek, and that the installed containment booms would keep the contaminant from reaching

[41] Based upon an average of not less than 5 samples per month.
[42] The State standards for bacteria in surface water can be found in 47 CSR § 2.
[43] The WAB's report can be viewed in its' entirety at Appendix H.
[44] It is estimated that the West Union water treatment facility's intakes are all together approximately 5 miles downstream of the spill site.

Middle Island Creek. Mr. Reynolds raised legitimate concerns regarding spill notification procedures. While reporting procedures were already in place to notify downstream water treatment facilities in the event of a spill, DEP, the West Virginia Department of Health, and the West Virginia Division of Homeland Security and Emergency Management have reviewed reporting procedures and made changes to better ensure that public water treatment facilities receive notification when a spill may affect public water supplies.

At the request of OOG, Mr. Reynolds supplied the facility's intake analyses dating back to January 2007. While Mr. Reynolds was correct that in late August 2009, manganese levels were elevated (between 1.0 mg/L and 1.5 mg/L), the rise in manganese levels first seen at the intakes began around August 9, 2009, which is before OOG believes the spill occurred. Iron levels were constant at around 0.3 mg/L during the last half of August, but did spike dramatically in late July, but decreased at about the same time manganese levels began to rise in August. Similar increases in iron and manganese levels were seen in July/August 2008, December 2007, and July/August 2007. [45]

Several factors can affect iron and manganese levels, which naturally occur in the State's waters. In a letter to OOG dated November 12, 2009[46], Mr. Reynolds writes that:

> "I believe that the raw water turbidity should be considered when approaching the analysis of our data as some degree of manganese and iron are present in our raw water daily. Also, the amount varies with several factors of which turbidity is probably the most prominent. When we experience heavy rainfall and therefore, heavy ground runoff the creek muddies and the manganese and iron content of the raw water goes up. Temperature and creek flow (velocity) also contribute to elevated levels of manganese and iron."

The spill occurred in late August, when temperatures are typically high, rainfall is sparse, and water flow is low. Because of the variables that can affect manganese and iron levels generally, in addition to comparable activity around the same time in previous years, OOG cannot agree with Mr. Reynolds' conclusion that the discharge into Buckeye Creek reached Middle Island Creek. However, OOG appreciates Mr. Reynolds' efforts as a catalyst for review of spill notification procedures. Ultimately, OOG and Mr. Reynolds have the same goal, to protect West Virginia's waters and public health.

Well API 47-017-05814

OOG issued a well work permit for well API 47-017-05814 to Tapo Energy, Inc. on March 2, 2009. The permit was for a shallow well with the Marcellus Shale as the target formation. The well is a conventional well, with no horizontal legs. The well was drilled to the target depth on March 19, 2009, completed on April 9, and began production on May 1.

The cuttings and fluid from the drilling went into a properly constructed pit. The fluids from the drilling process were properly land applied at the end of March. All completion fluids were also directed into the same pit. Tapo acquired the services of Johnson Screens, an oil and

[45] The 2007 and 2008 spikes in iron and manganese levels were actually more dramatic than the spike seen in August 2009.

[46] Mr. Reynolds letter is attached as Appendix I.

gas contractor, to treat, recycle, and discharge the completion fluids from the pit. This process separates solids and other materials from the completion fluids, essentially leaving reusable water and waste water.[47] The reusable water was pumped into onsite tanks for use in future operations. The waste water was taken to an underground injection (UIC) well in Ohio. Conversations with Tapo Energy and Johnson Screens both confirm that approximately 260 barrels of waste water were produced by the process and then disposed at a UIC well.[48] Based upon estimates, this number is in line with what could be expected following the completion fluid return and recycling. The fluid recycling process occurred between July 14 and July 24[49], and the pit was reclaimed at the end of July.

On September 7, 2009, Inspector Scranage issued Notice of Violation (NOV) 8279[50] to Tapo Energy for violating W. Va. Code § 22-6-7(b)(1) by "allowing pollutants, or the effluent therefrom, produced by or emanating from any point source, to flow into the water of this State." To abate the violation, OOG required Tapo to make every effort to clean up the spill and report volume amounts. OOG also required Tapo to maintain containment booms on the creek to capture residual contaminant as long as it may be necessary to restore the creek to pre-spill conditions. Lastly, Tapo was required to share information with OOG regarding any testing. OOG abated the NOV on December 16, 2009 after OOG determined that Tapo had complied with the abatement requirements and the creek had been substantially restored to pre-spill conditions.

OOG and Tapo Energy entered Consent Order 2010-3[51] on March 17, 2010. As part of the terms of the Consent Order, Tapo agreed to take all steps necessary to comply with W. Va. Code § 22-6-7 and to meet the standards of the General Water Pollution Control Permit. Additionally, Tapo agreed to pay a ten thousand dollar ($10,000) assessment for violating W. Va. Code § 22-6-7(b)(1).

CONCLUSION

To date, there is no definite explanation for the discharge into Buckeye Creek. This does not mean that there is not an explanation, or a person or entity responsible; however, it does mean that all available evidence at this time only allows for theories and conjecture. DEP's investigation into this matter has included a review of Tapo Energy's drilling and completion activities, disposal of fluids, and reclamation of the drilling site. While DEP believes the discharge into Buckeye Creek was associated with Tapo Energy's drilling activity, there is no conclusive evidence that the discharge came directly from a drilling pit. OOG has explored multiple explanations as to how the discharge entered the creek, yet insufficient credible evidence exists to conclude anything other than accidental discharge.

OOG responded to the spill notification within thirty minutes of Louanne Fatora's report of the spill. Within two hours of notification, Inspector Scranage had the operator onsite and began a coordinated response. OOG expended several hundred man hours and substantial cost in

[47] This process cannot be discussed in any greater detail because the process is proprietary.
[48] Tapo Energy produced an invoice for 260 barrels of fluid delivered to an UIC well in Columbus, Ohio. This invoice is attached as Appendix J
[49] The invoice for the completion fluid recycling is attached as Appendix K.
[50] NOV 8279 is attached as Appendix L.
[51] Consent Order 2010-3 is attached as Appendix M.

clean-up coordination and oversight, as well as the investigation into this incident. Tapo Energy was cooperative and also expended considerable resources in the clean-up efforts.

OOG believes the creek has been restored substantially to pre-spill conditions, as the NOV required. The October and November water samples showed marked improvement over the September water samples; and, when the October and November samples are compared against the historical data for this watershed, the creek is currently in an analogous condition not only to what is known about the creek prior to the discharge, but also to the rest of the watershed. Additionally, the benthic survey concluded that the creek was not impaired and that the spill did not appear to cause a substantial negative impact.

The discharge into Buckeye Creek was an unfortunate occurrence. The exploration and production of oil and natural gas does not have to come at the expense of our State's other natural resources. The Office of Oil and Gas is committed to the protection of our State's waters, and continually reviews methods and practices to ensure that the exploration and production of oil and natural gas is undertaken in an environmentally sound manner.

APPENDIX A

8-25-09

Hardman, Helen M

From: dep.online@wv.gov
Sent: Tuesday, August 25, 2009 8:19 AM
To: DEP OOG Spill
Cc: Stevens, Kenneth D; Dorsey, Mike H; Joins, Rusty T
Subject: 09-88661 (A) Notification of Emergency Spill

This message was sent by an automatic mailer built with cfmail:
==========

Name:
LOUANNE FEROA

Call Back Number:

Spill Information

State and County:
WV 09 Doddridge
Responsible Party:
UKN
Incident Type:
Oil & Gas
Facility Type:
Other
Date and time Occurred:
08/24/09 9:00 PM
Detailed Description:
QUARTER INCH THICK GEL ON TOP OF THE WATER APPEARS TO BE OIL. THE OIL HAS A RED AND ORANGE COLOR TO IT. CALLER STATES THAT THEY HAVE BEEN DRILLING NEAR THIS LOCATION.
Exact Location:
OLD RT 50 RIGHT ACROSS FROM COASTAL LUMBER
Spill - Additional Information:
DOMINION AND DENNIS POWELL WELLS IN THE AREA. THERE HAS BEEN SOME ANIMALS FOUND DEAD AROUND THE CREEK IN THE PAST COUPLE MONTHS.
Material Spilled:
OIL
Quantity Spilled:
UKN
Is Material Hazardous or Toxic:
Unknown
Has spill caused Fishkill:
Unknown
Stream Affected:
BUCKEYE RUN

Bypass Information

Back Online:

Bypass Begin:

Bypass Back Online:

Bypass - Additional Information:

HSEM Information

HSEM Reference:
09-88661 (A)
Spill Received Date and time:
08/25/2009 8:00 AM
Recorded By:
DEREK JOHNSON
HSEM - Additional Information:

DEP Information

Created By:
JOHNSD68
Date and Time Created:
08/25/2009 08:19:08

APPENDIX B

To: Mr. James Martin Chief of the Office of Oil & Gas

Approximately 8:19 A.M. on Tuesday, August 25th 2009 an oil spill was reported to David Scranage. The spill was to be on Buckeye Run. Which, is a tributary to the Middle Island Creek. I responded to the call shortly there, after.

When I arrived on scene the first thing to do was to access the situation. By trying to determine, both the source of the spill, and the length of the spill. Also, I saw no evidence of a fish kill or harm to other aquatic life. I received assistance by David Cowan district inspector from Ritchie County. After a determination of the possible source or entry point of the, contaminates was made. The well operators Designated Agent was contacted. At that point he coordinated the response of the clean-up crew.

The Designated Agent met with David Cowan and myself. We discussed, what might be the best possible way to start the clean-up. At that point his crew started to set booms in place across the water shed at a fairly large portion of the spill located at approximately the half way point of the total length. Inspector Cowan and myself went down stream looking for signs of the lower end of the spill site. We determined that for one it had not entered the Middle Island Creek and was contained on Buckeye Run. After, this determination had been made we again contacted the Designated Agent. He met with us and another, containment was set up along the stream. Then as a precaution an additional or secondary containment was set up below the contaminated area. While this was going on his crew was in the process of using a vac. truck to suck up the bulk of the material up stream at the first containment site. We could see what appeared to be oil on the stream and needed to get the bulk of the oil cleaned up at the upper location first then deal with the lower contaminated area second. Because, oil floats on the surface and any of the bulk, contaminates that were lost at that site would float down stream to the second site. That evening the vac. truck was set up at the second site and it was determined that additional hoses would be needed to reach the second area and would be brought out the next morning when the clean-up continued.

Wednesday, August 26th I (David Scranage) made an inspection of the second site in the morning. The clean-up crew was working to vac. up this location. It was apparent that they would have an all day job ahead of them. I (David Scranage) returned to the site to check up of their progress later that day. Inspected all containment sites for breeches and could find none.

Thursday, August 27th I was assisted by inspector David Gilbert we made several site inspections along the stream and discussed possible things that could be done as the crew was starting the residual part of the clean-up. A determination was made to install a under flow dam at a site below the first containment site and it would be installed the next morning.

Friday, August 27th I was assisted again by Inspector Gilbert and also, Inspector Gainer. The under flow dam was put in place. Also, the Designated Agent hired an Environmental Consultant with Ryan Environmental to take samples of the stream I assisted with this. Samples were taken at four different collection points on the stream. One of those samples was taken at appoint where we could get a good composite of the, contaminates. Another was taken above the source to determine pre-spill condition of the waters of Buckeye Run. The other two samples were taken above and below the last containment site on Buckeye Run.

