

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 Start: 2:00	Finish:	
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A						
Reach			CANOPY COVER:			
Station			Downstream			Upstream
LAT	38.88831	-	-	<input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
LONG	-84.7551	-	-	<b>STREAM TYPE:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input type="checkbox"/> Intermittent		
<b>WEATHER</b> Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential			
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input type="checkbox"/> Cloudy			<input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers			
<b>INSTREAM FEATURES</b> Stream Width <u>50</u> ft Maximum Depth <u>2</u> ft Reach Length <u>15.2</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>0</u> Run <u>1</u> Pool			<b>HYDRAULIC STRUCTURES</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:		<b>STREAM FLOW</b> <input type="checkbox"/> Dry <input checked="" type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input type="checkbox"/> Normal	
			<b>RIPARIAN VEGETATION</b> Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Shrubs Number of strata <u>2</u> Dom. Tree/Shrub Taxa <b>PLATANUS OCCIDENTALIS,</b> <b>LYONICFRA SP</b>		<b>CHANNEL ALTERATIONS</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input type="checkbox"/> Partial	
<b>P-CHEM</b> Instrument Used: _____ Date Calibrated: _____ Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____						
Sample Collection Verification						
<b>Algae</b> Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____						
<b>Fish</b> <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____						
<b>Habitat</b> <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____						
<b>Invertebrates</b> <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____ <input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)						
<b>Tissue:</b> No. of Samples collected _____ Sp. Lead Collector: _____						
<b>Water Chem</b> <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____ <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:						
<b>Duplicate Samples Taken:</b>						
Substrate Characterization						
Substrate	<input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>75</u> %	Run <u>0</u> %	Pool <u>25</u> %	Reach Total	
Silt/Clay (<0.06 mm)					20	
Sand (0.06 – 2 mm)					10	
Gravel (2-64 mm)					20	
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)

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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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 8	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  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.					
<b>3. Velocity/ Depth Regime</b>  Score 13	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).					
<b>4. Sediment Deposition</b>  Score 10	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.					
<b>5. Channel Flow Status</b>  Score 5	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.					
<b>6. Channel Alteration</b>  Score 3	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.					
<b>7. Frequency of Riffles (or bends)</b>  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.					
<b>Left/Right Bank</b>	10	9				8	7	6			5	4	3			2	1				0
<b>8. Bank Stability</b> LB 6 RB 6	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.					
<b>9. Vegetative Protection</b> LB 7 RB 7	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 6 RB 6	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

94

NOTES/COMMENTS:

50' REACH

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High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-CDK-010			LOCATION: BIGBONE, KY		
STATION #: N/A			COUNTY: BOONE		PROGRAM: G141890.03
INVESTIGATORS: CDK, RFL			DATE: 10/15/15		TIME Start: 2:30 PM
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Reach					CANOPY COVER:
			Downstream		Upstream
LAT	38.887878	-			<input type="checkbox"/> Fully Exposed (0-25%)
LONG	-84.756212	-			<input checked="" type="checkbox"/> Partially Exposed (25-50%)
					<input type="checkbox"/> Partially Shaded (50-75%)
					<input type="checkbox"/> Fully Shaded (75-100%)
					STREAM TYPE:
					<input checked="" type="checkbox"/> Perennial
					<input type="checkbox"/> Ephemeral
					<input type="checkbox"/> Intermittent
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Now			Past 24 hours		
Has there been a scouring rain in the last 14 days?			<input type="checkbox"/> Heavy rain		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Steady rain		
			<input type="checkbox"/> Intermittent showers		
			<input type="checkbox"/> Clear/sunny		
			<input type="checkbox"/> Cloudy		
			<input type="checkbox"/> Surface Mining		
			<input type="checkbox"/> Deep Mining		
			<input type="checkbox"/> Oil Wells		
			<input type="checkbox"/> Land Disposal		
			<input checked="" type="checkbox"/> Residential		
			<input type="checkbox"/> Construction		
			<input type="checkbox"/> Commercial		
			<input type="checkbox"/> Industrial		
			<input type="checkbox"/> Row Crops		
			<input type="checkbox"/> Forest		
			<input checked="" type="checkbox"/> Pasture/Grazing		
			<input type="checkbox"/> Silviculture		
			<input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES			HYDRAULIC STRUCTURES		
Stream Width <u>10</u> ft			<input type="checkbox"/> Dams		
Maximum Depth <u>1.5</u> ft			<input checked="" type="checkbox"/> Bridge Abutments		
Reach Length <u>15.24</u> m			<input type="checkbox"/> Island		
Riffle/Run/Pool Sequence (No. Sampled in Reach)			<input type="checkbox"/> Waterfalls		
<u>0</u> Riffle <u>1</u> Run <u>1</u> Pool			<input type="checkbox"/> Other:		
			STREAM FLOW		
			<input type="checkbox"/> Dry		
			<input type="checkbox"/> Pooled		
			<input type="checkbox"/> Low		
			<input type="checkbox"/> High		
			<input checked="" type="checkbox"/> Normal		
			RIPARIAN VEGETATION		
			Dominate Type:		
			<input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous		
			<input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Shrubs		
			Number of strata <u>2</u> Dom.		
			Tree/Shrub Taxa		
			DIPSACUS SP.,		
			JUGLANS		
			CHANNEL ALTERATIONS		
			<input type="checkbox"/> Dredging		
			<input checked="" type="checkbox"/> Channelization		
			( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____					
<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____					
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>75</u> %	Pool <u>15</u> %	Reach Total	
Silt/Clay (<0.06 mm)				30	
Sand (0.06 – 2 mm)				30	
Gravel (2-64 mm)				30	
Cobble (64 – 256 mm)				10	
Boulders (>256 mm)				0	
Bedrock				0	

NOTES/COMMENTS:

50' REACH USED.

SITE NOT SAMPLED:

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

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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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 4	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 2	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.					
<b>3. Velocity/ Depth Regime</b>  Score 2	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).					
<b>4. Sediment Deposition</b>  Score 12	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.					
<b>5. Channel Flow Status</b>  Score 16	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.					
<b>6. Channel Alteration</b>  Score 7	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 9	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.					
<b>Left/Right Bank</b>	10 9					8 7 6					5 4 3					2 1 0					
<b>8. Bank Stability</b> LB 7 RB 7	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.					
<b>9. Vegetative Protection</b> LB 4 RB 4	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.					
<b>10. Riparian Vegetative Zone Width</b> 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

80

NOTES/COMMENTS:

50' REACH USED.

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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 Start: 2:30	
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Station			Reach		
			Downstream	Upstream	
LAT	38.88909		-	-	
LONG	-84.7489		-	-	
			CANOPY COVER:		
			<input type="checkbox"/> Fully Exposed (0-25%)		
			<input checked="" type="checkbox"/> Partially Exposed (25-50%)		
			<input type="checkbox"/> Partially Shaded (50-75%)		
			<input type="checkbox"/> Fully Shaded (75-100%)		
			STREAM TYPE:		
			<input type="checkbox"/> Perennial		
			<input type="checkbox"/> Ephemeral		
			<input checked="" type="checkbox"/> Intermittent		
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Now			Past 24 hours		
Has there been a scouring rain in the last 14 days?			Heavy rain		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Heavy rain		
			<input type="checkbox"/> Steady rain		
			<input type="checkbox"/> Intermittent showers		
			<input checked="" type="checkbox"/> Clear/sunny		
			<input type="checkbox"/> Cloudy		
			<input type="checkbox"/> Surface Mining		
			<input type="checkbox"/> Deep Mining		
			<input type="checkbox"/> Oil Wells		
			<input type="checkbox"/> Land Disposal		
			<input checked="" type="checkbox"/> Residential		
			<input type="checkbox"/> Construction		
			<input type="checkbox"/> Commercial		
			<input type="checkbox"/> Industrial		
			<input type="checkbox"/> Row Crops		
			<input type="checkbox"/> Forest		
			<input type="checkbox"/> Pasture/Grazing		
			<input type="checkbox"/> Silviculture		
			<input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES			HYDRAULIC STRUCTURES		
Stream Width <u>5</u> ft			<input type="checkbox"/> Dams		
Maximum Depth <u>0</u> ft			<input type="checkbox"/> Bridge Abutments		
Reach Length <u>15.2</u> m			<input type="checkbox"/> Island		
Riffle/Run/Pool Sequence (No. Sampled in Reach)			<input type="checkbox"/> Waterfalls		
<u>0</u> Riffle <u>0</u> Run <u>0</u> Pool			<input checked="" type="checkbox"/> Other: CULVER		
			STREAM FLOW		
			<input checked="" type="checkbox"/> Dry		
			<input type="checkbox"/> Pooled		
			<input type="checkbox"/> Low		
			<input type="checkbox"/> High		
			<input type="checkbox"/> Normal		
			RIPARIAN VEGETATION		
			Dominate Type:		
			<input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous		
			<input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Shrubs		
			Number of strata <u>2</u> Dom.		
			Tree/Shrub Taxa		
			FRAXINUS AMERICANA,		
			SALIX NIGRA, CUPRESSUS SP.,		
			POPULUS SP.		
			CHANNEL ALTERATIONS		
			<input type="checkbox"/> Dredging		
			<input checked="" type="checkbox"/> Channelization		
			( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____					
<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____					
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>0</u> %	Pool <u>0</u> %	Reach Total	
Silt/Clay (<0.06 mm)				30	
Sand (0.06 – 2 mm)				25	
Gravel (2-64 mm)				30	
Cobble (64 – 256 mm)				15	
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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 6	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 12	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.					
<b>3. Velocity/ Depth Regime</b>  Score N/A	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).					
<b>4. Sediment Deposition</b>  Score 13	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.					
<b>5. Channel Flow Status</b>  Score N/A	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.					
<b>6. Channel Alteration</b>  Score 7	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 7	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.					
<b>8. Bank Stability</b> LB 7 RB 7	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.					
<b>9. Vegetative Protection</b> LB 5 RB 5	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 6 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

