Calculation of Gradient

B-006-OWQ-WAP-XXX-21-T-R1
Technical Standard Operating Procedure (TSOP)
Office: Office of Water Quality
Branch: Watershed Assessment and Planning Branch
Section: All

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Purpose (of the TSOP)

This technical standard operating procedure (TSOP) provides instructions in using Esri's ArcGIS software to calculate gradients for sampling sites. Gradient for a stream location is the drop in elevation between topographic lines for a minimum of one square mile.

This TSOP should be used by:

This TSOP applies to agency staff in the Office of Water Quality (OWQ) Watershed Assessment and Planning Branch (WAPB) responsible for calculating gradient and performing quality control (QC) of the measurements.

Editor

Scott Zello-Dean

Authorizing Signatures

I approve and authorize this technical standard operating procedure:

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Michelle Ruan, Environmental Manager — Date
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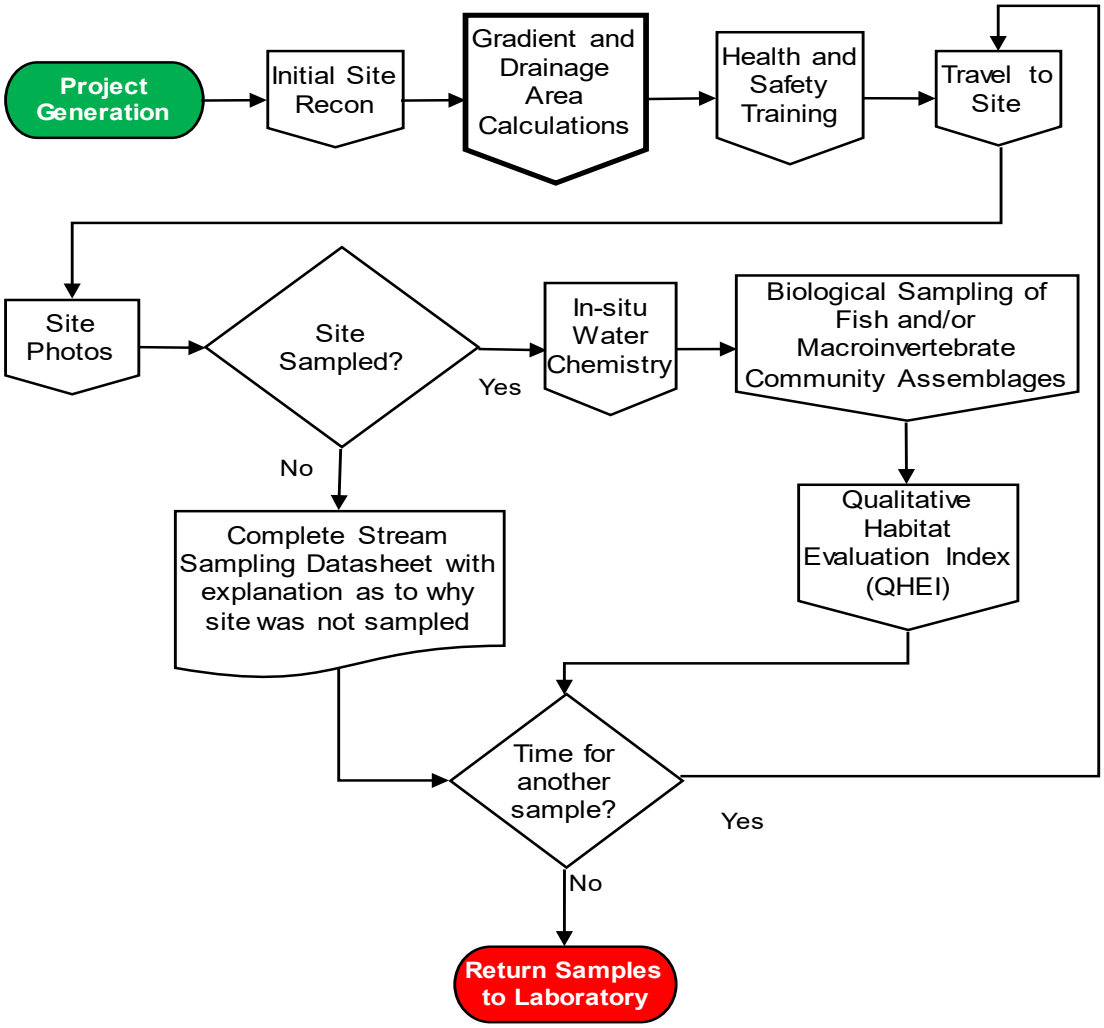
This technical standard operating procedure is consistent with agency requirements.