Peat-sorb was sprinkled on to heavy laden areas along the stream as the residual clean-up commenced. Workers used leaf blowers to move this along the surface of the water to lock up any sheen or residues as they were released along the banks of the stream. At the riffles and along the shallows various places it became necessary to utilize a fresh water pump to flush the residue again

peat-sorb was utilized to lock up these substances as they were released. In places crews picked up oil laden leafs from the stream and bagged them to remove the bulk of the residue from the stream. This became necessary largely in part of the continually decreasing flow rates of the waters of Buckeye Run, due to the lack of rainfall.

Saturday, August 29th I made an inspection of the clean-up efforts as they continued down- stream from the source. They had some new help that day and upon my arrival they were going about the process backwards. They were trying to clean the stream and put peat-sorb down behind them. I had them go back and start over they then saw how the absorbent would lock up the sheen as it was released.

Monday, August 31st I was accompanied by Specialist Richard Campbell. We, Inspected all the containments along Buckeye Run. He also, witnessed the clean-up efforts as they continued down-stream from the site. By late that evening the crew had made it approximately one mile from the source still about a half mile from the upper containment structure.

Wednesday Morning, September 2nd I made an inspection the crew had vacuumed up the peat -sorb on Tuesday evening at the upper containment site, and were ready to continue further down-stream. The water looked to be in good shape behind the first containment being that there was very little visible sign of contamination. Only, some residual peat-sorb, and leafs had floated down -stream behind the containment over night. I spoke with the workers and ask them to keep the containments vacuumed up. They reassured me that they would.

Thursday, September 3rd I made an inspection as the crew was working down-stream from the upper containment site this section was going to be a challenge with steep slopes along with a deep section of stream that had large rip-rap along U.S. Route 50 East. This section had been moved when the roadway was constructed, and would be a very time consuming section to clean up.

Tuesday, September 8th again I was accompanied by Specialist Campbell we looked at various sites along the stream along with inspections of the various containment sites.

Wednesday, September 9th I made an inspection of the clean-up efforts and posted Well API #47-017-05814 for Violation of West Virginia Code 22-6-7(1).

Thursday, September 10th I made an inspection of the site they were in the process of vacuuming up the lower containment site. In all, it has appeared to be a successful clean-up. At this point I instructed the operators agent to go ahead and remove the under flow dam and to monitor the remaining two structures on a daily basis, and vacuum the sites as necessary. At the very least until we receive enough rainfall to create a flow on the stream. This would help reassure a proper clean-up.

*****To date: There has been approximately 50-70 Barrels of the contaminate, vacuumed up along with 9 Industrial bags of leafs and debris that does not include the leafs and debris vacuumed up by the truck.

*****I have no proof that this was a deliberate act by the operator and shall commend the efforts made to correct the situation.

***** The Operators Agent has agreed to share test result information as it becomes available.

Sincerely, David Scranage

APPENDIX C

Mr. Martin

I received a call on August 25, 09 that there had been a spill on Buckeye Creek in Doddridge Co. and that Dave Scranage and Dave Cowan were on scene and organizing an effort to contain and start a cleanup of the spilled material. They had tracked the material back to a wellsite 017-5814 and had contacted that company, Tapo Energy, to do a cleanup.

I was onsite on August 31st, 09 and with Dave Scranage we surveyed the stream the length of the spill, approx. 3 miles, and found no fish kill and found no evidence of contamination below the lowest boom placed on Buckeye Creek to contain the spilled material. I found that Tapo Energy personel were onsite and doing a very good job of cleanup and that a vac truck, leave blowers, water pump to wash stream edge and peat sorb being used to trap oil residue.

I was also onsite with Dave Scranage on September 8th,09 and rechecked the length of the spill and found Tapo Energy still onsite, but on the final stages of cleanup. The stream cleanup had progressed to the point that some of the booms were to be removed that were no longer needed. The vac truck was still being used along with the leave blowers and pump to wash the sreaam edge. The last 2 booms were to be left in place after all cleanup and to be monitored for any further material that could be removed or till a rain event.

Rick Campbell

APPENDIX D

REIC

Improving the environment, one client at a time...

225 Industrial Park Drive
Beaver, WV 25813
TEL: 304.255.2500
FAX: 304.255.2572
Website: www.reiclabs.com

September 15, 2009

Mr. Greg Mayle
RYAN ENVIRONMENTAL
RT 4 BOX 260
BRIDGEPORT WV 26330

TEL: (304) 842-5578
FAX (304) 842-5131

RE: HALL'S DRILLING SPILL

Order No.: 0909118

Dear Mr. Greg Mayle:

REI Consultants, Inc. received 4 sample(s) on 9/2/2009 for the analyses presented in the following report.

Please note two changes you may see on your report.

- Results for "Dissolved" parameters will be shown under a separate sample ID, rather than as a separate analysis under the same sample ID. The sample ID for "Dissolved" parameters will include "Field Filtered" or "Lab Filtered", as appropriate.
- Metals results will no longer be identified as "Total" or "Total Recoverable". The methods have not been changed, only their appearance on the report.

If you have any questions regarding these results, please do not hesitate to call.

Sincerely,

Kathy Lough

Kathy Lough
Project Manager

REIC

225 Industrial Park Drive
Beaver, WV 25813
TEL: 304.255.2500
FAX: 304.255.2572
Website: www.reiclabs.com

3025-B Peters Creek Road
Roanoke, VA 24019
TEL: 540.777.1276
FAX: 540.400.8508

Improving the environment, one client at a time...

Report Narrative

Project Manager:: **Kathy Lough** Kathy Lough

WO#: **0909118**
Date: **9/15/2009**

CLIENT: RYAN ENVIRONMENTAL
Project: HALL'S DRILLING SPILL

All analyses were performed using documented laboratory SOPs that incorporate appropriate quality control procedures as described in the applicable methods. REI Consultants, Inc. (REIC) technical managers have verified compliance of reported results with the REIC's Quality Program and SOPs, except as noted in this case narrative. Any deviation from compliance is explained below and/or identified within the body of this report by a qualifier footnote which is defined at the bottom of each page.

All samples were analyzed using the methods stated in the analytical report without modification, unless otherwise noted.

All sample results are reported on an "as-received" wet weight basis unless otherwise noted.

Results reported for sums of individual parameters, such as Total Trihalomethanes (TTHM) and Total Haloacetic Acids (HAA5), may vary slightly from the sum of the individual parameter results. This apparent anomaly is caused by rounding individual results and summations at reporting, as required by EPA.

The test results in this report meet all NELAP requirements for parameters for which accreditations are required or available. Any exceptions are noted in this report. This report may not be reproduced, except in full, without the written approval of REIC.

In compliance with federal guidelines and standard operating procedures, all reports, including raw data and supporting quality control, will be disposed of after five years unless otherwise arranged by the client via written notification or contract requirement.

If you have any questions please contact the project manager whose name is listed above.

REI Consultants, Inc. Analytical Results

Date: *15-Sep-09*

CLIENT:	RYAN ENVIRONMENTAL	**WorkOrder:**	0909118 **Lab ID** 0909118-01A
Client Sample ID:	WS-1	**DateReceived:**	9/2/2009
Project:	HALL'S DRILLING SPILL	**Collection Date:**	8/28/2009 2:13:00 PM
Site ID:	WV	**Matrix:**	WASTE WATER

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
METALS BY ICP			**E200.7**			Analyst: **JD**
Iron	0.105	mg/L		NA	0.100	9/3/2009 8:44:51 PM
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.10	9/8/2009 6:15:29 PM
TPH (Oil Range)	ND	mg/L		NA	0.26	9/8/2009 6:15:29 PM
Surr: o-Terphenyl	91.9	%REC			51.7-134	9/8/2009 6:15:29 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **AS**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	9/9/2009 4:59:42 PM
Surr: 2,5-Dibromotoluene	101	%REC			43.9-126	9/9/2009 4:59:42 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **AS**
Benzene	ND	µg/L		NA	1.0	9/9/2009 4:59:42 PM
Toluene	ND	µg/L		NA	1.0	9/9/2009 4:59:42 PM
Ethylbenzene	ND	µg/L		NA	1.0	9/9/2009 4:59:42 PM
m,p-Xylene	ND	µg/L		NA	2.0	9/9/2009 4:59:42 PM
o-Xylene	ND	µg/L		NA	1.0	9/9/2009 4:59:42 PM
Surr: 1,1,1-Trifluorotoluene	91.5	%REC			57.3-124	9/9/2009 4:59:42 PM
ANIONS BY ION CHROMATOGRAPHY			**E300.0**			Analyst: **CW**
Chloride	46.0	mg/L		NA	1.00	9/9/2009 1:40:00 AM

NOTES:
The CCB1 for CHLORIDE exceeded REIC control limits indicating a high bias.

Key:				
	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

REI Consultants, Inc. Analytical Results

Date: *15-Sep-09*

CLIENT:	RYAN ENVIRONMENTAL	**WorkOrder:**	0909118 **Lab ID** 0909118-02A
Client Sample ID:	WS-2	**DateReceived:**	9/2/2009
Project:	HALL'S DRILLING SPILL	**Collection Date:**	8/28/2009 2:00:00 PM
Site ID:	WV	**Matrix:**	WASTE WATER

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
METALS BY ICP			**E200.7**			Analyst: **JD**
Iron	0.424	mg/L		NA	0.100	9/3/2009 8:54:06 PM
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	4,590	mg/L		NA	21.5	9/10/2009 11:21:22 AM
TPH (Oil Range)	4,560	mg/L		NA	53.8	9/10/2009 11:21:22 AM
Surr: o-Terphenyl	7,300	%REC	S		51.7-134	9/10/2009 11:21:22 AM
NOTES:						
Surrogate recovery was not within method criteria due to matrix interference.						
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **AS**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	9/9/2009 5:34:40 PM
Surr: 2,5-Dibromotoluene	113	%REC			43.9-126	9/9/2009 5:34:40 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **AS**
Benzene	ND	µg/L		NA	1.0	9/9/2009 5:34:40 PM
Toluene	ND	µg/L		NA	1.0	9/9/2009 5:34:40 PM
Ethylbenzene	ND	µg/L		NA	1.0	9/9/2009 5:34:40 PM
m,p-Xylene	ND	µg/L		NA	2.0	9/9/2009 5:34:40 PM
o-Xylene	ND	µg/L		NA	1.0	9/9/2009 5:34:40 PM
Surr: 1,1,1-Trifluorotoluene	93.3	%REC			57.3-124	9/9/2009 5:34:40 PM
ANIONS BY ION CHROMATOGRAPHY			**E300.0**			Analyst: **CW**
Chloride	109	mg/L		NA	5.00	9/9/2009 1:59:00 AM
NOTES:						
The CCV for [CHLORIDE] exceeded REIC control limits indicating a high bias.						