80

NOTES/COMMENTS:

50' REACH

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

<b>STREAM NAME:</b> SKY-			<b>LOCATION:</b> BIGBONE,																																												
<b>STATION #:</b> N/A			<b>COUNTY:</b> BOON		<b>PROGRAM:</b> <b>PROJECT:</b> G141890.0																																										
<b>INVESTIGATORS:</b> CDK,			<b>DATE:</b> 10/15/1		<b>TIME</b> Start: 3:30 (24hr) Finish:																																										
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A																																															
		<b>Reach</b>																																													
	<b>Station</b>	<b>Downstream</b>	<b>Upstream</b>																																												
<b>LAT</b>	38.87939 A	-	-	<b>CANOPY COVER:</b> <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)																																											
<b>LONG</b>	-84.70139 5	-	-																																												
<table border="0" style="width:100%;"> <tr> <td colspan="3"><b>WEATHER</b></td> <td colspan="3"><b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b></td> </tr> <tr> <td>Has there been a scouring rain in the last 14 days?</td> <td>Now</td> <td>Past 24 hours</td> <td><input type="checkbox"/> Surface Mining</td> <td><input type="checkbox"/> Construction</td> <td><input type="checkbox"/> Forest</td> </tr> <tr> <td><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/> Heavy rain</td> <td><input type="checkbox"/> Deep Mining</td> <td><input type="checkbox"/> Commercial</td> <td><input type="checkbox"/> Pasture/Grazing</td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/> Steady rain</td> <td><input type="checkbox"/> Oil Wells</td> <td><input type="checkbox"/> Industrial</td> <td><input type="checkbox"/> Silviculture</td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/> Intermittent showers</td> <td><input type="checkbox"/> Land Disposal</td> <td><input type="checkbox"/> Row Crops</td> <td><input type="checkbox"/> Urban Runoff/Storm Sewers</td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/> Clear/sunny</td> <td><input checked="" type="checkbox"/> Residential</td> <td></td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/> Cloudy</td> <td></td> <td></td> <td></td> </tr> </table>						<b>WEATHER</b>			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b>			Has there been a scouring rain in the last 14 days?	Now	Past 24 hours	<input type="checkbox"/> Surface Mining	<input type="checkbox"/> Construction	<input type="checkbox"/> Forest	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/> Heavy rain	<input type="checkbox"/> Deep Mining	<input type="checkbox"/> Commercial	<input type="checkbox"/> Pasture/Grazing		<input checked="" type="checkbox"/>	<input type="checkbox"/> Steady rain	<input type="checkbox"/> Oil Wells	<input type="checkbox"/> Industrial	<input type="checkbox"/> Silviculture		<input type="checkbox"/>	<input checked="" type="checkbox"/> Intermittent showers	<input type="checkbox"/> Land Disposal	<input type="checkbox"/> Row Crops	<input type="checkbox"/> Urban Runoff/Storm Sewers		<input type="checkbox"/>	<input type="checkbox"/> Clear/sunny	<input checked="" type="checkbox"/> Residential				<input type="checkbox"/>	<input type="checkbox"/> Cloudy			
<b>WEATHER</b>			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b>																																												
Has there been a scouring rain in the last 14 days?	Now	Past 24 hours	<input type="checkbox"/> Surface Mining	<input type="checkbox"/> Construction	<input type="checkbox"/> Forest																																										
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	<input type="checkbox"/>	<input type="checkbox"/> Clear/sunny	<input checked="" type="checkbox"/> Residential																																												
	<input type="checkbox"/>	<input type="checkbox"/> Cloudy																																													
<b>INSTREAM FEATURES</b>		<b>HYDRAULIC STRUCTURES</b>		<b>RIPARIAN VEGETATION</b>																																											
Stream Width	9 ft	<input type="checkbox"/> Dams	<b>STREAM FLOW</b>		<b>CHANNEL ALTERATIONS</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial )																																										
Maximum Depth	0.33 ft	<input type="checkbox"/> Bridge Abutments	<input type="checkbox"/> Dry	<b>Dominant Type:</b> <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Shrubs Number of strata 2 Dom. Tree/Shrub Taxa <b>SALIX NIGRA, SOLIDAGO CANADENSIS, DIPSACUS</b>																																											
Reach Length	15.2 m	<input type="checkbox"/> Island	<input checked="" type="checkbox"/> Pooled																																												
Riffle/Run/Pool Sequence (No. Sampled in Reach)		<input type="checkbox"/> Waterfalls	<input type="checkbox"/> High																																												
2 Riffle 1 Run 0 Pool		<input checked="" type="checkbox"/> Other: CULVER	<input type="checkbox"/> Normal																																												
<b>P-CHEM</b> Instrument Used: _____ Date Calibrated: _____																																															
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____																																															
<b>Sample Collection Verification</b>																																															
<b>Algae</b>	Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other		<input type="checkbox"/> Visual Assessment		Lead Collector: _____																																										
<b>Fish</b>	<input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other		Time: BPEF Seine		Lead Collector: _____																																										
<b>Habitat</b>	<input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other:				Lead Collector: _____																																										
<b>Invertebrates</b>	<input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other:				Lead Collector: _____																																										
	<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)																																														
<b>Tissue:</b>	No. of Samples collected _____ Sp:				Lead Collector: _____																																										
<b>Water Chem</b>	<input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg				Lead Collector: _____																																										
	<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:																																														
<b>Duplicate Samples Taken:</b>																																															
<b>Substrate Characterization</b>																																															
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	<b>Riffle</b> 75 %	<b>Run</b> 25 %	<b>Pool</b> 0 %	<b>Reach Total</b>																																											
Silt/Clay (<0.06 mm)				25																																											
Sand (0.06 – 2 mm)				15																																											
Gravel (2-64 mm)				20																																											
Cobble (64 – 256 mm)				35																																											
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 6	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 <u>not</u> new fall and <u>not</u> 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 7	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 6	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 14	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 9	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 9	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 10	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 4 RB 4	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

91

NOTES/COMMENTS:

50' REACH

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/15/1	TIME Start: 4:15	
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A			Finish:		
Station		Reach		CANOPY COVER:	
		Downstream	Upstream	<input checked="" type="checkbox"/> Fully Exposed (0-25%)	
LAT	38.89736	-	-	<input type="checkbox"/> Partially Exposed (25-50%)	
LONG	-84.66256	-	-	<input type="checkbox"/> Partially Shaded (50-75%)	
					<input type="checkbox"/> Fully Shaded (75-100%)
			STREAM TYPE:		
			<input checked="" type="checkbox"/> Perennial		
			<input type="checkbox"/> Ephemeral		
			<input type="checkbox"/> Intermittent		
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Now			Past 24 hours		
Has there been a scouring rain in the last 14 days?			<input type="checkbox"/> Heavy rain		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Steady rain		
			<input type="checkbox"/> Intermittent showers		
			<input checked="" type="checkbox"/> Clear/sunny		
			<input type="checkbox"/> Cloudy		
			<input type="checkbox"/> Surface Mining		
			<input type="checkbox"/> Deep Mining		
			<input type="checkbox"/> Oil Wells		
			<input type="checkbox"/> Land Disposal		
			<input checked="" type="checkbox"/> Residential		
			<input type="checkbox"/> Construction		
			<input type="checkbox"/> Commercial		
			<input type="checkbox"/> Industrial		
			<input type="checkbox"/> Row Crops		
			<input type="checkbox"/> Forest		
			<input checked="" type="checkbox"/> Pasture/Grazing		
			<input type="checkbox"/> Silviculture		
			<input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES			HYDRAULIC STRUCTURES		
Stream Width <u>14</u> ft			<input type="checkbox"/> Dams		
Maximum Depth <u>2</u> ft			<input checked="" type="checkbox"/> Bridge Abutments		
Reach Length <u>15.2</u> m			<input type="checkbox"/> Island		
Riffle/Run/Pool Sequence (No. Sampled in Reach)			<input type="checkbox"/> Waterfalls		
<u>2</u> Riffle <u>1</u> Run <u>1</u> Pool			<input type="checkbox"/> Other:		
			STREAM FLOW		
			<input type="checkbox"/> Dry		
			<input type="checkbox"/> Pooled		
			<input checked="" type="checkbox"/> Low		
			<input type="checkbox"/> High		
			<input type="checkbox"/> Normal		
			RIPARIAN VEGETATION		
			Dominate Type:		
			<input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous		
			<input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Shrubs		
			Number of strata <u>2</u> Dom.		
			Tree/Shrub Taxa		
			PLATANUS OCCIDENTALIS, BALSAM		
			CHANNEL ALTERATIONS		
			<input type="checkbox"/> Dredging		
			<input checked="" type="checkbox"/> Channelization		
			( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____					
<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____					
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>15</u> %	Run <u>50</u> %	Pool <u>35</u> %	Reach Total	
Silt/Clay (<0.06 mm)					
Sand (0.06 – 2 mm)				2	
Gravel (2-64 mm)					
Cobble (64 – 256 mm)					
Boulders (>256 mm)				10	
Bedrock					

NOTES/COMMENTS:

50' REACH

SITE NOT SAMPLED:

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

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<b>1. Epifaunal Substrate/ Available Cover</b>  Score 6	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 14	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.					
<b>3. Velocity/ Depth Regime</b>  Score 13	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).					
<b>4. Sediment Deposition</b>  Score 15	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.					
<b>5. Channel Flow Status</b>  Score 16	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.					
<b>6. Channel Alteration</b>  Score 5	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 7	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.					
<b>Left/Right Bank</b>	10	9				8	7	6			5	4	3			2	1				0
<b>8. Bank Stability</b> LB 7 RB 7	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.					
<b>9. Vegetative Protection</b> LB 4 RB 4	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.					
<b>10. Riparian Vegetative Zone Width</b> 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

104

NOTES/COMMENTS:

50' REACH

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1		TIME Start: 8:50
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Station			Reach		
			Downstream	Upstream	
LAT	38.88882		-	-	
LONG	-84.68538		-	-	
			CANOPY COVER:		
			<input checked="" type="checkbox"/> Fully Exposed (0-25%)		
			<input type="checkbox"/> Partially Exposed (25-50%)		
			<input type="checkbox"/> Partially Shaded (50-75%)		
			<input type="checkbox"/> Fully Shaded (75-100%)		
			STREAM TYPE:		
			<input checked="" type="checkbox"/> Perennial		
			<input type="checkbox"/> Ephemeral		
			<input type="checkbox"/> Intermittent		
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Now			Past 24 hours		
Has there been a scouring rain in the last 14 days?			<input type="checkbox"/> Heavy rain		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Steady rain		
			<input type="checkbox"/> Intermittent showers		
			<input checked="" type="checkbox"/> Clear/sunny		
			<input type="checkbox"/> Cloudy		
			<input type="checkbox"/> Surface Mining		
			<input type="checkbox"/> Deep Mining		
			<input type="checkbox"/> Oil Wells		
			<input type="checkbox"/> Land Disposal		
			<input type="checkbox"/> Residential		
			<input type="checkbox"/> Construction		
			<input type="checkbox"/> Commercial		
			<input type="checkbox"/> Industrial		
			<input type="checkbox"/> Row Crops		
			<input type="checkbox"/> Forest		
			<input checked="" type="checkbox"/> Pasture/Grazing		
			<input type="checkbox"/> Silviculture		
			<input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES			HYDRAULIC STRUCTURES		
Stream Width 12 ft			<input type="checkbox"/> Dams		
Maximum Depth 0.83 ft			<input checked="" type="checkbox"/> Bridge Abutments		
Reach Length 15.2 m			<input type="checkbox"/> Island		
Riffle/Run/Pool Sequence (No. Sampled in Reach)			<input type="checkbox"/> Waterfalls		
0 Riffle 1 Run 1 Pool			<input type="checkbox"/> Other:		
			STREAM FLOW		
			<input type="checkbox"/> Dry		
			<input checked="" type="checkbox"/> Pooled		
			<input type="checkbox"/> Low		
			<input type="checkbox"/> High		
			<input type="checkbox"/> Normal		
			RIPARIAN VEGETATION		
			Dominate Type:		
			<input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous		
			<input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs		
			Number of strata 1 Dom.		
			Tree/Shrub Taxa		
			PERSICARIA		
			LONGISETA		
			CHANNEL ALTERATIONS		
			<input type="checkbox"/> Dredging		
			<input checked="" type="checkbox"/> Channelization		
			<input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial		
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____					
<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp. Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____					
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle 0 %	Run 30 %	Pool 70 %	Reach Total	
Silt/Clay (<0.06 mm)				60	
Sand (0.06 – 2 mm)				5	
Gravel (2-64 mm)				10	
Cobble (64 – 256 mm)				15	
Boulders (>256 mm)				10	
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
<b>1. Epifaunal Substrate/ Available Cover</b> Score 6	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b> 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.					
<b>3. Velocity/ Depth Regime</b> 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).					
<b>4. Sediment Deposition</b> Score 5	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.					
<b>5. Channel Flow Status</b> Score 13	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.					
<b>6. Channel Alteration</b> Score 5	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.					
<b>7. Frequency of Riffles (or bends)</b> Score 5	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.					
<b>8. Bank Stability</b> LB 2 RB 3	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.					
<b>9. Vegetative Protection</b> LB 2 RB 2	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 2 RB 2	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

65

NOTES/COMMENTS:

50' REACH USED. HEAVY GRAZING WITHIN

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1		TIME Start: 9:30
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Reach					
	Station	Downstream	Upstream		
LAT	38.89908 7	-	-		<b>CANOPY COVER:</b> <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)
LONG	-84.6531 2	-	-		
					<b>STREAM TYPE:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input type="checkbox"/> Intermittent
<b>WEATHER</b> Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential		
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input type="checkbox"/> Cloudy			<input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>INSTREAM FEATURES</b> Stream Width <u>30</u> ft Maximum Depth <u>0.5</u> ft Reach Length <u>15.2</u> m		<b>HYDRAULIC STRUCTURES</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:		<b>STREAM FLOW</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input type="checkbox"/> Normal	
Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>0</u> Riffle <u>1</u> Run <u>1</u> Pool		<b>RIPARIAN VEGETATION</b> Dominate Type: <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>1</u> Dom. Tree/Shrub Taxa SETARIA PUMILA, TARAXICUM OFFICIANALE		<b>CHANNEL ALTERATIONS</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial	
<b>P-CHEM</b> Instrument Used: _____ Date Calibrated: _____ Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
<b>Algae</b> Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
<b>Fish</b> <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
<b>Habitat</b> <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
<b>Invertebrates</b> <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____ <input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
<b>Tissue:</b> No. of Samples collected _____ Sp. Lead Collector: _____					
<b>Water Chem</b> <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____ <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
<b>Duplicate Samples Taken:</b>					
Substrate Characterization					
Substrate	<input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>65</u> %	Run <u>25</u> %	Pool <u>10</u> %	Reach Total
Silt/Clay (<0.06 mm)					20
Sand (0.06 – 2 mm)					10
Gravel (2-64 mm)					25
Cobble (64 – 256 mm)					35
Boulders (>256 mm)					10
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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 5	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 7	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.					
<b>3. Velocity/ Depth Regime</b>  Score 9	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).					
<b>4. Sediment Deposition</b>  Score 6	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.					
<b>5. Channel Flow Status</b>  Score 9	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.					
<b>6. Channel Alteration</b>  Score 3	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 12	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.					
<b>8. Bank Stability</b> 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.					
<b>9. Vegetative Protection</b> LB 4 RB 4	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 4 RB 4	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

83

NOTES/COMMENTS:

50' REACH

CONFIDENTIAL PROPRIETARY TRADE SECRET

High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1		TIME Start: 10:00
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Reach					
	Station	Downstream	Upstream		
LAT	38.89832	-	-		<b>CANOPY COVER:</b> <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)
LONG	-84.65085	-	-		
			<b>STREAM TYPE:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input type="checkbox"/> Intermittent		
<b>WEATHER</b> Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>INSTREAM FEATURES</b> Stream Width <u>30</u> ft Maximum Depth <u>1</u> ft Reach Length <u>15.2</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>0</u> Riffle <u>1</u> Run <u>1</u> Pool			<b>HYDRAULIC STRUCTURES</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:		<b>STREAM FLOW</b> <input type="checkbox"/> Dry <input checked="" type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input type="checkbox"/> Normal
			<b>RIPARIAN VEGETATION</b> Dominate Type: <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>2</u> Dom. Tree/Shrub Taxa PLATANUS OCCIDENTALIS, SOLIDAGO CANADENSIS, GLEDITSIA TRIACANTHOS		<b>CHANNEL ALTERATIONS</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization (Full <input type="checkbox"/> Partial)
<b>P-CHEM</b> Instrument Used: _____ Date Calibrated: _____ Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
<b>Sample Collection Verification</b>					
<b>Algae</b>		Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other		<input type="checkbox"/> Visual Assessment	
<b>Fish</b>		<input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other		Time: BPEF Seine	
<b>Habitat</b>		<input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other:		Lead Collector:	
<b>Invertebrates</b>		<input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other:		Lead Collector:	
		<input type="checkbox"/> 20 Jab (#Jabs: Cobble Snags Veg. Banks Sand Macrophytes Other )			
<b>Tissue:</b>		No. of Samples collected _____ Sp:		Lead Collector:	
<b>Water Chem</b>		<input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg		Lead Collector:	
		<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:			
<b>Duplicate Samples Taken:</b>					
<b>Substrate Characterization</b>					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>15</u> %	Pool <u>85</u> %	Reach Total	
Silt/Clay (<0.06 mm)				15	
Sand (0.06 – 2 mm)				10	
Gravel (2-64 mm)				5	
Cobble (64 – 256 mm)				35	
Boulders (>256 mm)				0	
Bedrock				35	

NOTES/COMMENTS:

50' REACH

**SITE NOT SAMPLED:**

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

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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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 6	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 16	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.					
<b>3. Velocity/ Depth Regime</b>  Score 4	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).					
<b>4. Sediment Deposition</b>  Score 16	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.					
<b>5. Channel Flow Status</b>  Score 16	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.					
<b>6. Channel Alteration</b>  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.					
<b>7. Frequency of Riffles (or bends)</b>  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.					
<b>Left/Right Bank</b>	10 . 9					8 7 6					5 4 3					2 1 0					
<b>8. Bank Stability</b> LB 3 RB 3	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.					
<b>9. Vegetative Protection</b> LB 4 RB 4	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 2 RB 2	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

83

NOTES/COMMENTS:

50' REACH

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High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1		TIME Start: 10:25
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Reach			CANOPY COVER:		STREAM TYPE:
	Station	Downstream	Upstream		
LAT	38.89519	-	-	<input checked="" type="checkbox"/> Fully Exposed (0-25%)	
LONG	-84.64805	-	-	<input type="checkbox"/> Partially Exposed (25-50%)	
				<input type="checkbox"/> Partially Shaded (50-75%)	
				<input type="checkbox"/> Fully Shaded (75-100%)	
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential		
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input type="checkbox"/> Cloudy			<input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES		HYDRAULIC STRUCTURES		RIPARIAN VEGETATION	
Stream Width <u>12</u> ft Maximum Depth <u>0.5</u> ft Reach Length <u>15.2</u> m		<input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:		Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>1</u> Dom. Tree/Shrub Taxa <b>FRAXINUS AMERICANA</b>	
Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>1</u> Run <u>1</u> Pool				CHANNEL ALTERATIONS <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial	
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____ <input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____ <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>25</u> %	Run <u>50</u> %	Pool <u>15</u> %	Reach Total	
Silt/Clay (<0.06 mm)					
Sand (0.06 – 2 mm)				10	
Gravel (2-64 mm)					
Cobble (64 – 256 mm)					
Boulders (>256 mm)				15	
Bedrock					

NOTES/COMMENTS:

50' REACH

**SITE NOT SAMPLED:**

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

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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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 9	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 12	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.					
<b>3. Velocity/ Depth Regime</b>  Score 9	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).					
<b>4. Sediment Deposition</b>  Score 12	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.					
<b>5. Channel Flow Status</b>  Score 9	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.					
<b>6. Channel Alteration</b>  Score 6	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 10	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
<b>8. Bank Stability</b>  LB 3 RB 5	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.					
<b>9. Vegetative Protection</b>  LB 4 RB 4	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.					
<b>10. Riparian Vegetative Zone Width</b>  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

89

NOTES/COMMENTS:

50' REACH

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High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1		TIME Start: 11:00
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
		Reach			
	Station	Downstream	Upstream		
LAT	38.88984	-	-	CANOPY COVER: <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	
LONG	-84.64017	-	-		
WEATHER Now Past 24 hours Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input type="checkbox"/> Cloudy					
LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use): <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers					
INSTREAM FEATURES Stream Width <u>14</u> ft Maximum Depth <u>0.16</u> ft Reach Length <u>15.2</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>0</u> Riffle <u>1</u> Run <u>1</u> Pool		HYDRAULIC STRUCTURES <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input checked="" type="checkbox"/> Other: CULVER		STREAM FLOW <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input checked="" type="checkbox"/> Low <input type="checkbox"/> High <input type="checkbox"/> Normal	
RIPARIAN VEGETATION Dominate Type: <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Shrubs Number of strata <u>2</u> Dom. Tree/Shrub Taxa TYPHA LATIFOLIA, SALIX NIGRA, SOLIDAGO CANADENSIS					
CHANNEL ALTERATIONS <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)					
P-CHEM Instrument Used: _____ Date Calibrated: _____ Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____ <input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other: Lead Collector: _____					
Duplicate Samples Taken: _____					
Substrate Characterization					
Substrate	<input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>75</u> %	Pool <u>25</u> %	Reach Total
Silt/Clay (<0.06 mm)					60
Sand (0.06 – 2 mm)					10
Gravel (2-64 mm)					15
Cobble (64 – 256 mm)					15
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					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 13	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.					
<b>2. Embeddedness</b>  Score 4	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.					
<b>3. Velocity/ Depth Regime</b>  Score 6	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).					
<b>4. Sediment Deposition</b>  Score 4	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.					
<b>5. Channel Flow Status</b>  Score 8	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.					
<b>6. Channel Alteration</b>  Score 7	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.					
<b>7. Frequency of Riffles (or bends)</b>  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.					
<b>Left/Right Bank</b>	10	9				8	7	6			5	4	3			2	1				0
<b>8. Bank Stability</b> LB 7 RB 7	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.					
<b>9. Vegetative Protection</b> LR 7 RB 7	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.					
<b>10. Riparian Vegetative Zone Width</b> 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

84

NOTES/COMMENTS:

50' REACH

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High Gradient Bioassessment Stream Visit Sheet

STREAM NAME: SKY-			LOCATION: BIGBONE,		
STATION #: N/A			COUNTY: BOON		PROGRAM: PROJECT: G141890.0
INVESTIGATORS: CDK,			DATE: 10/16/1	TIME Start: 11:45	Finish:
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					
Station		Downstream		Upstream	
LAT	38.89012	-	-	CANOPY COVER:	
LONG	-84.62415	-	-	<input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	
WEATHER			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input type="checkbox"/> Residential		
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input type="checkbox"/> Cloudy			<input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops		
<input type="checkbox"/> Forest <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers			STREAM TYPE: <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input type="checkbox"/> Intermittent		
INSTREAM FEATURES		HYDRAULIC STRUCTURES		RIPARIAN VEGETATION	
Stream Width <u>7</u> ft Maximum Depth <u>0.25</u> ft Reach Length <u>15.2</u> m		<input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input checked="" type="checkbox"/> Other: CULVER		Dominate Type: <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>1</u> Dom. Tree/Shrub Taxa CONIUM MACULATUM, HELIANTHUS SP.	
Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>1</u> Run <u>1</u> Pool		CHANNEL ALTERATIONS <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial			
P-CHEM Instrument Used: _____ Date Calibrated: _____					
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
Sample Collection Verification					
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____					
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____					
Habitat <input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: _____					
Invertebrates <input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: _____					
<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)					
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____					
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____					
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:					
Duplicate Samples Taken:					
Substrate Characterization					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>35</u> %	Run <u>50</u> %	Pool <u>15</u> %	Reach Total	
Silt/Clay (<0.06 mm)				35	
Sand (0.06 – 2 mm)				15	
Gravel (2-64 mm)				15	
Cobble (64 – 256 mm)				35	
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)

