west virginia department of environmental protection

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

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well - 1

NORTHEAST NATURAL ENERGY LLC
707 VIRGINIA STREET EAST
STE 1200
CHARLESTON, WV 25301

Re: Permit Modification Approval for KASSAY 8H
47-061-01740-00-00

Adjusted Horizontal Well Bore

NORTHEAST NATURAL ENERGY LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin
Chief

Operator's Well Number: KASSAY 8H
Farm Name: KASSAY, NEHEMIAH
U.S. WELL NUMBER: 47-061-01740-00-00
Horizontal 6A / Horizontal 6A Well - 1
Date Issued: 10/18/2016

northeast
NATURAL ENERGY

September 28, 2016

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

4706101740 MOD 2

Re: Kassay 8H Permit Application Modification
API # 47-061-01740 MOD 2

Dear Permit Reviewer,

Northeast Natural Energy LLC ("NNE") would like to request a modification to its existing Kassay 8H Permit (061-01740). NNE has adjusted the horizontal well bore to allow for more efficient development of the permitted Kassay Well Pad.

Please find enclosed with this request a revised WW-6B Form, WW-6A1 Form and Attachment, Revised Site Safety Plan, Well Bore Schematic and Mylar Plat for the 8H well.

Should you have any questions please contact me at 304.212.0422 or by email at hmedley@nne-llc.com.

Sincerely,

Hollie M. Medley

Hollie M. Medley
Regulatory Coordinator

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Office of Oil and Gas
OCT 11 2016
WV Department of
Environmental Protection

47-061-01740 Mod2

northeast
NATURAL ENERGY

September 28, 2016

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

Re: Kassay 8H Permit Application Modification

Dear Permit Reviewer,

Please find enclosed an application to modify the existing Kassay 8H Permit.

Should you have any questions please contact me at 304.212.0422 or by email at hmedley@nne-llc.com.

Sincerely,

Hollie M. Medley

Hollie M. Medley
Regulatory Coordinator

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SEP 29 2016
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Horizontal 6A Well Permit App. Checklist

Operator Well No. Kassay 8H

OPERATOR: Northeast Natural Energy LLC

PAD NAME: Kassay WELL: Kassay 8H

PAD BUILT: X YES ____ NO DATE REVIEWED: 9/28/2016 INT. ____

REVIEWED BY (APPLICANT): Hollie Medley

CONTACT PHONE: 304.212.0422 EMAIL: hmedley@nne-llc.com

APPLICANT SIGNATURE: Hollie Medley

CHECKLIST FOR FILING A PERMIT
HORIZONTAL 6A WELL

Application to Modify Wellbore 061-01740 Mod2

Please include these required elements in the Horizontal Well 6A applications, in order listed below. Do not use staples.

First Well	Subsequent Well
$10,150.00 ☐	$5,150.00 ☐

____ Fees

____ Checklist / Cover letter

X WW-6B Notice of Application X Field Approved 4706101740 Mod2

X Cement Additives

X Well Bore Schematic

____ WW-9 Fluids/Cuttings Disposal and Reclamation Plan ____ Field Approved

X Site Safety Plan ____ Field Approved

____ Water Management Plan ____ DWWM Approval

____ Topographic Map w/water purveyors, showing access road

X Mylar Plat (Signed and sealed) (Surface Owner matches WW-6A)

X WW-6A1 Lease Information

____ Road Crossing Letter

____ WW-PN Application Notice by Publication

____ Public Notice (dated copy of advertisement or affidavit of publication)

X Area of Review Map and Spreadsheet

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Environmental Protection

Revised 12/30/13

WW-6B
(04/15)

API NO. 47- 061 - 01740
OPERATOR WELL NO. Kassay 8H
Well Pad Name: Kassay

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: Northeast Natural Energy LLC

494498281	Monongalia	Clay	Blacksville
Operator ID	County	District	Quadrangle

2) Operator's Well Number: Kassay 8H Well Pad Name: Kassay

3) Farm Name/Surface Owner: Nehemiah and Patty A. Kassay Public Road Access: County Route 25/3 (Yank Hollow Road)

4) Elevation, current ground: 1,534' Elevation, proposed post-construction: 1534'

5) Well Type (a) Gas X Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow X Deep _____
Horizontal X

MJK 9/28/2016

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus, 8,288.50' , 103' , 3,600 psi

8) Proposed Total Vertical Depth: 8,288.50'

9) Formation at Total Vertical Depth: Marcellus

4706101740 Mod

10) Proposed Total Measured Depth: 16,405.87'

11) Proposed Horizontal Leg Length: 7,129'

12) Approximate Fresh Water Strata Depths: 50' , 1,100'

13) Method to Determine Fresh Water Depths: Driller's Log from Offset Wells

14) Approximate Saltwater Depths: 1,946' , 2,696'

15) Approximate Coal Seam Depths: 316' , 1,098'

16) Approximate Depth to Possible Void (coal mine, karst, other): N/A

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes _____ No X

(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

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Environmental Protection

API NO. 47-_____-_____
OPERATOR WELL NO. Kassay 8H
Well Pad Name: Kassay

18) **CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	24"	New	NA	94.71	40'	40'	GTS
Fresh Water	13-3/8"	New	J-55	54.5	1,230'	1,200'	CTS
Coal							
Intermediate	9-5/8"	New	J-55	40	2,780'	2,750'	CTS
Production	5-1/2"	New	P-110	20	16,405.87'	16,375.87'	3,846 Cu. Ft.
Tubing	2-7/8"	New	N-80	6.5	NA	8,500'	NA
Liners							

MgK 9/28/2016

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	24"	30"	.375	415		4,500 psi Grout	NA
Fresh Water	13-3/8"	17 1/2"	.38"	2,760	2,000	Class A	1.23
Coal							
Intermediate	9-5/8"	12 1/4"	.395"	3,950	3,000	Class A	1.3
Production	5-1/2"	8 3/4"	.361"	12,530	9,700	50:50 Poz	1.21
Tubing	2-7/8"	NA	.217"	10,570	3,600	NA	NA
Liners							

4706101740 Mod

PACKERS

Kind:				
Sizes:				
Depths Set:				

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Environmental Protection

API NO. 47-_____-_____
OPERATOR WELL NO. Kassay 8H
Well Pad Name: Kassay

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drilling and completion of a horizontal Marcellus well. The well will be drilled on air to an approximate depth of 6,389.50' TVD/MD. The well will then be horizontally drilled on synthetic based mud from the KOP to approximately 8,288.5' TVD / 16,405.87' MD along a 146 degree azimuth.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Multi-stage / high-rate slickwater fracture treatment using various size sands as proppant. First stage will be initiated via pressurization against a burst disc ran in the production casing string or perforated with coiled tubing. Subsequent stages will be perforated with pumped down guns ran on wireline. Individual stages will be isolated with composite frac plugs. Maximum pump rate during any stage will be 110 BPM with a maximum allowable surface pressure of 9,500 PSI. Composite bridge plugs will be set at the end of the last stage to isolate the treated formation.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): N/A

22) Area to be disturbed for well pad only, less access road (acres): N/A

23) Describe centralizer placement for each casing string:

Surface and intermediate casing strings will have bow spring centralizers placed every third joint (~120') from the shoe joint to surface. Production casing will have rigid body centralizers placed at a minimum of every fourth joint (~160') from TD to surface.

24) Describe all cement additives associated with each cement type: 4706101740 Mod 2

Surface string cement will be a Class A + Max 3% bwoc Calcium Chloride Fresh Water blend. Intermediate string cement will be a Class A Cement + Max 3% bwoc Calcium Chloride + Fresh Water. Production string cement will be (50:50) Poz (Fly Ash):Type I Cement with a gas migration additive.

25) Proposed borehole conditioning procedures:

Surface string will use a 25.0 bbls Gel Pill + LCM + 25 lbs Cello Flake + 20 lbs/bbl Bentonite @ 8.4 ppg & 10 bbls fresh water spacer prior to cement. Intermediate string will use a 25.0 bbls Gel Pill + LCM + 25 lbs Cello Flake + 20 lbs/bbl Bentonite @ 8.4 ppg & 10 bbls fresh water spacer prior to cement. Production string will use a 50.0 bbls SealBond 25 + 1 gal/bbl US-40 + 275 lbs/bbl Barite + 1 gal/bbl SS-2 Spacer @ 13.5 ppg prior to cement.

SEP 29 2016
WV Department of Environmental Protection

*Note: Attach additional sheets as needed.

NORTHEAST NATURAL ENERGY, LLC

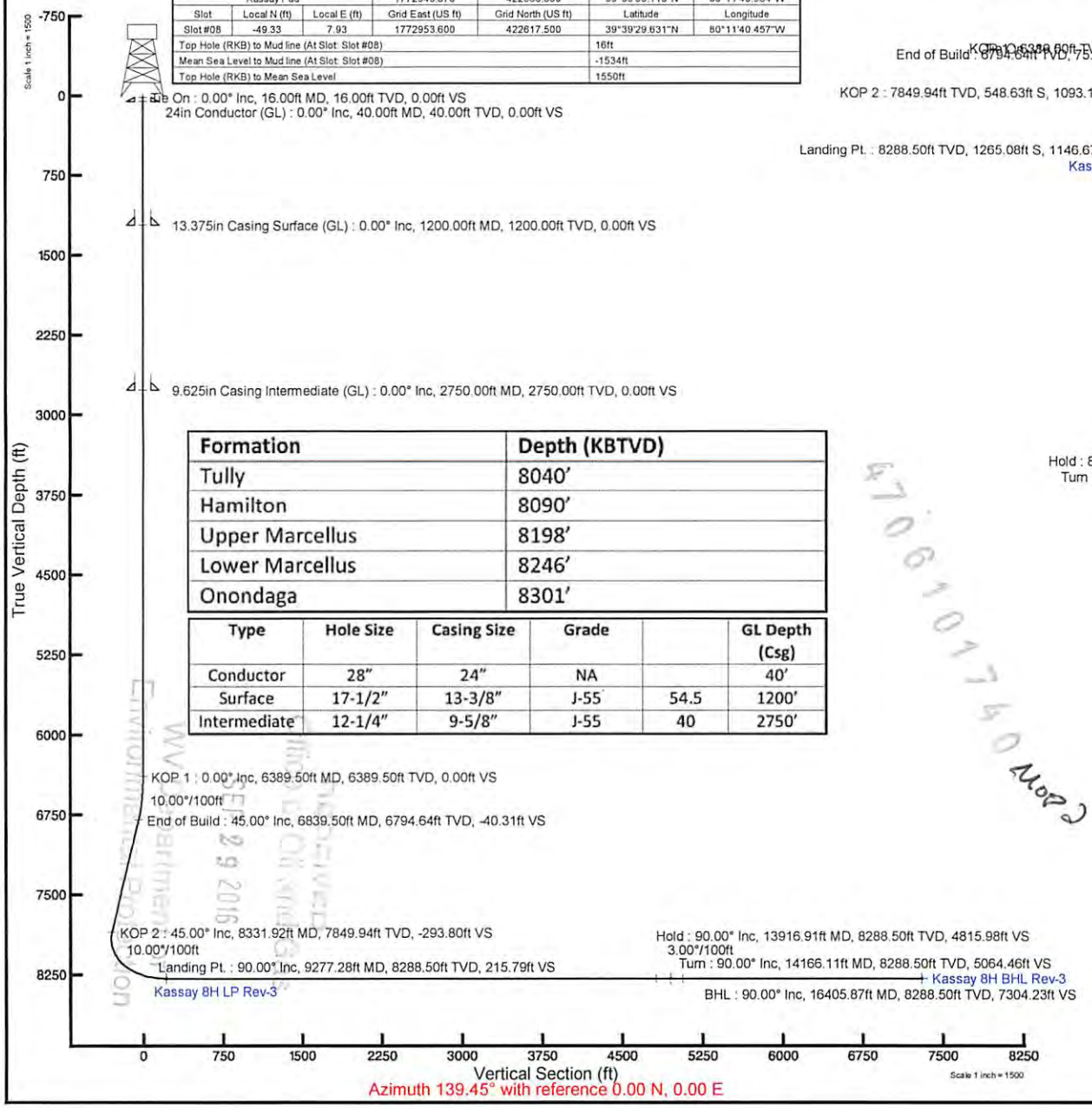
Location: Monongalia County, WV
Field: Monongalia
Facility: Kassay Pad

Slot: Slot #08
Well: Kassay 8H
Wellbore: Kassay 8H PWB

northeast NATURAL ENERGY

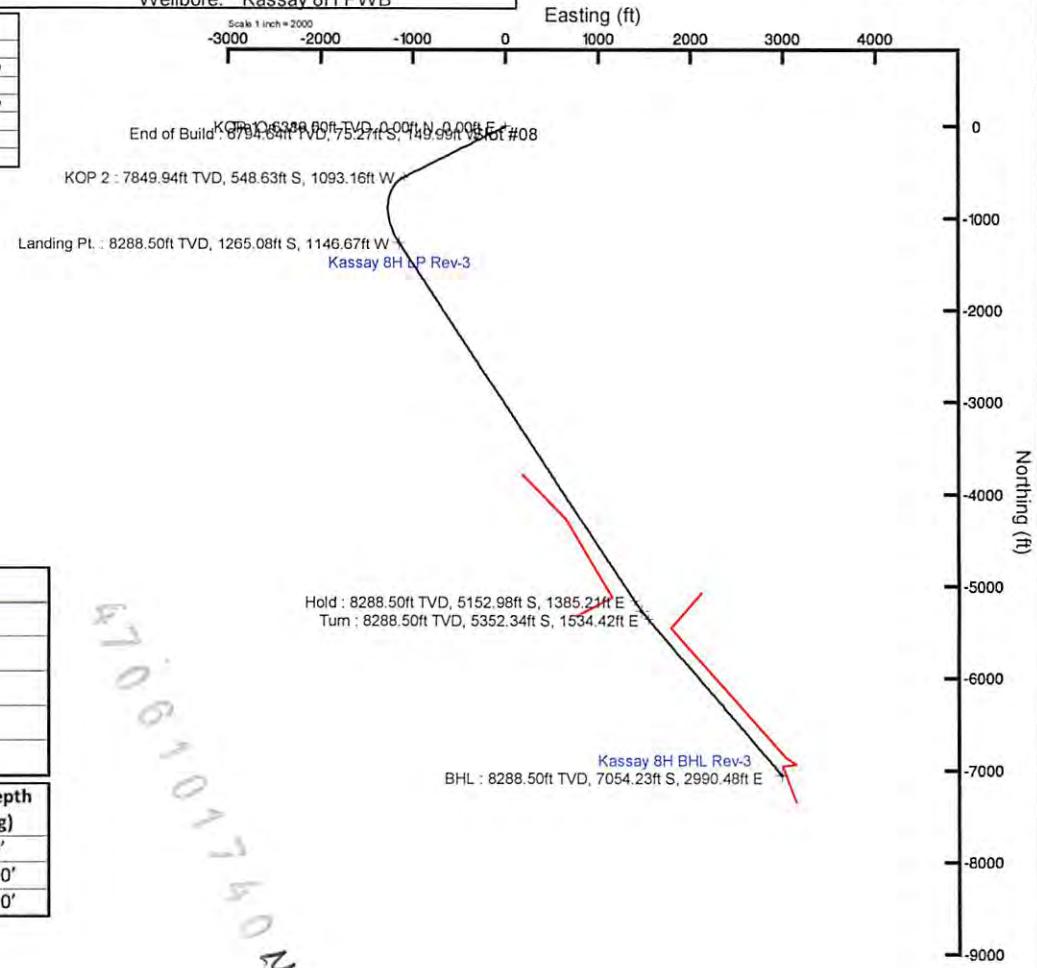
BAKER HUGHES

Location Information						
Facility Name			Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Kassay Pad			1772945.670	422666.830	39°39'30.118"N	80°11'40.564"W
Slot	Local N (ft)	Local E (ft)	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Slot #08	-49.33	7.93	1772953.600	422617.500	39°39'29.631"N	80°11'40.457"W
Top Hole (RKB) to Mud line (At Slot: Slot #08)					16ft	
Mean Sea Level to Mud line (At Slot: Slot #08)					-1534ft	
Top Hole (RKB) to Mean Sea Level					1550ft	



Formation	Depth (KBTVD)
Tully	8040'
Hamilton	8090'
Upper Marcellus	8198'
Lower Marcellus	8246'
Onondaga	8301'

Type	Hole Size	Casing Size	Grade		GL Depth (Csg)
Conductor	28"	24"	NA		40'
Surface	17-1/2"	13-3/8"	J-55	54.5	1200'
Intermediate	12-1/4"	9-5/8"	J-55	40	2750'



BGGM (1900.0 to 2018.0) Dip: 66.80° Field: 52189.4 nT
Magnetic North is 9.05 degrees West of True North (at 9/23/2016)
Grid North is 0.44 degrees West of True North
To correct azimuth from True to Grid add 0.44 degrees
To correct azimuth from Magnetic to Grid subtract 8.61 degrees

4706101740 (Mod)
RECEIVED
Office of Oil and Gas
SEP 29 2016
WV Department of Environmental Protection

northeast
NATURAL ENERGY

Kassay 8H

4706101740 Mod 2

SITE SAFETY PLAN

September 26, 2016

MDK
9/28/2016

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Office of Oil and Gas
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WV Department of
Environmental Protection

SITE NAME Kassay 8H

COUNTY Monongalia

ACCESS ROAD ENTRANCE N39° 39' 23.7" , W-80° 11' 54.49 (NAD 83)

N 4389949.4, E 568760.3 (NAD 83 UTM)

DIRECTIONS TO SITE:

From I-79, take exit 155. Merge onto Chaplin Hill Road/CR-19/24N toward US-19/WV-7/Star City. If traveling from the south, this will be a right off the exit. If traveling from the north, this will be a left off the exit. After approximately 0.8 miles, turn left at light onto US-19/WV-7. Continue on US-19/WV-7 for approximately 1.7 miles. Turn left on WV-7 and continue on route for approximately 8.3 miles, then turn left on Pedlar Run Road for approximately 0.6 miles. Take a right onto CR-37/1/Jessel Tennet Hill/Pedlar Run Road for approximately 2.1 miles, continue onto Long Drain Road for approximately 0.1 mile and turn left onto Mooresville Road for approximately 0.3 Miles. Turn Left onto Jakes Run Road for approximately 6.2 miles, then turn right onto Statler Run Road for approximately 0.6 miles. Turn right onto Country Road for approximately 1.2 miles. The Kassay Pad Access Road Entrance will be on the right.

