Waterbody Photographs

Photograph 1. Stream SKY-CDK-001, Upstream, Facing Southeast (10/15/15)

Photograph 2. Stream SKY-CDK-001, Downstream, Facing Northwest (10/15/15)

Photograph 3. Stream SKY-CDK-002, Upstream, Facing Southeast (10/15/15)

Photograph 4. Stream SKY-CDK-002, Downstream, Facing Northwest (10/15/15)

Photograph 5. Stream SKY-CDK-003, Upstream, Facing Southeast (10/15/15)

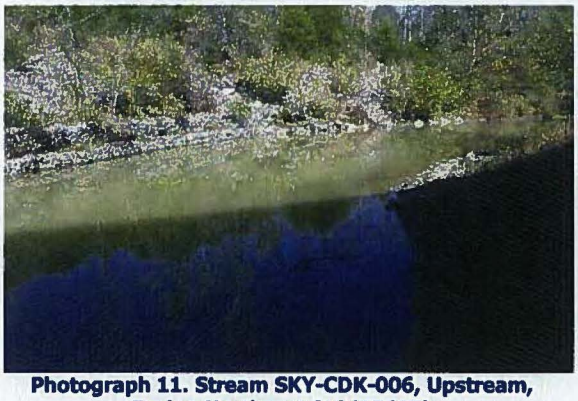
Photograph 6. Stream SKY-CDK-003, Downstream, Facing Northwest (10/15/15)

Photograph 7. Stream SKY-CDK-004, Upstream, Facing East (10/15/15)

Photograph 8. Stream SKY-CDK-004, Downstream, Facing West (10/15/15)

Photograph 9. Stream SKY-CDK-005, Upstream, Facing North (10/15/15)

Photograph 10. Stream SKY-CDK-005, Downstream, Facing South (10/15/15)



Photograph 11. Stream SKY-CDK-006, Upstream, Facing Northeast (10/15/15)

Photograph 12. Stream SKY-CDK-006, Downstream, Facing Southeast (10/15/15)

Photograph 13. Stream SKY-CDK-007, Upstream, Facing east-Northeast (10/15/15)

Photograph 14. Stream SKY-CDK-007, Downstream, Facing West-Southwest (10/15/15)

Photograph 15. Stream SKY-CDK-008, Upstream, Facing North (10/15/15)

Photograph 16. Stream SKY-CDK-008, Downstream, Facing South (10/15/15)

Photograph 17. Stream SKY-CDK-009, Upstream, Facing West (10/15/15)

Photograph 18. Stream SKY-CDK-009, Downstream, Facing East (10/15/15)

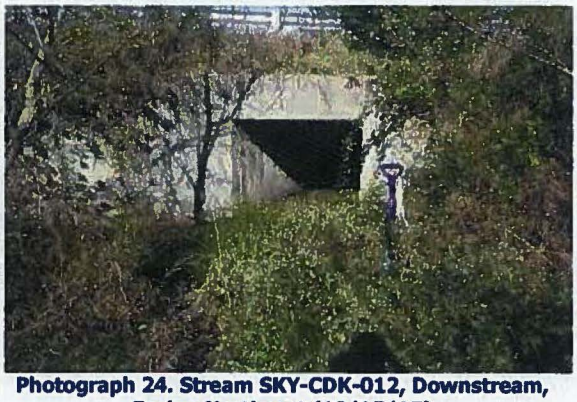
Photograph 19. Stream SKY-CDK-010, Upstream, Facing North (10/15/15)

Photograph 20. Stream SKY-CDK-010, Downstream, Facing South (10/15/15)

Photograph 21. Stream SKY-CDK-011, Upstream, Facing North (10/15/15)

Photograph 22. Stream SKY-CDK-011, Downstream, Facing South (10/15/15)

Photograph 23. Stream SKY-CDK-012, Upstream, Facing Southwest (10/15/15)



Photograph 24. Stream SKY-CDK-012, Downstream, Facing Northeast (10/15/15)

Photograph 25. Stream SKY-CDK-013, Upstream, Facing North (10/15/15)

Photograph 26. Stream SKY-CDK-013, Downstream, Facing South (10/15/15)

Photograph 27. Stream SKY-CDK-014, Upstream, Facing North (10/15/15)

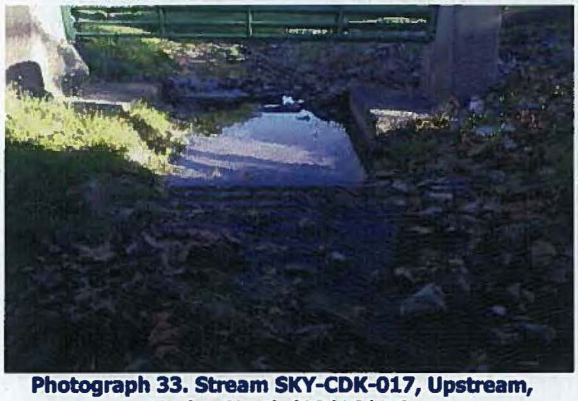
Photograph 28. Stream SKY-CDK-014, Downstream, Facing South (10/15/15)

Photograph 29. Stream SKY-CDK-015, Upstream, Facing Northeast (10/16/15)

Photograph 30. Stream SKY-CDK-015, Downstream, Facing Southwest (10/16/15)

Photograph 31. Stream SKY-CDK-016, Upstream, Facing North (10/16/15)

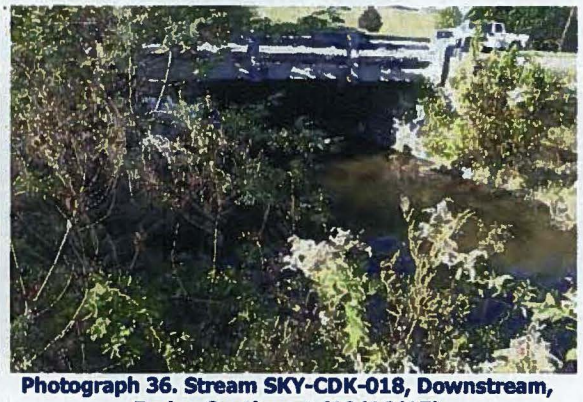
Photograph 32. Stream SKY-CDK-016, Downstream, Facing South (10/16/15)



Photograph 33. Stream SKY-CDK-017, Upstream, Facing North (10/16/15)

Photograph 34. Stream SKY-CDK-017, Downstream, Facing South (10/16/15)

Photograph 35. Stream SKY-CDK-018, Upstream, Facing East-Northeast (10/16/15)



Photograph 36. Stream SKY-CDK-018, Downstream, Facing Southwest (10/16/15)

Photograph 37. Stream SKY-CDK-019, Upstream, Facing Northwest (10/16/15)

Photograph 38. Stream SKY-CDK-019, Downstream, Facing Southeast (10/16/15)

Photograph 39. Stream SKY-CDK-020, Upstream, Facing Northeast (10/16/15)

Photograph 40. Stream SKY-CDK-020, Downstream, Facing Southwest (10/16/15)

Photograph 41. Stream SKY-CDK-021, Upstream, Facing Northeast (10/16/15)

Photograph 42. Stream SKY-CDK-021, Downstream, Facing Southwest(10/16/15)

Photograph 43. Stream SKY-CDK-022, Upstream, Facing Northeast (10/16/15)

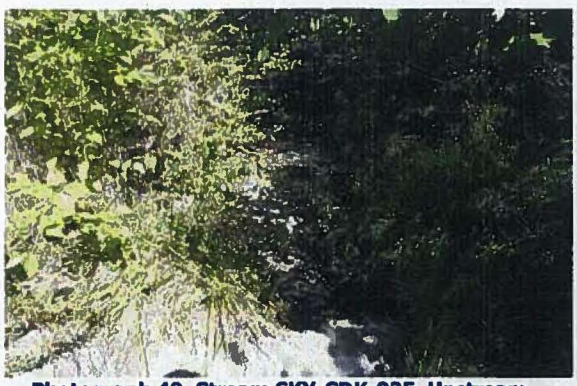
Photograph 44. Stream SKY-CDK-022, Downstream, Facing Southwest (10/16/15)

Photograph 45. Stream SKY-CDK-023, Upstream, Facing North (10/16/15)

Photograph 46. Stream SKY-CDK-023, Downstream, Facing South (10/16/15)

Photograph 47. Stream SKY-CDK-024, Upstream, Facing North (10/16/15)

Photograph 48. Stream SKY-CDK-024, Downstream, Facing South (10/16/15)



Photograph 49. Stream SKY-CDK-025, Upstream, Facing North (10/16/15)

Photograph 50. Stream SKY-CDK-025, Downstream, Facing South (10/16/15)

Photograph 51. Stream SKY-CDK-026, Upstream, Facing North (10/16/15)

Photograph 52. Stream SKY-CDK-026, Downstream, Facing South (10/16/15)

Photograph 53. Stream SKY-CDK-027, Upstream, Facing Northeast (10/16/15)

Photograph 54. Stream SKY-CDK-027, Downstream, Facing Southwest (10/16/15)