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RBP High Gradient Habitat

Habitat Parameter	Condition Category																			
	Optimal					Suboptimal					Marginal					Poor				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 4	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.				
<b>2. Embeddedness</b>  Score 4	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.				
<b>3. Velocity/ Depth Regime</b>  Score 4	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).				
<b>4. Sediment Deposition</b>  Score 4	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.				
<b>5. Channel Flow Status</b>  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.				
<b>6. Channel Alteration</b>  Score 5	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.				
<b>7. Frequency of Riffles (or bends)</b>  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.				
<b>8. Bank Stability</b> LB 5 RB 5	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.				
<b>9. Vegetative Protection</b> LB 5 RB 5	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.				
<b>10. Riparian Vegetative Zone Width</b> 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

58

NOTES/COMMENTS:

50' REACH

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: 10/16/1		TIME Start: 11:30
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					Finish:
Reach					
	Station	Downstream	Upstream		
LAT	38.89016	-	-		<b>CANOPY COVER:</b> <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)
LONG	-84.62363	-	-		
					<b>STREAM TYPE:</b> <input type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input checked="" type="checkbox"/> Intermittent
<b>WEATHER</b> Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			<b>LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input type="checkbox"/> Residential <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>INSTREAM FEATURES</b> Stream Width <u>8</u> ft Maximum Depth <u>0.08</u> ft Reach Length <u>15.2</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>0</u> Run <u>0</u> Pool			<b>HYDRAULIC STRUCTURES</b> <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input checked="" type="checkbox"/> Other: CULVER		<b>STREAM FLOW</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input checked="" type="checkbox"/> Low <input type="checkbox"/> High <input type="checkbox"/> Normal
			<b>RIPARIAN VEGETATION</b> Dominate Type: <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>1</u> Dom. Tree/Shrub Taxa LONICERA SP., FRAXINUS AMERICANA, SOLIDAGO SP		<b>CHANNEL ALTERATIONS</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization (Full <input type="checkbox"/> Partial)
<b>P-CHEM</b> Instrument Used: _____ Date Calibrated: _____ Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____					
<b>Sample Collection Verification</b>					
<b>Algae</b>		Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other		<input type="checkbox"/> Visual Assessment	
<b>Fish</b>		<input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other		Time: BPEF Seine	
<b>Habitat</b>		<input type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other:		Lead Collector:	
<b>Invertebrates</b>		<input type="checkbox"/> 1m <sup>2</sup> <input type="checkbox"/> Qual <input type="checkbox"/> Other:		Lead Collector:	
		<input type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)			
<b>Tissue:</b>		No. of Samples collected _____ Sp:		Lead Collector:	
<b>Water Chem</b>		<input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg		Lead Collector:	
		<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:			
<b>Duplicate Samples Taken:</b>					
<b>Substrate Characterization</b>					
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>100</u> %	Run <u>0</u> %	Pool <u>0</u> %	Reach Total	
Silt/Clay (<0.06 mm)				25	
Sand (0.06 – 2 mm)				0	
Gravel (2-64 mm)				25	
Cobble (64 – 256 mm)				50	
Boulders (>256 mm)				0	
Bedrock				0	

NOTES/COMMENTS:

50' REACH

<b>SITE NOT SAMPLED:</b>		
<input type="checkbox"/> Land owner denial	<input type="checkbox"/> Dry	<input type="checkbox"/> Too deep/Impounded
<input type="checkbox"/> Site not found/Secluded	<input type="checkbox"/> Unsafe	
<input type="checkbox"/> Other (indicate under comments)		

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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
<b>1. Epifaunal Substrate/ Available Cover</b>  Score 4	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 <u>not</u> new fall and <u>not</u> 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.					
<b>2. Embeddedness</b>  Score 8	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.					
<b>3. Velocity/ Depth Regime</b>  Score 3	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).					
<b>4. Sediment Deposition</b>  Score 3	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.					
<b>5. Channel Flow Status</b>  Score 2	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.					
<b>6. Channel Alteration</b>  Score 3	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.					
<b>7. Frequency of Riffles (or bends)</b>  Score 2	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.					
<b>Left/Right Bank</b>	10 9					8 7 6					5 4 3					2 1 0					
<b>8. Bank Stability</b> LB 7 RB 7	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.					
<b>9. Vegetative Protection</b> LB 3 RB 3	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.					
<b>10. Riparian Vegetative Zone Width</b> LB 2 RB 2	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

49

NOTES/COMMENTS:

50' REACH

**CONFIDENTIAL PROPRIETARY TRADE SECRET**

**APPENDIX B**  
**Descriptions of Soils Found**  
**Within the Project Study Area**

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Soil Unit Symbol	Soil Unit Name	% in 20-Foot Corridor	Acres	Hydric
AsB	Ashton silt loam, 2 to 6 percent slopes (occasionally flooded)	0.08%	0.02	No
Bo	Boonesboro silt loam (0 to 4 percent slopes, occasionally flooded)	0.91%	0.22	No
BrC	Brashear silty clay loam, 6 to 12 percent slopes	0.74%	0.18	No
BsD3	Brashear silty clay, 12 to 20 percent slopes, severely eroded	1.44%	0.35	No
CyF	Cynthiana flaggy silty clay loam, 20 to 50 percent slopes	1.42%	0.35	No
EdE2	Eden silty clay loam, 20 to 35 percent slopes, eroded	10.28%	2.53	No
Eg	Egam silty clay loam, (woolper 0 to 4 percent slopes)	1.54%	0.38	No
FcC	Faywood silty clay loam, 6 to 12 percent slopes	2.68%	0.66	No
FcD	Faywood silty clay loam, 12 to 20 percent slopes	15.57%	3.83	No
FdD3	Faywood silty clay, 12 to 20 percent slopes, severely eroded	6.00%	1.47	No
JeB	Jessup silt loam, 2 to 6 percent slopes	1.08%	0.27	No
JeC	Jessup silt loam, 6 to 12 percent slopes	1.17%	0.29	No
LkB	Licking silt loam, 2 to 6 percent slopes	1.06%	0.26	No
LIC	Licking silty clay loam, 6 to 12 percent slopes	2.78%	0.68	No
LID	Licking silty clay loam, 12 to 20 percent slopes	2.22%	0.55	No
Ln	Lindside silt loam (0 to 3 percent slopes, occasionally flooded)	0.58%	0.14	No
Nk	Newark silt loam (0 to 2 percent slopes, occasionally flooded)	0.01%	0.00	No
NIB	Nicholson silt loam, 2 to 6 percent slopes	6.24%	1.53	No
NIC	Nicholson silt loam, 6 to 12 percent slopes	1.73%	0.43	No
No	Nolin silt loam (0 to 2 percent slopes, occasionally flooded)	30.50%	7.50	Yes
Rsb	Rossmoyne silt loam, 0 to 6 percent slopes	6.11%	1.50	No
Rsc	Rossmoyne silt loam, 6 to 12 percent slopes	4.07%	1.00	No
W	Water	0.23%	0.06	No
WoC	Woolper silty clay loam, 6 to 12 percent slopes	1.57%	0.39	No

CONFIDENTIAL PROPRIETARY TRADE SECRET

Site Number	Latitude	Longitude	Cowardin Code <sup>2</sup> /Flow Regime	Estimated Amount of Aquatic Resource in Project Area (acre)	Estimated Amount of Aquatic Resource in Project Area (linear ft.)	Class of Aquatic Resource
W004	38.8857	-84.7270	PEM	0.003	—	Non-Section 10 – Wetland
W005	38.8858	-84.7240	PEM	0.004	—	Non-Section 10 – Wetland
W006	38.8858	-84.7229	PEM	0.006	—	Non-Section 10 – Wetland
W007	38.8789	-84.6998	PEM	0.031	—	Non-Section 10 – Wetland
W008	38.8792	-84.6990	PEM	0.055	—	Non-Section 10 – Wetland
W009	38.8898	-84.6401	PSS	0.045	—	Non-Section 10 – Wetland
W010	38.8894	-84.6287	PEM	0.016	—	Non-Section 10 – Wetland
W011	38.8894	-84.6279	PEM	0.032	—	Non-Section 10 – Wetland
W013	38.8891	-84.6151	PEM	0.029	—	Non-Section 10 – Wetland
<b>Total Wetlands</b>				<b>0.22</b>	<b>—</b>	<b>—</b>
S001	38.8886	-84.7516	Intermittent	—	28	Non-Section 10 – Non-Wetland
S003	38.8882	-84.7428	Intermittent	—	27	Non-Section 10 – Non-Wetland
S004	38.8871	-84.7410	Intermittent	—	28	Non-Section 10 – Non-Wetland
S005	38.8862	-84.7393	Intermittent	—	28	Non-Section 10 – Non-Wetland
S006	38.8861	-84.7389	Ephemeral	—	37	Non-Section 10 – Non-Wetland
S008	38.8838	-84.7342	Intermittent	—	33	Non-Section 10 – Non-Wetland
S009	38.8838	-84.7327	Intermittent	—	18	Non-Section 10 – Non-Wetland
S010	38.8849	-84.7299	Ephemeral roadside drainage	—	0	Non-Section 10 – Non-Wetland
S011	38.8854	-84.7285	Ephemeral	—	91	Non-Section 10 – Non-Wetland
S012	38.8858	-84.7239	Intermittent	—	10	Non-Section 10 – Non-Wetland