James E Bailey _____ 10 Feb 2021

Quality Assurance Staff — Date
Office of Program Support

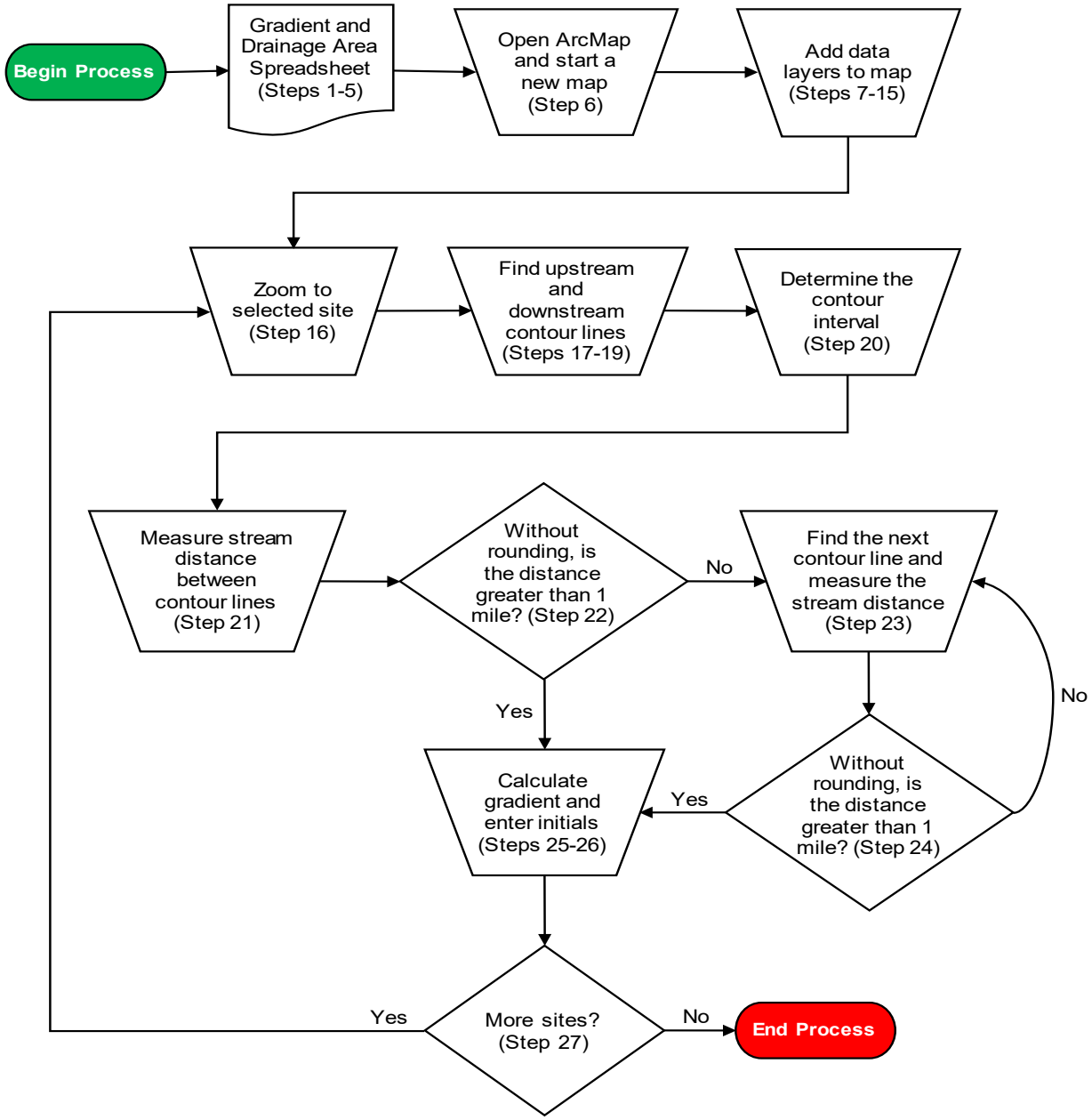
Table of Contents

1.0. Overview Flowchart



2.0. Procedure

2.1. Procedural Flowchart:



2.2. Procedural Steps:

Step 1. A WAPB staff completes all steps. Query the following site data from the Assessment Information Management System (AIMS) database: Latitude, Longitude, L-Site, Stream Name, Description, Site Number, Easting, and Northing. Save the unaltered queried data using a filename which includes the year and sampling basin, such as 2019OhioRiverBasin_GradientDrainageArea_GIS.

Note: Check with other staff to determine whether this document was previously created, to prevent duplicating an existing file.

Step 2. Create a new Microsoft Excel spreadsheet with the column headers Latitude, Longitude, L-Site, Stream Name, Description, and Site Number for sites approved through site reconnaissance (Appendix A). Save the file in the project folder on the shared drive using a filename which includes the year and sampling basin, such as 2019 Ohio River Basin Gradient and Drainage Area.

Note: The spreadsheet created to record drainage area (mi^2) values is the same spreadsheet used to record gradient values. Check with other staff to determine whether this document was created previously to prevent duplicating an existing file.

Step 3. Add columns for Gradient, Gradient QC, Gradient QC2, Drainage Area (mi^2), Drainage Area QC, and Drainage Area QC 2. Directly underneath the list of sites, add a row for Initial/Date. A staff filling in the Gradient and QC columns, initials and dates the completed columns in the Initial/Date cell below the last calculation. Each set of columns should include three different initials.

Step 4. In the same spreadsheet, add columns for Site Number, Distance (mi), U/S elevation, D/S elevation, Gradient (ft/mi), and Pattern below the columns created in Step 2 and Step 3. Next, copy and paste the information from the Site Number column created in Step 2 into the Site Number column added in this step (Appendix B).

Note: This step is not necessary to calculate Drainage Area (mi^2). If a spreadsheet to record drainage area (mi^2) was already created, these columns may need to be added.

