COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

IN THE MATTER OF:

Range Resources-Appalachia, LLC	:	Violations of the Oil and Gas Act,
3000 Town Center Boulevard	:	the 2012 Oil and Gas Act,
Canonsburg, PA 15317	:	the Clean Streams Law,
	:	the Solid Waste Management Act, and
	:	the Dam Safety and Encroachments Act

CONSENT ORDER AND AGREEMENT

This Consent Order and Agreement is entered into this 17th day of September 2014, by and between the Commonwealth of Pennsylvania, Department of Environmental Protection ("Department") and Range Resources-Appalachia, LLC ("Range").

Findings

The Department has found and determined the following:

A. The Department is the agency with the duty and authority to administer and enforce The Clean Streams Law, Act of June 22, 1937, P.L. 1987, *as amended*, 35 P.S. §§ 691.1-691.1001 ("The Clean Streams Law"); the Oil and Gas Act, Act of December 19, 1984, P.L. 1140, *as amended*, 58 P.S. §§ 601.101-601.605 ("Oil and Gas Act"); Chapter 32 of Title 58 of the Pennsylvania Consolidated Statutes, 58 Pa. C.S. §§ 3201 – 3274 ("2012 Oil and Gas Act"); the Dam Safety and Encroachments Act, Act of November 26, 1978, P.L. 1375, *as amended*, 32 P.S. §§ 693.1-693.27 ("Dam Safety Act"); the Solid Waste Management Act, Act of July 7, 1980, P.L. 380, *as amended*, 35 P.S. §§ 6018.101-6018.1003 ("Solid Waste Management Act"); Section 1917-A of the Administrative Code of 1929, Act of April 9, 1929, P.L. 177, *as amended*,

71 P.S. § 510-17 ("Administrative Code"); and the rules and regulations promulgated thereunder ("Regulations").

B. Range is a Delaware limited liability company. Range engages in various oil and gas exploration and production activities in Pennsylvania, and has a mailing address of 3000 Town Center Boulevard, Canonsburg, PA 15317.

C. Range owns and operates the centralized impoundments listed below, located in Washington County ("Impoundments" or "Centralized Impoundments). Range used these Centralized Impoundments to store fluids associated with oil and gas development.

Permit Number	Name	Also Known As:	Township	County	ESCGP No.
DOG 6309-001	Hopewell Twp. 11	Lowry	Hopewell	Washington	0063-08-8-009
95-7-60915-1	Hopewell Twp. 12	Bednarski	Hopewell	Washington	0063-08-8-005
	Kearns	Kearns	Hopewell	Washington	ESG13-125-0091
95-7-60915-6	Amwell Twp. 15	Jon Day	Amwell	Washington	ESX09-125-0030
95-7-60915-7	Chartiers Twp. 16	Carol Baker	Chartiers	Washington	ESX09-125-0004
95-7-60915-8	Mt. Pleasant Twp. 17	Carter	Mt. Pleasant	Washington	ESX09-125-0013
95-7-60915-9	Yeager	Yeager	Amwell	Washington	ESX14-125-0059
95-7-60915-12	Cecil Twp. 23	Worstell	Cecil	Washington	ESX10-125-0031

D. ***Releases***. Sampling information indicates that releases or potential releases of contaminants to soils, water, and/or groundwater have or may have occurred from the following Centralized Impoundments:

1. Amwell Township 15: On April 15th, 2014, Chloride impacted soils were encountered during the removal of the centralized impoundment's liner.
2. Chartiers Township 16: There was a hole in the liner on or before February 2012. Subsequent samples from the groundwater monitoring wells of this centralized impoundment show elevated levels of manganese, chlorides, and total dissolved solids. A Soil Excavation Completion Report details the excavation of chloride contaminated soils.

3. Yeager: A May 15, 2014 Site Assessment Report submitted by Range details contamination to soils beneath the centralized impoundment's liner. Monitoring well data submitted by Range shows elevated chlorides and total dissolved solids in samples collected on June 18, 2014.
4. Cecil Township 23: Sample Results from groundwater monitoring wells for this Centralized Impoundment for sampling dates starting October 24, 2013 through August 7, 2014, show elevated concentrations of chloride, total dissolved solids, and sodium.
5. Hopewell Township 12: March 20, 2014 sampling from the leak detection zone underdrain showed elevated chloride levels. The presence of elevated chloride levels in the leak detection zone in this impoundment design indicates the potential for contamination to soils and/or groundwater.
6. Kearns: On July 11, 2014, Range notified the Department that 1 of 10 sub-liner soil samples had elevated chloride levels, indicating contamination to soils and potential contamination to groundwater.
7. The impoundments listed in numbers 1 - 4, and 6, above, are not presently holding fluids or otherwise in use.

E. ***Permit Violations***. Range failed to submit as-built plans to the Department, as required in the conditions of the Centralized Impoundment permits for the Lowry, Bednarski, Jon Day, Carol Baker, Carter and Yeager Centralized Impoundments.

Hopewell Township 12

F. On November 25, 2013, Range failed to properly contain and control brine fluid, specifically, approximately 30 barrels of reuse water was released at a pump/manifold structure when a valve malfunctioned.

G. Range failed to install and implement a groundwater monitoring program designed to detect any leakage from the Hopewell Township 12 Centralized Impoundment as required in condition number 14 of the permit for the Hopewell Township 12 Centralized Impoundment.

Kearns

H. On November 18, 2009, Range failed to properly contain and control diluted frac fluid from a black corrugated 4 inch pipe to the ground, causing and/or contributing to an impairment to the protected water uses, specifically resulting in harm to aquatic-life in an unnamed tributary to Brush Run, a High Quality Stream.

I. On February 23, 2010, Range failed to properly contain and control diluted frac fluid; specifically, fluids overflowed from the collection pit and discharged to an unnamed tributary.

J. On October 31, 2011, Range failed to properly contain and control diluted frac fluid; specifically, approximately 400 barrels of refac water was released to the ground and discharged to Dunkle Run.

K. On or before June 6, 2012, Range failed to obtain the necessary permit for the operation of a centralized impoundment.

Amwell Township 15

L. On February 11, 2013, Range failed to properly contain and control frac fluid; specifically, approximately twenty five (25) barrels of frac fluid discharged onto the ground while pumping fluids from holding tanks to the centralized impoundment.

M. On April 15, 2014, Range failed to properly contain and control diluted frac fluid; specifically, diluted frac fluid discharged from the impoundment through a hole in the liner.

Yeager

N. While in operation, and as notified on July 24, 2014, Range failed to monitor chlorides in the Yeager Impoundment's leak detection zone, as required by the permit for the Yeager Impoundment.

O. While in operation, Range failed to contain fluids in the Yeager Impoundment; specifically, on May 15, 2014, Range submitted a site assessment for the Yeager Impoundment, including information regarding areas beneath the impoundments liners where stored fluids with high chlorides concentrations were released to the ground, indicating a release of flowback, frac fluids, or similar fluids stored for use and/or re-use.

P. On August 8, 2014, the Department approved Range's plan to close the Yeager Impoundment, with modifications to Range's plan.

Chartiers Township 16

Q. On February 13, 2012, Range failed to properly contain and control frac fluid; specifically, frac fluid discharged via a hole in the centralized impoundment liner.

Mt. Pleasant Township 17

R. On or before March 24, 2014, Range constructed an encroachment on waters of the Commonwealth on a temporary waterline connected to the Mt. Pleasant Township 17

Centralized Impoundment without a permit or authorization; Range caused erosion and sedimentation entered into an unnamed tributary Cherry Run along this waterline; Ranged failed to follow plans contained in the general permit authorization for this project; Range failed to properly stabilize this project; and, Range failed to maintain copies of the permits on the site of this project.

S. On the dates and at the locations set forth above, describing failures to contain fluids stored in centralized impoundments, Range violated Sections 78.54 and 78.56(a) of the Department's Regulations, 25 Pa. Code §§ 78.54 and 78.56(a), by failing to properly contain fluids described in those paragraphs.

T. The fluids stored in the above-described Centralized Impoundments (including but not limited to frac fluid, diluted frac fluid, brine, flowback water, treated fluids, and production fluids), when released onto the ground, are each a "residual waste" as that term is defined in Section 103 of the Solid Waste Management Act, 35 P.S. § 6018.103.

U. On the dates and at the locations of the above-listed releases from Centralized Impoundments, Range disposed of residual waste by deposition onto the ground at the above described sites, in a manner not authorized by the rules and regulations of the Department, in violation of Sections 301 and 610(4) of the Solid Waste Management Act, 35 P.S. §§ 6018.301, 6018.610(4).

V. The fluids stored in these centralized impoundments (including but not limited to frac fluid, diluted frac fluid, brine, flowback water, treated fluids, and production fluids), when discharged into a water of the Commonwealth, is each an "industrial waste" as that term is defined in Section 1 of the Clean Streams Law, 35 P.S. § 691.1. A stream, tributary, conveyance

of surface water, and groundwater are defined in Section 1 of the Clean Streams Law, 35 P.S. § 691.1, as waters of the Commonwealth.

W. On the dates and at the locations of the above-listed releases, Range discharged industrial waste into waters of the Commonwealth, in a manner not authorized by the rules and regulations of the Department, in violation of Sections 301 and 307 of the Clean Streams Law, 35 P.S. §§ 691.301 and 691.307.

X. On the dates and at the locations set forth above wherein Centralized Impoundments released fluids and subsequent sampling and monitoring of waters of the Commonwealth show continued impacts therefrom, Range failed to take necessary actions to prevent the discharge of pollutants to waters of the Commonwealth and/or to recover or remove the substance that was released, in violation of 25 Pa. Code §§ 78.66, 91.34(a).

Y. On the dates and at the locations set forth above describing releases from Centralized Impoundments, Range failed to properly document, monitor, operate, and maintain the Centralized Impoundments in accordance with the terms and conditions of their permits, in violation of Section 13(a)(1) of the Dam Safety and Encroachment Act, 32 P.S. § 693.13(a)(1).

Z. In regard to the above-described temporary waterline associated with the Carter centralized impoundment, Range failed to obtain a permit or approval for an encroachment in a violation of Section 6 of the Dam Safety Act, 32 P.S. § 693.6, and 25 Pa. Code § 105.11, and failed to prevent sediment-laden water, an industrial waste, from entering a tributary to Cherry Run due its failure to follow plans in a general permit authorization requiring erosion and sediment controls, in violation of 25 Pa. Code § 102.5(m)(4) and Sections 301 and 307 of the Clean Streams Law, 35 P.S. §§ 691.301 and 691.307.