CONFIDENTIAL PROPRIETARY TRADE SECRET

Site Number	Latitude	Longitude	Cowardin Code <sup>2</sup> /Flow Regime	Estimated Amount of Aquatic Resource in Project Area (acre)	Estimated Amount of Aquatic Resource in Project Area (linear ft.)	Class of Aquatic Resource
S013	38.8858	-84.7252	Ephemeral	—	8	Non-Section 10 – Non-Wetland
S016	38.8845	-84.7164	Ephemeral	—	50	Non-Section 10 – Non-Wetland
S017	38.8845	-84.7164	Perennial	—	32	Non-Section 10 – Non-Wetland
S018	38.8840	-84.7139	Ephemeral	—	5	Non-Section 10 – Non-Wetland
S019	38.8837	-84.7129	Ephemeral	—	8	Non-Section 10 – Non-Wetland.
S020	38.8831	-84.7109	Ephemeral	—	30	Non-Section 10 – Non-Wetland
S021	38.8831	-84.7107	Ephemeral	—	30	Non-Section 10 – Non-Wetland
S022	38.8837	-84.7127	Ephemeral	—	15	Non-Section 10 – Non-Wetland
S023	38.8804	-84.7044	Perennial	—	35	Non-Section 10 – Non-Wetland
S024	38.8795	-84.7017	Ephemeral roadside drainage	—	138	Non-Section 10 – Non-Wetland
S025	38.8791	-84.7005	Intermittent	—	166	Non-Section 10 – Non-Wetland
S026	38.8788	-84.6998	Ephemeral	—	11	Non-Section 10 – Non-Wetland
S027	38.8789	-84.6999	Ephemeral	—	15	Non-Section 10 – Non-Wetland
S028	38.8791	-84.6991	Perennial	—	31	Non-Section 10 – Non-Wetland
S029	38.8791	-84.6990	Ephemeral	—	2	Non-Section 10 – Non-Wetland
S030	38.8791	-84.6991	Ephemeral	—	29	Non-Section 10 – Non-Wetland
S031	38.8859	-84.6924	Intermittent	—	105	Non-Section 10 – Non-Wetland
S032	38.8872	-84.6895	Ephemeral	—	25	Non-Section 10 – Non-Wetland
S033	38.8937	-84.6734	Intermittent	—	8	Non-Section 10 – Non-Wetland
S035	38.9008	-84.6501	Ephemeral	—	17	Non-Section 10 – Non-Wetland

CONFIDENTIAL PROPRIETARY TRADE SECRET

Site Number	Latitude	Longitude	Cowardin Code <sup>a</sup> /Flow Regime	Estimated Amount of Aquatic Resource In Project Area (acre)	Estimated Amount of Aquatic Resource In Project Area (linear ft.)	Class of Aquatic Resource
S036	38.9008	-84.6501	Ephemeral	—	34	Non-Section 10 – Non-Wetland
S037	38.9041	-84.6454	Intermittent	—	31	Non-Section 10 – Non-Wetland
S038	38.8888	-84.6301	Ephemeral roadside drainage	—	82	Non-Section 10 – Non-Wetland
S041	38.8883	-84.6147	Ephemeral	—	1	Non-Section 10 – Non-Wetland
S044	38.8891	-84.6152	Perennial	—	65	Non-Section 10 – Non-Wetland
S045	38.8885	-84.6150	Ephemeral	—	34	Non-Section 10 – Non-Wetland
S046	38.8887	-84.6151	Intermittent	—	33	Non-Section 10 – Non-Wetland
SKY-CDK-001	38.8830	-84.7106	Ephemeral	—	34	Non-Section 10 – Non-Wetland
SKY-CDK-004	38.8837	-84.7127	Ephemeral	—	40	Non-Section 10 – Non-Wetland
SKY-CDK-005	38.8845	-84.7162	Ephemeral roadside drainage	—	51	Non-Section 10 – Non-Wetland
SKY-CDK-006	38.8850	-84.7297	Perennial	—	59	Non-Section 10 – Non-Wetland
SKY-CDK-007	38.8847	-84.7364	Perennial	—	36	Non-Section 10 – Non-Wetland
SKY-CDK-008	38.8882	-84.7552	Perennial	—	23	Non-Section 10 – Non-Wetland
SKY-CDK-009	38.8878	-84.7569	Ephemeral roadside drainage	—	296	Non-Section 10 – Non-Wetland
SKY-CDK-010	38.8879	-84.7562	Perennial	—	26	Non-Section 10 – Non-Wetland
SKY-CDK-011	38.8889	-84.7489	Intermittent	—	27	Non-Section 10 – Non-Wetland
SKY-CDK-012	38.8794	-84.7014	Perennial	—	72	Non-Section 10 – Non-Wetland
SKY-CDK-013	38.8974	-84.6626	Perennial	—	30	Non-Section 10 – Non-Wetland
SKY-CDK-014	38.8938	-84.6733	Perennial	—	13	Non-Section 10 – Non-Wetland

CONFIDENTIAL PROPRIETARY TRADE SECRET

Site Number	Latitude	Longitude	Cowardin Code <sup>a</sup> /Flow Regime	Estimated Amount of Aquatic Resource in Project Area (acre)	Estimated Amount of Aquatic Resource in Project Area (linear ft.)	Class of Aquatic Resource
SKY-CDK-015	38.8793	-84.6989	Intermittent	—	58	Non-Section 10 – Non-Wetland
SKY-CDK-016	38.8889	-84.6854	Perennial	—	33	Non-Section 10 – Non-Wetland
SKY-CDK-017	38.8992	-84.6531	Perennial	—	30	Non-Section 10 – Non-Wetland
SKY-CDK-018	38.8985	-84.6509	Perennial	—	143	Non-Section 10 – Non-Wetland
SKY-CDK-019	38.9062	-84.6423	Ephemeral	—	33	Non-Section 10 – Non-Wetland
SKY-CDK-020	38.8953	-84.6480	Perennial	—	46	Non-Section 10 – Non-Wetland
SKY-CDK-021	38.8914	-84.6431	Ephemeral	—	33	Non-Section 10 – Non-Wetland
SKY-CDK-022	38.8899	-84.6401	Perennial	—	35	Non-Section 10 – Non-Wetland
SKY-CDK-023	38.8878	-84.6329	Ephemeral	—	30	Non-Section 10 – Non-Wetland
SKY-CDK-024	38.8896	-84.6269	Intermittent	—	32	Non-Section 10 – Non-Wetland
SKY-CDK-025	38.8898	-84.6258	Ephemeral	—	36	Non-Section 10 – Non-Wetland
SKY-CDK-026	38.8902	-84.6242	Perennial	—	31	Non-Section 10 – Non-Wetland
SKY-CDK-027	38.8902	-84.6236	Perennial	—	43	Non-Section 10 – Non-Wetland
<b>Total Streams</b>				—	<b>2,630</b>	—
<sup>a</sup> PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested. These are based on the professional judgment of CH2M HILL.						

**PRELIMINARY JURISDICTIONAL DETERMINATION FORM**

**BACKGROUND INFORMATION**

**A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD):** April 18, 2016

**B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:**  
Mr. Stephen Lane, Duke Energy                      Mr. Mike Frank, CH2M HILL Engineers, Inc.  
139 East 4th Street                                      400 E. Business Way Suite 400  
Cincinnati, OH 45202                                      Cincinnati, OH 45241

**C. DISTRICT OFFICE, FILE NAME, AND NUMBER:** TBD

**D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:  
(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)**

State: KY                      County/parish/borough: Boone    City:  
Center coordinates of site (lat/long in degree decimal format): Lat.    °  
Pick List, Long.            ° Pick List.    Lat: 38.886595    Long: -84.690560  
Universal Transverse Mercator:

Name of nearest waterbody:    See attached table.