Step 5. Copy and paste the columns added in Step 4 next to those same columns. Copy and paste twice, with a single column separating

each new set of columns. In the row above the three sets of columns, label the set of columns Gradient Calculations, Gradient QC, and Gradient QC2. The sets of columns will be used to help calculate gradients.

Step 6. Open ArcMap and start a blank map.

Step 7. Add USGS National Map base map to the map from Step 6. Click File on the top dropdown menu. Click Add Data. Then click Add Basemap, Scroll down, click USGS National Map, then click Add (Figure 1).

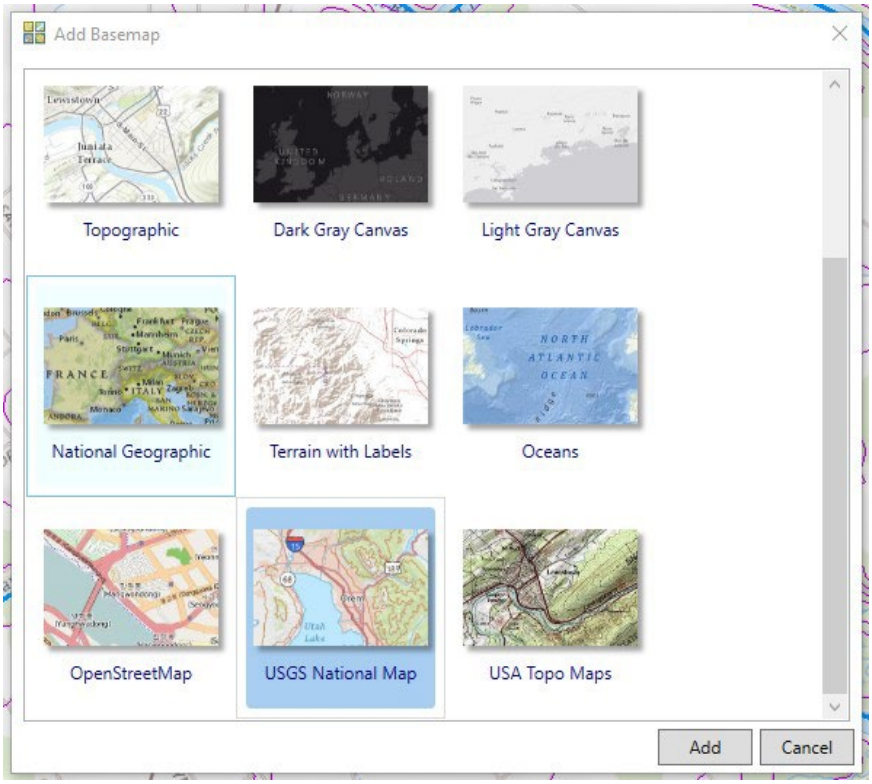


Figure 1

Step 8. In the Table of Contents, right click on the base map layer then click Ungroup.

Note: Ungrouping the base map layer changes the layer name from USGS National Map to USGSTopo.

Step 9. Add a folder connection to the project folder on the shared drive. Adding can be done by clicking the Connect To Folder icon in the Catalog menu. Find and select the project folder location in the menu and click OK. The project folder location will now appear in the Catalog menu under Folder Locations (Figure 2).

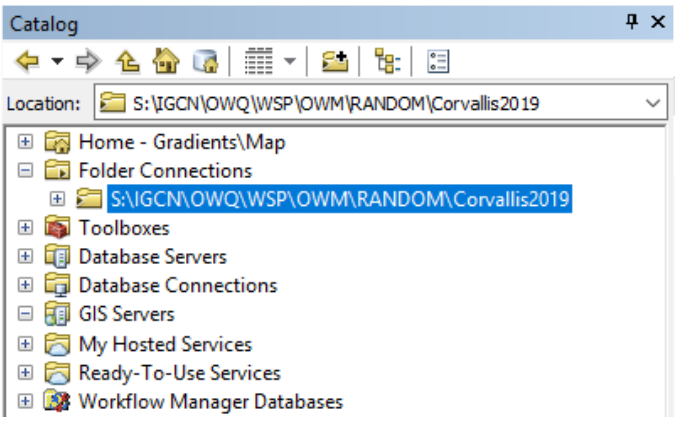


Figure 2

Step 10. Add the sites layer by selecting the spreadsheet created in Step 1. Right click and hover over Create Feature Class. Next click From XY Table, which displays the sites as points. In the From XY Table window, specify Easting for the X Field and Northing for the Y Field. Make sure the NAD 1983 UTM Zone 16N coordinate system has been assigned.
Next, click on the folder icon in the Output section of the pop up. Save the new shapefile using a filename which includes the year and sampling basin, such as 2019OhioRiverBasin_ApprovedSites. Click OK. Drag the newly created shapefile into the Table of Contents to display the approved sites on the map.

Notes: Check with other staff to determine whether this layer was previously created to prevent recreating an existing file.

Step 11. Two additional layers which can be added – a hydrography layer, such as GIO.NHD_HighRes_Streams_USGS_IN, and a layer displaying contour lines in vector form, GIO.CONTOURS_24K_USGS_IN (Figure 3). The GIO.CONTOURS_24K_USGS_IN layer uses digital line graphs (DLGs) to represent contour lines, which are created from downloading, projecting, and combining several data sets from the United States Geological Survey (USGS). This is helpful in areas where contour lines are not easily distinguishable nor labeled with elevation values, because using the Identify tool on vector data pulls up the attribute information associated with a feature.