Or, take exit 155. Merge onto Chaplin Hill Road/CR-19/24N toward US-19/WV-7/Star City. If traveling from the south, this will be a right off the exit. If traveling from the north, this will be a left off the exit. After approximately 0.8 miles, turn left at light onto US-19/WV-7. Continue on US-19/WV-7 for approximately 1.7 miles. Turn left on WV-7 and continue on route for approximately 13.9 miles, then take a slight left onto WV-218 S/Daybrook Run Road for approximately 5.9 miles. Turn left onto Yank Hollow Road for approximately 1 mile and the Kassay Pad Access Entrance will be on the left.

From Blacksville, take WV-218 S/Daybrook Run Road for approximately 5.9 miles, then turn left onto Yank Hollow Road for approximately 1 mile. The Kassay Pad Access Road Entrance will be on the left.

*See Attached Maps

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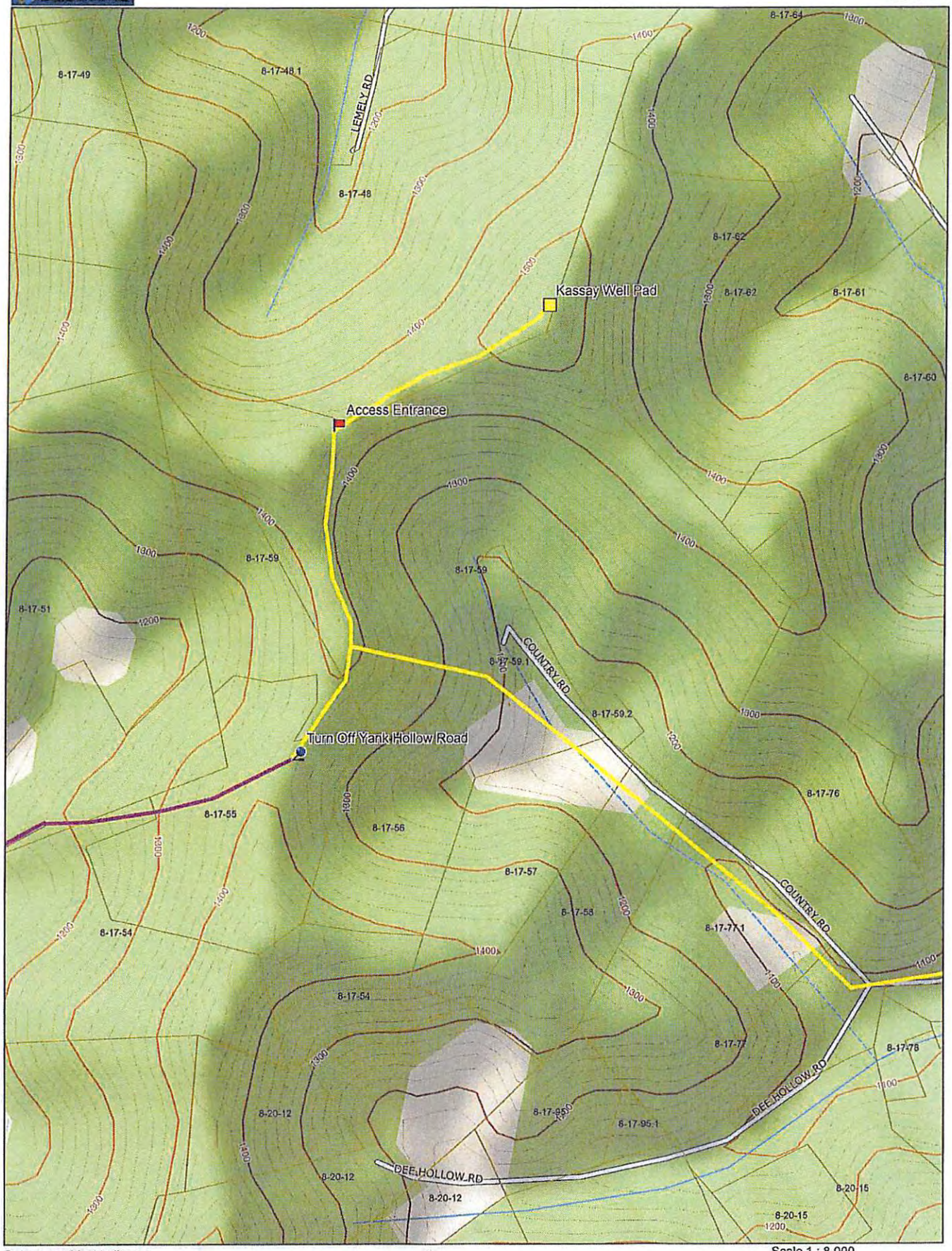

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TN

MN (8.9°W)

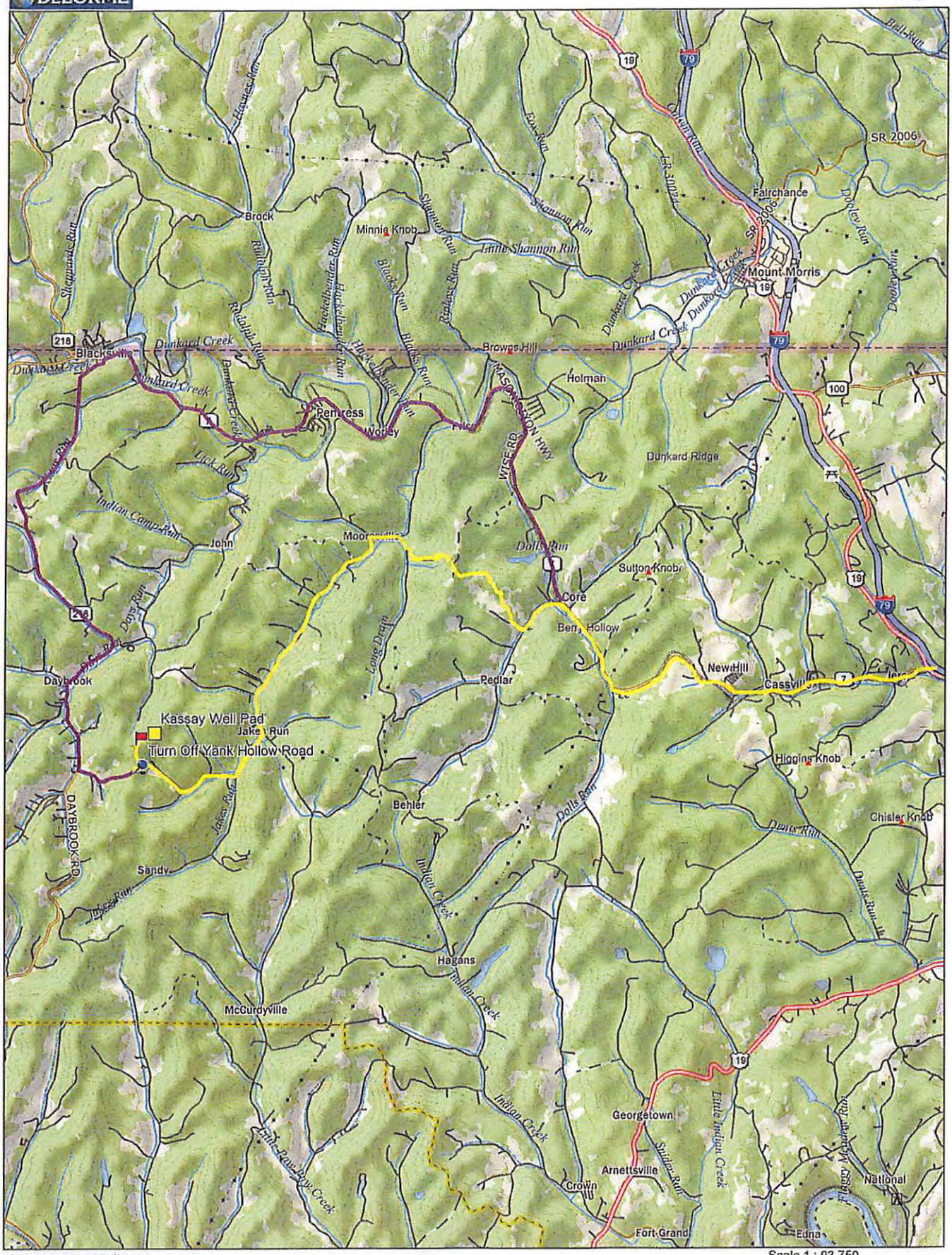
Scale 1 : 8,000

1" = 666.7 ft

Data Zoom 14-6

DeLORME

XMap® 7



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TN

MN (9.0°W)

Scale 1 : 93,750

1" = 1.48 mi

Data Zoom 11-1

Introduction

Northeast Natural Energy LLC ("NNE") is an oil and gas exploration and production company with company headquarters located at the following address:

Northeast Natural Energy LLC
707 Virginia Street East, Suite 1200
Charleston, WV 25301

And a Field Operations Office located at the following address:

Northeast Natural Energy LLC
48 Donley Street, Suite 601
Morgantown, WV 26501

NNE is committed to protecting the people, property, and resources of the company and of the communities in which it works by establishing a safe and healthy work environment that is free from recognized hazards and complies with all local, state and federal regulations.

This Plan will be reviewed annually and may be subject to revision and/or update whenever any of the following occur:

- An incident occurs.
- A new chemical or process is utilized onsite.
- Existing processes are modified significantly.
- Regulations are revised significantly.
- The current Plan fails in an emergency situation.
- Changes in emergency response equipment occur.
- Changes in internal and external emergency resources occur.

TABLE OF CONTENTS

1 – Contacts, Schedules and Meetings

2 – Maps and Diagrams

3 – Well Work

4 – Chemical Inventory & MSDS

5 – BOP and Well Control

6 – Hydrogen Sulfide (H_2S)

7 – Flaring

8 – Collision Avoidance Safeguards, Practices and Standards

1

Contacts, Schedules and Meetings

A. NORTHEAST NATURAL ENERGY LLC CONTACTS:

24 hour emergency number 1-866-207-1846

Construction/Reclamation

- Mike Shreve – Construction Coordinator 304.918.3050
- Dave McDougal – Manager of Civil Engineering 304.941.5033
- Brett Loflin – VP of Regulatory Affairs 304.414.7063

Drilling/Completion

- Jay Hewitt – Drilling Manager 304.382.1825
- Ian Costello – Completions Engineer 304.610.9764
- Zack Arnold – Manager of Operations 304.203.8059

Production

- Ryan Warner - Production Engineer 304.777.3287
- Zack Arnold – Manager of Operations 304.203.8059

B. EMERGENCY CONTACTS :

In the case of an emergency call 911

1. **OPERATOR CONTACTS**
   - 24 hour emergency number 1-866-207-1846

2. **DRILLING CONTRACTORS**
   - Performance Drilling –Vertical Drilling 304.553.2180
   - Pioneer Drilling – Horizontal Drilling 570.465.2151

   KEY CONTRACTORS AND VENDORS
   - Baker Hughes – Cement/Pumping 724.743.9208
   - Halliburton – Cement/Pumping 888.223.4255
   - Schlumberger – Logging/Cement 724.820.3360

3. **WV DEP/ OFFICE OF OIL AND GAS**

   Pollution and Emergency Spills 1-800-642-3074
   - James Martin – Chief 304.926.0499 Ext. 1654
   - Gayne Knitoswski – Inspector 304.546.8171
   - Joe McCourt– WV DEP Northern Inspector Supervisor 304.380.2467

4. LOCAL EMERGENCY RESPONSE UNITS

MONONGALIA COUNTY OFFICE OF EMERGENCY MANAGEMENT

- Mike Wolfe – Director 304.598.0301
- James Smith – Deputy Director

FIRE DEPARTMENTS

- Blacksville Volunteer 304.432.8282

AMBULANCE / EMS

- MON EMS 304.599.0650
- JAN-CARE 304.296.9700

LIFE FLIGHT AMBULANCE SERVICE (HELICOPTER)

- Angel MedFlight 866.604.8307

STATE POLICE

- Morgantown Detachment 304.285.3200

COUNTY POLICE

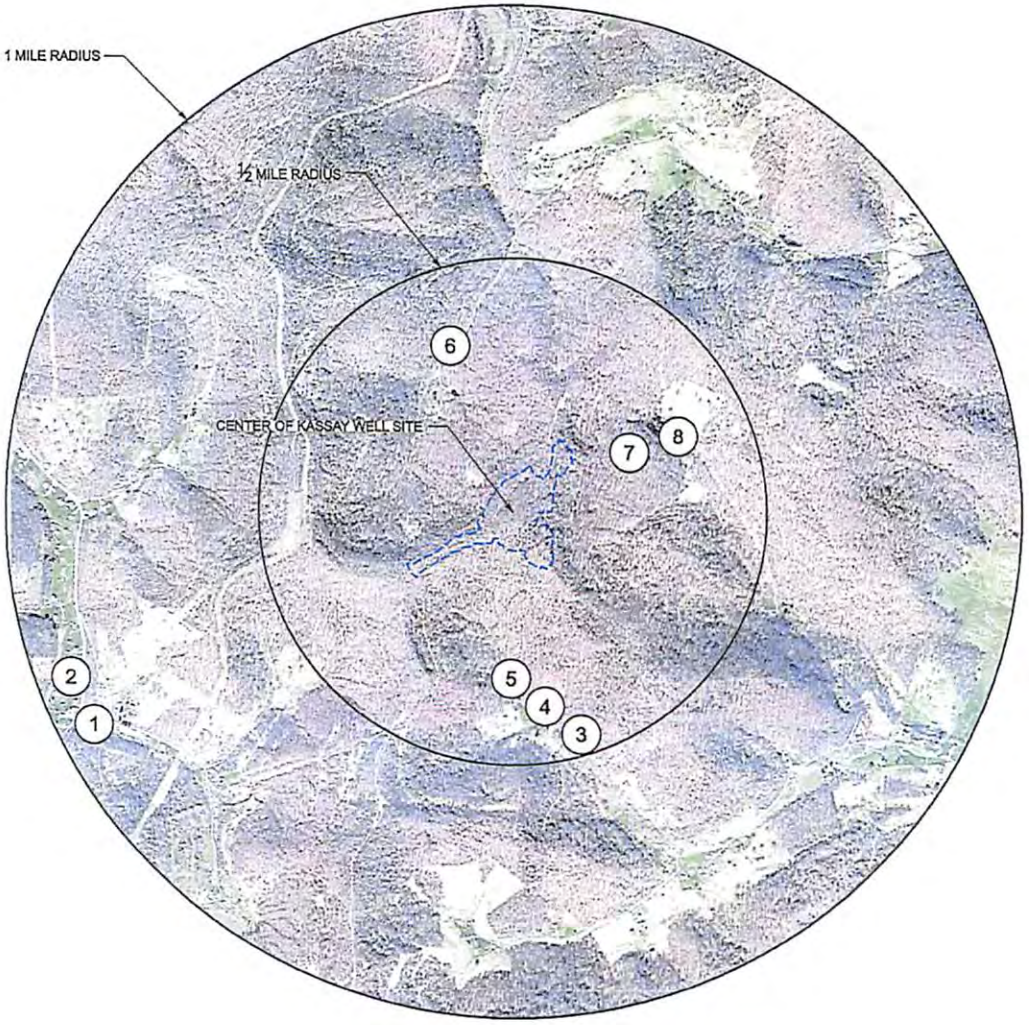
- Monongalia Sheriff 304.291.7290

5. LOCAL ER PERSONNEL

HOSPITAL

- Ruby Memorial (trauma 1) 304.598.4000
- Monongalia General (trauma 4) 304.598.1200