FIGURES

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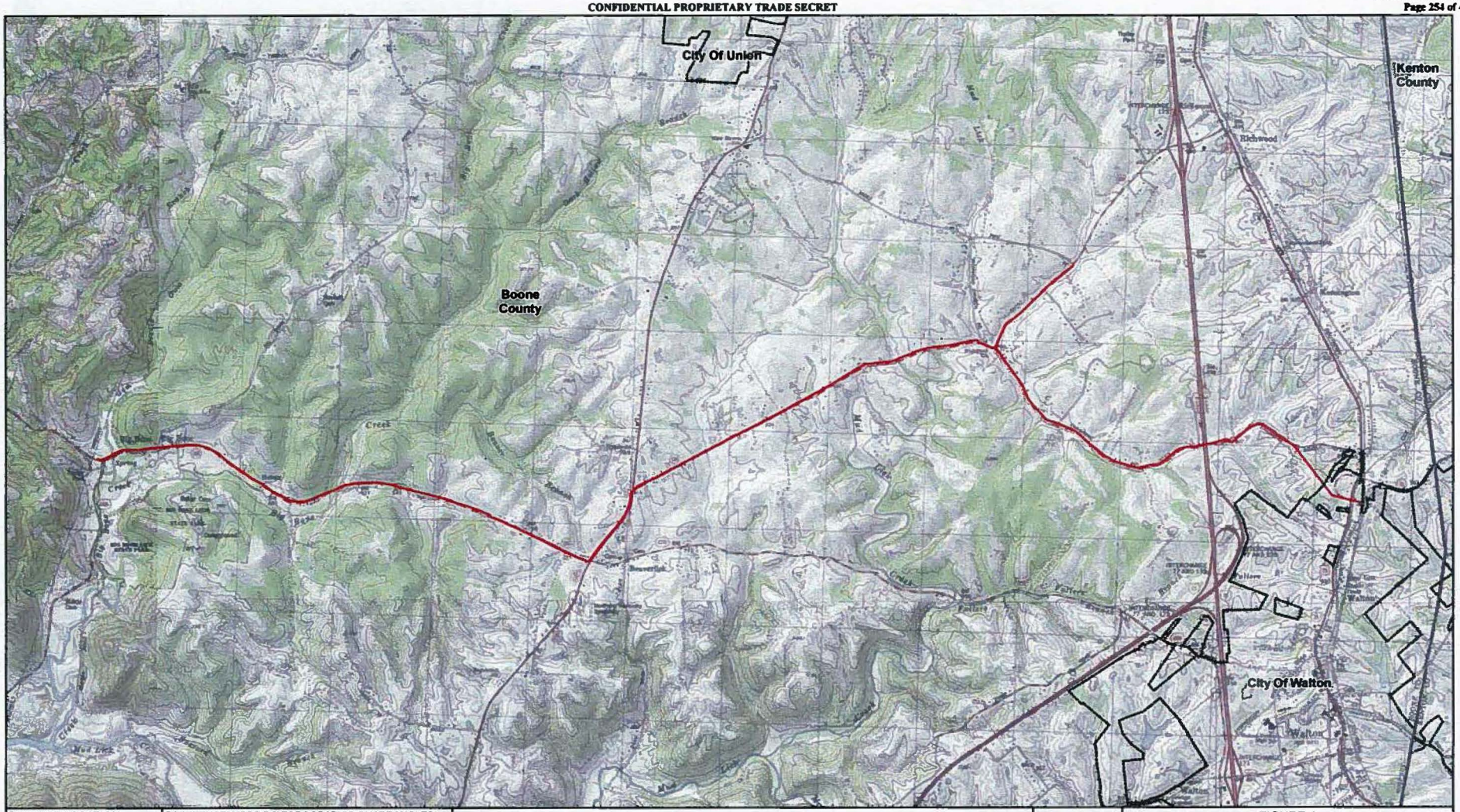
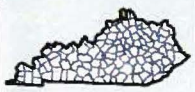


PROJECT LOCATION



BOONE COUNTY, KENTUCKY

REFERENCE: USGS 7.5' TOPOGRAPHIC QUADRANGLES: UNION (1982), VERONA (1982), RISING SUN (1982), PATRIOT (1982), WALTON (1982), AND INDEPENDENCE (1982), KENTUCKY, OBTAINED THROUGH ESRI USA TOPO MAPS, NATIONAL GEOGRAPHIC TOPO AND USGS, ACCESSED 11/2015.

N

0 1,500 3,000 Feet

Route Centerline
Municipal Boundary
County Boundary

DUKE ENERGY.

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FIGURE 1
PROJECT VICINITY

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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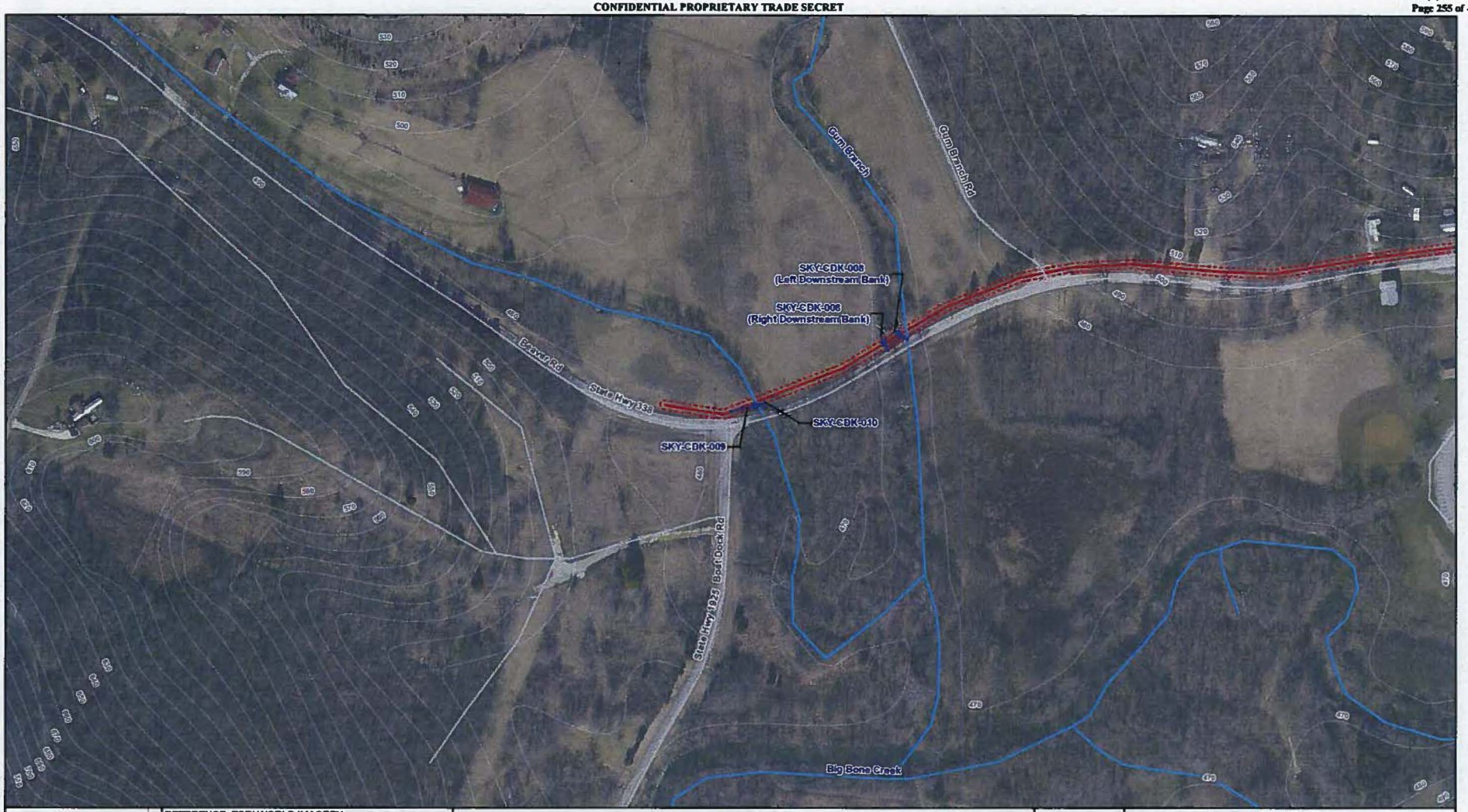

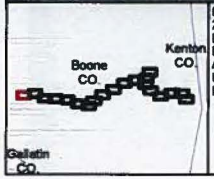

REFERENCE: ESRI WORLD IMAGERY, 2012. OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

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FIGURE 2
RESOURCE LOCATION

SHEET 1 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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FIGURE 2
RESOURCE LOCATION

SHEET 2 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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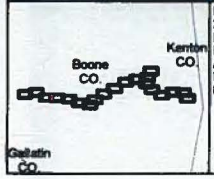

REFERENCE: ESRI WORLD IMAGERY, 2012, OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