Key:				
	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

REI Consultants, Inc. Analytical Results

Date: *15-Sep-09*

CLIENT:	RYAN ENVIRONMENTAL	**WorkOrder:**	0909118 **Lab ID** 0909118-03A
Client Sample ID:	WS-3	**DateReceived:**	9/2/2009
Project:	HALL'S DRILLING SPILL	**Collection Date:**	8/28/2009 2:35:00 PM
Site ID:	WV	**Matrix:**	WASTE WATER

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
METALS BY ICP			**E200.7**			Analyst: **JD**
Iron	ND	mg/L		NA	0.100	9/3/2009 8:57:11 PM
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	1.10	mg/L		NA	0.11	9/8/2009 5:38:12 PM
TPH (Oil Range)	2.88	mg/L		NA	0.26	9/8/2009 5:38:12 PM
Surr: o-Terphenyl	96.3	%REC			51.7-134	9/8/2009 5:38:12 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **AS**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	9/9/2009 2:52:03 PM
Surr: 2,5-Dibromotoluene	115	%REC			43.9-126	9/9/2009 2:52:03 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **AS**
Benzene	ND	µg/L		NA	1.0	9/9/2009 2:52:03 PM
Toluene	ND	µg/L		NA	1.0	9/9/2009 2:52:03 PM
Ethylbenzene	ND	µg/L		NA	1.0	9/9/2009 2:52:03 PM
m,p-Xylene	ND	µg/L		NA	2.0	9/9/2009 2:52:03 PM
o-Xylene	ND	µg/L		NA	1.0	9/9/2009 2:52:03 PM
Surr: 1,1,1-Trifluorotoluene	93.3	%REC			57.3-124	9/9/2009 2:52:03 PM
ANIONS BY ION CHROMATOGRAPHY			**E300.0**			Analyst: **CW**
Chloride	90.5	mg/L		NA	5.00	9/9/2009 2:19:00 AM

NOTES:
The CCB1 for [CHLORIDE] exceeded REIC control limits indicating a high bias.

Key:				
	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

REI Consultants, Inc. Analytical Results

Date: *15-Sep-09*

CLIENT:	RYAN ENVIRONMENTAL	**WorkOrder:**	0909118 **Lab ID** 0909118-04A
Client Sample ID:	WS-4	**DateReceived:**	9/2/2009
Project:	HALL'S DRILLING SPILL	**Collection Date:**	8/28/2009 2:45:00 PM
Site ID:	WV	**Matrix:**	WASTE WATER

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
METALS BY ICP			**E200.7**			Analyst: **JD**
Iron	ND	mg/L		NA	0.100	9/3/2009 9:00:15 PM
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.10	9/8/2009 5:00:54 PM
TPH (Oil Range)	ND	mg/L		NA	0.26	9/8/2009 5:00:54 PM
Surr: o-Terphenyl	92.8	%REC			51.7-134	9/8/2009 5:00:54 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **AS**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	9/9/2009 4:24:43 PM
Surr: 2,5-Dibromotoluene	94.1	%REC			43.9-126	9/9/2009 4:24:43 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **AS**
Benzene	ND	µg/L		NA	1.0	9/9/2009 4:24:43 PM
Toluene	ND	µg/L		NA	1.0	9/9/2009 4:24:43 PM
Ethylbenzene	ND	µg/L		NA	1.0	9/9/2009 4:24:43 PM
m,p-Xylene	ND	µg/L		NA	2.0	9/9/2009 4:24:43 PM
o-Xylene	ND	µg/L		NA	1.0	9/9/2009 4:24:43 PM
Surr: 1,1,1-Trifluorotoluene	92.4	%REC			57.3-124	9/9/2009 4:24:43 PM
ANIONS BY ION CHROMATOGRAPHY			**E300.0**			Analyst: **CW**
Chloride	91.5	mg/L		NA	5.00	9/9/2009 2:38:00 AM

NOTES:
The CCB1 for [CHLORIDE] exceeded REIC control limits indicating a high bias.

Key:		
	MCL	Maximum Contaminant Level
	MDL	Minimum Detection Limit
	NA	Not Applicable
	ND	Not Detected at the PQL or MDL
	PQL	Practical Quantitation Limit
	TIC	Tentatively Identified Compound, Estimated Concentration
	B	Analyte detected in the associated Method Blank
	E	Estimated Value above quantitation range
	H	Holding times for preparation or analysis exceeded
	S	Spike/Surrogate Recovery exceeds REIC control limits
	*	Value exceeds MCL or Regulatory Limits

APPENDIX E

Statistics Table

Parameter	Units	Buckeye with Tributaries				Buckeye Creek Only			
		No.	Min.	Avg.	Max.	No.	Min.	Avg.	Max.
Alkalinity (Total as CaCO3)	mg/l	1	141	141	141	0	-	-	-
Aluminum	mg/l	2	0.05	0.065	0.08	0	-	-	-
Calcium	mg/l	12	17	32.03	53.9	1	17	17	17
Chloride	mg/l	26	5	60.73	197	1	11	11	11
Copper	mg/l	1	0.004	0.004	0.004	0	-	-	-
Dissolved Oxygen	mg/l	87	4.74	11.92	18.61	37	4.74	11.84	17.48
Fecal Coliform	Colonies/100 ml	78	3	1457.55	12000	34	3	720.09	5200
Hardness (as Calcium Carbonate)	mg/l	4	58.51	101.32	179.47	1	58.51	58.51	58.51
Iron	mg/l	70	0.03	1.142	15.3	30	0.12	1.13	9.56
Kjeldahl Nitrogen	mg/l	1	1	1	1	0	-	-	-
Magnesium	mg/l	5	3.9	6.12	10.9	1	3.9	3.9	3.9
Mn	mg/l	8	0.02	0.05	0.09	0	-	-	-
Nitrite (NO2) and Nitrate (NO3) as Nitrogen	mg/l	1	0.15	0.15	0.15	0	-	-	-
Nitrogen	mg/l	1	1.15	1.15	1.15	0	-	-	-
pH	S.U.	87	6.47	7.4	8.19	37	6.55	7.36	8.19
Phosphorus as P	mg/l	1	0.04	0.04	0.04	0	-	-	-
Potassium	mg/l	13	0.8	1.44	2.8	1	1	1	1
Selenium	mg/l	1	0.005	0.005	0.005	0	-	-	-
Sodium	mg/l	13	5.3	26.42	53.9	1	5.3	5.3	5.3
Solids (Filterabale Residue)	mg/l	42	20	131.86	368	18	20	82.61	173
Solids (Non-Filterabale Residue)	mg/l	77	2	25.34	415	33	2	24.45	279
Specific Conductance	umhos/cm	91	71	259.48	762	39	82	183.92	415
Sulfate	mg/l	26	10	18.93	39	1	15	15	15
Zinc	mg/l	1	0.01	0.01	0.01	0	-	-	-
Temperature	°C	87	0.01	11.23	27.59	37	0.03	11.88	27.59

APPENDIX F

RELIANCE LABORATORIES, INC.

ENVIRONMENTAL ANALYSTS AND CONSULTANTS

BRIDGEPORT, WV www.RelianceLabs.net MARTINSBURG, WV

Certifications: WV Department of Health #: 00354, 00433 | WV Department of Environmental Protection #: 156, 191 | MD Department of Environment #: 336, 337
VA DGS Division of Consolidated Laboratory Services #: 00434, 00435 | US Environmental Protection Agency #: WV00042, WV00901

DOWNSTREAM STRATEGIES, LLC Thursday, September 24, 2009

219 WALL STREET

MORGANTOWN WV 26505-

Lab Number 136688-2009-W **Sample ID** BUCKEYE CK

Parameter	Value	MDL	MCL	Units	Method
Benzene	ND	0.0007		mg/l	8021B/5030
Toluene	ND	0.002		mg/l	8021B/5030
Ethylbenzene	ND	0.0014		mg/l	8021B/5030
Xylene	ND	0.003		mg/l	8021B/5030
MTBE	ND	0.003		mg/l	8021B/5030

Surrogate	% Recovery
BTEX (LIMITS = 80.0 - 120.0%)	91.8%
TPH - GRO (LIMITS = 58.9 - 154.7 %)	100%

Remarks:

Date Sample Analyzed: 9/3/2009 16:10

Analyst: A.Seitz

REPORT REVIEWED BY: _____

Sample Submitted By M CHRIST

Date Sample Collected 9/2/2009 10:45

Date Sample Received: 9/2/2009 12:47

ND: Not Detected. If present, the result is less than the MDL - Minimum Detectable Limit

* Method Code: STANDARD METHODS 18TH ED; US EPA METHODS FOR THE CHEMICAL ANALYSIS OF WATER AND WASTES, Rev. 83; US EPA METHODS FOR THE DETERMINATION OF METALS IN ENVIRONMENTAL SAMPLES, May 1994; TEST METHODS FOR EVALUATING SOLID WASTE, SW-846, 3rd Edition

RLL012

RELIANCE LABORATORIES, INC.

ENVIRONMENTAL ANALYSTS AND CONSULTANTS

BRIDGEPORT, WV www.RelianceLabs.net MARTINSBURG, WV

Certifications: WV Department of Health #: 00354, 00433 | WV Department of Environmental Protection #: 168, 181 | MD Department of Environment #: 330, 337
VA DGS Division of Consolidated Laboratory Services #: 00434, 00435 | US Environmental Protection Agency #: WV00042, WV00501

DOWNSTREAM STRATEGIES, LLC **Thursday, September 24, 2009**

219 WALL STREET
MORGANTOWN WV 26505-

Lab Number: 130680-2009-W **Sample ID:** BUCKEYE CK

Parameter	Value	Units	Method	Date/Time Analyzed	Analyst	MDL	MCL
pH	7.32	S.U.	SM4500H+B	9/9/2009 14:42	M.Coffman		
Total Dissolved Solids	914	mg/l	SM 2540C	9/4/2009 10:45	T. Miller	10	
Oil and Grease	ND	mg/l	EPA 1664A	9/22/2009 9:10	L. Lanham	8.23	
Total Chloride	168	mg/l	EPA 300.0	9/2/2009 23:46	M.Coffman	0.15	
Specific Conductivity	1385	umhos	EPA 120.1	9/9/2009 14:42	M.Coffman	0.14	
Total Sulfate	149	mg/l	EPA 300.0	9/2/2009 23:46	M.Coffman	0.05	
Total Calcium	112	mg/l	EPA 200.8	9/4/2009 15:14	T.Hanshaw	0.01	
Total Sodium	69.8	mg/l	EPA 200.8	9/4/2009 15:14	T.Hanshaw	0.01	
Total Manganese	1.49	mg/l	EPA 200.8	9/4/2009 13:41	T.Hanshaw	0.007	
Total Iron	0.96	mg/l	EPA 200.8	9/4/2009 13:41	T.Hanshaw	0.005	
Total Aluminum	ND	mg/l	EPA 200.8	9/4/2009 13:41	T.Hanshaw	0.009	
Dissolved Aluminum	ND	mg/l	EPA 200.8	9/4/2009 13:41	T.Hanshaw	0.009	

Remarks:

Date Sample Collected	9/2/2009	10:45
Sample Submitted By	M CHRIST	
Date Sample Received:	9/2/2009	12:47

REPORT REVIEWED BY:

ND = Not Detected
MDL - Minimum Detectable Limit PQL - Practical Quantifiable Limit
MCL - Maximum Contaminant Level, USEPA Regulated [MCL] = Maximum Contaminant Level, Non-Regulated

*Method Code: STANDARD METHODS 19TH ED; US EPA METHODS FOR THE CHEMICAL ANALYSIS OF WATER AND WASTES, Rev. 83; US EPA METHODS FOR THE DETERMINATION OF METALS IN ENVIRONMENTAL SAMPLES, May 1994; TEST METHODS FOR EVALUATING SOLID WASTE, SW-846, 3rd Edition