AA. These violations constitute unlawful conduct under Section 3259 of the 2012 Oil and Gas Act, 58 Pa.C.S. § 3259, Section 611 of the Clean Streams Law, 35 P.S. § 691.611, Section 610 of the Solid Waste Management Act, 35 P.S. § 6018.610, and Section 18 of the Dam Safety and Encroachments Act, 32 P.S. § 693.18; a public nuisance under Section 601 of the Solid Waste Management Act, 35 P.S. § 6018.601; and, subject Range to civil penalty liability under Section 3256 of the 2012 Oil and Gas Act, 58 Pa C.S. § 3256, Section 605 of the Clean Streams Law, 35 P.S. § 691.605, Section 605 of the Solid Waste Management Act, 35 P.S. § 6018.605, and/or Section 21 of the Dam Safety and Encroachments Act, 32 P.S. § 693.21.

Order

After full and complete negotiation of all matters set forth in this Consent Order and Agreement, and upon mutual exchange of the covenants contained herein, the Parties desiring to avoid litigation and intending to be legally bound, it is hereby ORDERED by the Department and AGREED to by Range as follows:

1. ***Authority.*** This Consent Order and Agreement is an Order of the Department authorized and issued pursuant to Sections 5, 316, and 610 of The Clean Streams Law, 35 P.S. §§ 691.5, 691.316, and 691.610; Section 3253 of the 2012 Oil and Gas Act, 58 Pa.C.S. § 3253; Section 602 of the Solid Waste Management Act, 35 P.S. § 6018.602; Section 20 of the Dam Safety Act, 32 P.S. § 693.20; and, Section 1917-A of the Administrative Code, 71 P.S. § 510-17.

2. ***Findings.***

a. Range agrees that the Findings in Paragraphs A through R, above, are true and correct and, in any matter or proceeding involving Range and the Department, Range shall not challenge the accuracy or validity of these Findings.

b. The Parties do not authorize any other persons to use the Findings in this Consent Order and Agreement in any matter or proceeding.

3. ***Impoundment Closure and Site Assessment.***

a. Range shall cease all use of, including but not limited to any fluid storage operations, in accordance with the schedule set forth in Appendix A, at the Hopewell Township 11, Hopewell Township 12, Cecil Township 23, and Kearns Centralized Impoundments, and continue the closure of the Yeager centralized impoundment (collectively, the "Closed Impoundments"), and shall complete the permanent closure of those facilities in accordance with the schedule identified in Appendix A to this Consent Order and Agreement. Permanent closure of each Closed Impoundment must be completed in accordance with this Consent Order and Agreement, the permits identified in Paragraph C, any approved closure plans, and any subsequent amendments and/or modifications thereto. Upon ceasing fluid storage operations, any stormwater that accumulates due to precipitation events shall be removed and handled in accordance with the requirements found in 25 Pa. Code § 78.60 or as otherwise approved by the Department.

b. During closure of the impoundments, Range shall perform an environmental site assessment of each Closed Impoundment pursuant to the "Generalized Site Assessment and Remediation Plan" identified in Appendix B to this Consent Order and Agreement.

c. Upon completion of the activities in the Generalized Site Assessment and Remediation Plan for each Closed Impoundment, Range shall prepare a Generalized Site Assessment and Remediation Plan Report. The Generalized Site Assessment and Remediation Plan Report for each centralized impoundment shall be completed and submitted to the

Department pursuant to the schedule contained in Appendix A of this Consent Order and Agreement.

d. If the results in the Generalized Site Assessment and Remediation Plan Report described in Paragraph 3.c. indicate that a release has previously occurred or continues to occur to soil, groundwater or surface water ("Reported Releases"), Range shall conduct an investigation and remediate each contaminated area in accordance with Paragraph 5, below.

4. ***Impoundment Upgrades and Investigation – Amwell Township 15 and Chartiers Township 16 Impoundments:***

a. Prior to placing the Amwell Township 15 and Chartiers Township 16 Impoundments back into service for the purpose of storing any fluids, Range shall submit a request for a Letter of Amendment to the Dam Permits for a Centralized Impoundment at Marcellus Shale sites ("Letter of Amendment for Dam Permit" or "Letter of Amendment") for the Amwell Township 15 and Chartiers Township 16 impoundments ("Upgraded Impoundments"), in accordance with 25 Pa. Code § 105.89. Range shall upgrade the design of the Upgraded Impoundments to, at a minimum, comply with the impoundment standards set forth in the Department's document titled *Design and Construction Standards for Centralized Impoundment Dams (document number 8000-PM-OOGM0084, revised 12/2013)* and as amended in the technical design specifications provided for in Appendix C of this Consent Order and Agreement (the standards set forth in document number *8000-PM-OOGM0084*, as amended by Appendix C, are hereinafter referred to as the "Design Standards"). In accordance with 25 Pa. Code § 105.89(b), the requirements in 25 Pa. Code §§ 105.89(a)(1), 105.89(a)(5), 105.89(a)(7), and 105.89(a)(9) will be deemed to have been met or waived if Range complies with the minimum standards in the Design Standards. Each Letter of Amendment shall include a

schedule of re-installation of an Upgraded Impoundment. The Department will review the Letter of Amendment submissions in an expedited manner.

b. Range shall complete the re-installation of the Upgraded Impoundments in accordance with each facility's current centralized impoundment dam permit as amended by the Letter of Amendment for each Upgraded Impoundment.

c. Upon completion of the re-installation of each Upgraded Impoundment, Range shall notify the Department of the date of completion and shall supply to the Department with updated as-built drawings, maps, plans, profiles, and specifications of the Upgraded Impoundment within forty-five days of the completion of construction and prior to putting the Upgraded Impoundment back into use.

d. Range shall operate each Upgraded Impoundment in accordance with the conditions of the current centralized impoundment dam permit for each Upgraded Impoundment (as amended), the Department's regulations, the additional operating requirements contained in the Design Standards (as defined in Paragraph 4.a), and an approved Letter of Amendment for Dam Permit.

e. Upon signing this Consent Order and Agreement, Range shall begin the investigation, documentation, and remediation of contaminated soils, surface water, and groundwater at each Upgraded Impoundment in accordance with Paragraph 5, below.

f. The Erosion and Sediment Control General Permit Authorization for the Chartiers Township 16 Centralized Impoundment is extended pending issuance of an ESCGP-2 authorization (application previously submitted). Any earth disturbance conducted pursuant to ESCGP-1 shall be completed in accordance with the general permit conditions of the ESCGP-2.

5. ***Investigation and Remediation of Contaminated Areas.***

a. In accordance with the applicable remediation standards of the Land Recycling and Environmental Remediation Standards Act, Act of May 19, 1995, P.L. 4, No. 1995-2, 35 P.S. §§ 6026.101-6026.909 ("Act 2") and its Regulations and this Consent Order and Agreement, Range shall investigate and remediate impacts to soil, groundwater, and surface waters from the Closed and Upgraded Impoundments, including but not limited to investigation and remediation of contamination from the discharge of impoundment fluids to or into the soils, surface waters, and/or groundwater.

b. Within ten days after the date of this Consent Order and Agreement Range shall hire a qualified environmental consultant to investigate and remediate impacts to soil, groundwater or surface water and shall simultaneously submit to the Department, in writing, the name, address, and telephone number of such consultant. For Reported Releases (as defined in Paragraph 3.d.) that are identified pursuant to the Environmental Site Assessment performed pursuant to paragraph 3, above, this 10-day period shall commence upon the submittal of the Generalized Site Assessment and Remediation Plan Report described in Paragraph 3.b.

c. Range shall submit to the Department a written plan to investigate and remediate impacts to soil, groundwater and surface water that was contaminated by the discharge and disposal of fluids from the Closed or Upgraded Impoundment ("Remediation Plan"), within 60 days after the date of this Consent Order and Agreement. For Reported Releases (as defined in Paragraph 3.d) that are identified pursuant to the Environmental Site Assessment performed pursuant to paragraph 3, above, this 60-day period shall commence upon the submittal of the Generalized Site Assessment and Remediation Plan described in Paragraph 3.b. The Remediation Plan shall, at a minimum:

i. be prepared and submitted by the qualified environmental consultant hired by Range in accordance with Paragraph 5.b., above;

ii. be developed pursuant to the Department's Technical Guidance Document, *Addressing Spills and Releases at Oil and Gas Well Sites or Access Roads* (document number 800-50000-001). For contaminants where a statewide health standard does not exist for a specific media of concern, such as for chloride in soil, the remedial approach may include a demonstration that the contaminant levels in the specific environmental media meet background levels and/or a demonstration that the contaminant levels as such that the contaminant no longer poses a threat to the environment;

iii. include a summary of the interim remedial actions that have been completed to date to contain the discharge and disposal of oil, brine, and/or other production fluids from the Closed or Upgraded Impoundment onto the ground, and the plan and schedule for continuing these interim remedial actions until the final, Department-approved remedial actions have been completed in accordance with this Consent Order and Agreement; and,

iv. include a schedule for completing the remedial actions and for submitting the reports required to demonstrate attainment with the chosen remediation standard in accordance with the requirements of 25 Pa. Code §§ 250.2(b)(1) and 250.2(b)(2).

d. Upon receipt of the Department's written approval of the Remediation Plan or revised Remediation Plan, and in accordance with the Department-approved schedule,

Range shall timely proceed with the investigation and remediation of the contaminated soil, surface water and groundwater at each Centralized Impoundment.

e. Range shall submit "Progress Reports" to the Department on a quarterly basis. The Progress Reports shall be due by the 30th day of the month following each calendar quarter (*i.e.* April 30, July 30, October 30, and January 30), and shall describe the actions taken in the previous quarter to comply with the requirements of this Order, including the requirements in plans or other documents approved by the Department under this Order.

f. All work described in Remediation Plans shall be completed within the time periods set forth in the approved Remediation Plan.

6. ***Mt. Pleasant Township 17 Impoundment.***

a. ***Freshwater usage only***. Upon signing this Consent Order and Agreement, Range shall only use the Mt. Pleasant 17 Impoundment for storage of freshwater. For the purposes of this Consent Order and Agreement only, "freshwater" is defined as water to be used in fracturing operations which is water taken directly from a source approved in Range's Water Management Plan and which has not been used in prior fracturing operations, as well as rainwater that enters the Impoundment. Brine that has been used in prior fracturing operations but which has been cleaned, processed, and supplied from a source under Range's Water Management Plan will not be considered as freshwater under this Consent Order and Agreement.

b. ***Waterline/Disturbed Areas/Encroachments***. Within 30 days from the date of this Consent Order and Agreement, Range shall apply for all of the necessary authorizations for the land disturbance and encroachments described in Paragraph R, above (a waterline project inspected on March 24, 2014). Alternatively, Range must abandon and restore any disturbed areas associated with that waterline project as approved by the Department.

c. ***Site Assessment.*** Within 90 days of the date of this agreement, Range shall install a groundwater monitoring network to determine current groundwater conditions near the Mt. Pleasant Township 17 impoundment. The design and operation of groundwater monitoring well network shall be consistent with Conditions IV(h) – (o) of the *Design and Construction Standards for Centralized Impoundment Dams (document number 8000-PM-OOGM0084, Rev. 12/2013)*. Within 90 days of closing the Mt. Pleasant Township 17 Impoundment, Range shall complete an environmental site assessment in accordance with Paragraphs 3.b and 3.c of this Consent Order and Agreement.