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FIGURE 2
RESOURCE LOCATION

SHEET 3 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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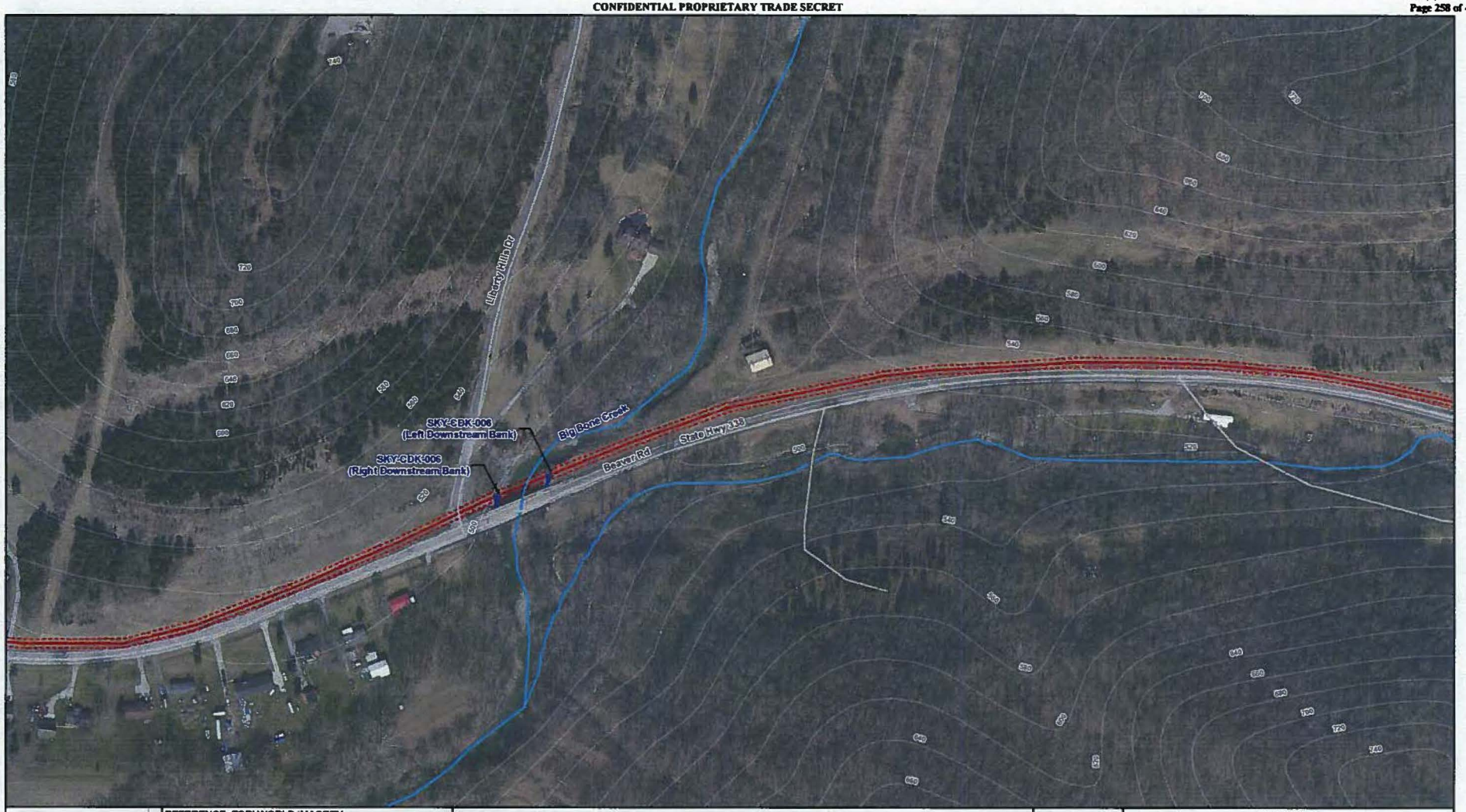

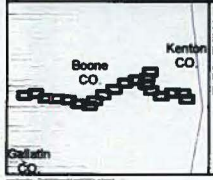

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

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FIGURE 2
RESOURCE LOCATION

SHEET 4 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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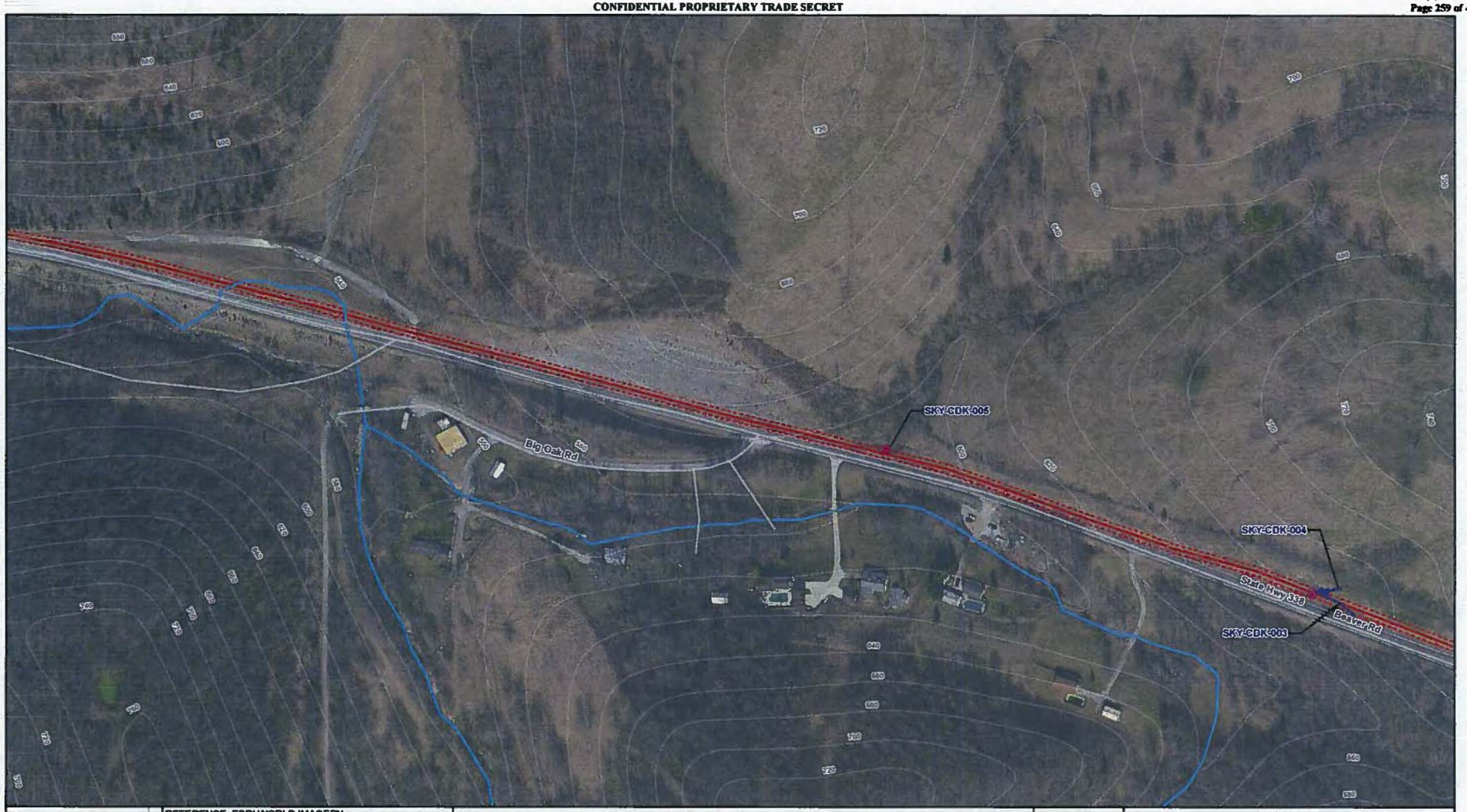

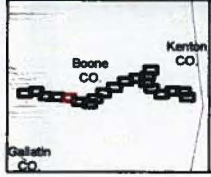

REFERENCE: ESRI WORLD IMAGERY, 2012, OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 5 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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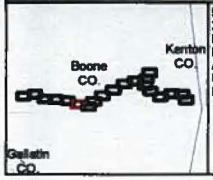