RLL.031

APPENDIX G

Sturm Environmental Services

COMPANY: WVDEP / CHARLESTON

DATE/TIME SAMPLED:* 11-02-09 1215

SAMPLE ID: BUCKEYE RUN

DATE/TIME RECEIVED: 11-02-09 1531

SAMPLED BY: J. PETERSON / D. GILBERT

SAMPLE ID	pH units	Fe ppm	Mn ppm	TDS ppm	SO_4 ppm	Cl- ppm	Ca ppm	Na ppm	TOC ppm
#1 UPSTREAM OF WELL SITE	8.0	.32	.01	294	13	44.8	33.0	22.3	2.7

* Client provided X Compliant ___ Non-compliant (see attached)

D. Burnett

APPROVED

MAIN OFFICE—POST OFFICE BOX 650 • BRIDGEPORT, WEST VIRGINIA 26330 • (304) 623-6549
CHARLESTON BRANCH—POST OFFICE BOX 8337 • SOUTH CHARLESTON, WEST VIRGINIA 25303-0337 • (304) 744-9864

Sturm Environmental Services

COMPANY: WVDEP / CHARLESTON

DATE/TIME SAMPLED:* 11-02-09

SAMPLE ID: BUCKEYE RUN

DATE/TIME RECEIVED: 11-02-09 1531

SAMPLED BY: J. PETERSON / D. GILBERT

SAMPLE ID	* TIME SAMP	pH units	Fe ppm	Mn ppm	TDS ppm	SO_4 ppm	Cl- ppm	Ca ppm	Na ppm	TOC ppm
#2 BELOW OXBOW	1230	7.9	.43	.03	186	13	47.9	35.6	24.2	2.9
#3 BELOW	1300	8.1	.37	.02	160	14	39.2	33.6	19.6	3.0
#4 MIDDLE ISLAND CREEK	1325	7.9	.36	<.01	199	11	8.3	18.9	7.59	3.1

* Client provided X Compliant ___ Non-compliant (see attached)

D Bennett

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Sturm Environmental Services

JOHN W. STURM, PRESIDENT

MICROBIOLOGY

COMPANY: WVDEP / CHARLESTON

SAMPLED BY: J. PETERSON / D. GILBERT

ANALYST: JMS / AR

DATE & TIME SAMPLED:* SEE BELOW

DATE & TIME RECEIVED: 11-02-09 1531

DATE & TIME ANALYZED: 11-02-09 1641

CHEMISTRY: Yes X No

For Multiple Samples Only

SAMPLE ID	FECAL 1 COLIFORM COL/100ml	FECAL 2 COLIFORM M.P.N.	TOTAL 3 COLIFORM COL/100ml	TOTAL 4 COLIFORM M.P.N.	* DATE/TIME SAMPLED	LOG NO.
#1 UPSTREAM OF WELL SITE	850				11-02-09 1215	CHAS 091102-1

Method of Analysis from "Standard Methods for the Examination of Water and Wastewater," 19th Ed., 1995

1 – Method 9222D, pg. 9-60.
2 – Method 9221E, pg. 9-51.
3 – Method 9222B, pg. 9-54.
4 – Method 9221B, pg. 9-45.

D. Burns
Approved

* Client provided
X Compliant ___Non-Compliant (see attached)

Sturm Environmental Services

JOHN W. STURM, PRESIDENT

MICROBIOLOGY

COMPANY: WVDEP / CHARLESTON

SAMPLED BY: J. PETERSON / D. GILBERT

ANALYST: JMS / AR

DATE & TIME SAMPLED:* SEE BELOW

DATE & TIME RECEIVED: 11-02-09 1531

DATE & TIME ANALYZED: 11-02-09 1641

CHEMISTRY: Yes X No

For Multiple Samples Only

SAMPLE ID	FECAL 1 COLIFORM COL/100ml	FECAL 2 COLIFORM M.P.N.	TOTAL 3 COLIFORM COL/100ml	TOTAL 4 COLIFORM M.P.N.	* DATE/TIME SAMPLED	LOG NO.
#2 BELOW OXBOW	360				11-02-09 1230	CHAS 091102-2
#3 BELOW	169				11-02-09 1300	CHAS 091102-3
#4 MIDDLE ISLAND CREEK	40				11-02-09 1325	CHAS 091102-4

Method of Analysis from "Standard Methods for the Examination of Water and Wastewater," 19th Ed., 1995

1 – Method 9222D, pg. 9-60.
2 – Method 9221E, pg. 9-51.
3 – Method 9222B, pg. 9-54.
4 – Method 9221B, pg. 9-45.

D. Burnam
Approved

* Client provided
X Compliant ___Non-Compliant (see attached)

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Sturm Environmental Services

JOHN W. STURM, PRESIDENT

MICROBIOLOGY

COMPANY:	WVDEP / CHARLESTON	DATE & TIME SAMPLED:*	SEE BELOW
SAMPLED BY:	J. PETERSON / D. GILBERT	DATE & TIME RECEIVED:	11-02-09 1531
ANALYST:	JMS	DATE & TIME ANALYZED:	11-02-09 1542
METHOD:	3	CHEMISTRY: Yes X	No

For Multiple Samples Only

SAMPLE ID	TOTAL COLIFORM P/A	E. COLI PA	* DATE/TIME SAMPLED	LOG NO.
#1 UPSTREAM OF WELL SITE	PRESENT	PRESENT	11-02-09 1215	CHAS 091102-1

Method of Analysis from "Standard Methods for the Examination of Water and Wastewater," 19th Ed., 1995

1 – MPN – Method 9221C, pg. 9-48
2 – MF Method 9222B, pg. 9-54
3 – "Colilert" – mmo-mug – Method 9223, pg. 9-64.

* Client provided
X Compliant ___Non-Compliant (see attached)

D. Bennett
Approved

Sturm Environmental Services

JOHN W. STURM, PRESIDENT

MICROBIOLOGY

COMPANY: WVDEP / CHARLESTON

SAMPLED BY: J. PETERSON / D. GILBERT

ANALYST: JMS

METHOD: 3

DATE & TIME SAMPLED:* SEE BELOW

DATE & TIME RECEIVED: 11-02-09 1531

DATE & TIME ANALYZED: 11-02-09 1542

CHEMISTRY: Yes X No

For Multiple Samples Only

SAMPLE ID	TOTAL COLIFORM P/A	E. COLI PA	* DATE/TIME SAMPLED	LOG NO.
#2 BELOW OXBOW	PRESENT	PRESENT	11-02-09 1230	CHAS 091102-2
#3 BELOW	PRESENT	PRESENT	11-02-09 1300	CHAS 091102-3
#4 MIDDLE ISLAND CREEK	PRESENT	PRESENT	11-02-09 1325	CHAS 091102-4

Method of Analysis from "Standard Methods for the Examination of Water and Wastewater," 19th Ed., 1995

1 – MPN – Method 9221C, pg. 9-48
2 – MF Method 9222B, pg. 9-54
3 – "Colilert" – mmo-mug – Method 9223, pg. 9-64.

* Client provided
X Compliant ___Non-Compliant (see attached)

Approved

Sturm Environmental Services

JOHN W. STURM, PRESIDENT

COMPANY: WVDEP / CHARLESTON

PARAMETER	DATE ANALYZED	INITIALS OF ANALYST	METHOD	DETECTION LIMITS (mg/l)
pH	11.3.09	KH	SM19th 4500 H B	.1
Hot Acid			SM19th 2310 B (4a)	1
Mineral Acid			SM 2310, Tritrametric	1
Alkalinity			SM19th 2320 B	1
Iron	11-4-09	AD	EPA 200.7 Rev 4.4-1994	.05
Dissolved Iron			EPA 200.7 Rev 4.4-1994	.05
Manganese	11-4-09	AD	EPA 200.7 Rev 4.4-1994	.01
TSS – Total Suspended Solids			SM19th 2540 D	1
TDS – Total Dissolved Solids	11/3/09		SM19th 2540 C	1
Conductivity			EPA 120.1 Rev-1982	1 umhos
Sulfate	11-6-09	TES	EPA 300.0 Rev 2.1-1993	1
Aluminum			EPA 200.7 Rev 4.4-1994	.05
Dissolved Aluminum			EPA 200.7 Rev. 4.4-1994	.05
Calcium	11-4-09	AD	EPA 200.7 Rev 4.4-1994	.01
Magnesium			EPA 200.7 Rev 4.4-1994	.01
Hardness (calc)			EPA 200.7 Rev 4.4-1994	1
Chloride	11-6-09	TES	EPA 300.0 Rev 2.1-1993	1.0
NH_3N			SM19th 4500NH_3B + SM19th 4500 NH_3C	.06
Settleable Solids			SM 19th 2540 F	.1 ml/l
Phenol			EPA 420.2 1983	.01
Turbidity			SM19th 2130 B	.01
Oil & Grease			EPA 1664A Gravimetric Extraction	3.0
Ferrous Iron			SM 3500 Fe-D	.05
Ferric Iron			Calculation	.05
BOD			SM19th 5210B	1.0
COD			HCAH 8000	2.0
TOC	11-6-09		SM19th 5310B	1.0
MBAS			SM19th 5540C	.01
TKN			SM19th 4500 N org + SM19th 4500 NH^3E	.10
TPO_4			SM19th 4500P B.5 + SM19th 4500 P E	.01
Selenium (furnace)			EPA 200.9	.0006 mg/l
Sulfide			SM19th 4500 S2 F	.50
Nitrate			EPA 300.0 Rev 2.1-1993	.01
Nitrite			EPA 300.0 Rev 2.1-1993	.01
Sodium	11-4-09	AD	EPA 200.7 Rev 4.4-1994	.10
Fluoride			EPA 300.0 Rev 2.1-1993	.01
Nitrate-Nitrite			EPA 300.0 Rev 2.1-1993	.01
Hexavalent Chromium			SM19th 3500 – Cr-D	.01
Chromium (furnace)			SM19th 3113 B	.001
Chromium			EPA 200.7 Rev 4.4-1994	.05
Cyanide			EPA 335.4 Rev 1.0-1993	.005
Ortho-Phosphate			SM19th 4500P E	.01
Zinc (ICP)			EPA 200.7 Rev 4.4-1994	.005
Beryllium (furnace)			SM19th 3113 B	.0005
Beryllium			EPA 200.7 Rev 4.4-1994	.005
Potassium			EPA 200.7 Rev 4.4-1994	.20
Cadmium (furnace)			SM19th 3113 B	.0005
Cadmium			EPA 200.7 Rev 4.4-1994	.005
Nickel			EPA 200.7 Rev 4.4-1994	.04

EPA-United States Environmental Protection Agency, "Method for the Chemical Analysis of Water and Waste," EPA 600/4-79-020, March 1979.
SM-Standard Methods for the Examination of Water and Wastewater, 18th Edition.

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(1)

STURM ENVIRONMENTAL SERVICES
P.O. BOX 650 BRIDGEPORT, WV 26330
(304) 623-6549
FAX: (304) 623-6552

STURM ENVIRONMENTAL SERVICES
CHAIN OF CUSTODY RECORD

CHARLESTON OFFICE
321 4TH AVENUE P.O. BOX 8337
SO CHARLESTON, WV 25303
(304) 744-9864

CLIENT: W.V. Dept. of Environ. Protection
ADDRESS: 601 57th St., SE
CITY / STATE / ZIP: Charleston, WV 25304
BILL TO: C WVDEP
Buckeye Run

CONTACT: Jamie Peterson
TELEPHONE / FAX: (304) 926-0499 ext. 1653
E-MAIL: James.A.Peterson@wv.gov
SAMPLER: Jamie Peterson / Dave Gilbert

SAMPLE ID	DATE/TIME SAMPLED	GRAB/ COMP	Analysis Requested	FLOW (gpm)	FIELD pH	FIELD TEMP	FIELD COND	FIELD DO	TRC
1.-Upstream of well site	11/2/09 12:05pm	G.ab	BTEX						
	"	"	TPH-ORO						
	"	"	TPH-GRO						
	"	"	TPH-DRO						
	"	"	TOC						
	"	"	TDS						
	"	"	Fe (Iron)						
	"	"	Mn (Manganese)						
	"	"	Ca (Calcium)						
	"	"	Cl⁻ (Chloride)						
	"	"	pH						
	"	"	(Bacteria)						
	"	"	E.Coli						
	"	"	Total Coliform						
	"	"	Fecal						
	"	"	Na (Sodium)						
			SO4 Added 11/3 J.P.						