Structure	Type	Owner	Street Address	City/Zip	Phone Number	Tax Map	Parcel
1	Business	Gary D. Yost	2575 Daybrook Road	Fairview, WV 26570	304-798-3161	17A	12-15
2	Church	Daybrook Methodist Church	2546 Daybrook Road	Fairview, WV 26570	304-798-3003	17A	4
3	Residence/Private Structure	Samuel Matteo	452 Country Road	Fairview, WV 26570	304-777-3942	17	59
4	Residence/Private Structure	Samuel Matteo	452 Country Road	Fairview, WV 26570	304-777-3942	17	59.2
5	Residence/Private Structure	Angela Martin & Timothy Mayle	477 Country Road	Fairview, WV 26570	304-798-3009	17	59.1
6	Residence/Private Structure	Makayla Barr	122 Blue Goose Road	Fairview, WV 26570	304-798-3324	17	65
7	Residence/Private Structure	Bernice Tennant	299 Ellis Tennant Hollow	Fairview, WV 26570	304-798-3434	17	64
8	Residence/Private Structure	Bernice Tennant	299 Ellis Tennant Hollow	Fairview, WV 26570	304-798-3434	17	63



1
BUSINESS
GARY D. YOST
TAX MAP 17A, PARCEL 12-15
2575 DAYBROOK RD
FAIRVIEW, WV 26570

2
CHURCH
ALLEGHENY CONFERENCE OF THE UNITED METHODIST CHURCH
TAX MAP 17A, PARCEL 4
2546 DAYBROOK RD
FAIRVIEW, WV 26570

3
DWELLING/PRIVATE STRUCTURE
SAMUEL MATTEO
TAX MAP 17, PARCEL 59
452 COUNTRY ROAD
FAIRVIEW, WV 26570

4
DWELLING/PRIVATE STRUCTURE
SAMUEL MATTEO
TAX MAP 17, PARCEL 59.2
452 COUNTRY ROAD
FAIRVIEW, WV 26570

5
DWELLING/PRIVATE STRUCTURE
ANGELA MARTIN & TIMOTHY MAYLE
TAX MAP 17, PARCEL 59.1
477 COUNTRY ROAD
FAIRVIEW, WV 26570

6
DWELLING/PRIVATE STRUCTURE
MAKAYLA BARR
TAX MAP 17, PARCEL 65
122 BLUE GOOSE ROAD
FAIRVIEW, WV 26570

7
DWELLING/PRIVATE STRUCTURE
BERNICE TENNANT
TAX MAP 17, PARCEL 64
299 ELLIS TENNANT HOLLOW
FAIRVIEW, WV 26570

8
DWELLING/PRIVATE STRUCTURE
BERNICE TENNANT
TAX MAP 17, PARCEL 63
299 ELLIS TENNANT HOLLOW
FAIRVIEW, WV 26570

SCALE: 0

REVISION	
NO. / DATE	
JRR/JDS DRAWN	
SCM CHECKED	
JNO APPROVED	
JUNE 2014 DATE	
1332001 PROJECT NO.	

DIEFFENBAUCH & HRITZ
MORGANTOWN, WV

CLIENT: NORTHEAST NATURAL ENERGY LLC

PROJECT: KASSAY WELL SITE

TITLE: STRUCTURE EXHIBIT

DRAWING NO. 1

C. NOTIFICATION OF H_2S GAS PRESENCE

Detection of H_2S shall sound an alarm which notifies personnel to shut in the well(s) and evacuate to the predetermined safe zone immediately.

A wind sock and/or flags will be utilized on location to identify wind direction. A safe zone upwind and away from the well will be established at the beginning of each tour. Personnel are trained to evacuate the well and gather at this safe zone immediately at the first sound of an H_2S explosive gas alarm.

When in a historically known area, or after H_2S is first detected, operations will halt, evacuation procedures will be followed, and all personnel will be trained for detailed H_2S protocols before operations begin or resume.

After personnel are located in a safe area, the onsite supervisor will take a head count, and make the proper offsite notifications. The DEP Office of Oil and Gas will be notified by a phone call to both the local inspector and the emergency number. The local emergency responders may also be notified of the detection.

In the event that H_2S has been detected, the onsite supervisor shall use his discretion as to the severity of the event and whether the local community should be notified. NNE will make a diligent effort to identify local residents and businesses within a ½ mile radius of its unconventional well sites (*see attached). Notification of such residence may be done in the form of a phone call or a door to door visit. NNE also recognizes that in most emergency situations the local emergency responders will coordinate any notification or evacuation procedures for the community and NNE will work closely with such emergency responders in their efforts.

D. PRE-SPUD MEETINGS

Prior to drilling operations, an onsite "Pre-Spud" meeting will be held to address operations and the site safety plan. This meeting shall include the overseeing NNE Drilling/Completions Engineer, the staff or contracted site supervisor(s) ("Company Man"), any staff or contracted safety personnel, key contractors to the drilling process, the contracted rig's superintendent/tool pusher, and the local oil and gas inspector if available. Local emergency response personnel may also be invited to the pre-spud meeting. The regional DEP inspector will be notified 48-hours in advance of the meeting. All attending personnel will be documented. Contractors will be provided copy of and instructed to go over the site safety plan with their respective individual employees.

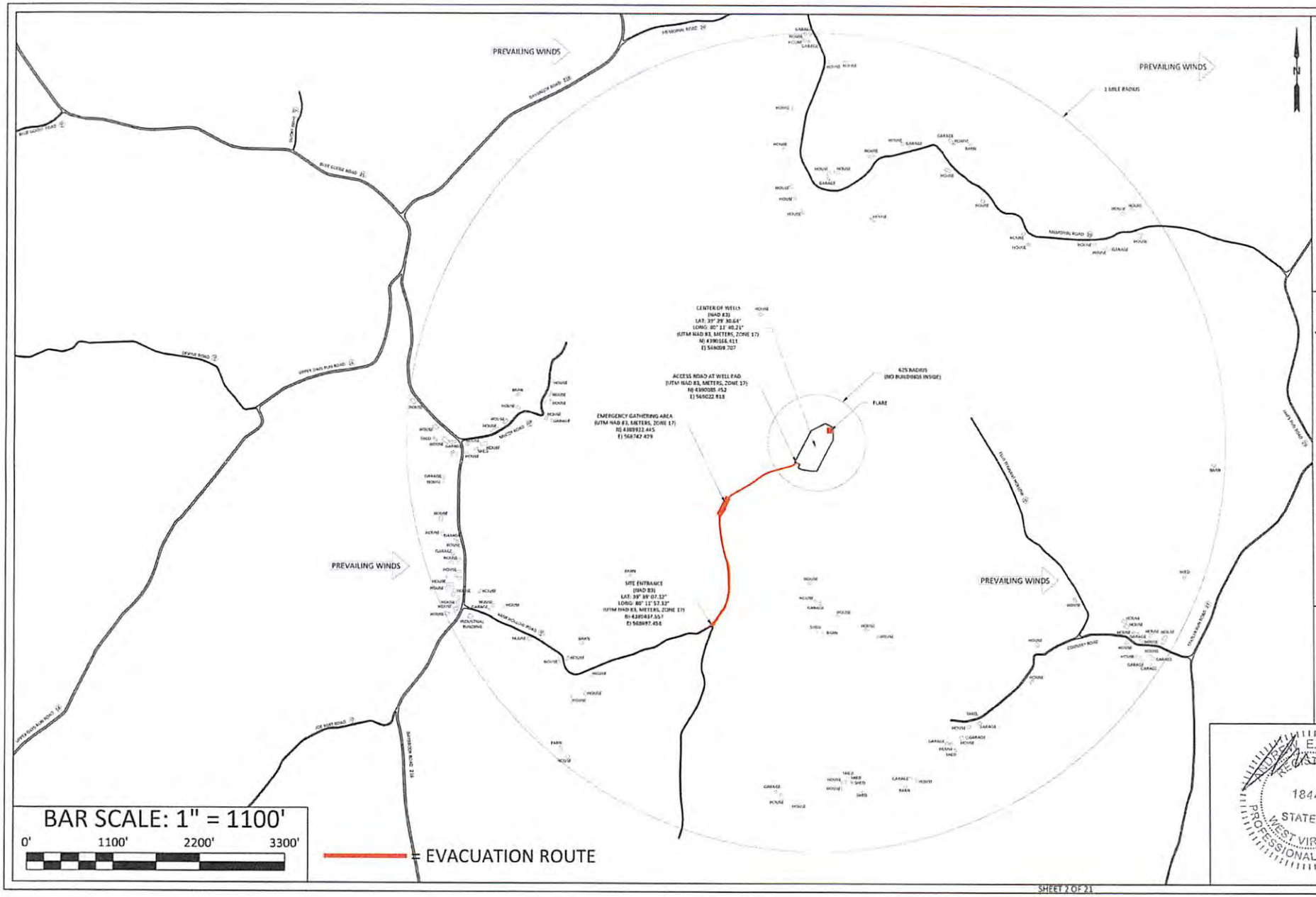
E. WELL SITE SAFETY MEETINGS

Safety Meetings will be held on-site, at a minimum, on a weekly basis and prior to the beginning of drilling, completion and work-over operations. Attendance at each safety meeting will be logged.

Additionally, as a means of safety and maintaining a head count in case of an incident, a check-in and check-out list of both personnel and visitors will be kept during all drilling, completion, and work over phases of operation. The rig/frac supervisor will be responsible for the checking in and out of all personnel on location. A sign will be posted at the entrance to the location directing all visitors to the company trailer.

2

Maps and Diagrams



BOORD, BENCHEK and ASSOC., INC.
Engineering, Surveying, Construction, and Mining Services
Southpointe, PA 15317 Phone: 724-746-1055

EVACUATION ROUTE/ PREVAILING WINDS

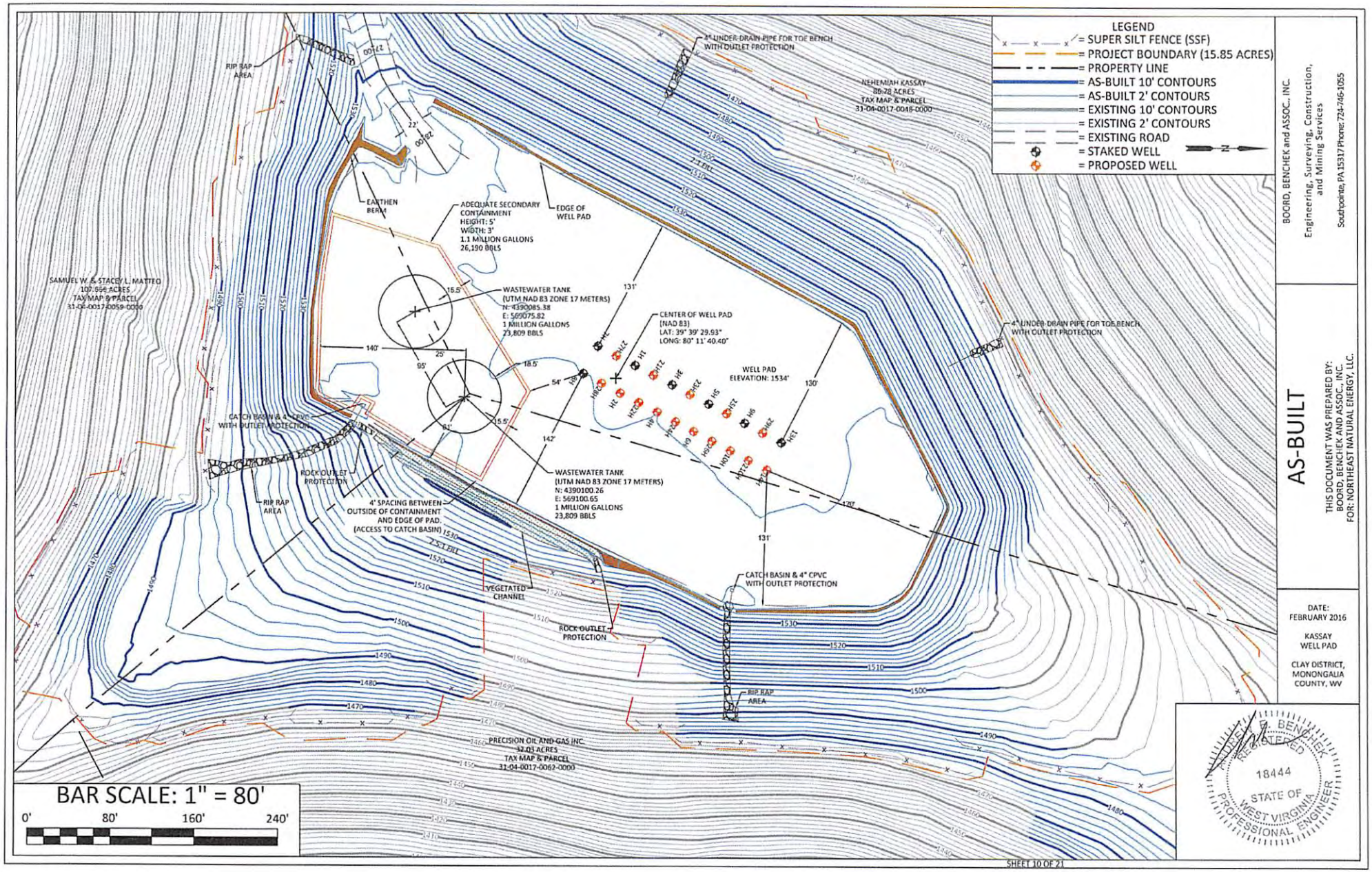
THIS DOCUMENT WAS PREPARED BY:
BOORD, BENCHEK AND ASSOC., INC.
FOR: NORTHEAST NATURAL ENERGY, LLC.

DATE:
FEBRUARY 2016

KASSAY
WELL PAD

CLAY DISTRICT,
MONONGALIA
COUNTY, WV

ANDREW E. BENCHEK
REGISTERED
18444
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER



BOORD, BENCHEK and ASSOC., INC.
Engineering, Surveying, Construction, and Mining Services
Southpointe, PA 15317 Phone: 724-746-1055

AS-BUILT

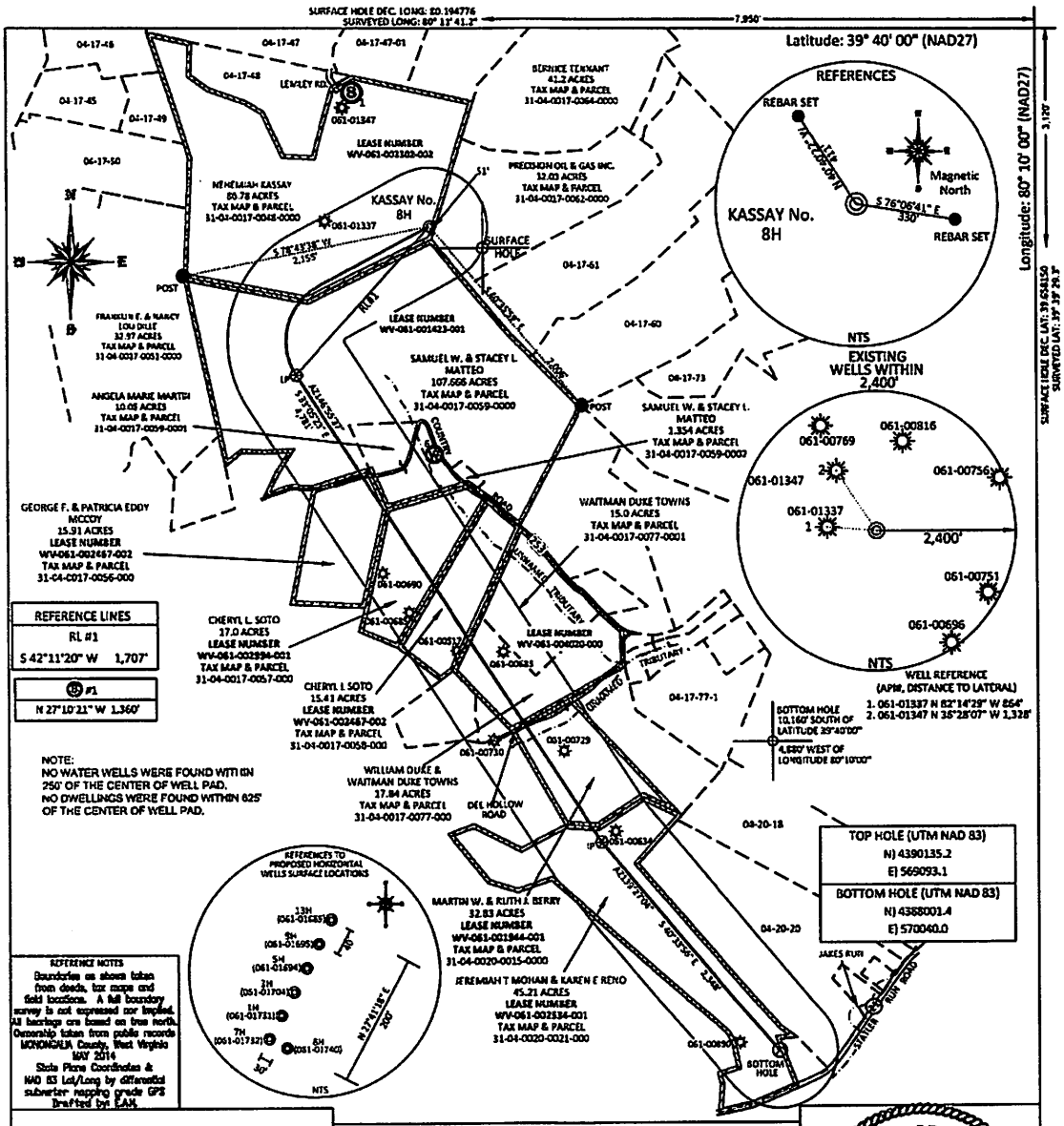
THIS DOCUMENT WAS PREPARED BY:
BOORD, BENCHEK AND ASSOC., INC.
FOR: NORTHEAST NATURAL ENERGY, LLC.