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 6 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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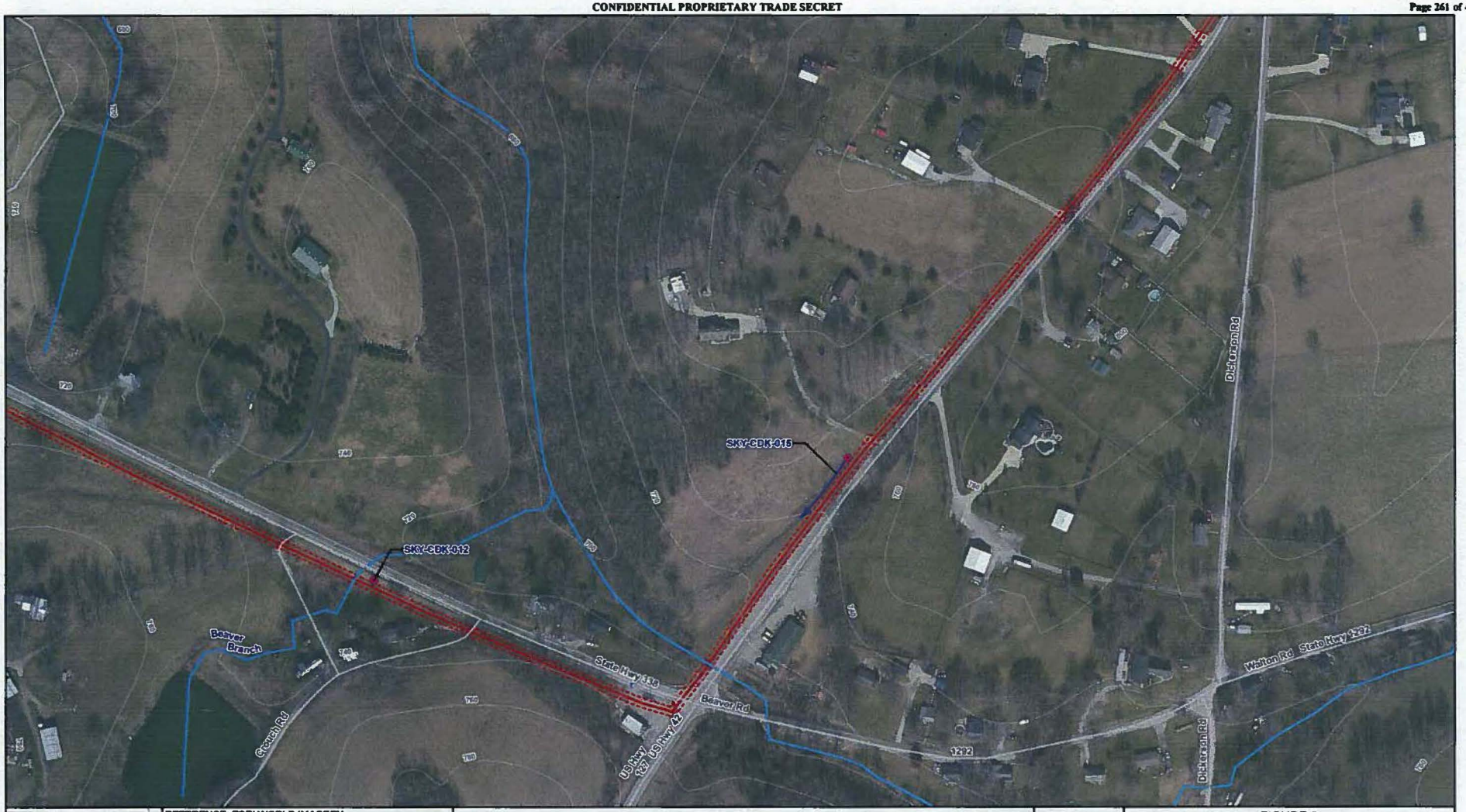

FIGURE 2
RESOURCE LOCATION

SHEET 7 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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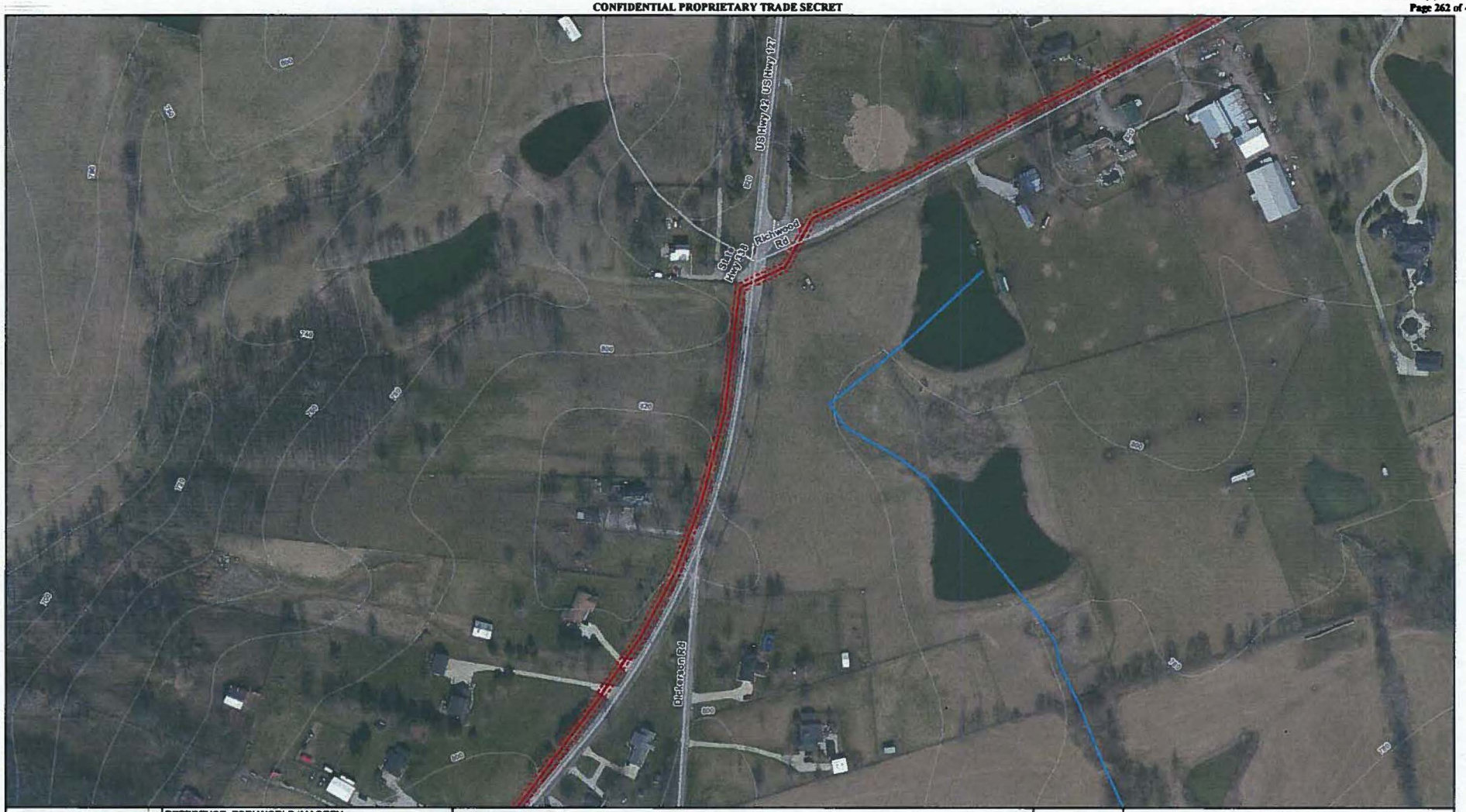

FIGURE 2
RESOURCE LOCATION

SHEET 8 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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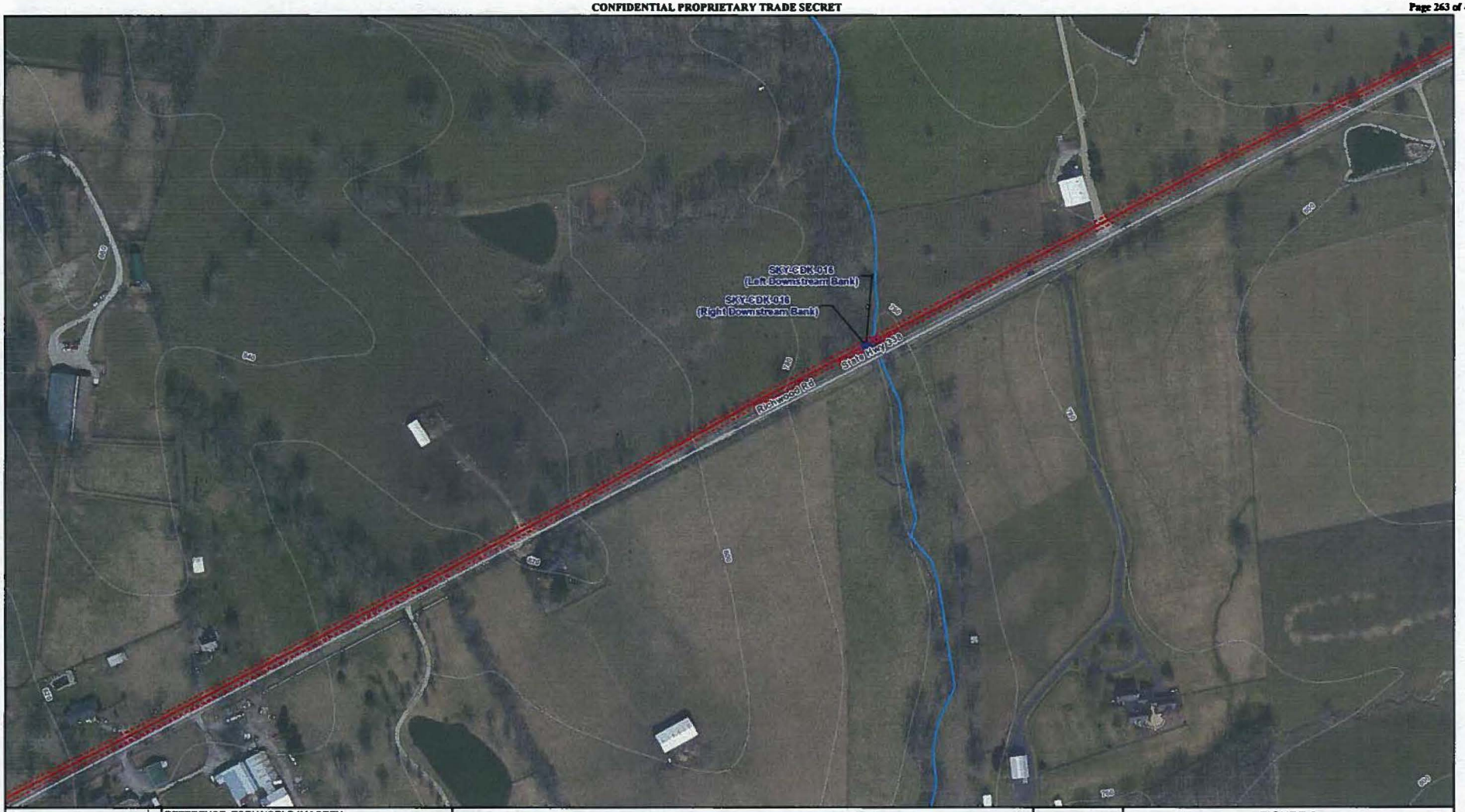