Relinquished by: Jamie Peterson Date/Time 11/2/09 3:31 pm Received by: [illegible] Date/Time 11-2-09 1531

Relinquished by: _____ Date/Time _____ Received by: _____ Date/Time _____

Relinquished by: _____ Date/Time _____ Received by: _____ Date/Time _____

Temp upon arrival: _____ Turn around time: Reg. _____ Rush _____ (fees will be charged) Non-conformance sheet attached _____

Sample Chlorinated: _____ SES pickup collection _____ Hand Delivered _____ Courier _____ Sample on Ice: Y or N

Preservative Codes: 0 – no preservative, 1- HCL, 2- HNO_3, 3-H_2SO_4, 4-$Na_2S_2O_3$, 5-NaOH, 6-other

(2)

STURM ENVIRONMENTAL SERVICES
P.O. BOX 650 BRIDGEPORT, WV 26330
(304) 623-6549
FAX: (304) 623-6552

STURM ENVIRONMENTAL SERVICES
CHAIN OF CUSTODY RECORD

CHARLESTON OFFICE
321 4TH AVENUE P.O. BOX 8337
SO CHARLESTON, WV 25303
(304) 744-9864

CLIENT: W.V. Dept. of Environ. Protection
ADDRESS: 601 57th St, SE
CITY / STATE / ZIP: Charleston, WV 25304
BILL TO: WVDEP
Buckeye Run

CONTACT: Jamie Peterson
TELEPHONE / FAX: (304)926-0499 ext 1653
E-MAIL: James.A.Peterson@wv.gov
SAMPLER: Jamie Peterson / Dave Gilbert

SAMPLE ID	DATE/TIME SAMPLED	GRAB/ COMP	Analysis Requested	FLOW (gpm)	FIELD pH	FIELD TEMP	FIELD COND	FIELD DO	TRC
2. Below oxbow	11/2/09 12:03	Grab	*All parameter listed	on	page (1) - above				
3 Below all bows	11/2/09 1:30	Grab	*All parameter listed on	page (1) - above					
4 Middle Island Creek	11/2/09 1:55	Grab	*All parameter listed on	page (1) - above					

Relinquished by: Jamie Peterson Date/Time 11/2/09 3:31pm Received by: [illegible] Date/Time 11-2-09 1531

Relinquished by: _____ Date/Time _____ Received by: _____ Date/Time _____

Relinquished by: _____ Date/Time _____ Received by: _____ Date/Time _____

Temp upon arrival: _____ Turn around time: Reg. _____ Rush _____ (fees will be charged) Non-conformance sheet attached _____

Sample Chlorinated: _____ SES pickup collection _____ Hand Delivered _____ Courier _____ Sample on ice: Y or N

Preservative Codes: 0 – no preservative, 1- HCL, 2- HNO_3, 3-H_2SO_4, 4-$Na_2S_2O_3$, 5-NaOH, 6-other

REI Consultants, Inc. Analytical Results

Date: *12-Nov-09*

CLIENT:	STURM ENVIRONMENTAL SERVICES	**WorkOrder:**	0911468 **Lab ID** 0911468-01A
Client Sample ID:	09632	**DateReceived:**	11/5/2009
Project:		**Collection Date:**	11/2/2009 12:15:00 PM
Site ID:	#1 UPSTREAM OF WELL SITE	**Matrix:**	LIQUID

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.11	11/9/2009 3:29:23 PM
TPH (Oil Range)	ND	mg/L		NA	0.27	11/9/2009 3:29:23 PM
Surr: n-Nonane	30.1	%REC			30-150	11/9/2009 3:29:23 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **JG**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	11/10/2009 2:15:18 PM
Surr: 2,5-Dibromotoluene	83.2	%REC			43.9-126	11/10/2009 2:15:18 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **JG**
Benzene	ND	µg/L		NA	1.0	11/10/2009 2:15:18 PM
Toluene	ND	µg/L		NA	1.0	11/10/2009 2:15:18 PM
Ethylbenzene	ND	µg/L		NA	1.0	11/10/2009 2:15:18 PM
m,p-Xylene	ND	µg/L		NA	2.0	11/10/2009 2:15:18 PM
o-Xylene	ND	µg/L		NA	1.0	11/10/2009 2:15:18 PM
Surr: 1,1,1-Trifluorotoluene	85.5	%REC			57.3-124	11/10/2009 2:15:18 PM

Key:

MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
NA	Not Applicable	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
TIC	Tentatively Identified Compound, Estimated Concentrati		

REI Consultants, Inc. Analytical Results

Date: *12-Nov-09*

CLIENT: STURM ENVIRONMENTAL SERVICES
Client Sample ID: 09633
Project:
Site ID: #2 BELOW OXBOW

WorkOrder: 0911468 **Lab ID** 0911468-02A
DateReceived: 11/5/2009
Collection Date: 11/2/2009 12:30:00 PM
Matrix: LIQUID

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.11	11/9/2009 4:39:43 PM
TPH (Oil Range)	ND	mg/L		NA	0.27	11/9/2009 4:39:43 PM
Surr: n-Nonane	61.8	%REC			30-150	11/9/2009 4:39:43 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **JG**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	11/10/2009 2:50:28 PM
Surr: 2,5-Dibromotoluene	86.2	%REC			43.9-126	11/10/2009 2:50:28 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **JG**
Benzene	ND	µg/L		NA	1.0	11/10/2009 2:50:28 PM
Toluene	ND	µg/L		NA	1.0	11/10/2009 2:50:28 PM
Ethylbenzene	ND	µg/L		NA	1.0	11/10/2009 2:50:28 PM
m,p-Xylene	ND	µg/L		NA	2.0	11/10/2009 2:50:28 PM
o-Xylene	ND	µg/L		NA	1.0	11/10/2009 2:50:28 PM
Surr: 1,1,1-Trifluorotoluene	85.3	%REC			57.3-124	11/10/2009 2:50:28 PM

Key:

MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
NA	Not Applicable	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
TIC	Tentatively Identified Compound, Estimated Concentrati		

REI Consultants, Inc. Analytical Results

Date: *12-Nov-09*

CLIENT:	STURM ENVIRONMENTAL SERVICES	**WorkOrder:**	0911468 **Lab ID** 0911468-03A
Client Sample ID:	09634	**DateReceived:**	11/5/2009
Project:		**Collection Date:**	11/2/2009 1:00:00 PM
Site ID:	#3 BELOW ALL	**Matrix:**	LIQUID

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.11	11/9/2009 5:17:01 PM
TPH (Oil Range)	ND	mg/L		NA	0.28	11/9/2009 5:17:01 PM
Surr: n-Nonane	57.8	%REC			30-150	11/9/2009 5:17:01 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **JG**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	11/10/2009 3:25:38 PM
Surr: 2,5-Dibromotoluene	85.6	%REC			43.9-126	11/10/2009 3:25:38 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **JG**
Benzene	ND	µg/L		NA	1.0	11/10/2009 3:25:38 PM
Toluene	ND	µg/L		NA	1.0	11/10/2009 3:25:38 PM
Ethylbenzene	ND	µg/L		NA	1.0	11/10/2009 3:25:38 PM
m,p-Xylene	ND	µg/L		NA	2.0	11/10/2009 3:25:38 PM
o-Xylene	ND	µg/L		NA	1.0	11/10/2009 3:25:38 PM
Surr: 1,1,1-Trifluorotoluene	85.2	%REC			57.3-124	11/10/2009 3:25:38 PM

Key:

MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
NA	Not Applicable	H	Holding times for preparation or analysis exceeded
ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
TIC	Tentatively Identified Compound, Estimated Concentrati		

REI Consultants, Inc. Analytical Results

Date: *12-Nov-09*

CLIENT:	STURM ENVIRONMENTAL SERVICES	**WorkOrder:**	0911468 **Lab ID** 0911468-04A
Client Sample ID:	09635	**DateReceived:**	11/5/2009
Project:		**Collection Date:**	11/2/2009 1:25:00 PM
Site ID:	#4 MIDDLE ISLAND CREEK	**Matrix:**	LIQUID

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
SEMI-VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **TM**
TPH (Diesel Range)	ND	mg/L		NA	0.11	11/9/2009 5:54:57 PM
TPH (Oil Range)	ND	mg/L		NA	0.28	11/9/2009 5:54:57 PM
Surr: n-Nonane	42.9	%REC			30-150	11/9/2009 5:54:57 PM
VOLATILE RANGE ORGANICS			**SW8015B**			Analyst: **JG**
TPH (Gasoline Range)	ND	mg/L		NA	0.50	11/10/2009 4:00:49 PM
Surr: 2,5-Dibromotoluene	86.6	%REC			43.9-126	11/10/2009 4:00:49 PM
VOLATILE ORGANIC COMPOUNDS			**SW8021B**			Analyst: **JG**
Benzene	ND	µg/L		NA	1.0	11/10/2009 4:00:49 PM
Toluene	ND	µg/L		NA	1.0	11/10/2009 4:00:49 PM
Ethylbenzene	ND	µg/L		NA	1.0	11/10/2009 4:00:49 PM
m,p-Xylene	ND	µg/L		NA	2.0	11/10/2009 4:00:49 PM
o-Xylene	ND	µg/L		NA	1.0	11/10/2009 4:00:49 PM
Surr: 1,1,1-Trifluorotoluene	85.2	%REC			57.3-124	11/10/2009 4:00:49 PM

Key:

MCL	Maximum Contaminant Level
MDL	Minimum Detection Limit
NA	Not Applicable
ND	Not Detected at the PQL or MDL
PQL	Practical Quantitation Limit
TIC	Tentatively Identified Compound, Estimated Concentrati
B	Analyte detected in the associated Method Blank
E	Estimated Value above quantitation range
H	Holding times for preparation or analysis exceeded
S	Spike/Surrogate Recovery exceeds REIC control limits
*	Value exceeds MCL or Regulatory Limits

APPENDIX H

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER AND WASTE MANAGEMENT (DWWM)
WATERSHED ASSESSMENT BRANCH (WAB)
BENTHIC SURVEY REPORT