7. ***Water Supply Impacts.*** Nothing in this Consent Order and Agreement shall limit Range's obligation to restore or replace any polluted or diminished water supplies as required by Section 3218 of the 2012 Oil and Gas Act, 58 Pa. C.S. § 3218, or any other law or regulation.

8 ***Time is of the Essence.*** Range shall timely fulfill all of the obligations set forth in this Consent Order and Agreement. If Range fails to comply with any obligation under this Consent Order and Agreement, then the Department may, among other remedies immediately terminate any permits described herein still in effect and may immediately terminate this Consent Order and Agreement. Range reserves the right to appeal any termination of this Consent Order and Agreement or any termination of the permits or authorizations that are extended or amended, as provided herein, as final actions.

9. ***Submission and Review of Documents***. With regard to the documents submitted by Range in accordance with this Agreement for the Department's approval, the Department will review those documents and will approve or disapprove them, or portions thereof, in writing. If any document, or any portion thereof, is disapproved by the Department, Range shall provide a revised document to the Department that addresses the Department's concerns within no more

than 15 days. If that revised document addresses the Department's concerns, the Department will approve, or modify and approve, the revised document in writing. Upon approval by the Department, the approved document will be automatically incorporated into this Consent Order and Agreement and shall be an enforceable requirement of this Consent Order and Agreement.

10. ***Civil Penalty Settlement.*** Upon signing this Consent Order and Agreement, Range shall pay a civil penalty of Four Million One Hundred Fifty Thousand Dollars ($4,150,000). This payment is in settlement of the Department's claim for civil penalties for the violations set forth herein, covering the dates set forth herein and up to the date of this Consent Order and Agreement. The payment shall be to the Commonwealth of Pennsylvania Department of Environmental Protection by wire transfer to the account number provided by the Department for deposit by the Department into the appropriate special funds.

11. ***Stipulated Civil Penalties.***

a. If Range fails to comply in a timely manner with any term or provisions of this Consent Order and Agreement, Range shall be in violation of this Consent Order and Agreement and in addition to other applicable remedies, Range shall pay a civil penalty in the amount of $1,500 per day for each violation.

b. Stipulated civil penalty payments shall be payable monthly on or before the 15th day of each succeeding month. Stipulated civil penalty payments shall be made out to the Commonwealth as set forth in the third sentence of Paragraph 10, above.

c. Any payment under this Paragraph shall neither waive Range's duty to meet its obligations under this Consent Order and Agreement nor preclude the Department from commencing an action to compel Range's compliance with the terms and conditions of this

Consent Order and Agreement. The payment resolves only Range's liability for civil penalties arising from the violation of this Consent Order and Agreement for which the payment is made.

d. Stipulated civil penalty payments shall be due automatically and without notice.

12. ***Additional Remedies.***

a. In the event Range fails to comply with any provision of this Consent Order and Agreement, the Department may, in addition to the remedies prescribed herein, pursue any remedy available for a violation of an order of the Department, including an action to enforce this Consent Order and Agreement.

b. The remedies provided by this Paragraph and Paragraph 11 (Stipulated Civil Penalties), above, are cumulative and the exercise of one does not preclude the exercise of any other. The failure of the Department to pursue any remedy shall not be deemed to be a waiver of that remedy. The payment of a stipulated civil penalty, however, shall preclude any further assessment of civil penalties for the violation for which the stipulated civil penalty is paid.

13. ***Reservation of Rights***. The Department reserves the right to require additional measures to achieve compliance with applicable law. Range reserves the right to challenge any action which the Department may take to require those measures.

14. ***Correspondence with the Department.*** All correspondence with the Department concerning this consent Order and Agreement and documents submitted in compliance with this Consent Order and Agreement shall be addressed to:

Compliance Specialist (Attn. J. Dewey)
Southwest District Oil and Gas Operations
Department of Environmental Protection
400 Waterfront Drive
Pittsburgh, PA 15222

15. ***Correspondence with Range.*** All correspondence with Range concerning this Consent Order and Agreement shall be addressed to:

Anthony Gaudlip
Range Resources-Appalachia, LLC
3000 Town Center Boulevard
Canonsburg, PA 15317

Range shall notify the Department in writing whenever there is a change in the contact person's name, title, or address. Service of any notice or any legal process for any purpose under this Consent Order and Agreement, including its enforcement, may be made by mailing a copy by first class mail to the above address.

16. ***Force Majeure.***

a. In the event that Range is prevented from complying in a timely manner with any time limit imposed in this Consent Order and Agreement solely because of a strike, fire, flood, act of God, or other circumstance beyond Range's control and which Range, by the exercise of all reasonable diligence, is unable to prevent, then Range may petition the Department for an extension of time. An increase in the cost of performing the obligations set forth in this Consent Order and Agreement shall not constitute circumstances beyond Range's control. Range's economic inability to comply with any of the obligations of this Consent Order and Agreement shall not be grounds for any extension of time.

b. Range shall only be entitled to the benefits of this paragraph if it notifies the Department within five (5) working days by telephone and within ten (10) working days in writing of the date it becomes aware or reasonably should have become aware of the event impeding performance. The written submission shall include all necessary documentation, as well as a notarized affidavit from an authorized individual specifying the reasons for the delay,

the expected duration of the delay, and the efforts which have been made and are being made by Range to mitigate the effects of the event and to minimize the length of the delay. The initial written submission may be supplemented within ten working days of its submission. Range's failure to comply with the requirements of this paragraph specifically and in a timely fashion shall render this paragraph null and of no effect as to the particular incident involved.

c. The Department will decide whether to grant all or part of the extension requested on the basis of all documentation submitted by Range and other information available to the Department. In any subsequent litigation, the Range shall have the burden of proving that the Department's refusal to grant the requested extension was an abuse of discretion based upon the information then available to it.

17. ***Transfer of Impoundments.***

a. Range's duties and obligations under this Consent Order and Agreement shall not be modified, diminished, terminated, or otherwise altered by the transfer of any legal or equitable interest in the Impoundments or any part thereof unless done in accordance with Paragraph 17.c., below.

b. If Range intends to transfer any legal or equitable interest in the Impoundments or any part thereof, which is affected by this Consent Order and Agreement at the time of such transfer, Range shall serve a copy of this Consent Order and Agreement upon the prospective transferee of the legal and equitable interest at least 30 days prior to the contemplated transfer and shall simultaneously inform the Department, in writing, of such intent pursuant to Paragraph 14 (Correspondence with Department), above.

c. The Department in its sole discretion may agree to modify or terminate Range's duties and obligations under this Consent Order and Agreement upon transfer of the

Centralized Impoundments. Range waives any right that it may have to challenge the Department's decision in this regard. Range shall not transfer any legal or equitable interest in the impoundments or any part thereof except upon written approval by the Department and the transferee entering into an agreement with the Department for the remaining obligations under this Consent Order and Agreement.

18. ***Decisions Under Consent Order and Agreement.*** Any decision which the Department makes under the provisions of this Consent Order and Agreement, including a notice that the stipulated civil penalties are due, is intended to be neither a final action under 25 Pa. Code §1021.2, nor an adjudication under 2 Pa.C.S.A. §101. Any objection which Range may have to the decision will be preserved until the Department enforces this Consent Order and Agreement.

19. ***Severability***. The Paragraphs of this Consent Order and Agreement shall be severable and should any part hereof be declared invalid or unenforceable, the remainder shall continue in full force and effect between the Parties.

20. ***Entire Agreement.***

a. This Consent Order and Agreement shall constitute the entire integrated agreement of the Parties. No prior or contemporaneous communications or prior drafts shall be relevant or admissible for purposes of determining the meaning or intent of any provisions herein in any litigation or any other proceeding.

b. This Consent Order and Agreement constitutes settlement only of the civil liabilities for the violations set forth herein.

21. ***Execution of Agreement and Counterpart Signatures.*** This Consent Order and Agreement may be signed in counterparts, each of which shall be deemed to be an original and all

of which together shall constitute one and the same instrument. Facsimile signatures and signatures transmitted by facsimile or electronically by portable document format (.pdf) shall be valid and effective.

22. ***Attorney Fees***. The Parties shall bear their respective attorney fees, expenses, and other costs in the prosecution or defense of this matter or any related matters, arising prior to execution of this Consent Order and Agreement.

23. ***Modifications***. No changes, additions, modifications, or amendments of this Consent Order and Agreement shall be effective unless they are set out in writing and signed by the Parties hereto.

24. ***Liability of Operator***. Range shall be liable for any violations of the Consent Order and Agreement, including those caused by, contributed to, or allowed by its officers agents, employees, or contractors. Range also shall be liable for any violation of this Consent Order and Agreement caused by, contributed to, or allowed by its successors and assigns, if any.

25. ***Titles***. A title used at the beginning of any paragraph of this Consent Order and Agreement may be used to aid in the construction of that paragraph, but shall not be treated as controlling.

26. ***Termination of Consent Order and Agreement***. Range's obligations, but not the Findings, of this Consent Order and Agreement shall terminate when Range has: 1) completed all of the requirements of this Consent Order and Agreement; 2) achieved compliance with the Oil and Gas Act, Clean Streams Law, Dam Safety and Encroachments Act, Solid Waste Management Act, and Regulations at the facilities described in this Consent Order and Agreement by having no outstanding violations; and 3) paid any outstanding civil penalties set

forth herein or any stipulated civil penalties due under Paragraph 11 (Stipulated Civil Penalties), above.

IN WITNESS WHEREOF, the Parties have caused this Consent Order and Agreement to be executed by their duly authorized representative. Range certifies under penalty of law, as provided by 18 Pa.C.S.A. § 4904, that it consents to the entry of this Consent Order and Agreement as a final ORDER of the Department; and that it hereby knowingly waive its right to appeal this Consent Order and Agreement and to challenge its content or validity, which rights may be available under Section 4 of the Environmental Hearing Board Act, the Act of July 13, 1988, P.L. 530, No. 1988-94, 35 P.S. § 7514; the Administrative Agency Law, 2 Pa.C.S.A. §103(a) and Chapters 5A and 7A; or any other provision of law. Signature by Range's attorney certifies only that the agreement has been signed after consulting with counsel.