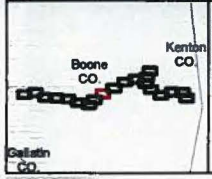

REFERENCE: ESRI WORLD IMAGERY, 2012. OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 9 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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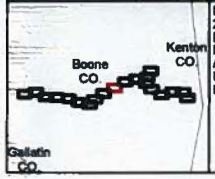

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 10 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
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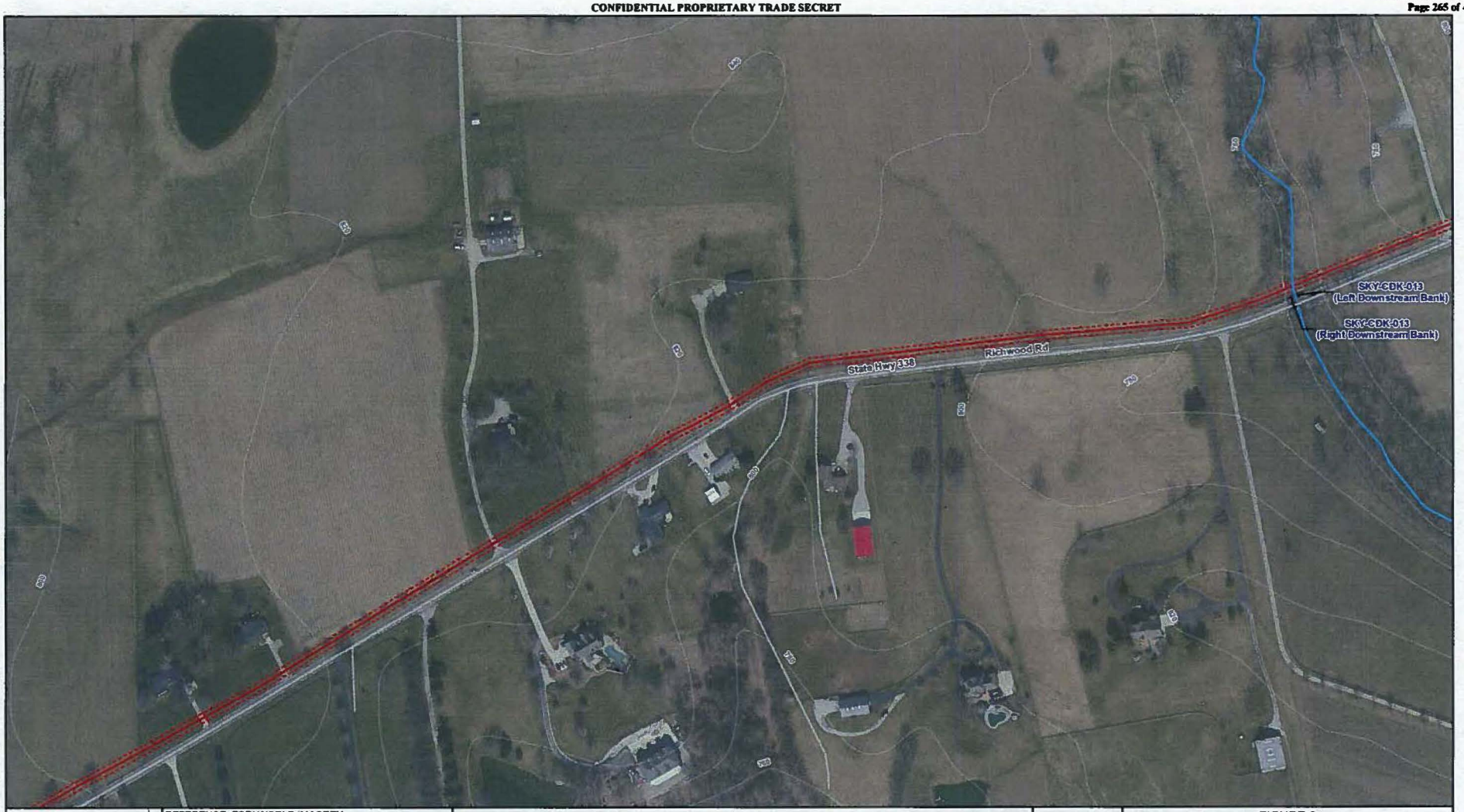

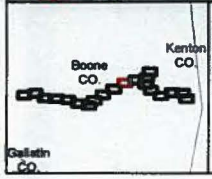

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 11 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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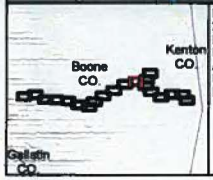

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 12 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

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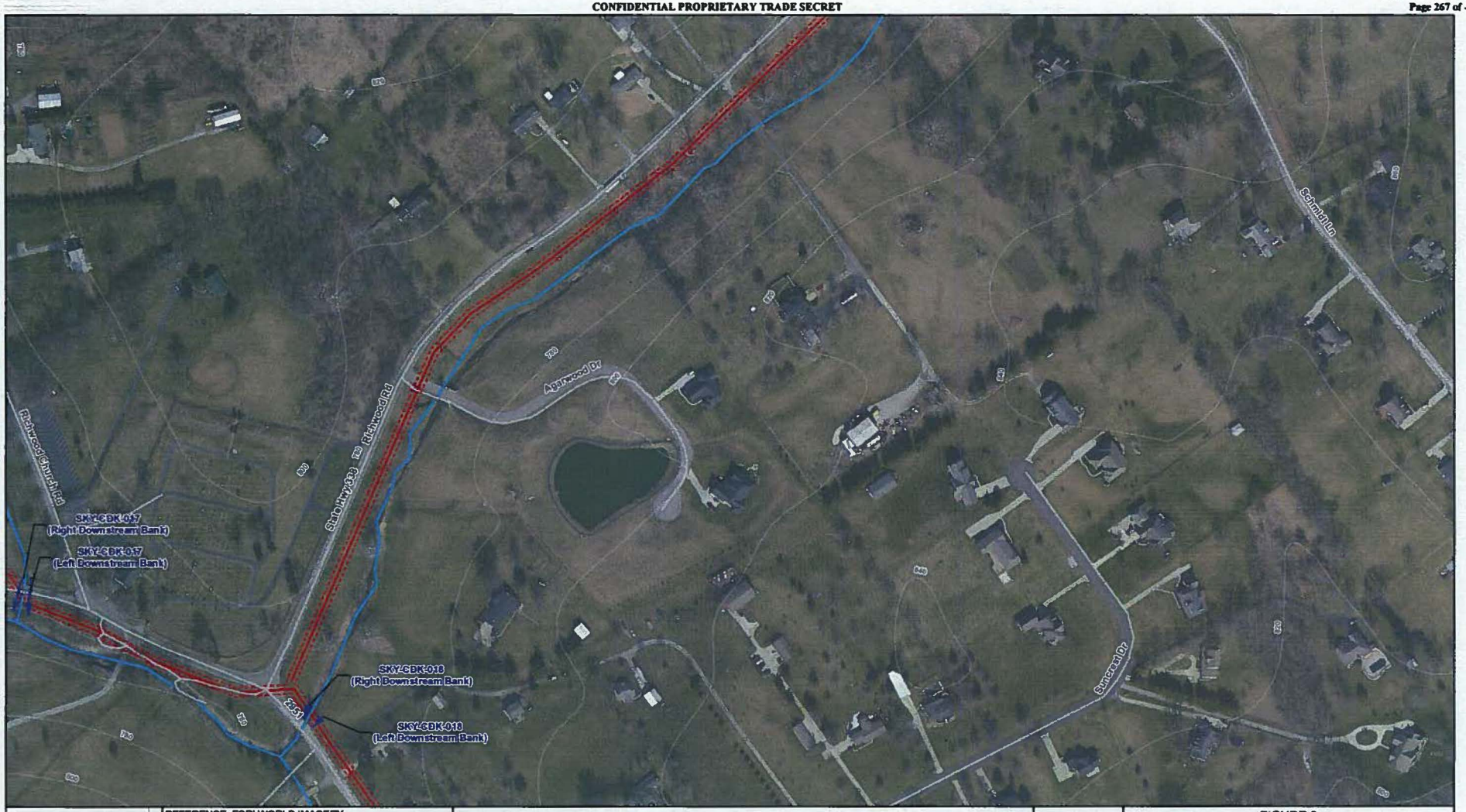