DATE:
FEBRUARY 2016

KASSAY
WELL PAD

CLAY DISTRICT,
MONONGALIA
COUNTY, WV

ANDREW J. BENCHEK
REGISTERED
18444
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER



FILE #: NNE15

DRAWING #: 2606

SCALE: PLAT: 1" = 1200' TOPO: 1" = 2000'

MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING GRADE GPS

I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

Signed: _____

L.L.S. #2124 : Ernest J. Benchek III

ERNEST J. BENCHEK III
LICENSED
No. 2124
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25304

DATE: SEPTEMBER 27, 2016

OPERATOR'S WELL #: KASSAY NO. 8H

API WELL #: 47 (STATE) 61 (COUNTY) ____ (PERMIT)

Well Type: ☐ Oil ☐ Waste Diposal ☐ Production ☐ Deep
☒ Gas ☐ Liquid Injection ☐ Storage ☒ Shallow

WATERSHED: DUNKARD CREEK

AS-BUILT ELEVATION: 1,534'

COUNTY/DISTRICT: MONONGALIA / CLAY

QUADRANGLE: BLACKSVILLE

SURFACE OWNER: NEHEMIAH KASSAY

ACREAGE: 86.78 +/-

OIL & GAS ROYALTY OWNER: NEHEMIAH & PATTY A. KASSAY

ACREAGE: 410.626 +/-

LEASE NUMBERS: _____

DRILL ☒ CONVERT ☐ DRILL DEEPER ☐ REDRILL ☐ FRACTURE OR STIMULATE ☒
PLUG OFF FORMATION ☐ PERFORATE NEW FORMATION ☐ PLUG & ABANDON ☐
CLEAN OUT & REPLUG ☐ OTHER CHANGE ☐ (SPECIFY): _____

TARGET FORMATION: MARCELLUS

ESTIMATED DEPTH: TVD: 8,288.5' TMD: 16,405.87'

WELL OPERATOR: NORTHEAST NATURAL ENERGY LLC

DESIGNATED AGENT: JOHN ADAMS

ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200

ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200

CITY: CHARLESTON STATE: WV ZIP CODE: 25301

CITY: CHARLESTON STATE: WV ZIP CODE: 25301

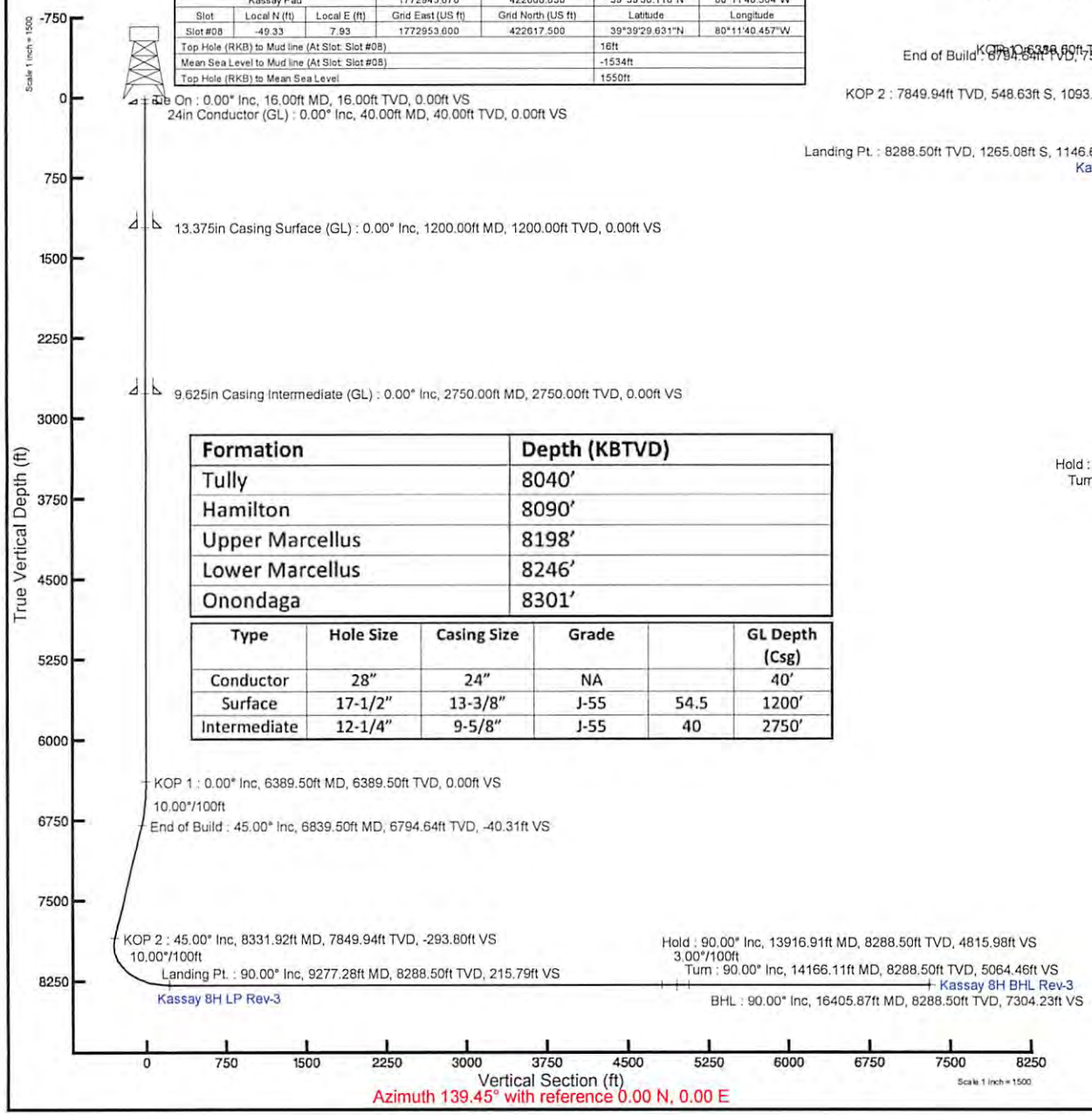
NORTHEAST NATURAL ENERGY, LLC

Location: Monongalia County, WV
Field: Monongalia
Facility: Kassay Pad

Slot: Slot #08
Well: Kassay 8H
Wellbore: Kassay 8H PWB

Location Information

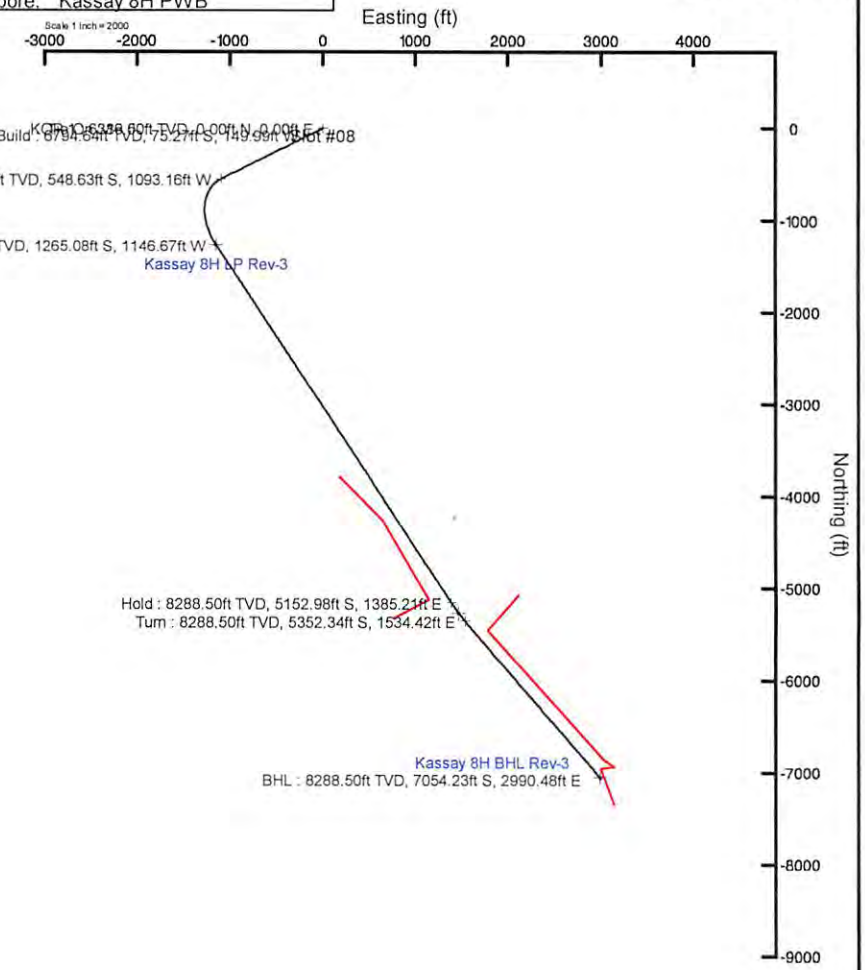
Facility Name			Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Kassay Pad			1772945.670	422666.830	39°39'30.118"N	80°11'40.564"W
Slot	Local N (ft)	Local E (ft)	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Slot #08	-49.33	7.93	1772953.600	422617.500	39°39'29.631"N	80°11'40.457"W
Top Hole (RKB) to Mud line (At Slot: Slot #08)					16ft	
Mean Sea Level to Mud line (At Slot: Slot #08)					-1534ft	
Top Hole (RKB) to Mean Sea Level					1550ft	

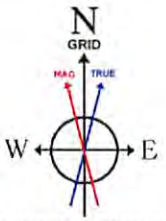


Azimuth 139.45° with reference 0.00 N, 0.00 E

Formation	Depth (KBTVD)
Tully	8040'
Hamilton	8090'
Upper Marcellus	8198'
Lower Marcellus	8246'
Onondaga	8301'

Type	Hole Size	Casing Size	Grade		GL Depth (Csg)
Conductor	28"	24"	NA		40'
Surface	17-1/2"	13-3/8"	J-55	54.5	1200'
Intermediate	12-1/4"	9-5/8"	J-55	40	2750'





BGGM (1900.0 to 2018.0) Dip: 66.80° Field: 52189.4 nT
Magnetic North is 9.05 degrees West of True North (at 9/23/2016)
Grid North is 0.44 degrees West of True North
To correct azimuth from True to Grid add 0.44 degrees
To correct azimuth from Magnetic to Grid subtract 8.61 degrees

3

Well Work

A(1.0) Description of Drilling Operations

The Kassay 8H well will be drilled on air to an approximate depth of 6389.5' TVD/MD. The well will then be horizontally drilled on synthetic based mud from the KOP of approximately 8,288.5' TVD and 16,405.87' MD along a 146 degree azimuth.

A(1.1) Anticipated Equipment/Materials

During the drilling of a horizontal Marcellus gas well the following equipment and materials could be on the drilling location:

Equipment / Materials	Potential Hazard
Double Stand Drilling Rig	Medical, Fire/Explosion, Spill/Release
Mud Pumps	Medical, Fire/Explosion, Spill/Release
Mud Tanks	Medical, Fire/Explosion, Spill/Release
Fork Lift	Medical, Fire/Explosion, Spill/Release
Excavator	Medical, Fire/Explosion, Spill/Release
Diesel Tank	Medical, Fire/Explosion, Spill/Release
Diesel Fuel	Medical, Fire/Explosion, Spill/Release
Generators	Medical, Fire/Explosion, Spill/Release
Air Compressor	Medical, Fire/Explosion
Light Tower	Medical, Fire/Explosion, Spill/Release
Frac Tanks (mud, cement additives,	Medical, Fire/Explosion, Spill/Release
Drilling Mud Additives	Medical, Fire/Explosion, Spill/Release

A(2.0) Description of Completions Operations

The Kassay 8H well will be completed using a multi-stage / high-rate slickwater fracture treatment using sand as a proppant. The First Stage will be initiated via pressurization against a burst disc ran in the production casing string and perforated by pumping down guns on wireline. Subsequent stages will also be perforated with pumped down guns ran on wireline. Individual stages will be isolated with composite frac plugs. Maximum pump rate during any stage will be 110 BPM with a maximum allowable surface pressure of 9,500 PSI. Composite bridge plugs will be set at the end of the last stage to isolate the treated formation. After the fracture treatment, composite frac plugs will be drilled out using a service rig and/or snubbing unit.

A(2.1) Anticipated Equipment/Materials

During the completion of a horizontal Marcellus gas well the following equipment and materials could be on the drilling location:

Equipment / Materials	Potential Hazard
Approximately 10 - 15 Pump Trucks	Medical, Fire/Explosion, Spill/Release
2 Blender Trucks	Medical, Fire/Explosion, Spill/Release
Belt Truck	Medical, Fire/Explosion, Spill/Release
Perforation Truck	Medical, Fire/Explosion, Spill/Release
Crane	Medical, Fire/Explosion, Spill/Release
Sand Tanks	Medical, Fire/Explosion, Spill/Release
Frac Tanks	Medical, Fire/Explosion, Spill/Release
Man Lift	Medical, Fire/Explosion, Spill/Release
Acid Truck	Medical, Fire/Explosion, Spill/Release
Fork Lift	Medical, Fire/Explosion, Spill/Release

Gel Truck	Medical, Fire/Explosion, Spill/Release
Communications Truck	Medical, Fire/Explosion, Spill/Release
Diesel Truck	Medical, Fire/Explosion, Spill/Release
Diesel Fuel	
80/90 wt gear oil	Medical, Fire/Explosion, Spill/Release
5/40 motor oil	Medical, Fire/Explosion, Spill/Release
Antifreeze	Medical, Fire/Explosion, Spill/Release
Ethylene Glycol	Medical, Fire/Explosion, Spill/Release
Tri-Ethylene Glycol	Medical, Fire/Explosion, Spill/Release
Frac Sand	Medical, Fire/Explosion, Spill/Release
Hydrochloric Acid (HCl)	Medical, Fire/Explosion, Spill/Release
Friction Reducer	Medical, Fire/Explosion, Spill/Release
Gelling Agents	Medical, Fire/Explosion, Spill/Release
Biocide	Medical, Fire/Explosion, Spill/Release
Scale Inhibitor	Medical, Fire/Explosion, Spill/Release
Iron Control	Medical, Fire/Explosion, Spill/Release
Gel Breaker Agent	Medical, Fire/Explosion, Spill/Release
Corrosion Inhibitor	Medical, Fire/Explosion, Spill/Release

A(3.0) Description of Production Operations

During the production phase, the well stream will flow through buried, welded piping to Gas Production Units. At this point, the gas will be separated from the water and sent through a meter to a sales pipeline. The water will be piped and stored in above ground tanks on the well site. Well pressures and flow rates will be monitored and recorded to ensure proper facility operation. All facilities will be installed according to industry standards and will have appropriate safety systems in place.