Note: Filenames may have changed from the time this TSOP was written.

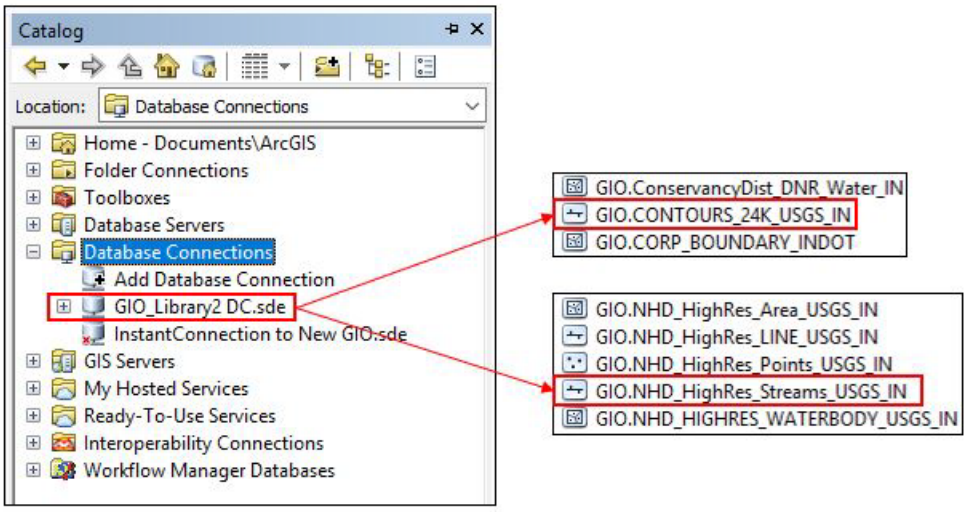


Figure 3

Step 12. Add a new File Geodatabase in the project folder on the shared drive. Do this by right clicking the project folder, clicking New, and then clicking File Geodatabase. Name the new file geodatabase using a filename which includes the year and sampling basin, such as 2019OhioRiverBasin_Contours.

Note: Check with other staff to determine whether this file geodatabase was created previously to prevent recreating an existing file geodatabase.

Step 13. Add a new Feature Class to the file geodatabase created in Step 12. Do this by right clicking the file geodatabase, clicking New, and then clicking Feature Class. This Feature Class will be used to add markers next to each contour used to calculate gradient. Name the new Feature Class using a filename which includes your initials and description, such as ABC_Contours. For Type select Point Features from the dropdown menu (Figure 4).

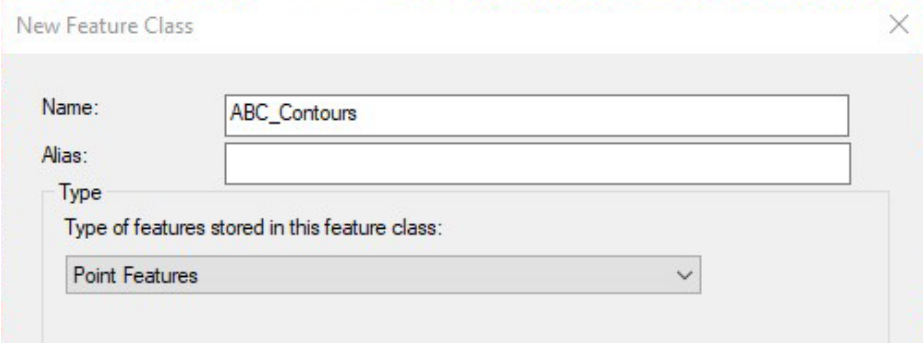


Figure 4

Step 14. Click Next. Make sure the NAD 1983 UTM Zone 16N coordinate system has been assigned. Click Next three times. In the Field

Name column type Label in the cell underneath SHAPE. In the Data Type column select Text from the drop-down menu (Figure 5). Click Finish.

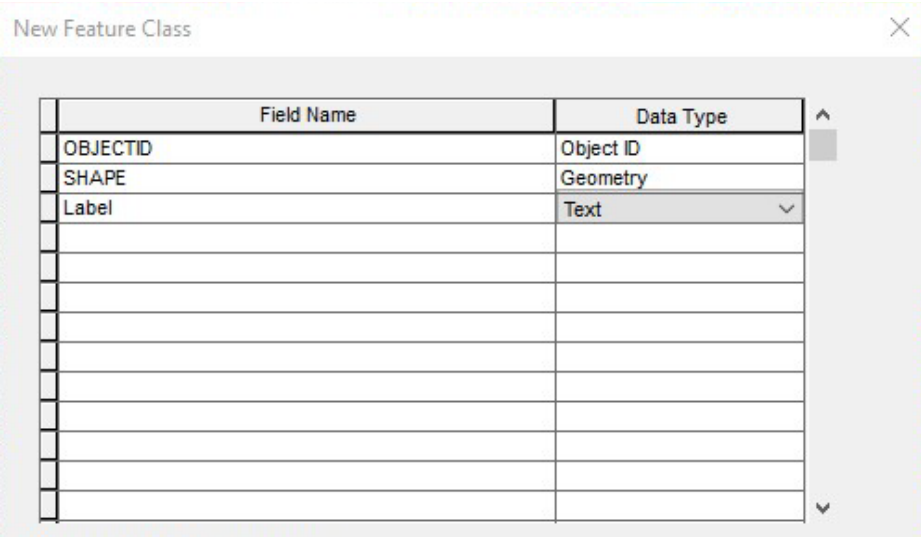


Figure 5

Step 15. Save the map document using a filename which includes the year and sampling basin, such as 2019 Ohio River Basin Gradient Calculations Map so recreation of the map is not required if gradient calculations are not completed in one sitting.