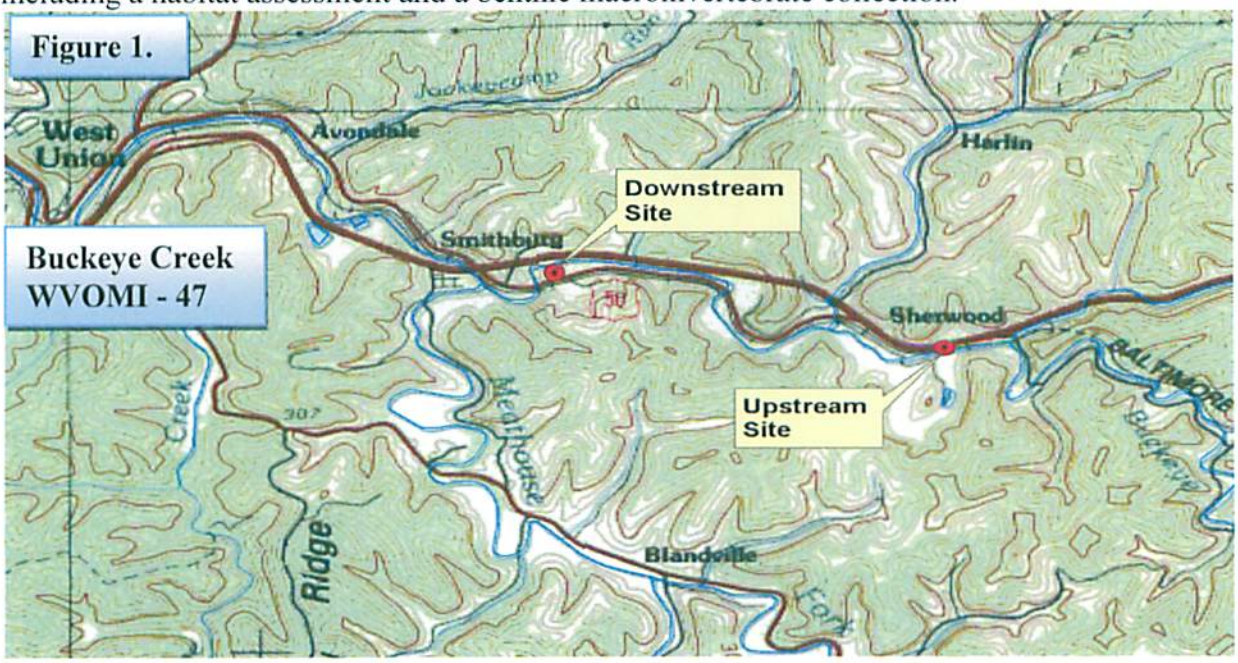
Streams: Buckeye Creek (WVOMI-47)
Survey Location: Doddridge County near Smithburg, WV
Survey Date: 11/23/09
Report Date: 12/30/09

INTRODUCTION

On November 23, 2009, personnel with the Watershed Assessment Branch (WAB) conducted a benthic macroinvertebrate survey on Buckeye Creek near Smithburg, West Virginia in response to a recent petroleum spill from a pit that was apparently drained into the Creek. WAB personnel included John Wirts (Program Manager) and Jeff Ginger (Aquatic Biologist). The objective of the survey was to determine the biological condition of Buckeye Creek post spill and compare conditions upstream and downstream of where the spill occurred. This report focuses primarily on the results of the benthic survey with reference to specific water quality constituents where applicable. No assessment of the fish community was conducted.

SURVEY AREA

The survey area was situated in Buckeye Creek along State Route 50 near the towns of Smithburg and Sherwood. The sample stations were located below Buckeye Run and above Meathouse Fork (see Table 1 for specific locations). The first test station (001) was established approximately 1.5 miles downstream of the area where the petroleum spill entered Buckeye Creek. This station was sampled in order to determine the condition of the benthic macroinvertebrate community post spill. A control station (002) was established in Buckeye Creek below the confluence with Buckeye Run but above the spill area. This control station was used to make comparisons of benthic data and water quality with the station located downstream of the spill area. Partial assessments were conducted at each station, including a habitat assessment and a benthic macroinvertebrate collection.



METHODS

Habitat Evaluation

A habitat evaluation was conducted utilizing a modified version of U.S. Environmental Protection Agency's Rapid Bioassessment technique. A detailed description of the protocol is given in EPA 841-B-99-002 Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (RBP). The approach focuses on integrating information from specific parameters on the structure of the physical habitat that are important to the survival and maintenance of benthic macroinvertebrate populations. Ten parameters were evaluated and given a score on a scale of 0 to 20. The scoring is broken down into four categories: 1) 0 to 5 = Poor; 2) 6 to 10 = Marginal; 3) 11 to 15 = Suboptimal; and 4) 16 to 20 = Optimal. The ten scores were summed to provide a total habitat score for each station (maximum score = 200).

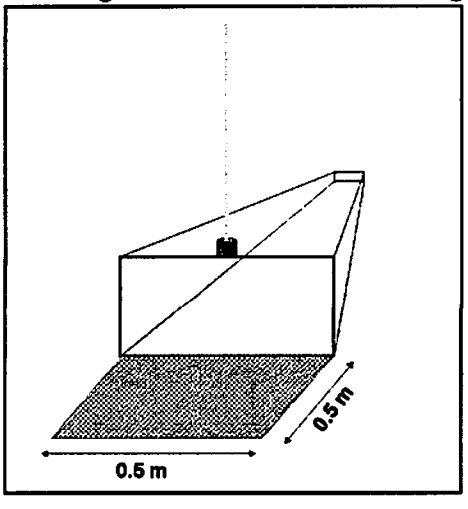
Physico-chemical Sampling

A YSI multi-parameter digital instrument was used to determine field measurements of dissolved oxygen (mg/L), water temperature (°C), pH (Std. Units), and conductivity (µmhos/cm).

Benthic Macroinvertebrate Sampling

The following are standard protocols (slightly modified) developed by the U.S. Environmental Protection Agency for conducting biological assessments of streams and rivers. A detailed description of the protocol is given in EPA 841-B-99-002 Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (RBP).

Benthic macroinvertebrates were collected using a 0.5 meter wide rectangular frame kick net with 600 µm mesh openings. The bottom substrate was examined to ensure that habitat was similar at each collection station. The net was positioned on the stream bottom in a riffle/run area so as to eliminate gaps under the frame. The surfaces of all large substrate particles (large gravel and larger) were cleaned using a dish washing scrub brush. The substrate particles were held in front of the net while brushing all surfaces so that dislodged organisms flowed into the net. Cleaned substrate particles were then set aside and the substrate was kicked vigorously for 20 seconds in an area approximating 0.25 square meters (one net width wide by one net width upstream of the net). This action dislodged bottom dwelling organisms and washed them into the net. Four kick samples were collected at each site and composited into one sample that represented approximately 1 square meter of stream bottom substrate. The samples were preserved in 95% ethanol and returned to WAB's biology laboratory for sorting and identification. Sorting involved placing the entire benthic sample into a rectangular sieve and removing a 200- organism sub-sample. The organisms were identified to the family level of classification or lowest level possible. A series of biological metrics were then calculated on each sample in order to determine the condition of the site:



Total Taxa - measures the total number of macroinvertebrate taxa (diversity or different kinds) collected in the sample. Total taxa generally decreases with increasing stream degradation

EPT Index - measures the total number of distinct taxa within the generally pollution sensitive groups Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). In general, this index increases with improving water quality. This index is widely used because it is very sensitive to changes in water quality.

Percent Contribution of 2 Dominant Taxa - measures the relative abundance of the 2 numerically dominant taxa to the total number of organisms in the sample. In healthy streams, there are generally several taxa, with the individuals being relatively evenly distributed among the different taxa. As stream water quality decreases, more individuals are concentrated in fewer, more tolerant taxa, and this metric increases. It is not uncommon for healthy streams to have as few as 40-60% of the total individuals in a sample in the 2 dominant taxa.

Percent EPT - measures the relative abundance of mayfly, stonefly, and caddisfly individuals to the total number of organisms in the sample. In general, this metric increases with improving water quality. It is common in healthy streams that at least 70 to 90% of the total organisms are in these sensitive orders.

Percent Chironomidae – measures the relative abundance of chironomid (midges) individuals to the total number of individuals in the sample. Chironomids are considered to be relatively tolerant to many pollutant sources. This metric generally increases in value with decreasing water quality. In healthy streams, it is not uncommon that less than 10% of the organisms in a sample belong to the family Chironomidae.

HBI (Hilsenhoff's Biotic Index - modified) - summarizes tolerances of the benthic community to organic pollution. Tolerance values are assigned to each taxon on a scale of 0 to 10, with 0 identifying the organisms that are least tolerant (most sensitive), and 10 identifying the most tolerant (least sensitive) organisms. The HBI metric score can be thought of as an average organic pollution tolerance value for a sample, weighted by the abundance of organisms. As water quality of a stream decreases, the HBI increases. This is especially true where organic enrichment is present. Since many of the organic pollution tolerant organisms are also tolerant to other stressors, the HBI is often used as a general indicator of stress. It is not uncommon for healthy streams with good water quality to have HBI scores in the 3 to 4 range.

WVSCI (WV Stream Condition Index) - The six benthic community metrics described above were combined into a single multimetric index, the West Virginia Stream Condition Index (WVSCI). The WVSCI was developed by Tetra Tech Inc. (2000) using WVDEP data collected from riffle habitats in wadeable streams. In general terms, all metric values were converted to a standard 0 (worst) to 100 (best) point scale. The six standardized metric scores were then averaged for each benthic sample site to come up with a final index score that ranges from 0.0 to 100.0. If a stream site received a WVSCI score greater than 78.0, it was considered in very good condition. A WVSCI score greater than 68.0, but equal to or less than 78.0 indicated good conditions. Initially, a site that received a WVSCI score equal to or less than 68.0 was considered impaired. However, because the final WVSCI score can be affected by a number of factors (collector, micro-habitat variables, subsampling, etc.), agency personnel sampled 26 sites in duplicate to determine the precision of the scoring. Following an analysis of the duplicate data, agency personnel determined the precision estimate to be 7.4 WVSCI points for a single sample. This value (7.4) was then subtracted from the impaired threshold score of

68.0 and generated what is termed the "gray zone" that ranges from 60.6 to 68.0. If a site had a WVSCI score within the gray zone, a single kick sample was considered insufficient for classifying it as impaired. If a site received a WVSCI score equal to or less than 60.6, the agency was highly confident that the site was truly biologically impaired based on a single benthic macroinvertebrate sample. In accordance, scores greater than 45.0 and equal to 60.6 indicated fair conditions. Scores between 22.0 to 45.0 indicated poor conditions, and between 0.0 to 22.0 indicated very poor conditions. *It should be noted that the WVSCI was developed based on benthic samples collected between May and October. It is unknown by WAB at this point what effect sampling outside this index period might have on the accuracy of a WVSCI score. However, because the benthic samples of all sites were compared to the same WVSCI standard, it was assumed for this report that they could be compared on a relative basis.*

Percent Ephemeroptera – measures the relative abundance of mayfly individuals to the total number of organisms in the sample. In general, mayflies are considered to be pollution sensitive. Stress to a benthic community may be indicated by substantial decreases in the percent of mayflies. *This metric was not used in the calculation of the WVSCI.*

Estimated Organism Density (per m^2) – provides an estimate of the total number of organisms collected in the sample per unit area (per square meter). *This metric was not used in the calculation of the WVSCI.*

RESULTS SUMMARY AND DISCUSSION

Habitat Evaluation

Results of the RBP habitat assessment for each site are presented in Table 2.

Photo 1. Station 001 – Upstream end of Assessment reach

Station 001

This test station was located (001) was established approximately 1.5 miles downstream of the area where the petroleum spill entered Buckeye Creek. In general, the benthic habitat at this station was good. The predominant substrate components within the riffle area were cobble and gravel. Other substrate components included sand and silt. The overall RBP habitat score (132) was in the sub-optimal category. Benthic substrate was given a score in the sub-optimal category (11)

and embeddedness was rated as sub-optimal (13) also. Sediment deposition was rated as sub-optimal with a score of 11.