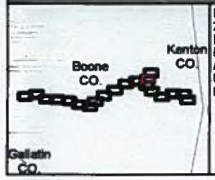

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N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

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FIGURE 2
RESOURCE LOCATION

SHEET 13 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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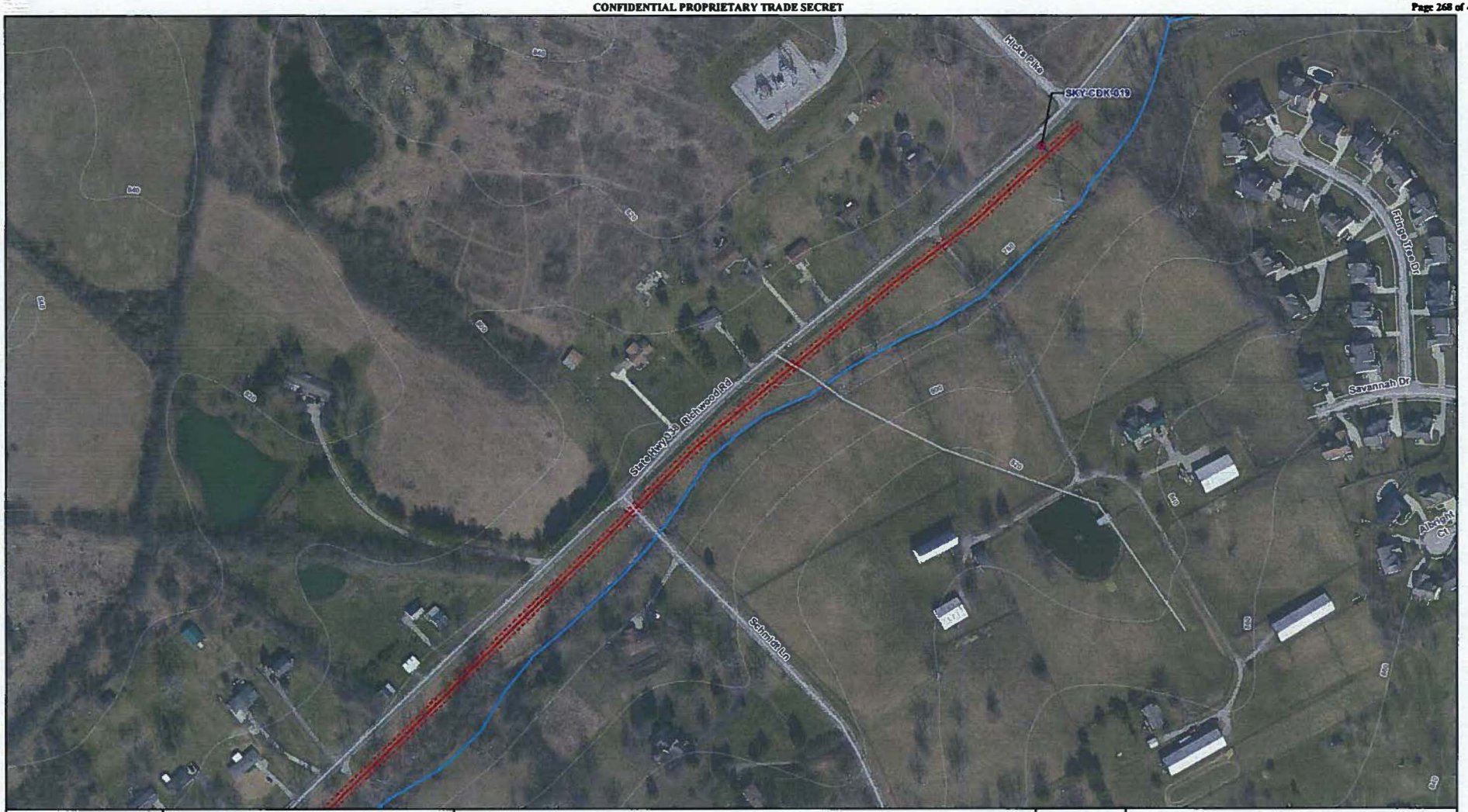

FIGURE 2
RESOURCE LOCATION

SHEET 14 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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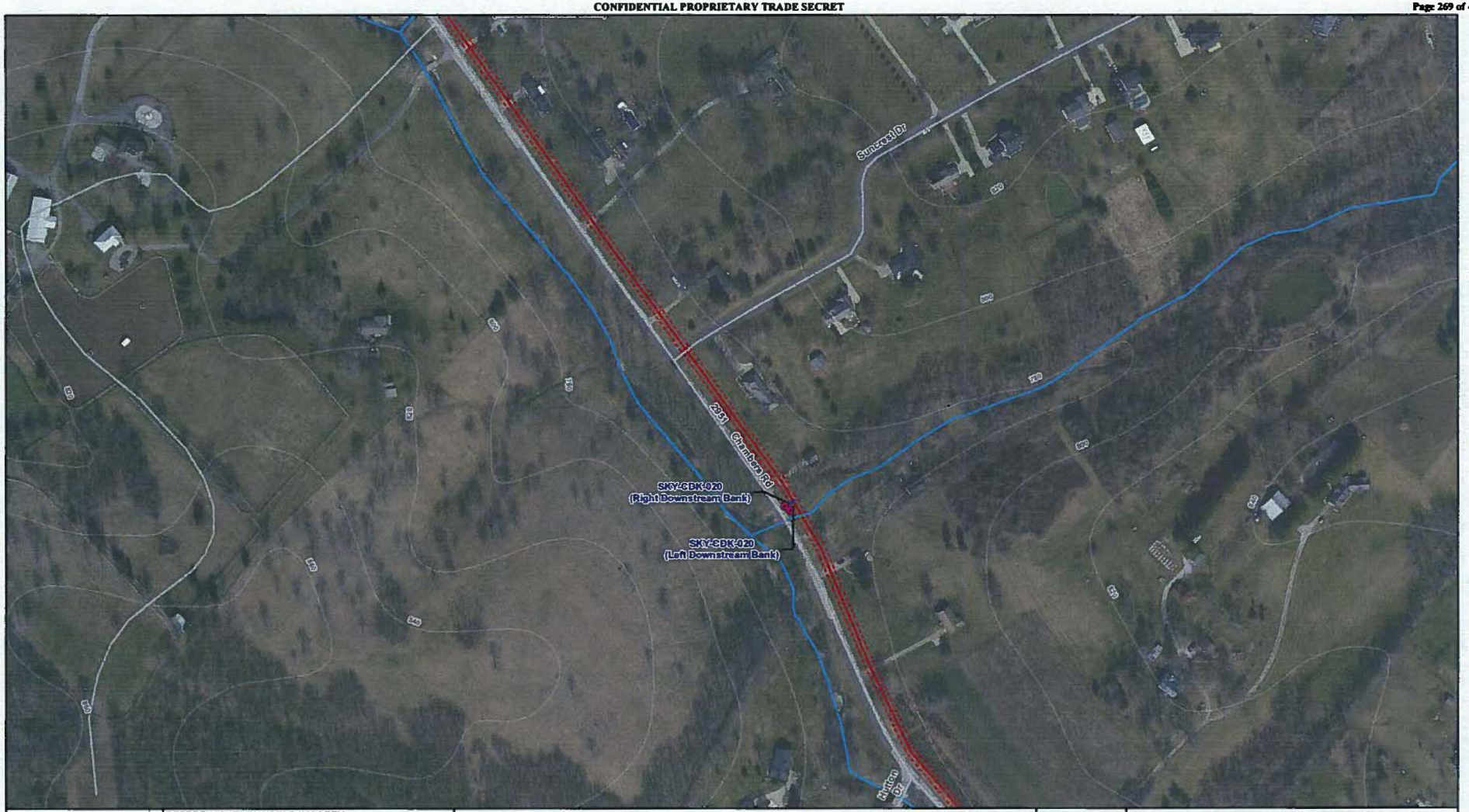

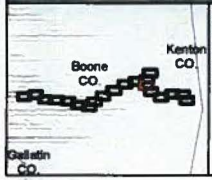

REFERENCE: ESRI WORLD IMAGERY, 2012. OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

gai consultants

FIGURE 2
RESOURCE LOCATION

SHEET 15 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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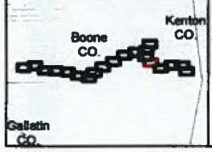
CONFIDENTIAL PROPRIETARY TRADE SECRET