FOR RANGE RESOURCES-APPALACHIA, LLC:

Name: David P. Poole
Senior Vice President

Name: David S. Goldberg
Assistant Secretary

Name: Terry R. Bossert, Esq.
Attorney for Range Resources-Appalachia, LLC

FOR THE COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION:

Eric A. Gustafson
District Manager
Southwest Oil and Gas Operations

Name: Richard T. Watling
Assistant Counsel

Appendix A

Impoundment Closure and Site Assessment Schedule

Hopewell Township 11, Cecil Township 23, Kearns and Yeager Impoundments:

1. Upon signing of COA: Cease all use of impoundment including fluid storage operations.

2. On or before October 1, 2014: Range shall begin implementing the "Generalized Site Assessment and Remediation Plan."

3. On or before October 30, 2014: Range shall submit a site-specific Impoundment Closure and Restoration Plan for the Hopewell Township 11, Cecil Township 23, and Kearns Centralized Impoundments for approval of the Department. The Impoundment Closure and Restoration Plan shall include a general construction sequence, description of proposed earthwork activities, a schedule for final restoration of the site, and be consistent with the Yeager Water Impoundment Closure and Reclamation Plan dated February 28, 2014 and as modified by the Department on August 8, 2014. As approved or modified by the Department, the site-specific Impoundment Closure and Restoration Plan for each site shall be completed in accordance with the schedule approved therein.

4. On or before April 1, 2015: Range shall complete all tasks identified in Sections 3 through 8 of the "Generalized Site Assessment and Remediation Plan."

5. On or before May 1, 2015: Range shall submit the "Interim Report on Soil Conditions" and the "Water Quality Assessment Report", as identified in Sections 9.1 and 9.2 of the "Generalized Site Assessment and Remediation Plan."

Hopewell Township 12 Centralized Impoundment:

1. On or before April 1, 2015: Cease all use of impoundment including fluid storage operations.

2. On or before April 15, 2015: Range shall begin implementing the "Generalized Site Assessment and Remediation Plan."

3. On or before April 15, 2015: Range shall submit a site-specific Impoundment Closure and Restoration Plan regarding the Hopewell Township 12 Centralized Impoundment for approval of the Department. The Impoundment Closure and Restoration Plan shall include a general construction sequence, description of proposed earthwork activities, a schedule for final restoration of the site, and be consistent with the Yeager Water Impoundment Closure and Reclamation Plan dated February 28, 2014 and as modified by the Department on August 8, 2014. As approved or modified by the Department, the site-specific Impoundment Closure and Restoration Plan for each site shall be completed in accordance with the schedule approved therein.

4. On or before October 15, 2015: Range shall complete all tasks identified in Sections 3 through 8 of the "Generalized Site Assessment and Remediation Plan."

5. On or before November 15, 2015: Range shall submit the "Interim Report on Soil Conditions" and the "Water Quality Assessment Report", as identified in Sections 9.1 and 9.2 of the "Generalized Site Assessment and Remediation Plan."

Appendix B

Generalized Site Assessment and Remediation Plan

GENERALIZED SITE ASSESSMENT AND REMEDIATION PLAN (SARP)

CECIL TWP. 23 IMPOUNDMENT (fka WORSTELL)
HOPEWELL TWP. 11 IMPOUNDMENT (fks LOWRY)
KEARNS IMPOUNDMENT
HOPEWELL TWP. 12 IMPOUNDMENT (fka BEDNARSKI)

WASHINGTON COUNTY, PENNSYLVANIA

Prepared for:

RANGE RESOURCES - APPALACHIA, LLC
CANONSBURG, PENNSYLVANIA

Prepared by:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
PITTSBURGH, PENNSYLVANIA

CEC Project 142-883

August 27, 2014
REVISED September 15, 2014

Civil & Environmental Consultants, Inc.

Pittsburgh 333 Baldwin Road | Pittsburgh, PA 15205 | p: 412-429-2324 f: 412-429-2114 | www.cecinc.com

TABLE OF CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

This Generalized Site Assessment and Remediation Plan (SARP) was prepared by Civil & Environmental Consultants, Inc. (CEC) on behalf of Range Resources - Appalachia, LLC (Range). It details the proposed investigative approach for assessing each impoundment's soil, groundwater and surface water condition. It also proposes an approach to remediate impacts, if impacts are encountered. This SARP has been prepared for four impoundments located in Washington County, Pennsylvania. The impoundments that are to be investigated under this SARP include

- Cecil Twp. 23 Impoundment (fka Worstell), Cecil Township, Washington County Pennsylvania
- Hopewell Twp. 11 Impoundment (fka Lowry), Hopewell Township, Washington County, Pennsylvania
- Kearns Impoundment, Hopewell Township, Washington County, Pennsylvania
- Hopewell Twp. 12 Impoundment (fka Bednarski), Hopewell Township, Washington County Pennsylvania

The proposed site assessment and remediation activities are being performed as part of Range's operational plan to retire impoundments that were constructed to the Department's guidance design standards prior to December of 2010. Under Range's plan, the Worstell, Lowry and Bednarski impoundments are scheduled to be closed and reclaimed. The Kearns impoundment will be closed and redeveloped to a tank pad.

This Generalized SARP includes the following sections:

2.0 Background Information
3.0 SARP Objectives and Overview
4.0 Site Reconnaissance
5.0 Liner Inspections
6.0 Subliner Soil Testing Program
7.0 LDZ Soil Testing Program
8.0 Framework for Assessing Water Quality
9.0 Reporting
10.0 Emergency Response Measures and Development of Impoundment Remediation Plans

2.0 BACKGROUND INFORMATION

2.1 GENERAL

General information on each impoundment is summarized on Table 1. Engineering and design information is summarized on Table 2.

3.0 SARP OBJECTIVES AND OVERVIEW

3.1 SARP OBJECTIVES

The objectives of the SARP are to:

a) Assess and document the condition of the impoundment liners prior to removal;

b) Evaluate soil conditions beneath the impoundment;

c) Provide a framework for conducting an assessment of water quality at the impoundments that includes the following actions:

- Conducting a site reconnaissance at Worstell, Lowry and Bednarski impoundments where groundwater monitoring networks have been installed to monitor groundwater conditions at the frequency established in this SARP;
- For the Kearns impoundment, conducting a site reconnaissance and installing a groundwater monitoring well network to evaluate the groundwater conditions at the site;
- Supplementing groundwater assessment by sampling springs and seeps, bench drains and other locations near each impoundment;
- Identifying surface water and evaluating its relationship to seeps, springs, groundwater and bench drains.
- Continue to monitor the water quality and flow rate in the leak detection zone (LDZ);

d) If impacted soil and/or groundwater are encountered, establish protocols for performing remediation.

3.2 GENERAL ASSESSMENT APPROACH

In order to meet the project objectives, this generalized plan provides the framework for a multimedia sampling program that will include the assessment of soil, groundwater and surface water conditions. The initial step in the assessment process will be to conduct a site reconnaissance to identify possible background soil sampling locations; and to identify springs, seeps, streams, ponds, bench drain outlets, private water supplies and other locations as yet to be determined that could be included in the monitoring network. At the Kearns Impoundment where no groundwater monitoring well network was installed, the site reconnaissance will include evaluating suitable locations for monitoring wells. A revised SARP that provides specific approaches for background sampling, establishes a grid for subliner sampling, and identifies water quality monitoring points for each impoundment will be prepared and implemented.

The impoundments will be dewatered in preparation for closure. Water from the impoundments will be transported to a permitted storage facility or it will be used during ongoing hydraulic fracturing or it will be handled by other PADEP-approved methods. Once the impoundments are dewatered, an inspection of the primary liner will be performed to document its condition. Defects, penetrations or

other signs indicating the primary liner may have been compromised will be field-located using a mapping grade, hand-held Trimble GEO-XH 6000-Series Global Positioning System (GPS) so that additional inspection of the secondary liner can be completed at the locations where primary liner penetrations were identified. Following inspection, the primary liner will be removed and a visual inspection of the secondary liner will be performed to evaluate and document the condition of the liner. Results of the secondary liner inspection will be considered when choosing targeted subliner soil sampling locations discussed in Section 6.

A subliner soil testing program will be conducted to assess soil conditions beneath the impoundment liners. The proposed approach for investigating soil conditions beneath the impoundment liner is to sample on a pre-established grid. Field screening will be performed at these locations to identify soil conductivity above 2.0 milliSiemens/cm (mS/cm), and to assess those locations for petroleum constituents. If areas are identified where soil conductivity exceeds the threshold (here in "Areas of Interest"), targeted samples will be collected from these Areas of Interest and analyzed for a more comprehensive list of analytical parameters to more fully characterize soil chemistry. Targeted samples may also be collected in areas where liner damage was identified during the, above discussed, liner inspection. Within each Area of Interest, vertical profiling of soil conditions will be performed by hand augering to a depth of three feet where possible. At least one profile will be obtained within each Area of Interest.

Soil conditions will be investigated along the existing LDZ lines and at the LDZ collection manhole. In these areas, soil conditions will be investigated by advancing soil borings to characterize soil conditions beneath the LDZ lines in areas where the LDZ line is not incised into bedrock.

A minimum of 12 soil samples will be collected to establish background soil conditions at each impoundment.

3.3 GENERAL REMEDIATION APPROACH

Results of grid grab sampling, targeted subliner soil sampling, and sampling along the LDZ lines will be compared to statewide health standards, and for those constituents for which no statewide health standards exists, a comparison to background conditions will be made to identify constituents of concern. Similarly, groundwater sampling results will be compared to statewide health standards, and for those constituents for which no statewide health standards exists, a comparison to background conditions (if available) will be made to identify constituents of concern. The statewide health standards against which soil and groundwater sampling results will be compared will assume a used aquifer residential exposure scenario. Constituents of concern in soil and groundwater will be remediated in accordance with the Department's Technical Guidance document, *Addressing Spills and Releases at Oil & Gas Well Sites or Access Roads* (document number 800-5000-001) or possibly by demonstrating that they are no longer an environmental concern.

If conditions are encountered that pose a danger for polluting waters of the Commonwealth, they will be addressed in accordance with Range's Pollution Prevention Contingency Plan (PPC) Plan. Possible actions that may be taken to address such a situation could include (1) interim/emergency measures to contain and prevent further migration of the release, (2) interim/emergency measures to prevent migration of regulated substances into surface water and/or groundwater, (3) notifying downstream water users, and (4) providing alternative water sources to users who's drinking water source has been affected.

4.0 SITE RECONNAISSANCE

A site reconnaissance will be performed to identify springs and seeps, streams ponds, bench drain outlets, private water supplies and other locations yet to be determined that could be included in the water quality monitoring program to enhance understanding of local groundwater conditions. Private water supplies (wells and springs, etc.) will be identified within a 2,500 foot radius of the impoundment and will be located using GPS. During site reconnaissance, areas that will be sampled to establish background soil conditions will be selected. United States Department of Agriculture (USDA) soil survey maps will be consulted and considered when selecting background soil sampling locations. At the Kearns Impoundment where no groundwater monitoring network was installed, the site reconnaissance will include evaluating suitable locations for monitoring wells. Upon completing the site reconnaissance, site-specific SARPs will be prepared that identify (1) proposed background soil sampling areas; (2) a proposed subliner soil sampling grid, and (3) sampling points to be included in the groundwater water quality monitoring program, will be submitted to PADEP.