There were signs of the petroleum spill still evident at this site. When the substrate was disturbed, flecks of oil were released into the water column. Also, there was a petroleum odor associated with the flotsam that had accumulated behind the upstream spill containment boom. However, there did not appear to be additional material floating downstream on the stream surface.

Photo 2. Jeff Ginger collecting benthic macroinvertebrate sample from Station 001.

Station 002

This station was located in Buckeye Creek below the confluence with Buckeye Run but above the spill area. Overall, the benthic habitat at this station was sub-optimal with a RBP habitat score of 132. Benthic substrate was given a score in the sub-optimal category (13) and embeddedness was rated as sub-optimal (11). Sediment deposition was also rated as sub-optimal (12). The predominant substrate components within the riffle area were cobble and gravel. Sand and silt were present in lesser quantities.

Photo 3. Spill containment boom located just upstream of Station 001.

Photo 4. Flotsom collecting behind the boom shown in Photo 3. This material had a distinct petroleum odor

Benthic Macroinvertebrate

Station 001

The results of this study indicated that the benthic macroinvertebrate community at Station 001 was in good condition (WVSCI = 71.53). Benthic diversity was relatively high at this station (Total Taxa = 16). The HBI metric was developed as means to measure organic pollution in streams. The HBI score (3.83) at Station 001 was an intermediate score, suggesting the spill had a marginal effect on the benthic community. Regardless, the station did have 7 EPT taxa including three mayflies, two stoneflies, and two caddisflies. The %EPT was relatively high with a score of 56.93. The two dominant taxa were Taeniopterygidae (stonefly) and Chironomidae (midges). These two organisms comprised 56.93% of the sample, indicating that the community was somewhat balanced. The percent (6.93) of the sample comprised of Ephemeroptera (mayflies) was notably low. This metric was not used in the calculation of the WVSCI. However, it was included in this study because it is known to be a good indicator of impairment in benthic studies. The estimated density of organisms at this station was 433 per square meter.

Station 002

Based on the WVSCI (72.6), the benthic macroinvertebrate community at this site was in good condition. Benthic diversity was good with a Total Taxa score of 16. The number of EPT taxa was relatively high with a score of 6. Additionally, the %EPT score (58.57) was relatively high and indicated that the benthic community was in good condition. The two dominant taxa in the sample were both caddisfly families, Hydropsychidae and Philopotamidae. These two taxa comprised 45.24% of the sample, indicating that the benthic community was well balanced. The HBI score increased from 3.83 at Station 001 to 4.48 at Station 002, an indication the benthic community was in slightly better condition at the 001. Compared to Station 001, the sample collected at Station 002 a higher

percentage of Ephemeroptera (mayflies), 6.93 % to 11.9%, respectively. The estimated density of organisms at this station was 400 per square meter.

CONCLUSIONS

The objective of the survey was to determine the biological condition of Buckeye Creek above and below where a recent petroleum spill was documented. Both upstream (002) and downstream (001) stations seem to be comparable and no adverse effects of the spill were observed except obvious sediment odors and visible oil sheens at station 001. The downstream station also had an elevated conductivity measurement which is not likely attributable to the spill. The benthic community was not impaired at either station according to the WVSCI. The discharges from this spill do not appear to be causing a substantial negative impact to the benthic macroinvertebrate community in Buckeye Fork. It is recommended that a more complete biological assessment be conducted in the spring of 2010 to determine the health of the fish and benthic communities.

Report Prepared By: Jeffrey Ginger– ERS 2

Report Reviewed By: John Wirts -

Table 1: Benthic Sample Site Location Information: *Buckeye Creek (11-23-09).*							
Station	**Stream Name**	**AN-Code**	**County**	**Quad**	**UTM(n)**	**UTM(e)**	**Date**
001	Buckeye Creek	WVOMI-47	Doddridge	Smithburg	4183471.5	470297.7	11/23/09
002 (control)	Buckeye Creek	WVOMI-47	Doddridge	Smithburg	4184491.9	469581.5	11/23/09

Table 2. Results of RBP habitat assessment: *Buckeye Creek (11-23-09).*			
Habitat Parameter (20 points possible per Parameter)		**Station Number**	
		001	002
Epifaunal Substrate/Available Fish Cover		11	13
Embeddedness		13	11
Velocity/Depth Regimes		13	10
Channel Alteration		17	13
Sediment Deposition		11	12
Riffle Frequency		13	15
Channel Flow Status		13	14
Bank Stability	Left	5	8
	Right	8	9
Bank Vegetative Protection	Left	5	8
	Right	9	9
Width of Undisturbed Zone	Left	5	2
	Right	9	8
Total Score (out of 200)		132	132
Score Category		sub-optimal	sub-optimal

Table 3: Field water quality data: *Buckeye Creek (11-23-09).*		
	Station Number	
Field Readings	001D	002U
Temperature ^{O}C	8.95	7.74
pH (std. Units)	7.59	7.23
Dissolved Oxygen (mg/L)	10.78	10.5
Conductivity (umhos/cm)	534	372

Table 4: Recent Field water quality data: *Buckeye Creek (2008-2009).*

STREAM NAME	MILE POINT	SAMPLE DATE	DO (mg/L)	pH (std. Units)	Specific Conductance (umhos/cm)	Temperature (^{o}C)
Buckeye Creek	0.4	21-Jul-08	7.63	7.85	298	26.71
Buckeye Creek	0.4	21-Aug-08	10.75	7.7	381	21.24
Buckeye Creek	0.4	09-Sep-08	7.55	7.66	415	19.55
Buckeye Creek	0.4	18-Nov-08	13.23	7.73	312	4.33
Buckeye Creek	0.4	10-Dec-08	12.63	7.65	NA	5.39
Buckeye Creek	0.4	20-Jan-09	16.57	7.26	188	0.04
Buckeye Creek	0.4	10-Feb-09	14.4	6.99	161	3.74
Buckeye Creek	0.4	24-Feb-09	17.48	7.17	165	1.55
Buckeye Creek	0.4	19-Mar-09	12.06	7.61	227	12.23
Buckeye Creek	0.4	08-Apr-09	13.4	7.18	125	7.22
Buckeye Creek	0.4	06-May-09	10.32	7.22	137	13.38
Buckeye Creek	0.4	17-Jun-09	8.92	7.81	316	23.28
Buckeye Creek	3.7	21-Jul-08	7.71	8.19	179	27.59
Buckeye Creek	3.7	21-Aug-08	9.61	7.82	228	22.51
Buckeye Creek	3.7	08-Sep-08	7.6	7.91	340	25.33
Buckeye Creek	3.7	17-Nov-08	12.39	7.6	251	5.53
Buckeye Creek	3.7	10-Dec-08	13.12	7.55	166	4.24
Buckeye Creek	3.7	20-Jan-09	16.09	6.73	117	0.03
Buckeye Creek	3.7	10-Feb-09	14.48	6.88	98	3.53
Buckeye Creek	3.7	24-Feb-09	17.36	7.3	104	1.75
Buckeye Creek	3.7	19-Mar-09	12.02	7.33	139	11.14
Buckeye Creek	3.7	08-Apr-09	13.47	6.86	95	6.26
Buckeye Creek	3.7	21-Apr-09	13.91	7.23	103	10.63
Buckeye Creek	3.7	17-Jun-09	9.86	7.86	175	23.49

Table 5: Benthic macroinvertebrate data: *Buckeye Creek (11-23-09).*		
	Station Number	
Taxon	001	002
ANNELIDA		
Oligochaeta (*Aquatic Earthworms*)	16	
MOLLUSCA		
Gastropoda *(Snails)*		
Ancylidae *(Limpets)*	3	3
Physidae	1	
Bivalva (*Clams*)		
Corbiculidae	1	5
Decapoda (*Crayfish*)		
Cambaridae		1
INSECTA		
Ephemeroptera (*Mayflies*)		
Baetiscidae	3	
Heptageniidae	13	16
Isonychiidae		9
Caenidae	1	
Odonata		
Anisoptera (*Dragonflies*)		
Coenagrionidae	2	2
Plecoptera (*Stoneflies*)		
Taeniopterygidae	85	
Leuctridae	11	2
Coleoptera (*Beetles*)		
Elmidae (*Riffle Beetles*)	28	20
Psephenidae *(Water Penny)*		26
Megaloptera		
Corydalidae (*Dobsonflies and Fishflies*)	3	1
Trichoptera (*Caddisflies*)		
Hydropsychidae		66
Limnephilidae	1	1
Philopotamidae	1	29
Glossosomatidae		
Diptera (True Flies)		
Simuliidae (*Black Flies*)		1
Chironomidae (*Midges*)	30	26
Tipulidae	3	2

Table 6. Benthic macroinvertebrate metric results: *Buckeye Creek (11-23-09).*		
	Station Number	
Metric	001	002
Total Taxa	16	16
EPT Taxa	7	6
% 2 Dominant Taxa	56.93	45.24
% EPT	56.93	58.57
% Chironomidae	14.85	12.38
HBI (family)	3.83	4.48
WVSCI	71.53	72.6
% Ephemeroptera (mayflies)	6.93	11.9
Est. Organism Density (per m^2)	433	400
Metric values were derived from a 200 organism sub-sample of the entire composite sample. WVSCI calculated using Total Taxa, EPT taxa, %2 Dom., %EPT, %Chironomidae, and HBI only.		

REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

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Title 46, Legislative Rule, Environmental Quality Board. 1999. Series 1. Requirements governing water quality standards.

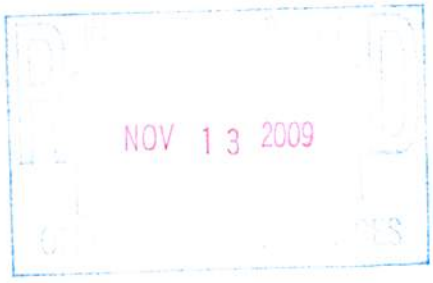
Ward, J.V. 1992. Aquatic Insect Ecology. 1. Biology and Habitat. New York, Chichester, Brisbane, Toronto, Singapore: John Wiley and Sons, Inc. 438 pp.

APPENDIX I

TOWN OF WEST UNION

◦ 300 Court Street ◦ PO Box 5 ◦ West Union, WV 26456-0005 ◦
PWSID 3300901 / NPDES permit WV0020109
Phone and Fax: 1-304-873-1249

November 12, 2009



Jody Jones, Esquire
WVDEP / Legal Counsel
601 57th St. SE
Charleston, WV 25304-2345

RE: Requested Data

Dear Mr. Jones:

The Town of West Union is pleased to supply the data you requested on November 10, 2009 at about 5 pm. We are glad that this matter is being aggressively pursued. Although, you only requested the EW-90, page three (Analytical Results) I thought it best that I include the page two for each month also. My reasoning for this is that the page two contains the "Raw" turbidity measurements (raw water is untreated water drawn directly from the creek before any treatment is performed) for the day also. Turbidity deals with the clarity or "muddiness" of the water in the stream.

I believe that the raw water turbidity should be considered when approaching the analysis of our data as some degree of manganese and iron are present in our raw water daily. Also, the amount varies with several factors of which turbidity is probably the most prominent. When we experience heavy rainfall and therefore, heavy ground runoff the creek muddies and the manganese and iron content of the raw water goes up. Temperature and creek flow (velocity) also contribute to elevated levels of manganese and iron. The temperature of our treated finished water is tracked on the supplied page three. I do not track the temperature of the raw water, but I believe we do little that would alter the temperature significantly enough to make a difference.