Step 16. Open the attribute table of the sites layer and select a site; this will highlight the site's row in the table. Then use the Pan To Selected button at the top of the attribute table window to navigate to the selected site.

Step 17. Use the scroll wheel on the mouse or the Zoom In button on the toolbar to get a closer look at the contour lines, which are shown in brown on the USGSTopo base map layer. Pan for the contour line upstream and downstream of the site. For tributaries which join a larger stream, continue to look for the downstream contour line on the larger stream.

Step 18. At each contour line used to calculate gradient, add a contour marker. To add a contour marker, click Editor on the Editor toolbar and click Start Editing. In the pop-up box, select the Feature Class created in Step 13. Then click the Create Features button on the Editor toolbar. The Create Features sidebar will appear. Click next to the contour on the map to place the contour marker.

Step 19. In the attribute table, label the contour marker created in Step 18 with a name which includes the Site Number, contour location in

relation to site (upstream (US) or downstream (DS)), and contour number. For example, the second contour marker downstream of site 9 would be labeled 9 DS2.

Note: The attribute table for the feature class created in Step 13 may not be open. To open the attribute table, right click the name of the contour marker feature class in the Layers sidebar. Then click Open Attribute Table.

Step 20. Determine the contour interval. Contour lines are usually 10-foot intervals but some areas are flat, like the Kankakee watershed, which may have 5-foot intervals. If utilizing the GIO.CONTOURS_24K_USGS_IN layer, use the Identify tool to help with contour intervals.

Step 21. Zoom in to an extent where tracing along the stream is easily performed. Use the Measure tool (Section 2.3.E Troubleshooting if the Measure Tool is grayed out) to quantify the stream length (**not straight-line distance**) between the two contour lines in miles. Left click once to start and use as many points as deemed necessary to trace the stream from the first contour line upstream of the site to the first contour line downstream of the site. Double click to end the line. The distance will be displayed in the Measure window.

Step 22. Without rounding, is the distance greater than 1 mile?
If yes, proceed to Step 25.
If no, continue to Step 23.

Step 23. Follow the pattern of 1 upstream then 1 downstream; 2 upstream then 1 downstream; 2 upstream then 2 downstream; 3 upstream then 2 downstream; 3 upstream then 3 downstream; etc. For example, if the distance from one contour line upstream of the site to one contour line downstream of the site is already measured, find the next contour line upstream of the site and measure the distance from two contour lines upstream of the site to one contour line downstream of the site. Always measure to the next contour line upstream before measuring to the next contour line downstream. The only exception to this rule is when the flowline ends upstream, then measure from one contour line upstream of the site to two contour lines downstream of the site.

Step 24. Without rounding, is the distance greater than 1 mile?
If yes, proceed to Step 25.
If no, return to Step 23 and continue to the next part of the pattern.

Step 25. Enter the stream length, upstream elevation, downstream elevation, and pattern in the appropriate column. Calculate gradient as the change in elevation of the contour lines in feet (also known as the contour interval) divided by the distance in stream miles. The units for gradient are feet per mile. Enter this number into the spreadsheet cell corresponding to the site number and round to three decimal places.

Step 26. Repeat Steps 16 through 25 for the remaining sites. Once gradient calculations are completed, see Section 7.0 QA/QC procedures listed in of this TSOP to complete the spreadsheet.

Step 27. Enter your initials and the date the gradient calculations were completed in the appropriate Completed by column. Each sampling site should have three different initials.

2.3. Related Technical Issues:

A. Health and Safety Warnings:
Not applicable. This procedure does not involve travel or field work. All steps are to be completed in an office setting at a computer workstation.

B. Cautions:
- Be sure to save often to avoid loss of work.
- Enter initials in the appropriate column after calculations are completed.
- To ensure the proper contour intervals are used, always check the contour intervals (5-foot or 10-foot) for the area's gradient being calculated.
- Make sure the unit of distance is in miles when using the Measure tool.
- Use as many points as necessary to capture the turns and bends of a stream to obtain a fairly accurate distance.
- Follow the methodology discussed in Steps 21 through 24. Going further upstream before preceding downstream matters because the upstream environment influences the site while the downstream does not.
- Only perform gradient calculations on sites with confirmed coordinates. Latitude and longitude can change following GPS verification and can result in incorrect gradient calculations.

C. Interferences:
Not applicable.

D. Calibration:

Not applicable.