A(3.1) Anticipated Equipment/Materials

Production

Equipment / Materials	Potential Hazard
Well Head	Medical, Fire/Explosion, Spill/Release
Buried Flow Line	Medical, Fire/Explosion, Spill/Release
Sand Separator	Medical, Fire/Explosion, Spill/Release
Gas Processing Unit	Medical, Fire/Explosion, Spill/Release
Water Tanks	Medical, Fire/Explosion, Spill/Release
Condensate Tank	Medical, Fire/Explosion, Spill/Release
Water Truck Hauling & Hook Up Equipment	Medical, Fire/Explosion, Spill/Release
Pig Launcher	Medical, Fire/Explosion, Spill/Release

M & R Station

Equipment / Materials	Potential Hazard
Flowline	Medical, Fire/Explosion, Spill/Release
Pig Receiver	Medical, Fire/Explosion, Spill/Release
Two Phase Separator	Medical, Fire/Explosion, Spill/Release
Filter Units	Medical, Fire/Explosion, Spill/Release
Heater Unit	Medical, Fire/Explosion, Spill/Release
Dehydration Tower	Medical, Fire/Explosion, Spill/Release
50 – 100 Barrel Water Tank	Medical, Fire/Explosion, Spill/Release
Meter House	Medical, Fire/Explosion, Spill/Release
Meter Skid	Medical, Fire/Explosion, Spill/Release

B DISTRIBUTION OF THE SITE SAFETY PLAN

Copies of this Plan will be located at NNE's corporate office building in Charleston, West Virginia, its field office in Morgantown, West Virginia, with the Designated Response Coordinators and field operation sites when applicable. This Plan may be accessed electronically by all NNE employees on the company's shared drive/share point. All NNE employees are to abide by the provisions of this Plan and are required to participate in its implementation. This Plan will also be shared with external entities such as the Monongalia County Office of Emergency Management within at least seven (7) days prior to earth disturbance and/or well work.

Efforts will be made to familiarize police, fire departments, emergency response teams and the County Emergency Management Coordinator with the layout of the well site, the properties and dangers associated with the equipment and materials that are on site, places where personnel would normally be working, and the possible evacuation routes should an emergency occur.

4

Chemical Inventory & Material Safety Data Sheets ("MSDS")

A Material Safety Data Sheets ("MSDS")

MSDS Sheets will be provided upon request on a CD or USB drive.

B Location of MSDS

MSDS sheets will be kept in the company trailer during the drilling and completion phases of operation. Any Contractors that bring hazardous materials on site will provide MSDS for such. The onsite supervisor will be responsible for ensuring that all MSDS sheets are obtained and are easily accessible in case of an emergency.

C DRILLING MUD

1,500 bbl of 12.9 ppg synthetic drilling mud will be used along with the below listed chemicals. The mud will be kept in an open top above ground mud pit and circulated by nozzles and paddles.

Material	Unit	Amount
Barite	4000lb	9
Calcium Choloride Powder	50lb	200
Carbo Gel	50lb	60
Base Oil	1 gal	1440
Lime	50lb	69
Mil Sorb	50lb	87

5

Blow Out Preventer ("BOP") and Well Control

A BOP EQUIPMENT – DRILLING PHASE

From the shoe of the intermediate casing string (9-5/8") to KOP, the well will continue to be drilled on air. For this section, at a minimum, an 11" 3,000 PSI annular-type BOP will be utilized as a means of well control. Installation of this equipment will be dependent upon two different conditions...

- Should the top-hole drilling rig have a substructure large enough to sit upon a cellar, an 11" 5,000 PSI API flanged casing head will be welded onto the top of the intermediate casing string (9-5/8") below grade after it has been set and cement has cured for a minimum of 8 hours. It is upon this casing head that the annular-type BOP will be bolted and torqued to specification as a means of well control for the section.
- Should the top-hole drilling rig have a substructure too small to sit upon a cellar, the intermediate casing string (9-5/8") will be landed at surface and a screw-on or weld flange annular-type BOP will be used as a means of well control for the section. Under this scenario, a cellar will be installed around the wellbore after the top-hole rig is released from the pad. Once installed, an 11" 5,000 PSI API flanged casing head will then be welded onto the top of the intermediate casing string (9-5/8") below grade.

For the remainder of the drilling of the well on fluid; at a minimum and from bottom to top; an 11" 5,000 PSI kill spool, an 11" 5,000 PSI blind ram-type BOP, an 11" 5,000 PSI pipe ram-type BOP, and an 11" 5,000 PSI annular-type BOP will be bolted and torqued to specification upon the 11" 5,000 PSI casing head.

B PROCEDURE AND SCHEDULE FOR TESTING BOP

For the bottom and horizontal wellbore drilling phase, function testing of BOP equipment shall occur upon initial installation, weekly, and after each trip. Pressure testing of all BOP equipment shall occur upon initial installation and every twenty-one (21) days thereafter, should the well not be completed within that time. Annular preventers are to be tested to seventy percent (70%) of the rated capacity and ram preventers should be tested to eighty percent (80%) of the rated capacity according to the following procedure;

- The WV DEP Regional Oil and Gas Inspector will be notified 24 hrs. in advance of the pressure testing of all BOP equipment.

- For the testing of the 3,000 PSI annular-type BOP before drilling through the shoe of the intermediate casing string to KOP, a cup-type tester will be lowered into the intermediate casing (9-5/8") or a plug-type tester will be inserted into the

casing head if installed. After a successful function test, the annular BOP will be closed around drill pipe and the void between the cup or plug will be pressurized using fluid as a medium. This shall consist of a minimum five minute low pressure (300 PSI maximum) test, and a thirty minute high pressure (2,100 PSI minimum) test. Annular preventer and valves shall be tested from the direction they are exposed to wellbore pressure. A successful test shall consist of less than a 10% bleed off after buildup over the entire duration of the low/high test period.

- For the testing of the BOP stack from KOP to TD of the well, a plug-type tester will be placed into the bowl of the 11" 5M x 9-5/8" casing head. After a successful functional test, all rams, valves, TIW valves, chokes, and annular preventers will be pressure tested from the direction they are subjected to wellbore pressure. The annular preventer will be tested by pressurization around drill pipe using water as a medium and subject to a minimum five minute low pressure (300 PSI maximum) test, and a minimum thirty minute high pressure (2,100 PSI minimum for 3M equipment, 3,500 PSI minimum for 5M equipment) test. Rams, valves, TIW, and choke components shall be tested using water as a medium and subject to a minimum five minute low pressure (300 PSI maximum) test, and a minimum thirty minute high pressure (2,400 PSI minimum for 3M equipment, 4,000 PSI minimum for 5M equipment) test. Each individual component must pass its respective test before drilling may commence. A successful test shall consist of less than a 10% bleed off after buildup over the entire duration of the low/high test period.

C ASSEMBLY INSTALLATION SCHEDULE

- During top hole operations a 11" 5,000 PSI API flanged casing head will be welded onto the top of the intermediate casing string (9-5/8") below grade and an 11" 3,000 PSI annular-type BOP will be used to KOP
- From curve to TD the following will be added to the flanged casing; 11" 5,000 PSI kill spool, 11" 5,000 PSI blind ram-type BOP, 11" 5,000 PSI pipe ram-type BOP, and 11" 5,000 PSI annular-type BOP 11" 5,000 PSI casing head.

D PERSONNEL WITH WELL CONTROL TRAINING

Throughout operations, the following Northeast Natural Energy representatives shall have and maintain IADC well control certification:

- Jay Hewitt – Drilling Manager
- Ian Costello – Completions Engineer
- Ryan Warner – Production Engineer
- Any onsite consultant hired to oversee drilling or completions operations

E SYSTEM OF MAINTAINING DETAILED RECORDS

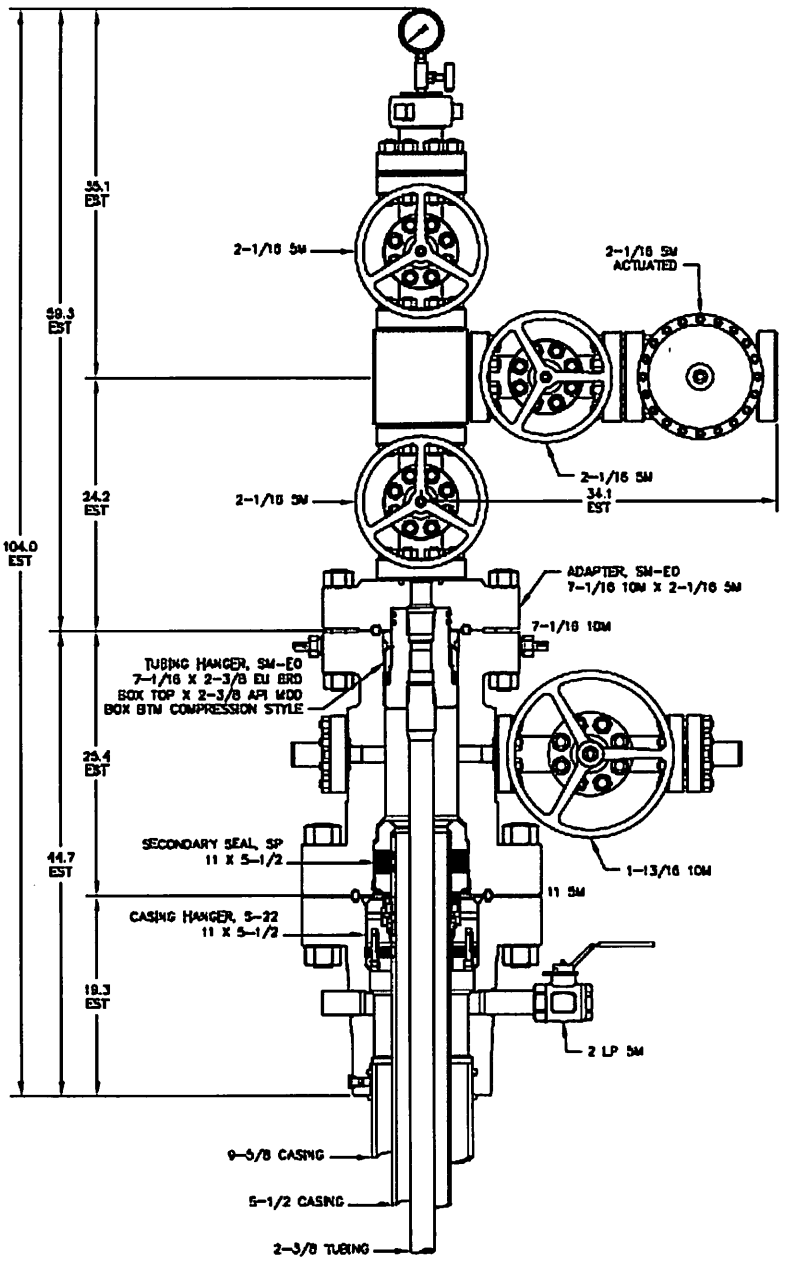
A detailed Driller's Log shall be maintained, including but not limited to, lost circulation, the presence of hydrogen sulfide gas, fluid entry, kicks, and abnormal pressures.

F NOTIFICATION OF THE OFFICE OF OIL AND GAS

The WV DEP Office of Oil and Gas will be immediately notified of the presence of hydrogen sulfide gas above 10 ppm, significant kicks, or blow-out events.

G WELL HEAD ASSEMBLY

A 5,000 PSI production tree will be placed upon the tubing spool after the drill out process. This unit will consist of, at a minimum and from bottom to top; one flanged 2-1/16" 5,000 PSI gated master valve, a studded three-way tee, a flanged 2-1/16" 5,000 PSI gated swab valve, and a 5,000 PSI flanged tree cap. The side outlet of the studded three-way tee shall include a flanged 2-1/16" 5,000 PSI gated wing valve. A schematic of the proposed wellhead and tree assembly is attached for reference.



H WELL KILLING PROCEDURE

An oil-based synthetic drilling fluid will be utilized for the bottom and horizontal sections of the well. A total onsite volume of 1,600 Bbls (1.5 times the hole volume) will be maintained at 12.5 ppg. Enough weighting material, in the form of barite, will be kept onsite to increase the density of the entire volume of drilling mud by 1.0 ppg. This constitutes enough weighting material to initiate a 16 ppg slug, should a kick be encountered.

Dual-purpose paddle style mixing/reserve tanks will be used for the blending of mud additives and weighting material. A minimum of two units will be employed, with the final number based upon the drilling contractor selected.

The well will be drilled in an overbalanced manner to maintain control over formation fluids. Should a kick be detected, the well will be killed by either the IADC approved "Driller's Method" or "Wait and Weight" method. Bottomhole pressure will be calculated from SIDPP obtained post-kick, and the drilling fluid density will be increased by adding barite to the system and circulated throughout the wellbore when using the "Wait and Weight" method. After circulation with either method, the well will then be checked for flow, and if none is detected, then drilling operations will resume.

6

Hydrogen Sulfide ("H_2S")

A DETECTION, MONITORING AND WARNING EQUIPMENT

Based upon previous experience and history in the area, no H_2S is expected to be encountered during the drilling or completion activities of the Kassay 8H. As a means of additional protection, mud loggers will be utilized during the drilling process to monitor any gas stream from the well through the flowline during the bottom and horizontal sections. Additional portable detection equipment shall be available on or near potential sources of explosive or hydrogen sulfide gases on the pad throughout all operations. Monitoring equipment shall be calibrated by and in accordance with the supplying contractor's guidelines. Detection of either shall sound an alarm which notifies personnel to shut in the well(s) and evacuate to the predetermined safe zone immediately.

B H_2S TRAINING

A safe zone upwind and away from the well will be established at the beginning of each tour. Personnel are trained to evacuate the well and gather at this safe zone immediately at the first sound of an H_2S explosive gas alarm.

When in a historically known area, or after H_2S is first detected, operations will halt, evacuation procedures will be followed, and all personnel will be trained for detailed H_2S protocols before operations begin or resume.

C NOTIFYING THE OFFICE OF OIL AND GAS

In the event that H2S is encountered, after all personnel have gathered in the safe zone, the onsite supervisor will take a head count, and then proper offsite notifications shall be made. The DEP Office of Oil and Gas will be notified by a phone call to both the local inspector and the emergency number.

D PROTECTION ZONES

A wind sock and/or flags will be utilized on location to identify wind direction, and safe zone upwind and away from the well will be established at the beginning of each tour. Personnel are trained to evacuate the well and gather at this safe zone immediately at the first sound of an H_2S explosive gas alarm.

E LIST OF PERSONAL PROTECTIVE EQUIPMENT ("PPE")

Since drilling in a historically known area to not contain H2S through the intervals drilled, H2S specific PPE will not be kept on site. Centralized H2S alarms, and supplemental personal alarms, will be maintained and used throughout the drilling and completion process. Personnel on site will be notified to cease the current operation safely, shut-in all wells on the pad, and evacuate all personnel to the pre-determined safe zone at the first signal of H2S from these alarms. It is at this time that NNE personnel would assess the hazards, and bring in H2S specialists and PPE to mitigate the situation. Normal work would return to the pad after all personnel passed a specific H2S training and were equipped with the proper PPE.

7

Flaring

A FLARING PLAN

Post frac, a system of 2" and 3" Figure 1502 integrated-hammer pup joints will be assembled from the wellhead to a 5,000 PSI plug catcher and choke manifold. The choke manifold shall consist of two parallel adjustable chokes to control the initial flow of the well. Using the same construction iron, from the choke manifold, flow will enter a high capacity temporary production unit. The liquid fraction from the well will be diverted to gas buster equipped frac- tanks on location. All or part of the gas fraction from the well will be diverted to a thirty foot flare stack approximately 150' downwind of the wellhead. Any gas not diverted to a flare line shall be diverted to sales.