5.0 LINER INSPECTIONS

Prior to commencement of the secondary liner inspection, rain water that has accumulated in the impoundment will be removed by pushing water into low areas using brooms and vacuuming. Rain water may also be pumped into staging tanks and subsequently removed by water trucks or it will be handled by other PADEP-approved methods.

Once the impoundments are dewatered, an inspection of the primary liner will be performed to document its condition. Defects, penetrations or other signs indicating the primary liner may have been compromised will be field-located using a GPS so that additional inspection of the secondary liner can be completed at the locations where primary liner penetrations were identified. Following inspection, the primary liner will be removed and a visual inspection of the secondary liner will be performed to evaluate and document the condition of the liner

Liner inspections will be conducted by a team of field personnel comprised of Range and third-party personnel. The liner inspection team will systematically perform a visual inspection of the liner surface to identify any holes or locations where suspected liner defects are encountered. Initially, three to four passes will be conducted on transect lines oriented along the length of the impoundment. The liner inspection team will then perform three to four passes on transect lines oriented along the width of the impoundment. The location of liner defects identified during the inspection will be marked with red pin flag markers. The pin flags will be inserted into hockey pucks that will be placed at locations where there was visual evidence of a possible liner puncture.

Upon completion of the liner inspections, each of the flagged locations will be surveyed using a GPS. The liner conditions at each of the flagged locations will be further inspected, documented, and photographed for reference.

A map identifying each of the flagged locations will be generated to aid in identifying locations for targeted subliner soil sampling.

6.0 SUBLINER SOIL TESTING PROGRAM

A subliner soil testing program will be conducted to evaluate soil conditions beneath the impoundment liner and along LDZ lines between the sump and the manhole. The details of how these areas will be investigated are described below.

6.1 COLLECTION OF BACKGROUND SOIL SAMPLES

At each impoundment location, a minimum of 12 background soil samples will be collected to establish background soil conditions. Areas for background sample locations will be identified after the field reconnaissance is completed and after consultation of USDA soil survey maps. For each impoundment, the background locations will be selected to be far enough from the impoundment to avoid theoretical influences from impoundment operations and biased to represent soil horizons likely to be similar in character to that used for structural fill in the impoundment. For example, if the top of the impoundment is 1,250 feet above mean sea level (AMSL) and toe elevation is 1,235 feet AMSL, ideally the background soil sample locations would be chosen to obtain soil samples from within these elevations possibly taking into consideration a slight adjustment for the dip of the bedrock.

Background soil samples will be collected by installing borings using either a truck mounted drill rig or hand-operated auger. At each boring location, a soil sample will be collected from the 0-2 foot depth horizon and from greater depth, ideally within 5 feet of the bedrock. Background soil samples will be screened with a Geiger Counter to establish background radiation levels in the soil. The background soil samples will then be submitted to a qualified laboratory to be analyzed for the A and B list of parameters on Table 3. Background borings will be backfilled with cuttings after completion of drilling activities.

It should be noted that the lists of analytical parameters on Table 3 are tentative and subject to change based on further discussion internally and with PADEP. Laboratory preparation and analytical methods for the analyses to be performed are shown on Table 4.

6.2 SUBLINER SOIL TESTING PROGRAM

The subliner soil sampling program will consist of a grid-based field screening program to identify Areas of Interest. Where elevated soil conductivity and petroleum compounds are encountered, samples will be collected and analyzed for the full parameter list to characterize the soil and identify constituents of concern. Targeted sampling locations will be evaluated similarly. A brief discussion of the rationale and approach for each type of sampling follows.

Field Screening: The purpose of the field screening program is to obtain a broad characterization of soil conductivity, the extent of petroleum hydrocarbons, and radioactivity levels in shallow subliner soil throughout the impoundment. The soil screening will be performed on a pre-established grid spacing along the impoundment bottom and side slopes. A proposed field screening grid for each of the four impoundments to be investigated will be developed following the field reconnaissance.

At each field screening location, the soil will be screened for temperature compensated soil conductivity and volatile organic compounds (VOCs) and radioactivity. Soil conductivity

readings will be obtained using an Oakton pH/CON 300 meter or equivalent equipped with automatic temperature compensation. Soil conductivity and temperature will be measured by inserting the conductivity probe into the subliner soil to a depth of 3 to 4 inches. If the shallow soil reading exceeds 2.0 mS/cm, a second reading will be obtained from a depth of 6 to 8 inches. A shallow depth hand-held induction electromagnetic conductivity meter may be used to supplement and possibly replace the direct field probe conductivity measurements if field tests verify its accuracy.

Field screening for VOCs will be performed by placing grab samples from each soil screening location into a zip lock bag and measuring the VOCs in the headspace using a photoionization detector (PID). The bag will be heated to room temperature prior to taking the field reading. Within each grid, the grab sample that exhibits the highest VOC reading on the PID will be submitted to a qualified laboratory to be analyzed for organic compounds, i.e. the B List on Table 3. In order to preserve the integrity of the soil samples to be analyzed for VOCs, two splits, a "viable split" and "non-viable split" will be collected at each sample location. The viable split will be collected and placed into laboratory-provided containers and placed on ice. The non-viable split will be placed into a zip lock bag and be allowed to warm to room temperature. The headspace of the non-viable split will be screened for the presence of VOCs using a PID. The viable portion of the grab sample from each composite group that exhibits the highest PID reading will be submitted to the laboratory.

Screening of subliner soil for radioactivity will be performed on in-place soil using a Geiger Counter. If Geiger Counter radioactivity readings exceed the higher of either (a) 2 X the mean of the background concentrations, or (b) the maximum background reading, the subliner soil sample will be submitted to the analytical laboratory to be analyzed for radionuclides listed on Table 3.

Results of field screening in combination with the results of the liner inspection will be taken into consideration when selecting targeted sampling locations.

Targeted Sampling Program: Under the Targeted Sampling Program, up to 10 additional grab samples may be collected to characterize subliner soil conditions in areas where soil conductivity measurements identify Areas of Interest and in areas where the liner inspection identifies punctures in the liner. The majority of the targeted samples will be collected as grab samples from depth intervals of 0 to 6 inches below the liner. A minimum of two grab samples will be collected from beneath the liner adjacent to the LDZ underdrain. The samples will be submitted to a qualified laboratory to be analyzed for the A and B List of analytes on Table 3.

A minimum of one vertical soil profile will be attempted within each Area of Interest. At each vertical profiling location, soil samples will be collected at discrete 1 foot depth intervals beginning at the top of the soil beneath the liner and extend through a depth of 3 feet. Each discrete sample will be screened in the field for soil conductivity and VOCs using the methods described above. The sample that exhibits the highest conductivity based on field screening (one sample per vertical profiling location) will be submitted to a qualified laboratory to be analyzed for the A list of analytes on Table 3. The sample that exhibits the highest VOC reading at each sampling location (one sample per vertical profiling location) will be submitted to a qualified laboratory to be analyzed for the B List of analytes on Table 3. In the absence of measurable VOCs, the sample from the 2 to 3 foot interval will be submitted for laboratory analysis.

Field measurements for field screening and collection of subliner samples will be performed by cutting a small hole in the liners. Holes that are cut in the liner will be repaired immediately to maintain liner integrity throughout the sampling program.

7.0 LDZ SOIL TESTING PROGRAM

At each impoundment, two soil borings will be advanced to investigate soil conditions along the LDZ transfer line leading from the impoundment to the LDZ Manhole. The borings will be installed in areas where the LDZ lines are not incised into bedrock.

The borings will be advanced using a track-mounted drill rig to a minimum depth of 10 feet below the elevation of the LDZ transfer piping, if possible. Soil samples will be collected at discrete 2 foot depth intervals beginning at ground surface. Each discrete sample will be screened in the field for chloride using a field chloride screening procedure and also for VOCs using a PID. The sample that contains the highest chloride concentration based on field screening (one sample per boring location) will be submitted to a qualified laboratory to be analyzed for the A list of analytes in Table 3. The sample that exhibits the highest PID reading at each sampling location (one sample per boring location) will be submitted to a qualified laboratory to be analyzed for the B List of analytes in Table 3. In the absence of measurable VOCs, the sample from the 2 to 4 foot interval below the LDZ transfer piping will be submitted for the B list of analytes on Table 3. Borings will be backfilled with bentonite and hydrated.

8.0 FRAMEWORK FOR ASSESSING WATER QUALITY

8.1 DESCRIPTION OF EXISTING WATER QUALITY MONITORING NETWORKS

Range has installed groundwater monitoring networks and implemented periodic monitoring at the Worstell and Lowry Impoundments. A monitoring well network was recently installed at Bednarski Impoundment; but the wells have not yet been sampled. The monitoring points that Range has historically monitored at the Worstell, Lowry and Kearns impoundments are listed on Table 5.

8.2 RECONNAISSANCE AND DEVELOPMENT OF INDIVIDUALIZED WATER QUALITY MONITORING PROGRAMS FOR EACH IMPOUNDMENT

As indicated in Section 4.0, a site reconnaissance will be conducted to identify springs, seeps, bench drains, streams, ponds, private water supplies and other monitoring locations as yet unidentified that could be included in the water quality monitoring to enhance understanding of local groundwater conditions. Monitoring locations will be field-located using a GPS. The site reconnaissance will also provide a basis for identifying locations at which to install monitoring wells at the Kearns Impoundment. Upon completing the reconnaissance, an updated SARP that identifies the monitoring locations and rationale for their inclusion in the monitoring program will be submitted to PADEP for review and comment.

8.3 SAMPLING FREQUENCY AND ANALYTICAL PARAMETERS

Range anticipates that monitoring points that are established for each impoundment will be sampled quarterly for a period of two quarters. During the quarterly sampling visits, the samples will be submitted to a qualified laboratory and analyzed for the C List of analytes in Table 3. The parameter list will be reevaluated after completing two rounds of quarterly sampling. If subliner soil screening with the Geiger Counter identifies areas where soil radioactivity exceeds the higher of 2 X mean or the maximum background reading recorded, the radionuclides on Table 3 will be added to the parameter list for groundwater. Laboratory preparation and analytical methods for the analyses to be performed are shown on Table 4. Range will notify the Department of proposed changes to the parameter list and secure Departmental approval prior to implementing any such changes.

Upon completing two quarterly sampling visits, the sampling results will be reviewed to determine whether additional rounds of sampling or other actions are warranted.

8.4 LDZ MONITORING

Sampling of the discharge from the LDZs will be performed on a quarterly basis consistent with the monitoring frequency established for the other monitoring locations in Section 8.3. Samples will be submitted to a qualified laboratory to be analyzed for the C list of parameters in Table 3.