E. Troubleshooting:
   - If data connections are not currently established to the Geographic Information Office (GIO) library and other servers on the computer used, visit Indiana Department of Environmental Management (IDEM) GIS Resources for setup instructions.
   - If the Measure Tool is unavailable for selection, the units may be unknown. Right click on the Layers header in the Table of Contents and select Properties. This will open the Data Frame Properties window. In the General Tab, ensure Units have been assigned and if not, use the Map and Display dropdown menus to select the appropriate units. This should enable the Measure Tool.
   - If uncertain about the calculated gradient value, visually compare with the spacing of the contour lines. A larger value represents a steep slope, which means contour lines are closer together. A smaller value represents a gentle slope, which means contour lines are further apart. Recalculate gradient if needed.
   - If on Step 23 and looking to measure to the next contour line upstream but the tributary ends, move to the next part of the pattern. Measure the distance from one contour line upstream of the site to two contour lines downstream of the site.
   - If looking for a contour line downstream of a site and the tributary flows into a larger stream, continue to look for the downstream contour line on the larger stream.
   - For further assistance, seek help from experienced full-time WAPB staff.

3.0. Roles

3.1. Responsibilities:

A. WAPB staff
   1. Reviews and follows this TSOP.
   2. Prepares the Gradient and Drainage Area Spreadsheet.
   3. For Gradient QC Round 2 assigned staff, will discuss value discrepancies with staff who performed calculations and finalize which gradient calculations to enter in AIMS.

3.2. Training requirements:

A. Microsoft Excel
   1. WAPB staff

B. Esri ArcGIS

1. WAPB staff

C. AIMS database management
   1. WAPB staff

4.0. List forms, equipment, or software to be used

4.1. Forms

A. Project Gradient and Drainage Area Spreadsheet

4.2. Equipment:

A. Computer workstation

4.3. Software:

A. Internet capabilities
B. Esri ArcGIS
C. AIMS database

5.0. Records Management

Information recorded in each Gradient and Drainage Area Spreadsheet is entered into the AIMS database. The Gradient and Drainage Area Spreadsheet is stored electronically in the project folder on the shared drive.

6.0. Definitions

6.1. "Agency staff" – Any employee or representative of Indiana Department of Environmental Management (IDEM) including regular employees, temporary employees, contractors, and interns.

6.2. "Assessment Information Management System database (AIMS database)" – Indiana Department of Environmental Management (IDEM) database containing information related to water chemistry; aquatic habitat; macroinvertebrate, fish, and, algae communities; fish tissue analyses; sediments; and *E. coli* bacteria data collected by agency staff from watershed sampling events.

6.3. "Attribute" – Nonspatial information about a geographic feature in GIS, usually stored in a table and linked to the feature by a unique identifier. For example, attributes of a river might include its name, length, and sediment load at a gauging station.

6.4. "Contour interval" – The difference in elevation between adjacent contour lines.

6.5. "Contour line" – A line on a map which connects points of equal elevation based on a vertical datum, usually sea level.

6.6. "Data connection" – In ArcCatalog, a mechanism used to access remote file systems and shared databases.

6.7. "Digital line graphs (DLGs)" – Digital vector representations of cartographic information derived from USGS maps and related sources.

6.8. “Elevation” – The vertical distance of a point or object above or below a reference surface or datum (generally mean sea level).

6.9. “Gradient” – The ratio of drop in elevation of a stream per unit of horizontal distance.

6.10. “Hydrography” – The measurement and description of water features and related land areas for the purposes of safe navigation.

6.11. “L-Site” – A unique site ID generated by the AIMS database for each sampling site, and linked with location information (stream name, description, latitude, longitude, county, HUC12, HUC14, etc.,).

6.12. “Quality control” – The overall system of technical activities which measures the attributes and performance of a process, item, or service against defined standards to verify they meet the stated requirements established by the customer; operational techniques and activities used to fulfill requirements for quality. In other words, QC involves measuring the "thing produced" against a standard to ensure the product’s quality meets the identified need.

6.13. “Raster data model” – A representation of the world as a surface divided into a regular grid of cells. Raster models are useful for storing data which varies continuously, as in an aerial photography, satellite image, a surface of chemical concentrations, or an elevation surface.

6.14. “Reconnaissance” – Obtaining information about a site through visual observations and investigating routes to safely access the site, as well as gathering property owner information and access permission.

6.15. “Site number” – The designated program area specific numeral given to an environmental location of interest.

6.16. “Technical standard operating procedure (TSOP)” – A standard operating procedure involving environmental data generation, manipulation, or compilation of an analytical process.

6.17. “Tributary” – A smaller river or stream which flows into a larger river or stream. Usually, a number of smaller tributaries merge to form a river.

6.18. “Vector data model” – A representation of the world using points, lines, and polygons. Vector models are useful for storing data which has discrete boundaries, such as country borders, land parcels, and streets.

7.0. Quality Assurance and Quality Control

New WAPB staff review this TSOP prior to calculating gradients. Before entering data into the AIMS database perform quality checks. Assign a WAPB staff to perform Gradient QC Round 1 by going through Steps 3 to 23 of Section 2.2. After QC Round 1 has been completed, calculate the relative percent difference (RPD) between the first and second calculation. The RPD between the first and second calculation should be less than or equal to 10%. RPD is calculated as follows:

$$\text{RPD} = \left(\frac{|\text{S} - \text{D}|}{(\text{S} + \text{D})/2}\right) \text{x } 100$$

Where:
S = the first calculation
D = the second calculation

If the RPD is greater than 10%, a third WAPB staff experienced in determining gradient with Esri ArcGIS performs Gradient QC Round 2 by going through Steps 3 to 23 of Section 2.2. Once the RPD calculation between two staff is less than or equal to 10%, average the two calculations for entry into AIMS. If the RPD between all three measurements is >10%, the staff will discuss the measurements to determine the possible reasons for the discrepancies and agree on a final gradient value.