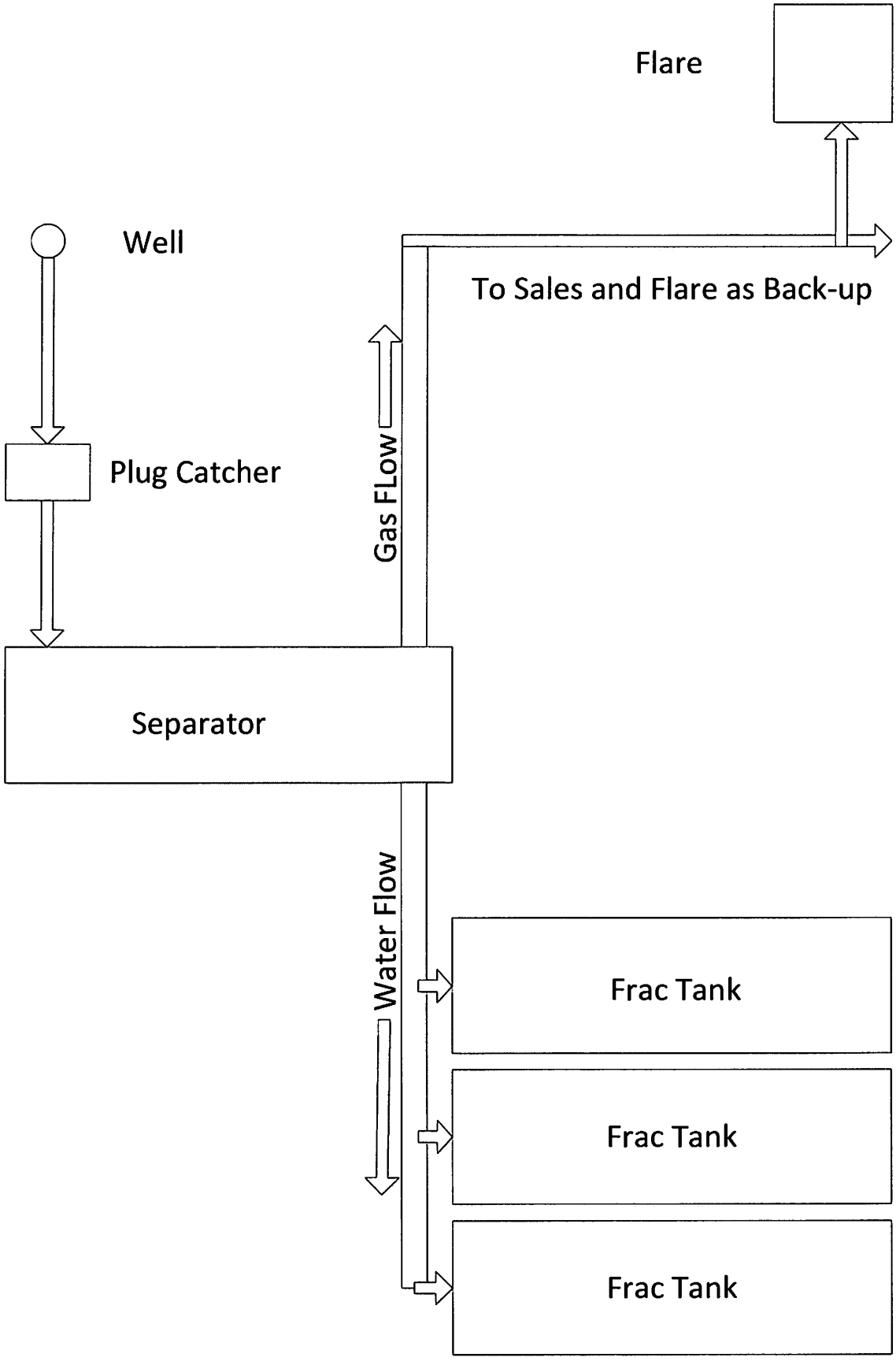
Iron pipe used in the flow/flare line assembly shall be banded at the joints with chain or steel cable. The flow/flare assembly shall be anchored in place by attachment to concrete blocks at vendor recommended intervals.

The flare stack will be equipped with an electronic ignition system, and a minimum of two backup ignition sticks will be kept on location at all times.

All gas diverted through the choke manifold shall either be burned through the flare stack or sent to sales. The local fire department will be given prior notice of the window in which gas flaring is to occur. They will also be notified immediately prior to lighting the flare, if possible, otherwise, as soon after lighting the flare as possible.

A 50' circumference shall be maintained around the flare stack which is to be kept free of flammable materials at all times prior to and during the flaring of any gas.

It is expected to flare the gas fraction of the well stream for a one week period.


Flare
Well
To Sales and Flare as Back-up
Plug Catcher
Gas FLow
Separator
Water Flow
Frac Tank
Frac Tank
Frac Tank

8

Collision Avoidance Safeguards, Practices and Standards

Scope of Work:

To ensure that wells are drilled in a safe manner that mitigates the risk of underground collisions on multi-well pads. Key portions of work will be described including roles, responsibilities and steps taken when returning to pads with existing producing or stimulated wells.

Definitions:

1) Proposed Wellbore- Involves sections of the vertical top-hole, the KOP, the lateral landing, and the lateral drilling to the total measured depth (TMD).
2) Nudge- Technique generally used in the vertical top-hole section. The well path is nudged from vertical to pass areas of possible magnetic interferences and to reduce the risk of collision by maintaining separation with other wellbores.
3) KOP- Kick off Point. Diverting a well path from one trajectory to another
4) MWD- Measurement While Drilling
5) LWD- Logging While Drilling
6) EM - Electromagnetic Telemetry
7) SF- Separation Factor or Clearance Factor:

   $SF^* = CC \div [UR_{ref} + UR_{off}]$

   CC - Well separation distance (center to center of wellbores)

   UR_{ref} – radius ellipse of uncertainty on reference well

   UR_{off} – radius ellipse of uncertainty on offset well

   Note: ellipses are half-axes or radii.

   *Calculation options may be considered
8) TMD- Total Measured Depth
9) Gyro – High accuracy well bore survey instrument unaffected by magnetic interference.
10) QC / QA – Quality Control and Quality Assurance
11) HSE – Health Safety and the Environment
12) UBHO Sub – Universal Bottom Hole Orientation Sub

Established descriptions of risk:

1)	SF ≤ 1.0	Level 1	Extreme collision risk
2)	SF = 1.0 to 1.5	Level 2	High collision risk
3)	SF = 1.5 to 2.0	Level 3	Moderate collision risk
4)	SF > 2.0	Level 4	Low to no collision risk

Well Planning:

Prior to drilling any well, a directional plan will be developed to ensure that the well is properly placed with consideration to permits, lease limitations and future drilling plans. The well will be planned to maintain a SF of ≥ 2.0 whenever possible. If a SF of <2.0 is encountered, additional risk mitigation steps may be required such as increased survey frequency, wellbore steering or installing downhole mechanical barriers.

Survey Protocol:

When drilling wells on a pad without producing or stimulated wells, surveys will be taken every 30' - 500' in the vertical portion of the wellbore depending on wellbore trajectory, hole walk and risk of collision.

When drilling wells on a pad with producing or stimulated wells, surveys will be taken every 30' - 250' in the vertical portion of the wellbore depending on wellbore trajectory, hole walk and risk of collision.

Tool Alignment Procedure:

Tool alignment is critical in eliminating wellbore collision risks. In all wells, north seeking gyro tools, MWD/EM tools and anti-collision processes are utilized to mitigate the risk of downhole collisions. All work groups responsible for the placement of the wellbore share responsibility in ensuring accuracy. The Company Representative, Directional Drilling Supervisor and Gyro Supervisor are all responsible for the alignment of the UBHO Sub and the motor to ensure that azimuthal directional is correct. All parties should visually verify the orientation of the shoe and agree upon a coordinate system and reference point. When possible, MWD tools will be used to minimize risk of incorrect orientation.

Directional Planning and Controls – Vertical Wellbore:

Drilling Without Stimulated Wellbores:

When drilling on pads without producing or stimulated wells, all wells will be planned with a minimum SF ≥ 1.5. Surveys will be taken at intervals of 500' to record the well path as it is drilled, but the frequency can be increased if needed. Drilling parameters should be held constant for the vertical portions of all wells to ensure the natural drilling path is similar for all wells on the pad. If two wells come within 10' of each other or a SF

of ≤1.5 is reached, each survey is monitored closely and anti-collision is run after each survey until the wells are clear of a collision risk.

Following the drilling of the vertical section of the wellbore, a gyro survey will be taken. Anti-collision software will be used to analyze this data to ensure safe wellbore spacing. Internally, the directional company will utilize their own software to monitor and model wellbores for collision risks; but, as a redundancy, NNE will utilize Hawkeye software to validate their results.

Drilling With Stimulated Wellbores:

If a rig is returning to a pad with producing or stimulated wellbores, additional steps are required to mitigate risks. Prior to commencing drilling, gyro data from existing wells is analyzed to determine normal hole walk. If a well does not have gyro data, a gyro survey will be run. Once all gyro data is gathered, a preliminary well path is planned to identify collision risks. That plan will be used to identify points of concern where additional risk mitigation steps are needed

NNE may choose to drill wells on a pad with active production; however, additional well path management practices will be employed. During this scenario, if two wells come within 14' or a SF ≤ 2.0, each survey is monitored closely and anti-collision re-run after reach survey until the wells are clear of a potential collision. The Survey frequency can vary from 30'-250' depending on wellbore trajectory, hole walk and risk of collision.

Directional Planning and Controls – Curve and Lateral Wellbore:

While drilling the curve and lateral portions of the wellbores, MWD technology will be used to ensure the well path is drilled according to the drilling plan and the state permit. Azimuth, gamma ray and other data will be collected and transmitted to surface. The information will be analyzed by the Directional Drilling Contractor, Company Representative, Drilling Manager and Geologist to ensure the quality of the data and proper interpretation.

Gyro data and/or MWD/EM data will be evaluated in anti-collision software to monitor the path of the well being drilled in relationship to all adjacent wells to ensure an adequate SF is maintained during the vertical, curve and horizontal portions of the wellbore. Survey frequency is to be a minimum of 100' while MWD/EM tools are being utilized. Each survey is analyzed and certified as accurate by the directional company before it can be used for any modeling or directional planning.

Other Data:

Prior to drilling new wells on a pad, a site overview with the wellhead arrangement will be developed. Among the information that will be included is API number, surface footage separation and wellbore status. Additionally, all survey data for each existing well will be compiled for use in well planning.

Contingency Plans:

The wellbore being drilled will be monitored in relation to existing wellbores. Should the active well approach an existing well and the SF be < 1.5, drilling will be suspended until risks are mitigated by adjusting the directional plan, increasing survey frequency and verifying any necessary mechanical barriers are present in the adjacent wells. If a SF ≤1 is experienced or two wellbores are within 5' of one another, the WV DEP Office of Oil and Gas Regional Inspector will be immediately contacted.

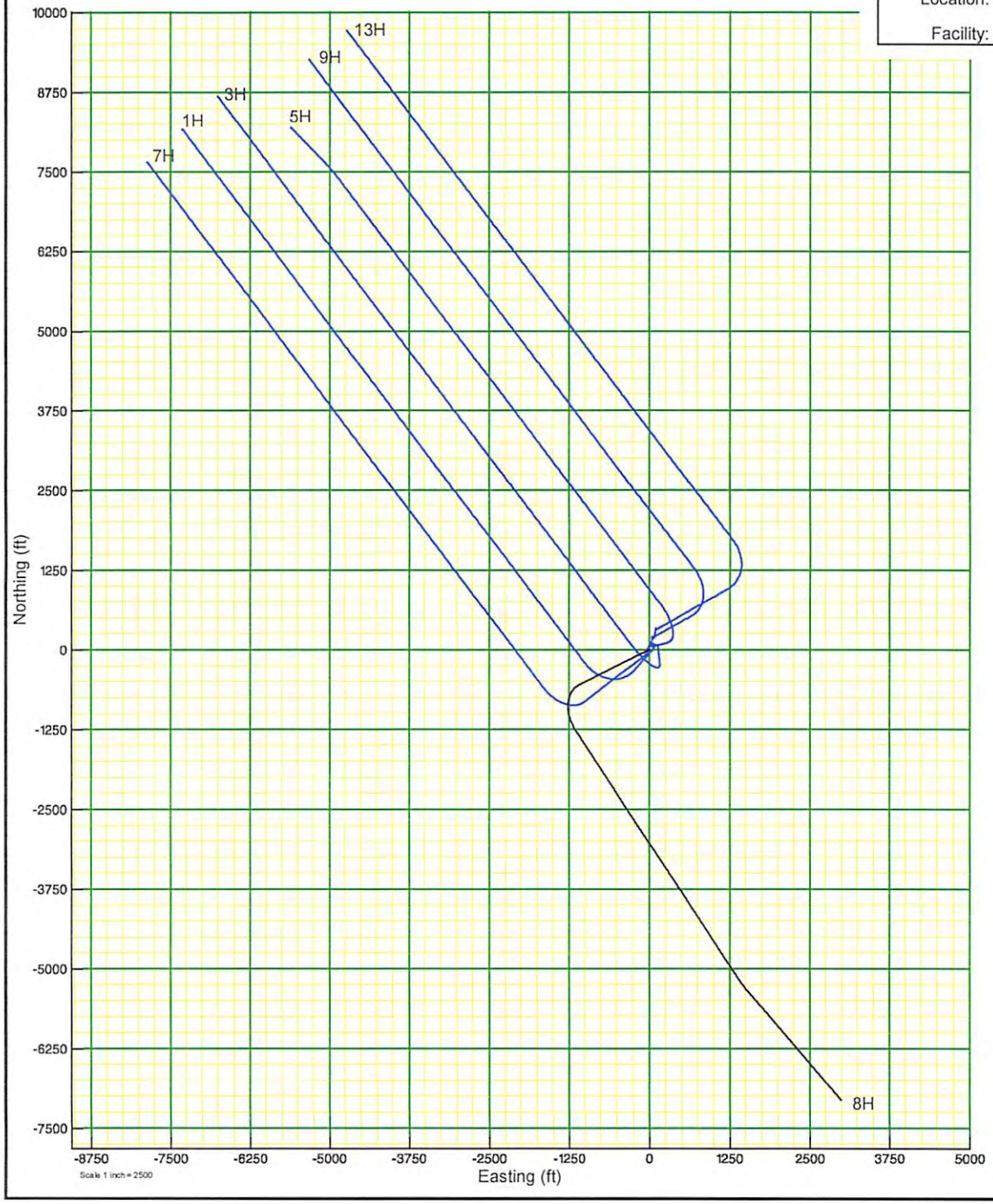
If the wellbore trajectories reach a point where a collision is unavoidable, NNE will properly secure each well and evaluate the most prudent path forward while openly communicating with the WV DEP Oil and Gas Regional Inspector.

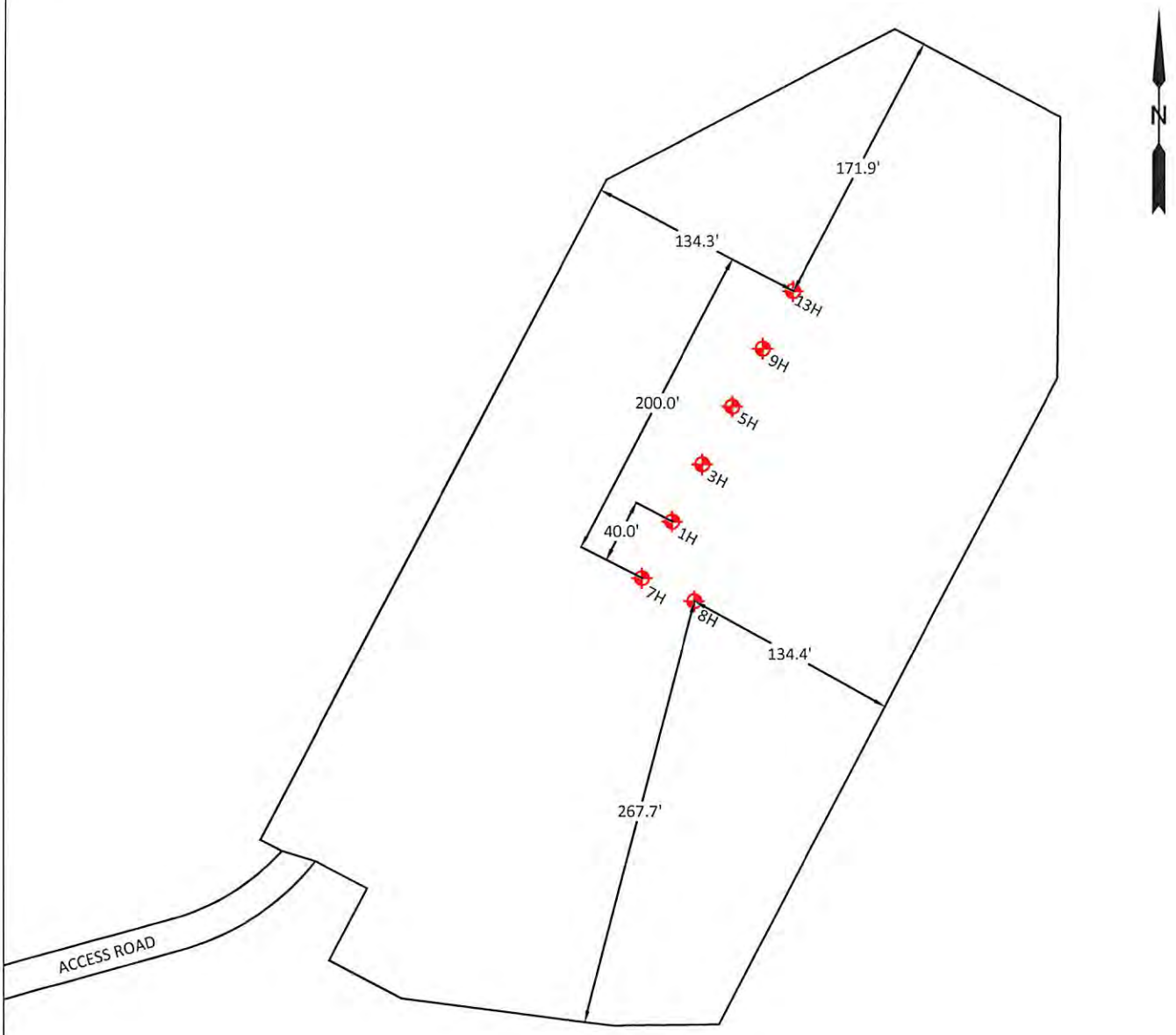
Should a collision occur, the WV DEP Office of Oil and Gas Regional Inspector will be immediately contacted, drilling will be suspended and all existing wells will be monitored for integrity. If a loss of pressure control in any well is experienced, Wild Well Control, or another professional well control company, will be contracted for technical support and services. If there is not a loss of pressure control, a separate well work procedure will be developed to repair or plug and abandon the affected wells.