Between quarterly monitoring visits, Range will continue to monitor the LDZs at each impoundment in accordance with their current practices.

9.0 REPORTING

9.1 UPDATES TO SARP

An updated SARP that provides specifics for each impoundment concerning proposed background sampling areas, schematics of the proposed subliner sampling grid and proposed locations to be included in the water quality monitoring program will be provided to PADEP for review and comment after the site reconnaissance has been completed.

9.2 INTERIM REPORT ON SOIL CONDITIONS

An interim report will be prepared that presents the findings of the soil assessment. The report will include maps showing soil sampling locations, tabulated analytical results, geologists boring logs, field sampling data records, and raw analytical laboratory reports. The interim report will serve to provide a basis for determining whether remedial actions are warranted to address any encountered soil conditions at each impoundment. If a soil remedial plan is warranted, it will be prepared in accordance with Section 10.0.

9.3 WATER QUALITY DATA REPORT

A Water Quality Data Report containing the results of the initial round of water quality monitoring will be provided to the Department within 15 days of receiving the results from the analytical laboratory. The report will include a map showing the water quality monitoring locations, a tabulated summary of the sampling results, and the raw analytical laboratory reports.

9.4 WATER QUALITY ASSESSMENT REPORT

Upon completing two quarters of water quality monitoring, a report will be prepared for each impoundment that presents findings of the water quality assessment. The report will include maps showing sampling locations; tabulated analytical results; geologists boring logs; well completion details; field sampling data records; geologic cross-sections; maps showing groundwater flow direction and variations in water quality; and raw analytical laboratory reports. The reports will also include conclusions concerning water quality and whether continued monitoring is warranted or other actions need to be taken to address surface water or groundwater conditions.

10.0 EMERGENCY RESPONSE MEASURES AND DEVELOPMENT OF IMPOUNDMENT REMEDIATION PLANS

Results of the site assessment will be evaluated to determine whether an impoundment remediation plan is warranted to protect human health and the environment. Results of subliner soil sampling and sampling along the LDZ lines will be compared against statewide health standards, and for those constituents for which no statewide health standards exists, to background conditions to identify constituents of concern. Similarly, groundwater sampling results will be compared against statewide health standards, and for those constituents for which no statewide health standards exists, to background conditions to identify possible constituents of concern.

If site investigations indicate soil and/or groundwater have been impacted by impoundment operations, Range will issue an informational letter to all property owners within 2,500 feet of the impoundment and offer to have their drinking water tested by an independent contractor free of charge.

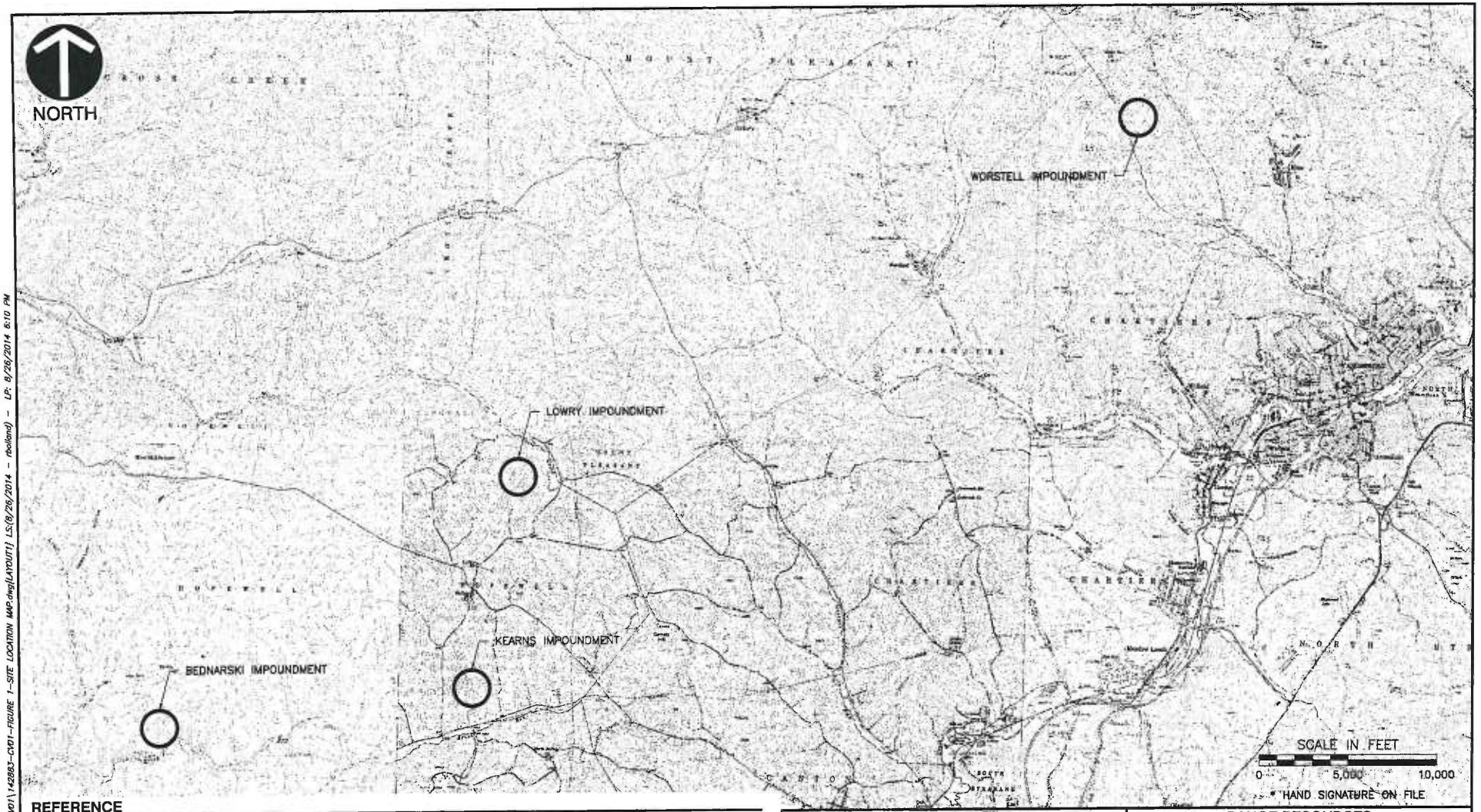
If conditions are encountered that pose a danger for polluting waters of the Commonwealth, they will be addressed in accordance with Range's Pollution Prevention Contingency Plan (PPC) Plan. Possible actions that may be taken to address such a situation could include (1) interim/emergency measures to contain and prevent further migration of the release, (2) interim/emergency measures to prevent migration of regulated substances into surface water and/or groundwater, (3) notifying downstream water users, and (4) providing alternative water sources to affected water users.

If warranted based on results of the Site Assessment, an Impoundment Remediation Plan will be developed to address soil and/or groundwater impacts. Impoundment Remediation Plans will be individualized to each impoundment and will be developed in general accordance with the Department's Technical Guidance document, *Addressing Spills and Releases at Oil & Gas Well Sites or Access Roads* (document number 800-5000-001). For micronutrients such as chloride, the remediation approach may involve a demonstration that the levels meet background levels and/or performing a demonstration showing that the levels present are no longer constituents of concern. Site specific cleanup standards may also be considered. If the Remediation Plan involves soil removal, the soil removal component will be incorporated into the Reclamation Plan. The Impoundment Remediation Plan will be submitted to PADEP for review and comment prior to undertaking closure and reclamation activities.

Typical components of a soil remediation plan include:

- Profiling and securing permits to dispose of the wastes;
- Abandoning and/or replacing of monitoring wells;
- Obtaining final delineation of impacted areas;
- Managing storm water during construction activities;
- Managing and documenting the disposition of wastes generated;
- Collecting confirmation soil samples; and
- Preparing a final report documenting the constituents of concern no longer constitute an environmental concern

FIGURES



REFERENCE

1. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE WEST MIDDLETOWN, PENNSYLVANIA, DATED 1964. PHOTOREVISED 1973, PHOTOINSPECTED 1977.
2. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE WASHINGTON WEST, PENNSYLVANIA, DATED 1954. PHOTOREVISED 1969.
3. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE CANONSBURG, PENNSYLVANIA, DATED 1960. PHOTOREVISED 1979.
4. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE WASHINGTON EAST, PENNSYLVANIA, DATED 1953. PHOTOREVISED 1969, PHOTOINSPECTED 1977.
5. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE MIDWAY, PENNSYLVANIA, DATED 1954. PHOTOREVISED 1969, PHOTOINSPECTED 1977.
6. USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE AVELLA, PENNSYLVANIA, DATED 1954. PHOTOREVISED 1979.

Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205
412-429-2324 · 800-365-2324
www.cecinc.com

RANGE RESOURCES
SITE ASSESSMENT AND REMEDIATION
FOUR IMPOUNDMENTS
WASHINGTON COUNTY, PENNSYLVANIA

IMPOUNDMENT LOCATIONS

DRAWN BY:	RJB	CHECKED BY:	RJV	APPROVED BY:	RJV*	FIGURE NO.:	1
DATE:	8/26/2014	DWG SCALE:	1"=5,000'	PROJECT NO:	142-883		

TABLES

TABLE 1
OPERATIONAL HISTORY
SITE ASSESSMENT AND REMEDIATION PLAN -
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES APPALACHIA , LLC

Impoundment Name/ Location	Operational History	Monitoring Well Network
Worstell Cecil Township Washington County, PA Lat: 40.3004 Long: -80.2300	Construction: May -June 2010 Initial Fill Date: September 1, 2010	Installed: October 2010 Previous Samplng Events: 14
Lowry Hopewell Township Washington County, PA Lat: 40.2453 Long: -80.3502	Construction: Nov - Dec 2008, Jan 2009; Dam Permit Approved: Jan 16 2009; Initial Fill Date: Jan 19 2009 (reuse); Impoundment Leak: Feb 2010 (reported Mar 2010); Primary GM Installed: Mar-Apr 2010 (*approx.*); Manhole Installed: Mar-Apr 2010 (*approx.*); Manifold Installed: Mar-Apr 2010 (*approx*).	Installed: January-February 2012 Previous Samplng Events: 3-5
Kearns Hopewell Township Washington County, PA Lat: 40.2052 Long: -80.4211	Construction: Jan - June 2009; Dam Permit Approved: NA Initial Fill Date: Sept 10 2009 (reuse); Existing Liner Repair : Aug-Sept 2010; Primary GM installed: Aug-Sept 2010; Manhole Installed: Aug-Sept 2010; Manifold Installed: Aug-Sept 2010.	Installed: NA Previous Samplng Events: NA
Bednarski Hopewell Township Washington County, PA Lat: 40.2122 Long: -80.3622	Construction: Jan - March 2009; Dam Permit Approved: June 24 2009; Initial Fill Date: Sept 8 2009 (*?*); Existing Liner Repair : Aug 2010; Primary GM installed: Aug 2010; Manhole Installed: Aug 2010; Manifold Installed: Aug 2010.	Installed: August 2014 Previous Sampling Events: 0