Identify (estimate) amount of waters in the review area:

Non-wetland waters: 2,630 linear feet:            width (ft) and/or            acres.  
Cowardin Class:    See attached table.  
Stream Flow:    See attached table.  
Wetlands: 0.22 acres.  
Cowardin Class: See attached table.

Name of any water bodies on the site that have been identified as Section 10 waters:

Tidal: NA  
Non-Tidal: N/A

**E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**

- Office (Desk) Determination. Date:
- Field Determination. Date(s):

CONFIDENTIAL PROPRIETARY TRADE SECRET

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable. This preliminary JD finds that there "may be" waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

**SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):**

- Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant:
- Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - Office concurs with data sheets/delineation report.
  - Office does not concur with data sheets/delineation report.
- Data sheets prepared by the Corps:
- Corps navigable waters' study:
- U.S. Geological Survey Hydrologic Atlas:
  - USGS NHD data.
  - USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: Rising Sun, Union, Independence
- USDA Natural Resources Conservation Service Soil Survey. Citation:  
Natural Resource Conservation Service (NRCS) Web Soil Survey. 2013. Boone County Soils. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed April 7, 2016.
- National wetlands inventory map(s). Cite name:
- State/Local wetland inventory map(s):
- FEMA/FIRM maps:
- 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- Photographs:  Aerial (Name & Date):  
or  Other (Name & Date):
- Previous determination(s). File no. and date of response letter:
- Other information (please specify):

**IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.**

\_\_\_\_\_  
Signature and date of  
Regulatory Project Manager  
(REQUIRED)

\_\_\_\_\_  
Signature and date of  
person requesting preliminary JD  
(REQUIRED, unless obtaining  
the signature is impracticable)

CONFIDENTIAL PROPRIETARY TRADE SECRET

**Table 2**  
**Impact Summary for Wetland Crossings**

Wetland ID	Cowardin Classification <sup>a</sup>	Latitude	Longitude	Length of Crossing at Centerline (feet) <sup>b</sup>	Wetland Impacts <sup>c</sup>	
					Construction	Operation
W004	PEM	38.885708	-84.726986	0	0.003	0.00
W005	PEM	38.885822	-84.724037	0	0.004	0.00
W006	PEM	38.885752	-84.722876	0	0.006	0.00
W007	PEM	38.878859	-84.699792	0	0.031	0.00
W008	PEM	38.879244	-84.698957	81	0.055	0.00
W009	PSS	38.889845	-84.640052	69	0.045	0.045
W010	PEM	38.889389	-84.62865	0	0.016	0.00
W011	PEM	38.889431	-84.627939	7	0.032	0.00
W013	PEM	38.889094	-84.615142	44	0.029	0.00
<b>Totals</b>	-	-	-	<b>202</b>	<b>0.22</b>	<b>0.05</b>

a PEM – Palustrine Emergent; PSS – Palustrine Scrub Shrub; PFO – Palustrine Forested

b A length of crossing at centerline equal to zero indicates that a wetland is not crossed by the Project centerline, but is within the construction right-of-way (workspace).

c Construction acreage of wetland impacts is based on a 30-foot wide construction corridor. There is no operational impact to PEM wetlands, because there is no planned change in the pre- and post-construction vegetation cover type.

## CONFIDENTIAL PROPRIETARY TRADE SECRET

**Table 1**  
**Impact Summary for Waterbody Crossings**

Waterbody ID	Waterbody Name	Flow Regime	Top of Bank Width (feet)	Average OHWM Width (feet)	Quality Rating (RBP)	Length within 30' Construction Workspace (linear feet) <sup>1</sup>	Crossing Method / Comments	TNW Connection	Latitude	Longitude
S001	UNT to Big Bone Creek	Intermittent	4	3.5	Poor	28	Open Cut	Ohio River	38.888648	-84.751589
S003	UNT to Big Bone Creek	Intermittent	6	3	Poor	27	Open Cut	Ohio River	38.888194	-84.742755
S004	UNT to Big Bone Creek	Intermittent	8	4	Poor	28	Open Cut	Ohio River	38.887106	-84.740995
S005	UNT to Big Bone Creek	Intermittent	5	4	Poor	28	Open Cut	Ohio River	38.886221	-84.739258
S006	UNT to Big Bone Creek	Ephemeral	2	1	-	37	Open Cut	Ohio River	38.886054	-84.738946
S008	UNT to Big Bone Creek	Intermittent	4	3	Poor	33	Open Cut	Ohio River	38.883806	-84.734229
S009	UNT to Big Bone Creek	Intermittent	3	2	Poor	18	Open Cut	Ohio River	38.883848	-84.732743
S010	UNT to Big Bone Creek	Ephemeral roadside drainage	2	1	Poor	0	HDD Bore in conjunction with Big Bone Creek	Ohio River	38.88485	-84.729948
S011	UNT to Big Bone Creek	Ephemeral	4	3	-	91	Open Cut	Ohio River	38.88538	-84.728482
S012	UNT to Big Bone Creek	Intermittent	2.5	2	Poor	10	Open Cut	Ohio River	38.885814	-84.723852
S013	UNT to Big Bone Creek	Ephemeral	4	3	-	8	Open Cut	Ohio River	38.885824	-84.725235
S016	UNT to Big Bone Creek	Ephemeral	3	2	-	50	Open Cut	Ohio River	38.88448	-84.716437
S017	UNT to Big Bone Creek	Perennial	10	8	Poor	32	Open Cut	Ohio River	38.884484	-84.716351
S018	UNT to Big Bone Creek	Ephemeral	3	2	-	5	Open Cut	Ohio River	38.883974	-84.71394
S019	UNT to Big Bone Creek	Ephemeral	2	1	-	8	Open Cut	Ohio River	38.883721	-84.712932
S020	UNT to Big Bone Creek	Ephemeral	2	1	-	30	Open Cut	Ohio River	38.883149	-84.710867
S021	UNT to Big Bone Creek	Ephemeral	3	2	-	30	Open Cut	Ohio River	38.883099	-84.71069
S022	UNT to Big Bone Creek	Ephemeral	2	1	-	15	Open Cut	Ohio River	38.8837	-84.712677
S023	UNT to Beaver Branch	Perennial	4	3	-	35	Open Cut	Ohio River	38.880417	-84.704449
S024	UNT to Beaver Branch	Ephemeral roadside drainage	2	1	-	138	Open Cut	Ohio River	38.879475	-84.70174
S025	UNT to Beaver Branch	Intermittent	4	3	Poor	166	Open Cut; pipeline will not be installed parallel to stream within the stream's jurisdictional area; much of stream is near edge of work space.	Ohio River	38.879072	-84.70048
S026	UNT to Beaver Branch	Ephemeral	1.5	1	-	11	Open Cut	Ohio River	38.878827	-84.699772
S027	UNT to Beaver Branch	Ephemeral	1.5	1	-	15	Open Cut	Ohio River	38.878877	-84.699924
S028	UNT to Beaver Branch	Perennial	15	9	Poor	31	Open Cut	Ohio River	38.879076	-84.699109
S029	UNT to Beaver Branch	Ephemeral	3	2	-	2	Open Cut	Ohio River	38.879131	-84.698998
S030	UNT to Beaver Branch	Ephemeral	2	1	-	29	Open Cut	Ohio River	38.879131	-84.699113
S031	UNT to Beaver Branch	Intermittent	6	5	Poor	105	Open Cut	Ohio River	38.885909	-84.692433
S032	UNT to Mud Lick Creek	Ephemeral	3	2	-	25	Open Cut	Ohio River	38.887165	-84.689459
S033	UNT to Mud Lick Creek	Intermittent	7	6	Poor	8	Open Cut	Ohio River	38.893733	-84.673369
S035	UNT to Mud Lick Creek	Ephemeral	2	1	-	17	Open Cut	Ohio River	38.900786	-84.650065
S036	UNT to Mud Lick Creek	Ephemeral	2	1	-	34	Open Cut	Ohio River	38.900811	-84.650081
S037	UNT to Mud Lick Creek	Intermittent	3	2	Poor	31	Open Cut	Ohio River	38.904096	-84.645433
S038	UNT to Mud Lick Creek	Ephemeral roadside (a portion)	3	1.5	-	82	Open Cut	Ohio River	38.888835	-84.630148
S041	UNT to Mud Lick Creek	Ephemeral	2	1	-	1	Open Cut	Ohio River	38.888275	-84.614664
S044	UNT to Mud Lick Creek	Perennial	3	2	Poor	65	Open Cut	Ohio River	38.889085	-84.615166
S045	UNT to Mud Lick Creek	Ephemeral	2	1	-	34	Open Cut	Ohio River	38.888522	-84.615012
S046	UNT to Mud Lick Creek	Intermittent	2	1	Poor	33	Open Cut	Ohio River	38.888731	-84.615091
SKY-CDK-001	UNT to Big Bone Creek	Ephemeral	3	1.5	-	34	Open Cut	Ohio River	38.883047	-84.710558
SKY-CDK-004	UNT to Big Bone Creek	Ephemeral	3.5	3	-	40	Open Cut	Ohio River	38.883661	-84.712715
SKY-CDK-005	UNT to Big Bone Creek	Ephemeral roadside drainage	5	4	-	51	Open Cut	Ohio River	38.884474	-84.71623