NORTHEAST NATURAL ENERGY, LLC

Location: Monongalia County, WV

Facility: Kassay Pad





SCALE BAR: 1"=100'

0' 100' 200' 300'

LEGEND

=PROPOSED WELL

=EXISTING WELL

PREPARED FOR

NORTHEAST NATURAL ENERGY LLC

KASSAY WELL PAD

CLAY DISTRICT, MONONGALIA COUNTY, WV

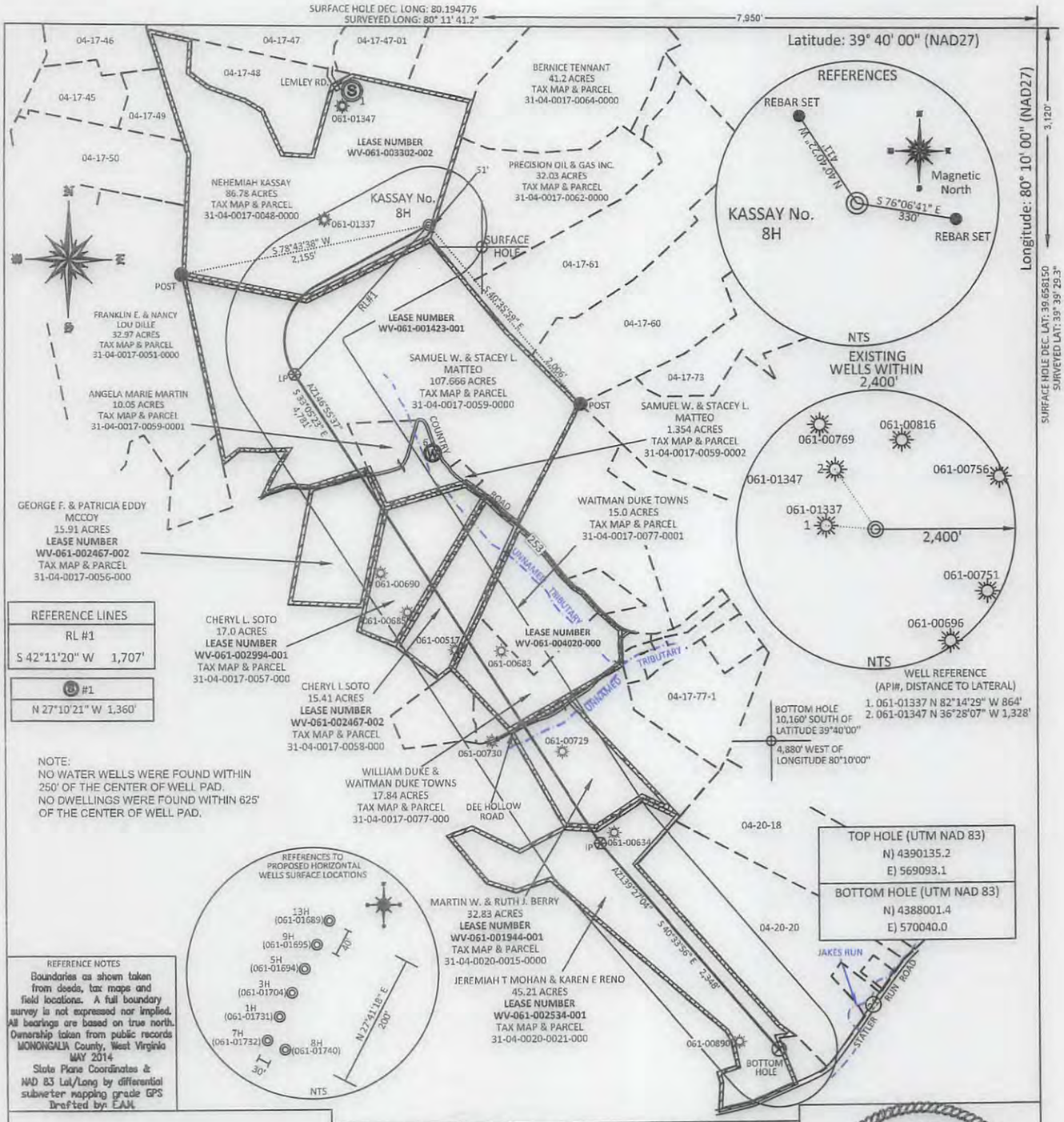
PREPARED BY

BOORD BENCHEK & ASSOC., INC.

ENGINEERING, SURVEYING, CONSTRUCTION AND MINING SERVICES

SOUTHPOINTE, PA 15317 PHONE: 724-746-1055

Well Number	API Number	Status
Kassay 3H	47-061-01704	Permitted - Not Drilled
Kassay 5H	47-061-01694	Permitted - Not Drilled
Kassay 9H	47-061-01695	Permitted - Not Drilled
Kassay 13H	47-061-01689	Permitted - Not Drilled
Kassay 1H	47-061-01731	Permitted - Not Drilled
Kassay 7H	47-061-01732	Permitted - Not Drilled
Kassay 8H	47-061-01740	Permitted - Not Drilled



REFERENCE LINES
RL #1
S 42°11'20" W 1,707'

#1
N 27°10'21" W 1,360'

NOTE:
NO WATER WELLS WERE FOUND WITHIN 250' OF THE CENTER OF WELL PAD.
NO DWELLINGS WERE FOUND WITHIN 625' OF THE CENTER OF WELL PAD.

TOP HOLE (UTM NAD 83)
N) 4390135.2
E) 569093.1
BOTTOM HOLE (UTM NAD 83)
N) 4388001.4
E) 570040.0

REFERENCE NOTES
Boundaries as shown taken from deeds, tax maps and field locations. A full boundary survey is not expressed nor implied. All bearings are based on true north. Ownership taken from public records MONONGALIA County, West Virginia MAY 2014
State Plane Coordinates & NAD 83 Lat/Long by differential submeter mapping grade GPS
Drafted by: EAK

FILE #: NNE15
DRAWING #: 2606
SCALE: PLAT: 1" = 1200' TICK: 1" = 2000'
MINIMUM DEGREE OF ACCURACY: 1/200
PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING GRADE GPS

I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

Signed: _____

L.L.S. #2124 : Ernest J. Benchek III

ERNEST J. BENCHEK III
LICENSED
No. 2124
STATE OF
WEST VIRGINIA
PROFESSIONAL SURVEYOR

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25304

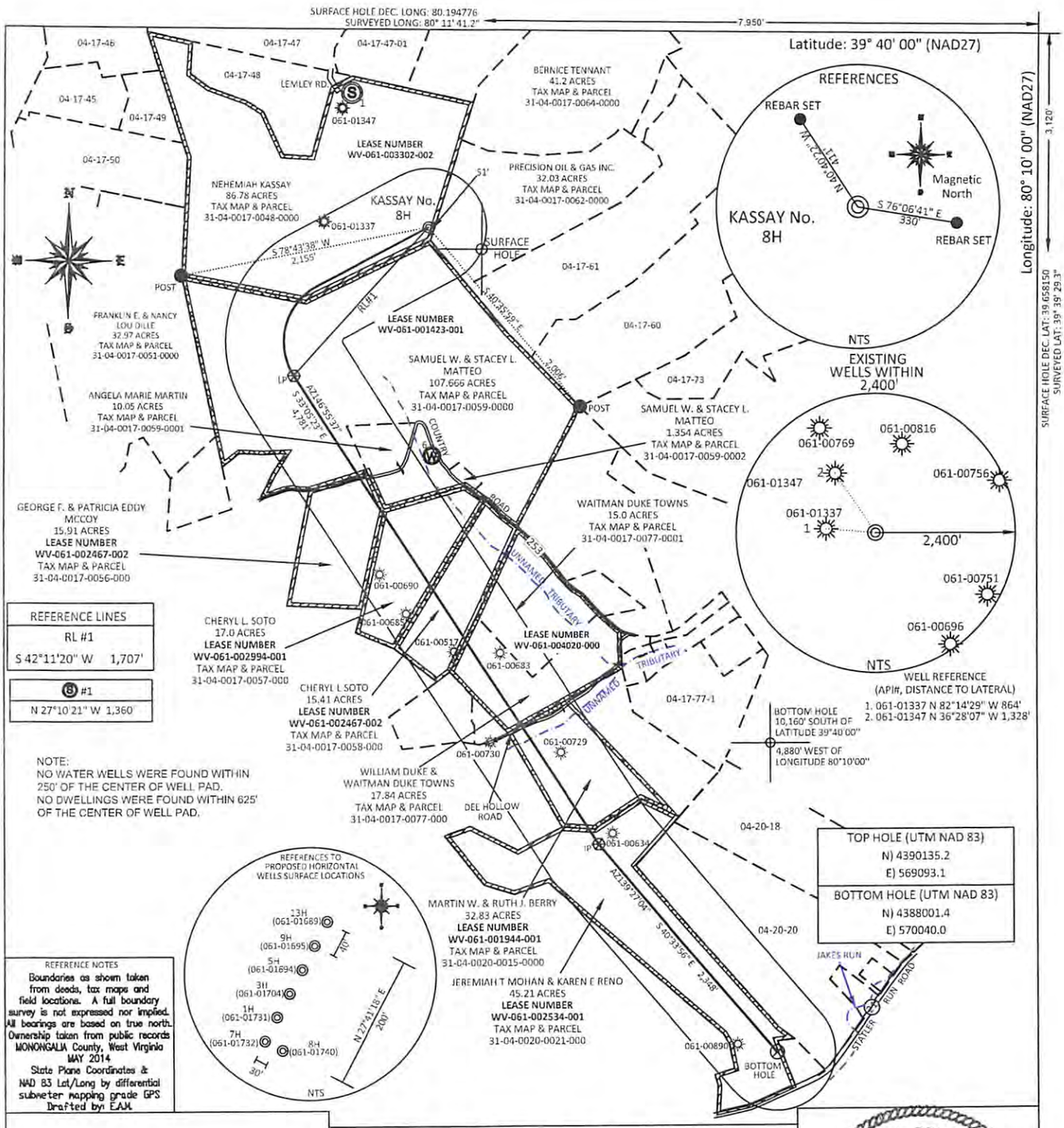
DATE: SEPTEMBER 27, 2016
OPERATOR'S WELL #: KASSAY NO. 8H
API WELL #: 47 (STATE) 61 (COUNTY) 01740 MOD (PERMIT)

Well Type: ☐ Oil ☐ Waste Diposal ☐ Production ☐ Deep
☒ Gas ☐ Liquid Injection ☐ Storage ☒ Shallow

WATERSHED: DUNKARD CREEK
AS-BUILT ELEVATION: 1,534'
COUNTY/DISTRICT: MONONGALIA / CLAY
QUADRANGLE: BLACKSVILLE
SURFACE OWNER: NEHEMIAH KASSAY
ACREAGE: 86.78 +/-
OIL & GAS ROYALTY OWNER: NEHEMIAH & PATTY A. KASSAY
ACREAGE: 410.626 +/-
LEASE NUMBERS:

DRILL ☒ CONVERT ☐ DRILL DEEPER ☐ REDRILL ☐ FRACTURE OR STIMULATE ☒
PLUG OFF FORMATION ☐ PERFORATE NEW FORMATION ☐ PLUG & ABANDON ☐
CLEAN OUT & REPLUG ☐ OTHER CHANGE ☐ (SPECIFY):

TARGET FORMATION: MARCELLUS
ESTIMATED DEPTH: TVD: 8,288.5' TMD: 16,405.87'
WELL OPERATOR: NORTHEAST NATURAL ENERGY LLC
DESIGNATED AGENT: JOHN ADAMS
ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200
ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200
CITY: CHARLESTON STATE: WV ZIP CODE: 25301
CITY: CHARLESTON STATE: WV ZIP CODE: 25301



FILE #: NNE15

DRAWING #: 2606

SCALE: PLAT: 1" = 1200' TICK: 1" = 2000'

MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING GRADE GPS

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Signed: _____

L.L.S. #2124 : Ernest J. Benchek III

ERNEST J. BENCHEK III
LICENSED
No. 2124
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR

RECEIVED
Office of Oil & Gas
SEP 29 2016
WV Dept. of Environmental Protection

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
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ACREAGE: 410.626 +/-

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PLUG OFF FORMATION ☐ PERFORATE NEW FORMATION ☐ PLUG & ABANDON ☐
CLEAN OUT & REPLUG ☐ OTHER CHANGE ☐ (SPECIFY): _____

TARGET FORMATION: MARCELLUS

ESTIMATED DEPTH: TVD: 8,288.5' TMD: 16,405.87'

WELL OPERATOR: NORTHEAST NATURAL ENERGY LLC

DESIGNATED AGENT: JOHN ADAMS

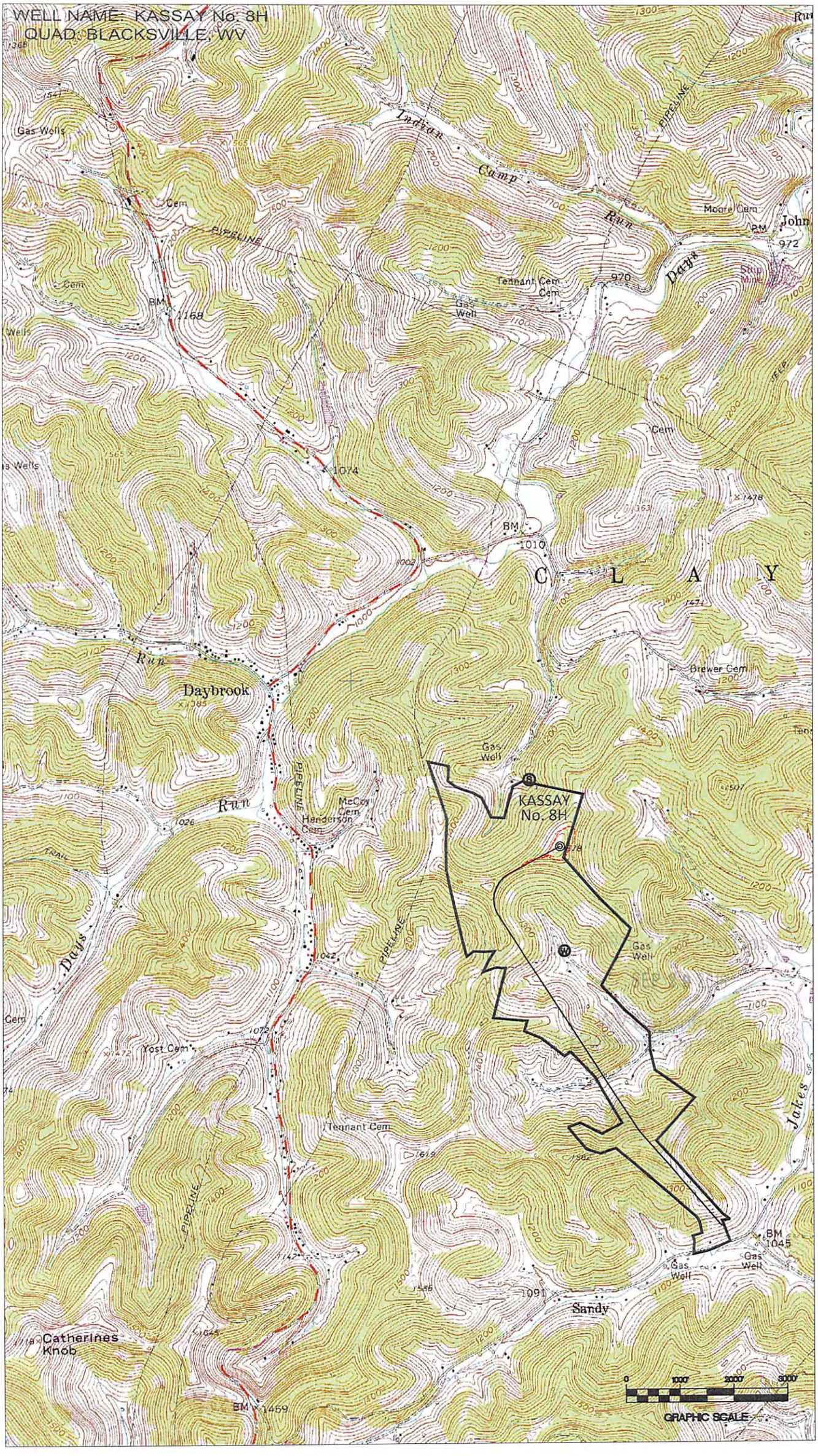
ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200