TABLE 2
SUMMARY OF ENGINEERING INFORMATION
SITE ASSESSMENT AND REMEDIATION PLAN -
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES APPALACHIA , LLC

Impoundment Name/ Location	Engineering Specifications	Underdrain	Geosynthetics
Worstell Canansburg Washington County, PA	Capacity: 325,000 bbl General Construction: Sedimentation Traps: 3	Underdrain: 4-inch diameter perforated pipe, PennDOT Type A Sand Backfill in Impoundment, Soil backfill through embankment to manhole	- geotextile: 6 oz/sy nonwoven; - secondary GM: 40-mil HDPE; - primary GM: 40 mil LLDPE;
Lowry Hopewell Twp, Washington County, PA	Capacity: 150,000 bbl General Construction: Sedimentation Traps: 0	*(ASSUMED):* Underdrain: 4-inch diameter perforated pipe, PennDOT Type A Sand Backfill in Impoundment, Soil backfill through embankment to manhole - embankment bench drains tied in to the underdrain outlet	- geotextile: none; - secondary GM: 30-mil HDPE; - primary GM: 40 mil HDPE;
Kearns Hopewell Twp, Washington County, PA	Capacity: 190,000 bbl General Construction: Sedimentation Traps: 1	*(ASSUMED):* Underdrain: 4-inch diameter perforated pipe, PennDOT Type A Sand Backfill in Impoundment, Soil backfill through embankment to manhole - embankment bench drains tied in to the underdrain outlet	- geotextile: none; - secondary GM: 30-mil HDPE; - primary GM: 40 mil LLDPE;
Bednarski Hopewell Twp, Washington County, PA	Capacity: 265,000 bbl General Construction: Sedimentation Traps: 0	*(ASSUMED):* Underdrain: 4-inch diameter perforated pipe, PennDOT Type A Sand Backfill in Impoundment, Soil backfill through embankment to manhole	- geotextile: none; - secondary GM: 30-mil HDPE; - primary GM: 40 mil LLDPE;

TABLE 3
ANALYTICAL PARAMETERS
SITE ASSESSMENT AND REMEDIATION PLAN
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES - APPALACHIA , LLC

	A List	B List	C List
	Soil		Water
	Inorganics	Organics	Inrganics and Organics
Volatile Organic Compounds			
Benzene		X	X
Toluene		X	X
Ethylbenzene		X	X
Xylene		X	X
1,2,4 Trimethylbenzene		X	X
1,3,5 Trimethylbenzene		X	X
Acrolein		X	X
Methanol		X	X
Semi Volatile Organic Compounds			
Polynuclear Aromatic Hydrocarbons [1]		X	X
Phenols		X	X
Glycols			
Ethylene glycol		X	X
Propylene glycol		X	X
2-Butoxyethanol		X	X
Aldehydes			
Glutaraldehyde		X	X
Metals			
Aluminum (Total)	X		X
Aluminum (Dissolved)			X
Arsenic (Total)	X		X
Arsenic (Dissolved)			X
Barium	X		X
Boron (Total)	X		X
Boron (Dissolved)			X
Calcium	X		X
Calcium SPLP	X		
Iron (Total)	X		X
Iron (Dissolved)			X
Lead (Total)	X		X
Lead (Dissolved)			X
Lithium	X		X
Magnesium	X		X
Magnesium SPLP	X		
Manganese (Total)	X		X
Manganese (Dissolved)			X
Potassium	X		X
Potassium SPLP	X		
Selenium (Total)	X		X
Selenium (Dissolved)			X
Sodium	X		X
Sodium SPLP	X		
Strontium	X		X
Vanadium (Total)	X		X
Vanadium (Dissolved)			X
Zinc (Total)	X		X
Zinc (Dissolved)			X
Anions and General Chemistry			
Alkalinity	X		X
Chloride	X		X
Chloride SPLP	X		
Bromide	X		X
Hardness			X
Nitrate Nitrogen			X
pH			X
Specific Conductance			X
Sulfate	X		X
Surfactant (MBAS)			X
Total Dissolved Solids (TDS)			X
Total Suspended Solids (TSS)			X
Radiological			
Gross Alpha	X[2]		X[2]
Gross Beta	X[2]		X[2]
Radium 226	X[2]		X[2]
Radium 228	X[2]		X[2]
Field Readings			
Chloride			X
pH			X
Specific Conductance			X
Oxidation Reduction Potential (ORP)			X
Temperature			X
Total Dissolved Solids (TDS)			X

Notes
1. Water samples are to be analyzed by low level selective ion method (SIMs) or other approved low-level method.
2. Parameter to be analyzed only if certain conditions are met.

TABLE 4 (Page 1)
LABORATORY METHODS - SOIL SAMPLES
SITE ASSESSMENT AND REMEDIATION PLAN
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES - APPALACHIA , LLC

	A List	B List	Prep Method [2]	Analytical Method [2]
Volatile Organic Compounds (mg/kg)				
Benzene		x	SW846 5035A	SW846 8260B
Toluene		x	SW846 5035A	SW846 8260B
Ethylbenzene		x	SW846 5035A	SW846 8260B
Xylene		x	SW846 5035A	SW846 8260B
1,3,5 - Trimethyl Benzene		x	SW846 5035A	SW846 8260B
1,2,4 - Trimethyl Benzene		x	SW846 5035A	SW846 8260B
Acrolein [3]		x	SW846 5035A	SW846 8260B
Methanol		x	In-house	SW846 8015C
Semi Volatile Organic Compounds (mg/kg)				
Polynuclear Aromatic Hydrocarbons		x	SW846 3550B	SW846 8270D
Phenolics (mg/kg)				
Phenol		x	SW846 3550B	SW846 8270D
Glycols (mg/kg)				
Ethylene glycol		x	In-house	SW846 8015C
Propylene glycol		x	In-house	SW846 8015C
2-Butoxyethanol [3]		x	In-house	SW846 8015C
Aldehydes (mg/kg)				
Glutaraldehyde [3]		x	EPA 8315 Prep	EPA 8315A
Petroleum Related Oil (mg/kg)				
TPH - Gasoline Range Organics (GRO)		x	NA	SW846 8015D
TPH - Diesel Range Organics (DRO)		x	SW846 3550	SW846 8015D
TPH - Oil Range Organics (ORO)		x	SW846 3550	SW846 8015D
Oil & Grease		x	NA	SW846 9071B
Metals (mg/kg)				
Aluminum	x		SW846 3051	SW846 6010C
Arsenic	x		SW846 3051	SW846 6020A
Barium	x		SW846 3051	SW846 6020A
Boron	x		SW846 3051	SW846 6010C
Calcium	x		SW846 3051	SW846 6010C
Calcium (SPLP)	x		SW846 1312 / 3110A	SW846 6010C
Iron	x		SW846 3051	SW846 6010C
Lead	x		SW846 3051	SW846 6020A
Lithium	x		SW846 3051	SW846 6010C
Magnesium	x		SW846 3051	SW846 6010C
Magnesium (SPLP)	x		SW846 1312 / 3110A	SW846 6010C
Manganese	x		SW846 3051	SW846 6020A
Potassium	x		SW846 3051	SW846 6010C
Potassium SPLP	x		SW846 1312 / 3110A	SW846 6010C
Selenium	x		SW846 3051	SW846 6010C
Sodium	x		SW846 3051	SW846 6010C
Sodium SPLP	x		SW846 1312 / 3110A	SW846 6010C
Strontium	x		SW846 3051	SW846 6020A
Vanadium	x		SW846 3051	SW846 6010C
Zinc	x		SW846 3051	SW846 6010C
Anions and General Chemistry (mg/kg)				
Alkalinity	x		NA	SM 2320B
Chloride	x		NA	SW846 9056A
Chloride SPLP	x		SW846 1312	SW846 9056A
Bromide	x		NA	SW846 9056A
Sulfate	x		NA	SW846 9056A
Radiological				
Gross Alpha	x[1]		EPA SW846 9310 Prep	EPA SW846 9310
Gross Beta	x[1]		EPA SW846 9310 Prep	EPA SW846 9310
Radium 226	x[1]		DOE Ga_01_R Prep	DOE Ga_01_R
Radium 228	x[1]		DOE Ga_01_R Prep	DOE Ga_01_R

Notes:
1. Paramater is only to be analyzed under certain conditions.
2. Other equivalent preparation or analytical methods may be used if approved by Range.
3. Constituent may be removed for the parameter list if it is determined that it was not used at a specific site.

TABLE 4 (Page 2)
LABORATORY METHODS - WATER SAMPLES
SITE ASSESSMENT AND REMEDIATION PLAN
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES - APPALACHIA , LLC

	C List	Prep Method [2]	Analytical Method [2]
Volatile Organic Compounds (mg/L)			
Benzene	x	n/a	SW846 8260B
Toluene	x	n/a	SW846 8260B
Ethylbenzene	x	n/a	SW846 8260B
Xylene	x	n/a	SW846 8260B
1,3,5 - Trimethyl Benzene	x	n/a	SW846 8260B
1,2,4 - Trimethyl Benzene	x	n/a	SW846 8260B
Acrolein [3]	x	n/a	SW846 8260B
Methanol	x	n/a	SW846 8015C
Semi Volatile Organic Compounds (mg/L)			
Polynuclear Aromatic Hydrocarbons	x	SW846 3510C	SW846 8270D SIM [4]
Phenolics and Pyridine (mg/L)			
Phenols	x	SW846 3510C	SW846 8270D *
Glycols (mg/L)			
Ethylene glycol	x	n/a	SW846 8015C
Propylene glycol	x	n/a	SW846 8015C
2-Butoxyethanol [3]	x	n/a	SW846 8015C
Aldehydes (mg/L)			
Glutaraldehyde [3]	x	EPA 8315A Prep	EPA 8315A
Petroleum Related Oil (mg/L)			
TPH - Gasoline Range Organics (GRO)	x	n/a	SW846 8015D
TPH - Diesel Range Organics (DRO)	x	SW846 3510C	SW846 8015D
TPH - Oil Range Organics (ORO)	x	SW836 3510C	SW846 8015D
Oil & Grease	x	n/a	EPA 1664A
Metals, unless otherwise noted (mg/L)			
Aluminum (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Arsenic (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Barium (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Boron (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Calcium (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Iron (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Lead (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Lithium (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Magnesium (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Manganese (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Potassium (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Selenium (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Sodium (total and dissolved)	x	SW846 3010/3005	SW846 6010C
Strontium (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Vanadium (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Vanadium (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Zinc (total and dissolved)	x	SW846 3010/3005	SW846 6020A
Anions and General Chemistry (mg/L, unless otherwise noted)			
Alkalinity	x	NA	SM 2320B
Chloride	x	NA	SW846 9056A
Bromide	x	NA	SW846 9056A
Hardness	x	SW846 3015	SW846 6010C
Nitrate Nitrogen	x	NA	SW846 9056A
pH (SU)	x	NA	SM 4500HB
Specific Conductance (umhos/cm)	x	NA	SM 2510B
Sulfate	x	NA	SW846 9056A
Surfactant (MBAS)	x	NA	SM 5540C
Total Dissolved Solids (TDS)	x	NA	SM 2540C
Total Suspended Solids (TSS)	x	NA	SM2540D
Radiological			
Gross Alpha	x[1]	EPA 9310 Prep	EPA 9310
Gross Beta	x[1]	EPA 9310 Prep	EPA 9310
Radium 226	x[1]	EPA 903 Prep	EPA 903
Radium 228	x[1]	EPA 904 Prep	EPA 904