REFERENCE: ESRI WORLD IMAGERY, 2012, OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

gai consultants

FIGURE 2
RESOURCE LOCATION

SHEET 16 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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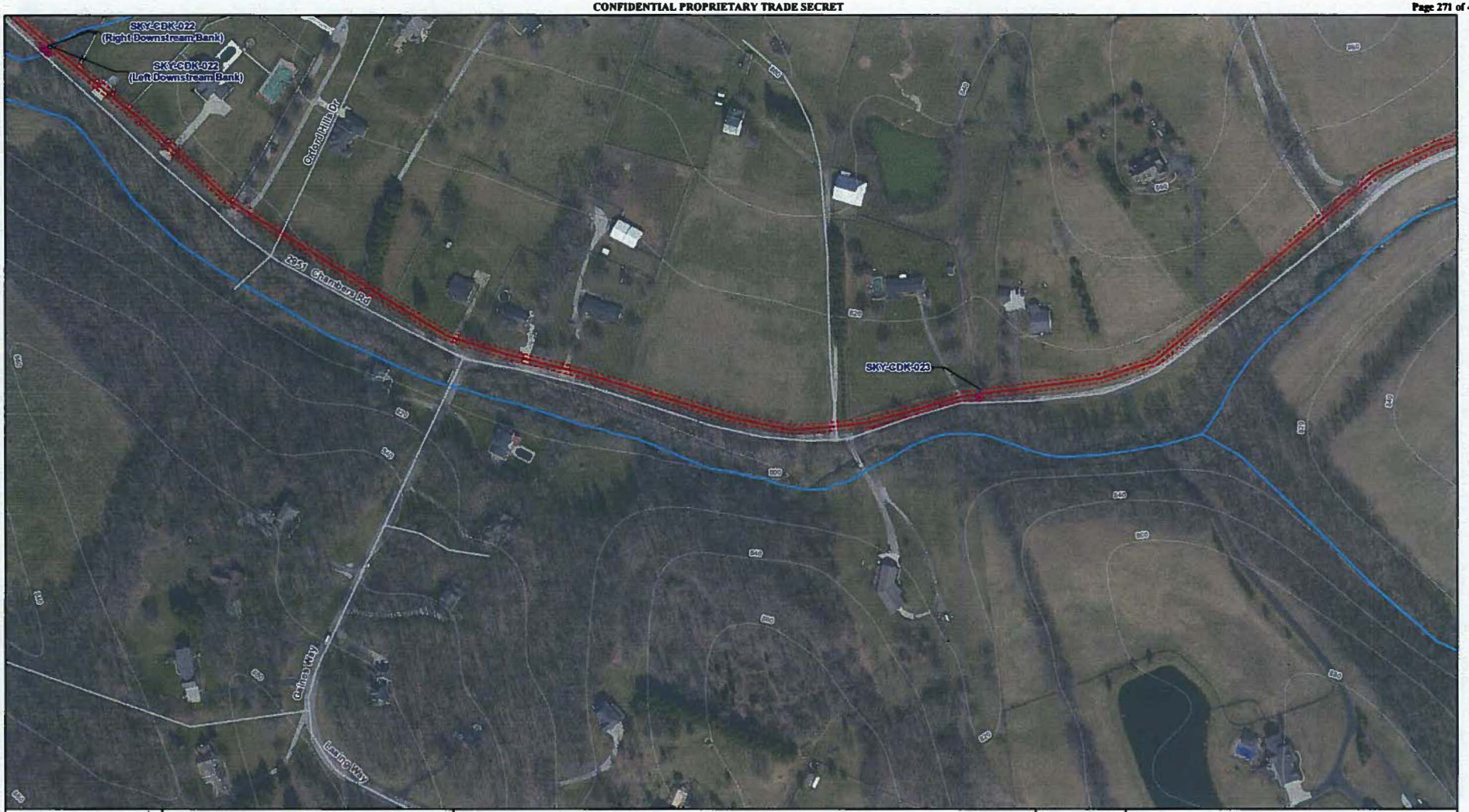

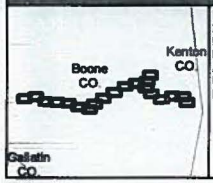

REFERENCE: ESRI WORLD IMAGERY, 2012, OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

gai consultants

FIGURE 2
RESOURCE LOCATION

SHEET 17 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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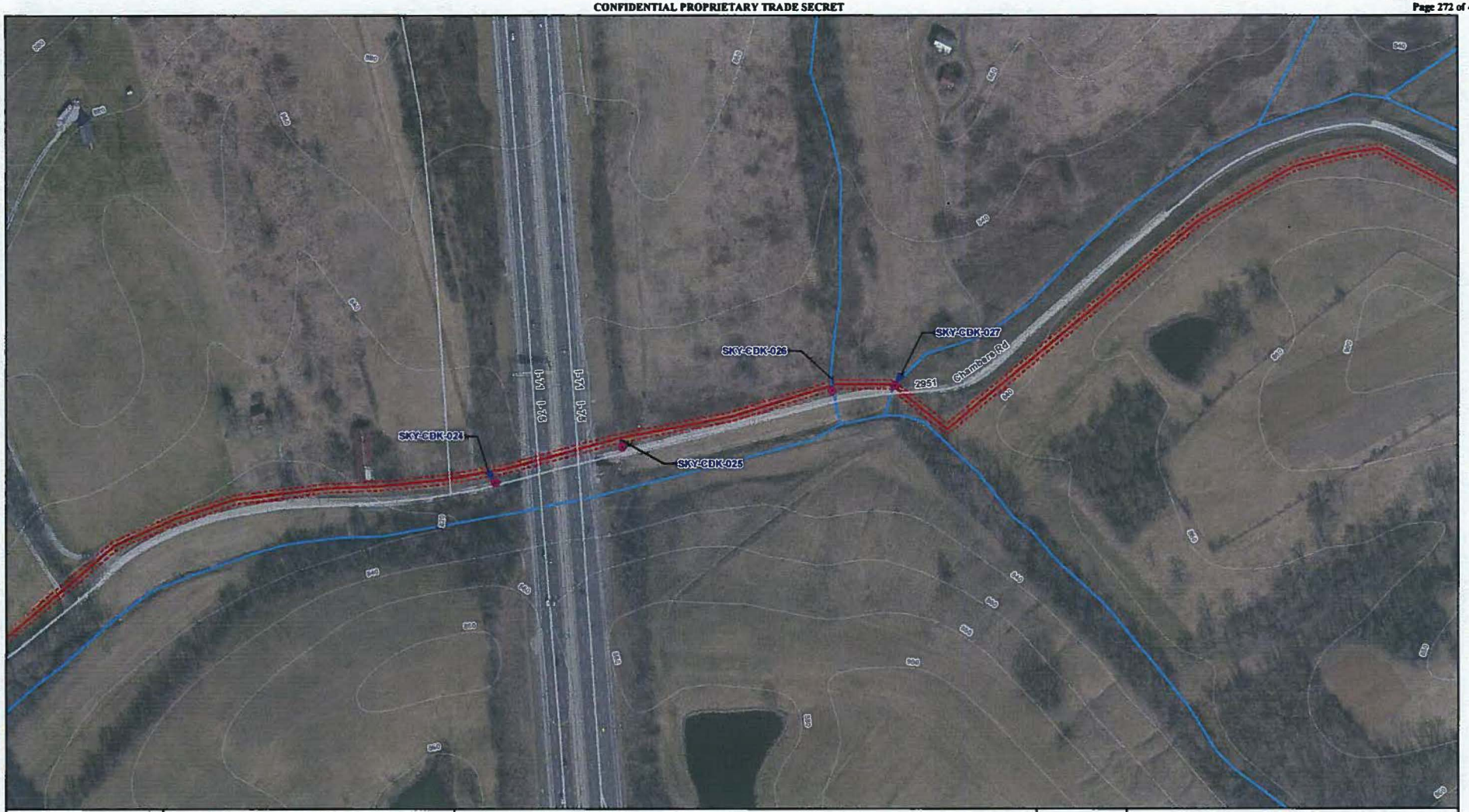

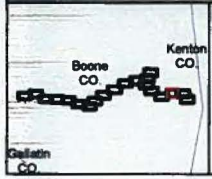

REFERENCE: ESRI WORLD IMAGERY, 2012. OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

gai consultants

FIGURE 2
RESOURCE LOCATION

SHEET 18 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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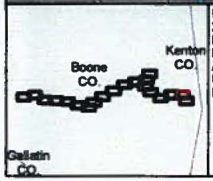
CONFIDENTIAL PROPRIETARY TRADE SECRET



REFERENCE: ESRI WORLD IMAGERY, 2012. OBTAINED THROUGH ESRI WORLD IMAGERY, MICROSOFT CORPORATION, ACCESSED 11/2015. USGS NHD, 2015; ROADS, 2013; NED 10FT CONTOURS, 2014.