CONFIDENTIAL PROPRIETARY TRADE SECRET

Table 1  
 Impact Summary for Waterbody Crossings

Waterbody ID	Waterbody Name	Flow Regime	Top of Bank Width (feet)	Average OHWM Width (feet)	Quality Rating (RBP)	Length within 30' Construction Workspace (linear feet) <sup>1</sup>	Crossing Method / Comments	TNW Connection	Latitude	Longitude
SKY-CDK-006	Big Bone Creek (KY OSRW) <sup>2</sup>	Perennial	120	50	Fair	59	HDD Bore	Ohio River	38.884966	-84.729662
SKY-CDK-007	UNT to Big Bone Creek	Perennial	10	8	Poor	36	Open Cut	Ohio River	38.884692	-84.736427
SKY-CDK-008	Gum Branch	Perennial	50	20	Poor	23	HDD Bore	Ohio River	38.888249	-84.755238
SKY-CDK-009	UNT to Gum Branch	Ephemeral roadside drainage	3	0.33	-	296	Open cut. Pipeline will not be installed parallel to stream within the stream's jurisdictional area. Pipeline trench will be within the road or along edge of pavement.	Ohio River	38.887815	-84.756859
SKY-CDK-010	UNT to Gum Branch	Perennial	10	5	Poor	26	Open Cut	Ohio River	38.887871	-84.75621
SKY-CDK-011	UNT to Big Bone Creek	Intermittent	9	7	Poor	27	Open Cut	Ohio River	38.888879	-84.748893
SKY-CDK-012	Beaver Branch	Perennial	9	7	Poor	72	Open Cut	Ohio River	38.879352	-84.701436
SKY-CDK-013	UNT to Mud Lick Creek	Perennial	14	13	Poor	30	Open Cut	Ohio River	38.897422	-84.662598
SKY-CDK-014	UNT to Mud Lick Creek	Perennial	6	5	Poor	13	Open Cut	Ohio River	38.893772	-84.673271
SKY-CDK-015	UNT to Beaver Branch	Intermittent	3.5	3	Poor	58	Open Cut	Ohio River	38.879312	-84.698893
SKY-CDK-016	UNT to Mud Lick Creek	Perennial	11	10	Poor	33	Open Cut	Ohio River	38.888883	-84.685416
SKY-CDK-017	Mud Lick Creek	Perennial	14	10	Poor	30	HDD Bore	Ohio River	38.899227	-84.653121
SKY-CDK-018	UNT to Mud Lick Creek	Perennial	20	10	Poor	143	Open Cut	Ohio River	38.898454	-84.650902
SKY-CDK-019	UNT to Mud Lick Creek	Ephemeral	4	3	-	33	Open Cut	Ohio River	38.906236	-84.642276
SKY-CDK-020	UNT to Mud Lick Creek	Perennial	7	6	Poor	46	Open Cut	Ohio River	38.895255	-84.648025
SKY-CDK-021	UNT to Mud Lick Creek	Ephemeral	4	3	-	33	Open Cut	Ohio River	38.891389	-84.643068
SKY-CDK-022	UNT to Mud Lick Creek	Perennial	10	8	Poor	35	Open Cut	Ohio River	38.889876	-84.640097
SKY-CDK-023	UNT to Mud Lick Creek	Ephemeral	2	1	-	30	Open Cut	Ohio River	38.887824	-84.632885
SKY-CDK-024	UNT to Mud Lick Creek	Intermittent	8	6	Poor	32	Open Cut	Ohio River	38.8896	-84.62685
SKY-CDK-025	UNT to Mud Lick Creek	Ephemeral	5	4	-	36	Open Cut	Ohio River	38.889815	-84.625822
SKY-CDK-026	UNT to Mud Lick Creek	Perennial	7	6	Poor	31	Open Cut	Ohio River	38.89017	-84.624154
SKY-CDK-027	UNT to Mud Lick Creek	Perennial	10	5	Poor	43	Open Cut	Ohio River	38.890222	-84.623559
<b>Total</b>			-	-	-	2,630				

<sup>1</sup> Includes planned areas that will be impacted by construction assuming a 30-foot wide corridor for work space. Additional work space, access, and staging areas not yet identified.

<sup>2</sup> OSRW - Designated by KDOW as Outstanding State Water Resource

Note: Without the jurisdictional roadside drainages, approximately 2,063 LF of stream is located within the planned construction right-of-way. Not all stream reaches will be temporary impacted as many are located near the edge of the right-of-way.



# CONSTRUCTION NOTES



1. TARGET START DATE: 03-01-17  
TARGET FINISH DATE: 11-30-17

- 2. THE WINNING BIDDER MUST INSTALL THE MAIN IN ACCORDANCE WITH THE SPECIFIED BID INSTALLATION METHOD UNLESS AN ALTERNATIVE METHOD IS SUBMITTED TO AND APPROVED BY THE DUKE ENERGY DESIGN ENGINEER. ANY CHANGES IN INSTALLATION METHOD SHALL NOT INCREASE THE COST OF THE PROJECT TO DUKE. NOR SHALL PAYMENT BE MADE FOR RESTORATION NOT PERFORMED.
- 3. RESTRICTED HOURS, TRAFFIC CONTROL OR OTHER RESTRICTIONS IMPOSED BY THE PERMITTING AGENCY ARE THE SOLE RESPONSIBILITY OF THE BIDDERS AND NO EXTRAS WILL BE PAID BY DUKE ENERGY.
- 4. EXTRA DEPTH WILL BE PAID FOR DIRECT BURY INSTALLATIONS WHEN EXCAVATIONS ARE GREATER THAN 5-FEET TOTAL DEPTH AND DEPTH IS GREATER THAN 2-FEET OVER THE PLANNED EXCAVATION DEPTH.
- 5. ROCK EXCAVATION WILL BE PAID PER GD-150. THE DUKE ENERGY INSPECTOR AND THE CONTRACTOR MUST AGREE ON THE ACTUAL AMOUNT OF ROCK BEFORE BACKFILLING THE TRENCH IN DIRECT BURY INSTALLATIONS. NO ROCK EXCAVATION WILL BE PAID FOR DIRECTIONAL DRILLING INSTALLATIONS.
- 6. TIE-IN WORK WILL BE GIVEN TO THE WINNING CONTRACTOR AT THE DISCRETION OF DUKE ENERGY. DUKE ENERGY RETAINS THE RIGHT TO HAVE DUKE ENERGY CREWS PERFORM TIE-IN WORK.
- 7. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE 'SPECIFICATIONS FOR THE 2010 GAS MAIN REPLACEMENT, RELOCATION, AND EXTENSION PROJECTS' AND THE MOST CURRENT VERSION OF GD-150.
- 8. TIE-IN MAINS MUST BE ADEQUATELY EXPOSED FOR PROPER LINE-UP.
- 9. OFFSETS WILL BE PAID IF TWO (2) UNPLANNED ELBOWS ARE USED FOR THE AVOIDANCE OF AN UNFORESEEN OBSTACLE IN EITHER THE HORIZONTAL OR VERTICAL DIRECTION.
- 10. OUT OF BALANCED BIDS WILL BE REJECTED AND NOT CONSIDERED BY DUKE ENERGY.

11. \_\_\_\_\_  
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\_\_\_\_\_

REVISIONS

MARCH 8, 2016

CONFIDENTIAL PROPRIETARY TRADE SECRET



**GAS DEPARTMENT**  
PUBLIC ENERGY  
EPLANKER DISTRICT

# BOM SHEET

MARCH 8, 2016

REVISIONS

**EXHIBIT 2(d) PUBLIC  
PAGES 319 THROUGH 323  
ARE BEING FILLED UNDER  
SEAL**