Notes:
1. Paramater is only to be analyzed under certain conditions.
2. Other equivalent preparation or analytical methods may be used if approved by Range.
3. Constituent may be removed for the parameter list if it is determined that it was not used at a specific site.
4. Other low level analytical methods may be used if approved by Range

TABLE 5
INFORMATION ON CURRENT WATER QUALITY MONITORING NETWORKS
SITE ASSESSMENT AND REMEDIATION PLAN
FOUR IMPOUNDMENTS IN WASHINGTON COUNTY, PENNSYLVANIA
RANGE RESOURCES APPALACHIA , LLC

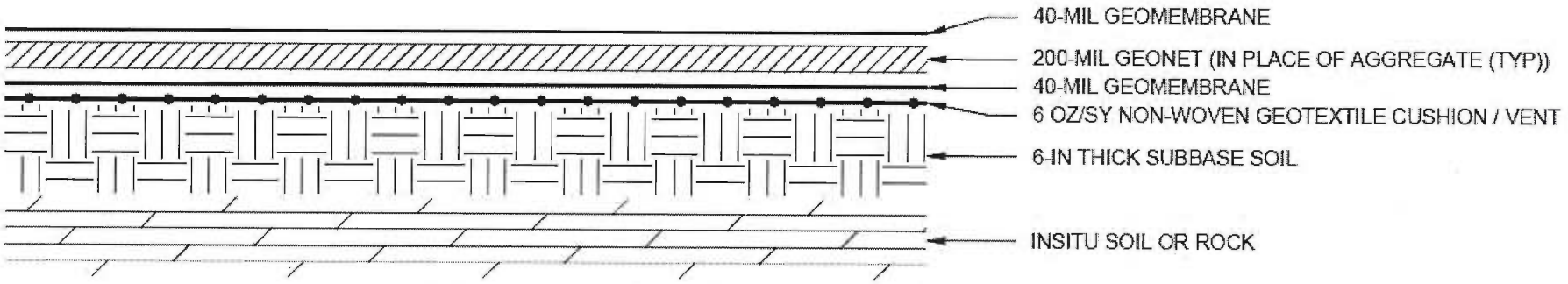
Impoundment Name/ Location	Existing Monitoring Well Network	Other Historical Water Quality Monitoring Points
Worstell Cecil Township Washington County, PA	Date Installed: October 2010 Upgradient Well(s): MW-2 Downgradient Wells: MW-1, MW-3 and MW-4 Previous Sampling Events: 14	Springs: Novotny Spring Residential Wells: None Other: Brush Run: Upstream Point (W-US) Downstream Point (W-DS)
Lowry Hopewell Township Washington County, PA	Date Installed: January-February 2012 Upgradient Well(s): MW-1 Downgradient Wells: MW-2, MW-3, MW-4 and MW-5 Previous Sampling Events: 3-5	Springs: Spring-1 Residential Wells: None Other: None
Kearns Hopewell Township Washington County, PA	Date Installed: NA Upgradient Well(s): NA Downgradient Wells: NA Previous Sampling Events: NA	Springs: None Residential Wells: None Other: None
Bednarski Hopewell Township Washington County, PA	Date Installed: August 2014 Upgradient Well(s): MW-1U Downgradient Wells: MW-2 and MW-3 Previous Sampling Events: None	Springs: None Residential Wells: None Other: None

Appendix C

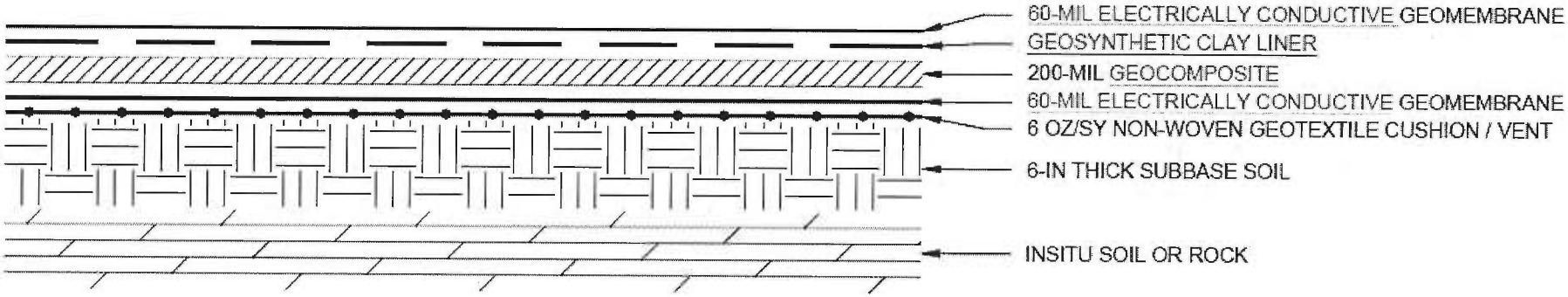
Range Resources' Proposed Impoundment Liner System Design Exceeds the Standards Set Forth in 8000-PM-OOGM0084 - *Design and Construction Standards for Centralized Impoundment Dams* (Rev 12/2013) as Shown Below

8000-PM-OOGM0084 (Rev 12/2013) DESIGN STANDARDS		RANGE RESOURCES DESIGN UPGRADES
CITATION	**CITATION DESCRIPTION**	
III(c)(v)(2)	The secondary liner shall have a minimum thickness of 40 mil unless a greater thickness is required by manufacturer recommendations.	Range will voluntarily use a 60-mil thick liner, which exceeds the O&G design standard.
		Electrically conductive geomembrane will be used, which is not required by the design standards. The conductive material provides a simpler means for liner integrity testing.
III(d)(i)(5)	The leak detection zone shall prevent the liner from puncturing, cracking, tearing, stretching or otherwise losing its physical integrity.	A geocomposite will be used which consists of a layer of drainage geonet sandwiched between and bonded to two layers of non-woven geotextile.
III(d)(i)(7)	The leak detection zone shall create a flow zone between the secondary liner and the primary liner equal to, or more permeable than 1.0 x 10-2 cm/sec, based on a laboratory testing and, when required by the Department, field testing.	The proposed drainage geocomposite has an approximate permeability of 2 cm/sec, which is 200 times greater than required by the design standards.
III(d)(i)(12)	The leak detection zone shall contain non-carbonate stones or aggregate with no sharp edges.	The proposed drainage geocomposite is proposed to be used instead of an aggregate. A geocomposite, has no sharp edges. Unlike using aggregate as a flow zone, the installation of a geocomposite does not require the use of equipment over the layers of geosynthetics that the geocomposite will cover.
III(d)(i)(13)	The operator shall monitor the leak detection zone weekly to determine whether liquid is flowing from the zone.	The leak detection zone will be setup to allow real-time remote monitoring via a telemetry system which will enable Range Resources to know immediately if liquid is detected in the leak detection zone.
III(e)(iv)(1)	The primary liner shall have a minimum thickness of 40 mil unless a greater thickness is required by manufacturer recommendations.	Range will voluntarily use a 60-mil thick liner, which exceeds the O&G design standard.
		Electrically conductive geomembrane will be used, which is not required by the design standards. The conductive material provides a simpler means for liner integrity testing.
		A brine resistant geosynthetic clay liner (GCL) which consists of a layer of bentonite sandwiched between two layers of geotextile will be installed underneath the primary geomembrane. The GCL and geomembrane will form a 'composite' primary liner. The GCL is an additional low permeability layer that is not required by the design standards.

A Profile Comparison of the Liner Design Required by 8000-PM-OOGM0084 - *Design and Construction Standards for Centralized Impoundment Dams* (Rev 12/2013) and Range Resources' Proposed Impoundment Liner Design



8000-PM-OOGM0084 (REV 12/2013) LINER SYSTEM DESIGN



RANGE RESOURCES LINER DESIGN

RED UNDERLINED ITEMS INDICATE COMPONENTS THAT EXCEED THE 8000-PM-OOGM0084 (REV 12/2013) DESIGN STANDARDS

Amendments to Technical Design and Construction Specifications for Upgrading Existing Impoundments

8000-PM-OOGM0084 (Rev 12/2013) DESIGN STANDARDS		RANGE RESOURCES EXCLUSION
CITATION	CITATION DESCRIPTION	
I(a)-(g)	Areas Where Centralized Impoundments are Prohibited*	Existing impoundments were sited under previous siting criteria; therefore, Section I is excluded.
II(a)-(d)	Construction Standards*	Existing impoundments were constructed under previous construction standards; therefore, Section II will only apply to new construction under this section.
III(d)(i)(10)	The leak detection zone shall have a minimum bottom slope of 2%.	The Chartiers Twp. 16 (fka Carol Baker) Impoundment was redesigned with a 1% slope pursuant to an agreement with the Department in the Fall of 2013. For this impoundment, this standard will be excluded.
IV(a)-(e)	Water Quality Monitoring*	These items will be excluded for existing impoundments.
IV(g)	A person or a company may not construct, install or use a centralized impoundment until the groundwater monitoring system has first been approved by the Department in writing.	The groundwater monitoring systems for the Chartiers Twp. 16 (fka Carol Baker) and Amwell Twp. 15 (fka Jon Day) Impoundments will be developed during ongoing groundwater assessment activities. For these impoundments, this standard will be excluded.
IV(h)(i) and IV(j)	Water Quality Monitoring – relating to upgradient well requirements*	The locations of the Amwell Twp. 15 (fka Jon Day) and Chartiers Twp. 16 (fka Carol Baker) Impoundments preclude the installation of up-gradient wells. Therefore, a suitable alternate location will be selected or intra-well monitoring will be utilized.
V(c), (d)	Certification*	Existing components were constructed under previous construction standards; therefore, these items will only be applied to new construction.
* The complete regulatory citations for these items have been omitted for ease of table review.		