The primary purpose of this data is for our internal adjustment of chemical feeds. We are not striving to drive the manganese completely from the water, only to maintain it below the threshold where it will cause us problems in our system (0.05mg/l). I have total feed data also for the treatment chemicals if they would be of use.

Personnel with the Oil and Gas division explained to me that in their opinion all of the suspect contaminates were kept upstream of the containment booms and this was the basis for

the DEP not notifying the Town of the spill. I agree that if the booms are properly installed and maintained this may have been true for floatable constituents, but I do not concur for things that would become a part of the water. I believe that is why our intake is designed to be submerged under approximately three feet of water at all times.

Our main concern in this matter is to prevent a reoccurrence of the lack of notification, we cannot go back and undo the past. It is our firm contention that the public water supplies must be notified so that they can be allowed to protect their customers. All of the "Monday morning quarterbacking" in the world cannot protect our customers as effectively as the knowledge of what we are dealing with can. The lack of notification serves no public good.

If the Town of West Union can assist you in any way, please do not hesitate to call me at 304-873-1249.

Sincerely,

Duane H. Reynolds
Chief, Water and Wastewater
Town of West Union

Attached: EW-90, page 2 & 3 for 2007, 2008 & 2009 until current date
(74 pages)

APPENDIX J

BROAD STREET ENERGY, LLC

37 ~~WEST~~ BROAD STREET
SUITE 1100
COLUMBUS, OH 43215

Sold To

9006
HALL DRILLING, LLC.
215 EAST WASHINGTON AVE.
P.O. BOX 249
ELLENBORO, WV 26346

Invoice

Ship To/Remarks

9006
HALL DRILLING, LLC.
215 EAST WASHINGTON
P.O. BOX 249
ELLENBORO, WV 26346

DATE	PAGE	NUMBER	DUE DATE
07/30/2009	1	1080	08/14/2009

DESCRIPTION			
BRINE	BRINE - Inv. #3557	130.0000 @	1.50/BBL
BRINE	BRINE - Inv. #3558	130.0000 @	1.50/BBL

BROADSTR INV. 1080
DATE 7/30/09 AMT. 390.00
DATE _____ AUTH. BY VMT
COMMENT _____
ACCT# - LOC 54360 - 14
ACCT# - LOC _____

APPENDIX K

SHIP TO: 2332381
HALL DRILLING, LLC
215 WASHINGTON AVE
ELLENBORO WV 26346
UNITED STATES

BeP

BILL TO: 1951305
HALL DRILLING LLC
P O BOX 249
ELLENBORO WV 26346
UNITED STATES

Johnson screens™
A Weatherford Company

REMIT TO:
JOHNSON SCREENS, INC.
P O BOX 203137
HOUSTON TX 77216
UNITED STATES

INVOICE

Invoice Number:	
Invoice Date:	AUG 29 2009
Order Number:	5161981 SO
Order Date:	AUG 27 2009
Customer PO:	VERBAL HALL DRILLING
Location:	13001 NEW BRIGHTON
Phone No.:	800.833-9473
Fax No.:	651.638-3177
Sales Person:	STEINKE, THOMAS J

TERMS	NET DUE DATE	ORDERED BY	ENTERED BY
Net 30 days	SEP 28 2009		GUY, DEBORAH A

SHIPPING TERMS	SHIPPING INSTRUCTIONS
EXW Ex Works	

LINE NO.	ITEM NUMBER DESCRIPTION	UOM	QTY SHIPPED	UNIT PRICE	EXTENDED PRICE	TAX
	5 DAYS OF OPERATION WITH COMAG MOBILE UNIT AT THE AGREED UPON DISCOUNTED RATE OF $ 0 PER DAY = FOR THE 5 DAYS.					
	ENERGY CHARGE (GENERATOR) AT THE AGREED UPON RATE OF FOR THE 5 DAYS.					
2.000	Legacy #: 1-JWS Part #: 243591 COMAG MOBILE UNIT Ship Date: AUG 28 2009	EA	5.00			N
3.000	Legacy #: 1-JWS Part #: 243591 ENERGY CHARGE (GENERATOR) Ship Date: AUG 28 2009	EA	1.00			N

JOHNSCRE INV. 5108963RI
DATE 8/29/09 ANT
DATE 9/28/09 AUTH. BY VHF
ACCT - LOC 932000-120000
ACCT# LOC
001720

Johnson Screens (including any subsidiary, division or affiliate of Johnson Screens, Inc.) will provide the requested equipment, materials or services to the customer. Such provision shall be governed by the current agreement signed by both the customer and an officer of Johnson Screens. In the event there is no such agreement, Johnson Screens' standard terms and conditions will apply (www.johnsonscreens.com/t&c). A paper copy of those terms and conditions will be provided to the customer upon request. Notwithstanding anything to the

SUBTOTAL	
SALES TAX	0.00
TOTAL (USD)	

APPENDIX L

VIOLATION NO. 4279 DATE 9-9-09

41-17
5314

FORM VI 27
(REV 3-2007)

API NO. 47-017-05314

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS

NOTICE OF VIOLATION

LOCATION: FARM NAME Powell, Dennis & Melia WELL NO. Powell 7
DISTRICT Grant COUNTY Doddridge

TO: TAPCO DESIGNATED AGENT Terry Poling
ADDRESS P.O. Box 335 ADDRESS P.O. Box 335
West Union, WV 26456 West Union, WV 26456

The above well is being posted this 7th day of September, 2009, for a violation of West Virginia Code 22-6-7(i) and/or 35 CSR Series ___, Section ___, a Legislative rule of the Office of Oil and Gas of the Department of Environmental Protection, set forth in detail as follows: Allow pollutants or the effluent therefrom, produced by or emanating from any point source, to flow into the water of this state;

To abate the violation you must: Make every effort to clean up Sp. Il, report Volume Amount's. Maintain booms on stream dailey for residual Oil residue as long as it may be deemed necessary to appropriately restore stream to prespill condition. Also, you must share information as needed with the Office of Oil & Gas related to any test that may be ordered

A copy of this notice has been posted at the wellsite and sent by certified or registered mail to the person or Designated Agent named above.

You are hereby granted until September 16th, 2009, to abate this violation.

Failure to abate the violation by that date will result in bond forfeiture and may result in assessment of civil penalties, filing of misdemeanor charges and/or an action for injunctive relief.

An informal conference with the Oil and Gas inspector should be arranged prior to the date set forth above for abatement of the violation.

If you wish to contest this violation, refer to procedures outlined in West Virginia Code 22-6-4.

SIGNED David K. Kennedy ADDRESS P.O. Box 11

TITLE Oil & Gas Inspector Lost Creek, WV 26385

TELEPHONE (304) 350-3749

UNTIL THE DISTRICT OIL AND GAS INSPECTOR ISSUING THIS NOTICE RECEIVES A CALL FROM YOU (THE OPERATOR) STATING THIS VIOLATION IS ABATED, IT WILL BE ASSUMED THAT THE VIOLATION

APPENDIX M

west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
Telephone: (304) 926-0450
Fax: (304) 926-0452

Joe Manchin III, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

CONSENT ORDER
ISSUED UNDER
WEST VIRGINIA CODE, CHAPTER 22, ARTICLE 6

TO: Tapo Energy, Inc.
1100 Avalon Road
Fairmont, WV 26554

DATE: March 17, 2010

ORDER NO.: 2010-3
REVISED

INTRODUCTION

This Consent Order is issued by the Chief of the Office of Oil and Gas (hereinafter "Chief"), under the authority of West Virginia Code, Chapter 22, Article 6, Section 1 et seq. to Tapo Energy, Inc. (hereinafter "Tapo").

FINDINGS OF FACT

In support of this Order, the Chief hereby finds the following:

1. On March 2, 2009, Tapo was issued a new well permit identified as API number 47-017-05814.

2. On September 9, 2009, personnel of the WVDEP conducted an inspection of well API number 47-017-05814 and issued a notice of violation pursuant to West Virginia Code §22-6-7.

ORDER FOR COMPLIANCE

Now, therefore, in accordance with Chapter 22, Article 6, Section 1 et seq. of the West Virginia Code, it is hereby agreed between the parties, and ORDERED by the Chief:

1. Tapo shall immediately take all steps necessary to follow the requirements within West Virginia Code §22-6-7 and meet the standards of the General Water Pollution Control Permit.

2. Tapo agrees to pay a civil administrative penalty of $10,000.00 to resolve the violation described in this Order. Payment shall be made within 30 days of the effective date of the Order. Payment shall be mailed and payable to:

   Office of Oil and Gas
   601 57th Street, SE
   Charleston, WV 25304

   In addition, if Tapo fails to take the action required by the order or pay the foregoing amount timely, Tapo agrees to pay a stipulated penalty of $2,500.00 for each day that the action remains incomplete. The Chief shall first notify Tapo in writing that it is in violation of the terms of conditions of the Order, and the stipulated penalty shall then become immediately due and payable. Payments made pursuant to this paragraph are not tax-deductible expenditures for purposes of State or federal law.

OTHER PROVISIONS

1. Tapo hereby waives its right to appeal this Order under the provisions of Chapter 22, Article 6, of the Code of West Virginia. Tapo agrees to take all actions required by the terms and conditions of this Order and consents to and will not contest the Chief's jurisdiction regarding this Order. However, Tapo does not admit to any factual and legal determinations made by the Chief and reserves all rights and defenses available regarding liability or responsibility in any proceedings regarding Tapo other than proceedings, administrative or civil, to enforce this Order.

2. The Chief reserves the right to take further action if compliance with the terms and conditions of this Order does not adequately address the violations noted herein and reserves all rights and defenses which he may have pursuant to any legal authority, as well as the right to raise, as a basis for supporting such legal authority or defenses, facts other than those contained in the Findings of Fact.

3. If any event occurs which causes delay in the achievement of the requirements of this Order, Tapo shall have the burden of proving that the delay was caused by circumstances beyond its reasonable control which could not have been overcome by due diligence (i.e., force majeure). Force majeure shall not include delays caused or contributed to by the lack of sufficient funding. Within three (3) working days after Tapo becomes aware of such a delay, notification shall be provided to the Chief, and Tapo shall within ten (10) working days after initial notification, submit a detailed written explanation of the anticipated length and cause of the delay, the measures taken and/or to be taken to prevent or minimize the delay, and a timetable by which Tapo intends to implement these measures. If the Chief agrees that the delay has been or will be caused by circumstances beyond the reasonable control of Tapo (i.e., force majeure), the time for performance hereunder shall be extended for a period of time equal to the delay resulting from such circumstances. A force majeure amendment granted by the Chief shall be considered a

binding extension of this Order and of the requirements herein. The determination of the Chief shall be final and not subject to appeal.

4. Compliance with the terms and conditions of this Order shall not in any way be construed as relieving Tapo of the obligation to comply with any applicable law, permit, other order, or any other requirement otherwise applicable. Violations of the terms and conditions of this Order may subject Tapo to additional penalties and injunctive relief in accordance with the applicable law.

5. The provisions of this Order are severable and should a court or board of competent jurisdiction declares any provisions to be invalid or unenforceable, all other provisions shall remain in full force and effect.

6. This Order is binding on Tapo, its successors and assigns.

7. This Order shall terminate upon Tapo of full compliance with this Order and verification by the Chief of that compliance.

Tapo Energy, Inc.

03/17/10
Date

James Martin, Chief
Office of Oil and Gas

3-17-10
Date