ADDRESS: 707 VIRGINIA STREET EAST, SUITE 1200

CITY: CHARLESTON STATE: WV ZIP CODE: 25301

CITY: CHARLESTON STATE: WV ZIP CODE: 25301

WELL NAME: KASSAY No. 8H
QUAD: BLACKSVILLE, WV



WW-6A1
(5/13)

Operator's Well No. Kassay 8H

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

(1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;

(2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
See Attachment	See Attachment	See Attachment	See Attachment	See Attachment

4706101740 mod

Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

RECEIVED
Office of Oil and Gas
SEP 29 2016
WV Department of
Environmental Protection

Well Operator: Northeast Natural Energy LLC
By: Hollie Medley Hollie Medley
Its: Regulatory Coordinator

WW-6A1 Operator's Well No. Kassay 8H

NNE Lease No.	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page	Tax Map & Parcel
WV-061-003302-002	KASSAY, NEHEMIAH AND PATTY A.	Northeast Natural Energy LLC	.125 or greater	1506/143	17-48
WV-061-001109-000	SHUMAN, INC.	*Chesapeake Appalachia, LLC	.125 or greater	1439/243	17-48
WV-061-001423-001	COLLINS, CATHY ANN	*Chesapeake Appalachia, LLC	.125 or greater	1377/172	17-59.1,59.2,59
WV-061-001423-002	JONES, LULA HAZE TENNANT	*Chesapeake Appalachia, LLC	.125 or greater	1377/226	17-59.1,59.2,59
WV-061-001423-004	GLOVER, BETTY ANN	*Chesapeake Appalachia, LLC	.125 or greater	1377/232	17-59.1,59.2,59
WV-061-001423-005	TENNANT, SHIRLEY	*Chesapeake Appalachia, LLC	.125 or greater	1377/229	17-59.1,59.2,59
WV-061-001423-006	MAYLE, PATRICIA ELLEN	*Chesapeake Appalachia, LLC	.125 or greater	1377/238	17-59.1,59.2,59
WV-061-001423-007	TENNANT, JACOB W. AND ELIZABETH B.	Northeast Natural Energy LLC	.125 or greater	1524/196	17-59.1,59.2,59
WV-061-003308-001	CHESAPEAKE APPALACHIA, LLC	*Chesapeake Appalachia, LLC	.125 or greater	1487/224	17-59.1,59.2,59
WV-061-002467-002	TENNANT, LINDSAY J.	*Chesapeake Appalachia, LLC	.125 or greater	1421/389	17-56,58
WV-061-003414-001	BRITVEC, STEVEN BURL	Northeast Natural Energy LLC	.125 or greater	1513/844	17-56
WV-061-003414-002	BROOKOVER, BARBARA KAY	Northeast Natural Energy LLC	.125 or greater	1513/842	17-56
WV-061-003414-003	BURKE, KRISTA	Northeast Natural Energy LLC	.125 or greater	1512/592	17-56
WV-061-003414-005	RALEY, MARY ANN	Northeast Natural Energy LLC	.125 or greater	1513/828	17-56
WV-061-002994-001	BRUMMAGE, RAY AND JANICE O.	*Chesapeake Appalachia, LLC	.125 or greater	1428/841	17-57
WV-061-002994-002	BONNELL, DIANE LYNN	*Chesapeake Appalachia, LLC	.125 or greater	1429/701	17-57
WV-061-002994-003	BRUMMAGE, JACK AND JANET	*Chesapeake Appalachia, LLC	.125 or greater	1429/335	17-57
WV-061-002994-004	WADE, GLADYS E. AND ALLEN E.	*Chesapeake Appalachia, LLC	.125 or greater	1428/852	17-57
WV-061-002994-005	BRUMMAGE, MICHAEL L.	*Chesapeake Appalachia, LLC	.125 or greater	1427/135	17-57
WV-061-002994-006	BARBER, BEN L., ET AL	*Chesapeake Appalachia, LLC	.125 or greater	1452/020	17-57
WV-061-002994-007	JOHNSON, PATRICIA	*Chesapeake Appalachia, LLC	.125 or greater	1435/188	17-57
WV-061-002994-008	WILSON, ROBERT E.	*Chesapeake Appalachia, LLC	.125 or greater	1442/164	17-57
WV-061-002994-009	WILSON, HOWARD E.	*Chesapeake Appalachia, LLC	.125 or greater	1450/395	17-57
WV-061-002994-010	WILSON, DAVID A.	*Chesapeake Appalachia, LLC	.125 or greater	1457/773	17-57
WV-061-002994-011	WILSON, STARLETT L.	*Chesapeake Appalachia, LLC	.125 or greater	1456/694	17-57
WV-061-002994-012	BOLNER, SANDRA L. AND CHARLES E.	*Chesapeake Appalachia, LLC	.125 or greater	1456/694	17-57
WV-061-002478-001	HAMILTON, FRANCES H., ET AL	*Chesapeake Appalachia, LLC	.125 or greater	1429/307	17-58
WV-061-002534-001	SHUMAN, INC.	*Chesapeake Appalachia, LLC	.125 or greater	1429/366	20-21
WV-061-001952-001	BASHAW, LINDA KAY	*Chesapeake Appalachia, LLC	.125 or greater	1502/044	20-21
WV-061-001952-002	HELDRETH, BARBARA J.	*Chesapeake Appalachia, LLC	.125 or greater	1502/052	20-21
WV-061-002143-001	TENNANT, DAVID GEORGE	*Chesapeake Appalachia, LLC	.125 or greater	1505/596	20-21
WV-061-002143-002	TENNANT, DELILAH S.	*Chesapeake Appalachia, LLC	.125 or greater	1511/535	20-21
WV-061-002143-005	MOORE, RUBY I.	*Chesapeake Appalachia, LLC	.125 or greater	1511/532	20-21
WV-061-002143-006	TENNANT, EDWARD	*Chesapeake Appalachia, LLC	.125 or greater	1511/489	20-21
WV-061-002143-007	BUTCHER, RICHARD D.	*Chesapeake Appalachia, LLC	.125 or greater	1511/510	20-21
WV-061-002263-001	TENNANT, ROY	*Chesapeake Appalachia, LLC	.125 or greater	1507/237	20-21
WV-061-002263-002	TENNANT, JUANITA RUTH	*Chesapeake Appalachia, LLC	.125 or greater	1507/466	20-21
WV-061-002514-001	FRANCIS, SANDRA K.	*Chesapeake Appalachia, LLC	.125 or greater	1517/842	20-21
WV-061-002549-001	TENNANT, JERRY LEE	*Chesapeake Appalachia, LLC	.125 or greater	1526/144	20-21
WV-061-002549-002	TENNANT, FLOYD	*Chesapeake Appalachia, LLC	.125 or greater	1526/145	20-21
WV-061-002549-003	SIERS, RICHARD	*Chesapeake Appalachia, LLC	.125 or greater	1526/153	20-21
WV-061-002549-004	GABELMAN, JANET	*Chesapeake Appalachia, LLC	.125 or greater	1526/151	20-21

17 0 6 A 0 1 7 0 MOP2

WW-6A1 Operator's Well No. Kassay 8H

NNE Lease No.	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page	Tax Map & Parcel
WV-061-002549-005	FLINT, RONALD	*Chesapeake Appalachia, LLC	.125 or greater	1526/141	20-21
WV-061-002549-006	BESS, BARBARA	*Chesapeake Appalachia, LLC	.125 or greater	1526/139	20-21
WV-061-002549-007	TENNANT, EDWARD	*Chesapeake Appalachia, LLC	.125 or greater	1523/422	20-21
WV-061-002549-008	TENNANT, STEPHEN	*Chesapeake Appalachia, LLC	.125 or greater	1523/419	20-21
WV-061-002549-009	TENNANT, LOUIE MAE	*Chesapeake Appalachia, LLC	.125 or greater	1523/417	20-21
WV-061-002549-010	DEWITT, DIANA	*Chesapeake Appalachia, LLC	.125 or greater	1523/427	20-21
WV-061-002566-001	SIERS, ROSE	*Chesapeake Appalachia, LLC	.125 or greater	1429/711	20-21
WV-061-002566-002	TENNANT, BERNICE	*Chesapeake Appalachia, LLC	.125 or greater	1426/757	20-21
WV-061-002566-003	BRUMMAGE, TERRY	*Chesapeake Appalachia, LLC	.125 or greater	1425/341	20-21
WV-061-001944-001	BASHAW, LINDA KAY	*Chesapeake Appalachia, LLC	.125 or greater	1394/140	20-15
WV-061-001944-002	HELDRETH, BARBARA	*Chesapeake Appalachia, LLC	.125 or greater	1396/098	20-15
WV-061-001944-003	MCWHORTER, ELEANOR L.	*Chesapeake Appalachia, LLC	.125 or greater	1394/143	20-15
WV-061-001944-004	TENNANT, DANNY D.	*Chesapeake Appalachia, LLC	.125 or greater	1395/170	20-15
WV-061-001944-008	TENNANT, ROY	*Chesapeake Appalachia, LLC	.125 or greater	1398/273	20-15
WV-061-002088-001	MCWHORTER, ELEANOR L.	*Chesapeake Appalachia, LLC	.125 or greater	1394/219	20-15
WV-061-002088-005	TENNANT, DANNY D.	*Chesapeake Appalachia, LLC	.125 or greater	1401/102	20-15
WV-061-004020-000	EDDY, MARK & BETTY A.	Northeast Natural Energy LLC	.125 or greater	1505/646	17-77,77.1
WV-061-004010-000	TENNANT, ALBERT	*C.J. Ford	.125 or greater	27/16	17-77,77.1

*See Attachment

4706101740 M082

Chesapeake Appalachia, LLC.

|

Northeast Natural Energy
Assignment
BK 120/769

4706101740 M012

C. J. Fod (Charles J. Ford)

South Penn Oil Company
Assignment
DB 27/287
South Penn Oil Company

South Penn Natural Gas Company
Assignment
DB 304/457
South Penn Natural Gas Company

South Penn Oil Company
Deed
DB 580/311
Pennzoil Company

New Dunstan, Inc.
Assignment
AB 20/484
New Dunstan, Inc.

Pennzoil Company & Pennzoil Producing Company
Deed
DB 210/611
Pennzoil Company & Pennzoil Production Company

Pennzoil Products Company
Assignment
AR 23/280
Pennzoil Products Company

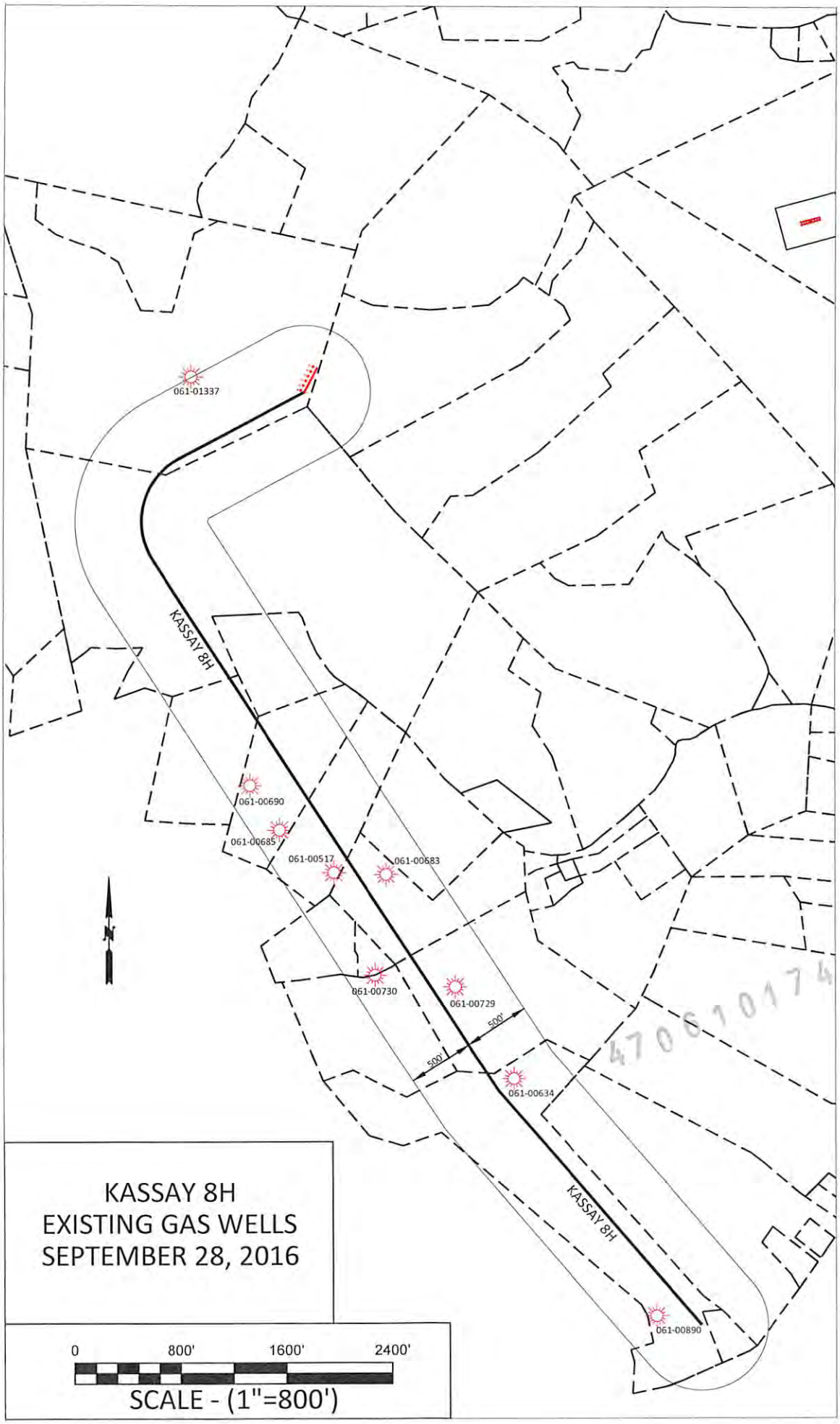
Eddy Brothers (Mark V. Eddy & Harry Eddy)

Assignment
DB 1063/553

Eddy Brothers (Mark V. Eddy & Harry Eddy)

NNE Resources, LLC
Assignment
AB 123/370

4706104740002



KASSAY 8H
EXISTING GAS WELLS
SEPTEMBER 28, 2016

4706101740 M002

Kassay 8H Area of Review

API Number	Well Name	Well Number	Operator	Latitude (NAD 27)	Longitude (NAD 27)	TMP	TVD	Producing Formation
47-061-01337	Nehemiah Kassay	6L2	Noumenon Corporation	39.658519	-80.197662	4-17-48	NA	Plugged 2015
47-061-00690	Delila Brewer	1	Consolidation Coal Company	39.650354	-80.19518	4-17-57	1427	Plugged 1982
47-061-00685	E.A Tennant	1	Consolidation Coal Company	39.648903	-80.194805	4-17-57	1427	Plugged 1982
47-061-00683	E.A Tennant	2	Consolidation Coal Company	39.648177	-80.192365	4-17-77	1800	Plugged 1982
47-061-00517	E.A Tennant	3	NNE Resources LLC	39.648467	-80.193491	4-17-58	2224	Big Injun
47-061-00730	Lavina Tennant	5	Consolidation Coal Company	39.646435	-80.191803	4-17-77	1442	Plugged 1983
47-061-00729	A. Tennant	1	Consolidation Coal Company	39.646	-80.189925	4-20-15	1388	Plugged 1983
47-061-00634	Martha Eddy	1	Consolidation Coal Company	39.644549	-80.188424	4-20-21	1546	Plugged 1981
47-061-00890	Audie Tennant	M1-487	Consolidation Coal Company	39.639323	-80.18467	4-20-21	1455	Plugged 1988