N

0 100 200 Feet

- Culvert
- Route Centerline
- Delineated Stream
- NHD Waterway
- Road Centerline
- Study Area
- County Boundary
- NED 10-Foot Contour

DUKE ENERGY.

gai consultants

FIGURE 2
RESOURCE LOCATION

SHEET 19 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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FIGURE 2
RESOURCE LOCATION

SHEET 20 OF 20

Wetland Delineation and Stream Identification Report

Duke Walton-Big Bone Pipeline

DRAWN BY: WCP	DATE: 11/5/2015
CHECKED: MRW	APPROVED: MRW

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APPENDIX A
High Gradient Bioassessment Stream Data Sheets

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY- | **LOCATION:** BIGBONE,

STATION #: N/A | **COUNTY:** BOON | **PROGRAM:** **PROJECT:** G141890.0

INVESTIGATORS: CDK, | **DATE:** 10/15/1 | **TIME (24hr)** **Start:** 12:45 **Finish:**

Verify Site LAT/LONG vs GPS ☐YES ☐NO ☒N/A

	Station	Reach Downstream	Reach Upstream
LAT	38.88495	-	-
LONG	-84.72972	-	-

CANOPY COVER:
☐ Fully Exposed (0-25%)
☒ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

STREAM TYPE:
☒ Perennial
☐ Ephemeral
☐ Intermittent

WEATHER
Has there been a scouring rain in the last 14 days? ☐ Yes ☒ No

	Now	Past 24 hours
Heavy rain	☐	☐
Steady rain	☐	☐
Intermittent showers	☐	☐
Clear/sunny	☒	☒
Cloudy	☐	☐

LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):
☐ Surface Mining ☐ Deep Mining ☐ Oil Wells ☐ Land Disposal ☒ Residential
☐ Construction ☐ Commercial ☐ Industrial ☐ Row Crops
☐ Forest ☐ Pasture/Grazing ☐ Silviculture ☐ Urban Runoff/Storm Sewers

INSTREAM FEATURES
Stream Width 120 ft
Maximum Depth 73 ft
Reach Length 15.2 m
Riffle/Run/Pool Sequence (No. Sampled in Reach)
0 Riffle 0 Run 1 Pool

HYDRAULIC STRUCTURES
☐ Dams
☒ Bridge Abutments
☐ Island
☐ Waterfalls
☐ Other:

STREAM FLOW
☐ Dry
☐ Pooled
☒ Low
☐ High
☐ Normal

RIPARIAN VEGETATION
Dominate Type:
☒ Trees ☐ Herbaceous
☐ Grasses ☒ Shrubs
Number of strata 2 Dom.
Tree/Shrub Taxa
PLATANUS OCCIDENTALIS, (☒Full ☐Partial)
ACER NEGUNDO

CHANNEL ALTERATIONS
☐ Dredging
☒ Channelization

P-CHEM Instrument Used: _____ Date Calibrated: _____

Temp(°C)_____ D.O. (mg/l)_____ %Saturation_____ pH(S.U.)_____ Cond._____ Turb._____

Sample Collection Verification

Algae	Sample: ☐ QualMHC ☐ Other ☐ Visual Assessment	Lead Collector:
Fish	☐BPEF ☐ Seine ☐ Other Time: BPEF_____ Seine_____	Lead Collector:
Habitat	☐ RBP ☐ Substrate ☐ Other:	Lead Collector:
Invertebrates	☐ 1m² ☐ Qual ☐ Other:	Lead Collector:
	☐ 20 Jab (#Jabs: Cobble____ Snags____ Veg. Banks____ Sand____ Macrophytes____ Other ____)	
Tissue:	No. of Samples collected_____ Sp:	Lead Collector:
Water Chem	☐ Acid/Alk ☐ Bulk ☐ Nutrients ☐ Metals ☐ Low Hg	Lead Collector:
	☐ Herbicides ☐ Pesticides ☐ Ortho P ☐ Other:	

Duplicate Samples Taken:

Substrate Characterization

Substrate ☒Est. ☐P.C.	Riffle 0 %	Run 0 %	Pool 100 %	Reach Total
Silt/Clay (<0.06 mm)				20
Sand (0.06 – 2 mm)				15
Gravel (2-64 mm)				15
Cobble (64 – 256 mm)				35
Boulders (>256 mm)				15
Bedrock				0

NOTES/COMMENTS:

50' REACH

SITE NOT SAMPLED:

☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

CONFIDENTIAL PROPRIETARY TRADE SECRET

RBP High Gradient Habitat

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
1.Epifaunal Substrate/ Available Cover Score 12	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2.Embeddedness Score 11	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
3.Velocity/ Depth Regime Score 17	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Sow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
4. Sediment Deposition Score 17	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5.Channel Flow Status Score 20	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
6.Channel Alteration Score 2	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
7.Frequency of Riffles (or bends) Score 3	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
Left/Right Bank	10 9	8 7 6	5 4 3	2 1 0
8.Bank Stability LB 9 / RB 9	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection LB 6 / RB 6	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width LB 3 / RB 3	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.

Total Score

118

NOTES/COMMENTS:

50' REACH

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY- **LOCATION:** BIGBONE,

STATION #: N/ **COUNTY:** BOON **PROGRAM/PROJECT:** G141890.0

INVESTIGATORS: CDK, **DATE:** 10/15/1 **TIME (24hr)** Start: 1:30 Finish:

Verify Site LAT/LONG vs GPS ☐YES ☐NO ☒N/A

	Station	Reach Downstream	Reach Upstream
LAT	38.8849	-	-
LONG	-84.73619	-	-

CANOPY COVER:
☐ Fully Exposed (0-25%)
☒ Partially Exposed (25-50%)
☐ Partially Shaded (50-75%)
☐ Fully Shaded (75-100%)

STREAM TYPE:
☒ Perennial
☐ Ephemeral
☐ Intermittent

WEATHER
Has there been a scouring rain in the last 14 days? ☐ Yes ☒ No

Now	Past 24 hours
☐	☐ Heavy rain
☐	☐ Steady rain
☐	☐ Intermittent showers
☒	☒ Clear/sunny
☐	☐ Cloudy

LOCAL WATERSHED FEATUREES (Predominant Surrounding Land Use):
☐ Surface Mining ☐ Deep Mining ☐ Oil Wells ☐ Land Disposal ☒ Residential
☐ Construction ☐ Commercial ☐ Industrial ☐ Row Crops
☐ Forest ☐ Pasture/Grazing ☐ Silviculture ☐ Urban Runoff/Storm Sewers

INSTREAM FEATURES
Stream Width 10 ft
Maximum Depth 0.16 ft
Reach Length 15.2 m
Riffle/Run/Pool Sequence (No. Sampled in Reach)
2 Riffle 1 Run 1 Pool

HYDRAULIC STRUCTURES
☐ Dams
☒ Bridge Abutments
☐ Island
☐ Waterfalls
☐ Other:

STREAM FLOW
☐ Dry
☐ Pooled
☒ Low
☐ High
☐ Normal

RIPARIAN VEGETATION
Dominate Type:
☒ Trees ☐ Herbaceous
☐ Grasses ☒ Shrubs
Number of strata 2 Dom. Tree/Shrub Taxa
SALIX NIGRA, PLATANUS

CHANNEL ALTERATIONS
☐ Dredging
☒ Channelization (☒ Full ☐ Partial)

P-CHEM Instrument Used: _____ Date Calibrated: _____

Temp(°C)_____ D.O. (mg/l)_____ %Saturation_____ pH(S.U.)_____ Cond._____ Turb._____

Sample Collection Verification

Algae	Sample: ☐ QualMHC ☐ Other ☐ Visual Assessment	Lead Collector:
Fish	☐ BPEF ☐ Seine ☐ Other Time: BPEF_____ Seine_____	Lead Collector:
Habitat	☐ RBP ☐ Substrate ☐ Other:	Lead Collector:
Invertebrates	☐ 1m² ☐ Qual ☐ Other:	Lead Collector:
	☐ 20 Jab (#Jabs: Cobble____ Snags____ Veg. Banks____ Sand____ Macrophytes____ Other ____)	
Tissue:	No. of Samples collected_____ Sp:	Lead Collector:
Water Chem	☐ Acid/Alk ☐ Bulk ☐ Nutrients ☐ Metals ☐ Low Hg	Lead Collector:
	☐ Herbicides ☐ Pesticides ☐ Ortho P ☐ Other:	

Duplicate Samples Taken:

Substrate Characterization

Substrate ☒Est. ☐P.C.	Riffle 70 %	Run 5 %	Pool 25 %	Reach Total
Silt/Clay (<0.06 mm)				10
Sand (0.06 – 2 mm)				5
Gravel (2-64 mm)				10
Cobble (64 – 256 mm)				75
Boulders (>256 mm)				0
Bedrock				0

NOTES/COMMENTS:

50' REACH

SITE NOT SAMPLED:
☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

CONFIDENTIAL PROPRIETARY TRADE SECRET

RBP High Gradient Habitat

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
1.Epifaunal Substrate/ Available Cover Score 7	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2.Embeddedness Score 13	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
3.Velocity/ Depth Regime Score 7	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Sow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
4. Sediment Deposition Score 8	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5.Channel Flow Status Score 7	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
6.Channel Alteration Score 4	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
7.Frequency of Riffles (or bends) Score 4	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
Left/Right Bank	10 9	8 7 6	5 4 3	2 1 0
8.Bank Stability LB 8 / RB 8	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection LB 6 / RB 6	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width LB 5 / RB 5	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.

Total Score

88

NOTES/COMMENTS:

50' REACH