When all discrepancies are resolved and gradient values are finalized, enter the data into the AIMS database. Following data entry, perform two rounds of quality control on the database entries to ensure proper reflection of the Gradient and Drainage Area Spreadsheet. As necessary, perform additional rounds of quality control. When quality control on the database entries is complete, the data is available for use in other work products.

8.0. References

8.1. USGS

A. Digital Line Graphs (DLGs)
B. Topographic Map Symbols
C. Water Science Glossary of Terms

8.2. Other Guidance

A. Esri GIS Dictionary
B. See pages 5-6 of WAPB GIS Class document. Wood, J.E. 2016. WAPB GIS Class. Technical and Logistical Services Section, Watershed Assessment and Planning Branch, Office of Water Quality, Indiana Department of Environmental Management, Indianapolis, Indiana.

9.0. Appendices

Appendix A – Example of a Gradient and Drainage Area Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L
1	Latitude	Longitude	Other Site ID	StreamName	Description	SiteID	Gradient	Gradient QC	Gradient QC 2	Drainage Area (sq. mi)	Drainage Area QC	Drainage Area QC 2
2	38.537279	-86.904546	WEL-15-0008	EXAMPLE	EXAMPLE	18T002	13.966	~~8.197~~	14.167	4.019	4.006	
3	38.31291184	-85.79350539	OSK-08-0014	Silver Creek	Gutford Road	INRB19-002						
4	39.15663562	-84.90017801	OML-03-0004	Tanners Creek	Kelsey Road	INRB19-003						
5	38.28123035	-86.09270534	OBS-04-0001	Indian Creek	State Road 335	INRB19-005						
6	38.44339852	-85.62978906	OSK-04-0004	Fourteenmile Creek	Charlestown State Park	INRB19-006						
7	38.07053095	-86.72394278	OLP-03-0008	Theis Creek	Atlanta Road	INRB19-007						
8	38.04431396	-87.20952669	OLP-10-0006	Otter Creek	Degonia Road	INRB19-008						
9	38.78065389	-85.07936217	OML-09-0004	Indian Creek	Posten Road	INRB19-009						
10	38.30565686	-86.53944315	OBS-11-0002	Otter Creek	Mifflin Community Church	INRB19-011						
11	38.55426777	-86.12480857	OBS-07-0022	Blue River	Cauble Road	INRB19-013						
12	38.99961444	-85.10745394	OML-06-0002	Boyd Branch	Grelle Road	INRB19-014						
13	38.00628256	-87.55738733	OHP-03-0001	Pigeon Creek	Stream Valley Park	INRB19-016						
14	38.06766468	-86.13853227	OBS-02-0002	Buck Creek	Squire Boone Caverns	INRB19-017						
15	38.3522878	-85.97099544	OBS-03-0001	Indian Creek	Old Vincennes Road	INRB19-018						
16	39.24872819	-84.98215978	OML-03-0005	East Fork Tanners Creek	Dog Ridge	INRB19-019						
17	38.04380242	-86.88461151	OLP-05-0002	Crooked Creek	County Road 1100 North	INRB19-020						
18	38.25504074	-85.86076735	OSK-09-0001	French Creek	Two Mile Lane	INRB19-021						
19	38.45269663	-85.73083265	OSK-08-0015	Sinking Fork	Brick Church Road	INRB19-022						
20	38.12861111	-86.89238309	OLP-05-0001	Tributary of Crooked Creek	Old State Road 162	INRB19-023						
21	38.2810756	-86.46390337	OBS-11-0008	Little Blue River	Old State Road 37	INRB19-027						
22	38.20337101	-87.1790631	OLP-09-0023	Tributary of Coles Creek	Scales Road	INRB19-028						
23	38.95637224	-85.11761256	OML-06-0003	Laughery Creek	Cutter Road	INRB19-030						
24	38.10799052	-87.46858635	OHP-03-0002	Bluegrass Creek	Warrick County Line Road	INRB19-032						
25	38.30274635	-86.06053835	OBS-04-0002	Indian Creek	State Road 335	INRB19-033						
26	38.32672247	-85.99521282	OBS-03-0002	Indian Creek	Hamby Road	INRB19-034						
27	38.06996136	-87.11203843	OLP-09-0024	Coles Creek	Wilson Lane	INRB19-036						
28	38.29255946	-85.77747964	OSK-09-0002	Mill Creek	Ohio River Greenway	INRB19-037						
29	38.50058426	-85.64681469	OSK-04-0005	Dry Branch	Charlestown New Market Road	INRB19-038						
30	38.79584807	-85.25155071	OSK-02-0025	Brushy Fork	Brushy Fork Road	INRB19-041						
31	39.08555939	-85.05652581	OML-04-0007	Allen Branch	Akes Road	INRB19-042						
32	38.22500482	-87.27975994	OHP-01-0002	Smith Fork	Spurgeon Road	INRB19-044						
33	38.56134134	-85.7609833	OSK-08-0016	Miller Fork	US Highway 31	INRB19-045						
34	39.16898429	-84.97483003	OML-03-0006	West Fork Tanners Creek	Konvadi Road	INRB19-046						
35	37.94783071	-86.64377321	OLP-01-0001	East Deer Creek	Triplett Road	INRB19-047						
36	38.21771051	-86.12824379	OBS-04-0003	Indian Creek	Cedar Glade Avenue	INRB19-049						
37	38.46861504	-86.1205988	OBS-06-0026	South Fork Blue River	Dalton Lane	INRB19-050						
38	38.12056865	-86.80368946	OLP-04-0019	Anderson River	Angelo Road	INRB19-051						
39	37.99645709	-87.23624396	OLP-10-0007	Caney Creek	New Hope Road	INRB19-052						
40	39.25837751	-85.24134584	OML-05-0047	Little Laughery Creek	State Road 229	INRB19-053						
41	38.46431712	-85.7157349	OSK-08-0017	Sinking Fork	Charlestown Memphis Road	INRB19-054						
42	38.20140345	-86.29126302	OBS-09-0004	Blue River	State Road 62	INRB19-055						
43	39.14629582	-85.21653673	OML-05-0049	Castators Creek	State Road 350	INRB19-058						
44	38.18341606	-86.42156459	OBS-11-0005	Little Blue River	Beechwood Road	INRB19-059						
45	37.98797068	-86.73047183	OLP-04-0016	Brushy Fork	Sagebrush Road	INRB19-063						
46	38.35310499	-86.28853914	OBS-08-0001	Whiskey Run	Milltown Road	INRB19-064						
47	38.13385777	-86.72574595	OLP-03-0009	Middle Fork Anderson River	Huffman Road	INRB19-067						
48	Initial/date -->											
49												

Appendix B – Example of a Gradient and Drainage Area Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
54																				
55																				
56	**Gradient**	**Calculations**						**Gradient QC**							**Gradient QC 2**					
57	**Site Number**	**Distance (mi)**	**U/S elevation**	**D/S elevation**	**Gradient (ft/mi)**	**Pattern**		**Site Number**	**Distance (mi)**	**U/S elevation**	**D/S elevation**	**Gradient (ft/mi)**	**Pattern**		**Site Number**	**Distance (mi)**	**U/S elevation**	**D/S elevation**	**Gradient (ft/mi)**	**Pattern**
58	**EXAMPLE**	1.432	470	450	13.96648045	2u/1d		~~EXAMPLE~~	~~2.440~~	~~470~~	~~450~~	~~8.196721311~~	~~1u/2d~~		*EXAMPLE*	*1.412*	*470*	*450*	*14.16747657*	*2u/1d*
59	INRB19-002							INRB19-002							INRB19-002					
60	INRB19-003							INRB19-003							INRB19-003					
61	INRB19-005							INRB19-005							INRB19-005					
62	INRB19-006							INRB19-006							INRB19-006					
63	INRB19-007							INRB19-007							INRB19-007					
64	INRB19-008							INRB19-008							INRB19-008					
65	INRB19-009							INRB19-009							INRB19-009					
66	INRB19-011							INRB19-011							INRB19-011					
67	INRB19-013							INRB19-013							INRB19-013					
68	INRB19-014							INRB19-014							INRB19-014					
69	INRB19-016							INRB19-016							INRB19-016					
70	INRB19-017							INRB19-017							INRB19-017					
71	INRB19-018							INRB19-018							INRB19-018					
72	INRB19-019							INRB19-019							INRB19-019					
73	INRB19-020							INRB19-020							INRB19-020					
74	INRB19-021							INRB19-021							INRB19-021					
75	INRB19-022							INRB19-022							INRB19-022					
76	INRB19-023							INRB19-023							INRB19-023					
77	INRB19-027							INRB19-027							INRB19-027					
78	INRB19-028							INRB19-028							INRB19-028					
79	INRB19-030							INRB19-030							INRB19-030					
80	INRB19-032							INRB19-032							INRB19-032					
81	INRB19-033							INRB19-033							INRB19-033					
82	INRB19-034							INRB19-034							INRB19-034					
83	INRB19-036							INRB19-036							INRB19-036					
84	INRB19-037							INRB19-037							INRB19-037					
85	INRB19-038							INRB19-038							INRB19-038					
86	INRB19-041							INRB19-041							INRB19-041					
87	INRB19-042							INRB19-042							INRB19-042					
88	INRB19-044							INRB19-044							INRB19-044					
89	INRB19-045							INRB19-045							INRB19-045					
90	INRB19-046							INRB19-046							INRB19-046					
91	INRB19-047							INRB19-047							INRB19-047					
92	INRB19-049							INRB19-049							INRB19-049					
93	INRB19-050							INRB19-050							INRB19-050					
94	INRB19-051							INRB19-051							INRB19-051					
95	INRB19-052							INRB19-052							INRB19-052					
96	INRB19-053							INRB19-053							INRB19-053					
97	INRB19-054							INRB19-054							INRB19-054					
98	INRB19-055							INRB19-055							INRB19-055					
99	INRB19-058							INRB19-058							INRB19-058					
100	INRB19-059							INRB19-059							INRB19-059					
101	INRB19-063							INRB19-063							INRB19-063					
102	INRB19-064							INRB19-064							INRB19-064					
103	INRB19-067							INRB19-067							INRB19-067					