

APPENDIX C – COMMENTS FROM AGENCIES, LOCAL GROUPS, AND LOCAL GOVERNMENT OFFICIALS

C.1. Comments from Agencies

National Weather Service (NWS)

United States Geological Survey (USGS)

Virginia Department of Environmental Quality (VA DEQ)

Virginia Department of Emergency Management (VDEM)

Virginia Department of Conservation and Recreation (VA DCR)

Virginia Department of Game and Inland Fisheries (DGIF)

Virginia Department of Health (VDH)

Virginia Farm Bureau Federation

Virginia Department of Transportation (VDOT)

C.2. Comments from Local Groups

Rappahannock River Basin Technical Committee

Rappahannock-Rapidan Regional Commission Land Use and Environmental Committee

Culpeper Soil and Water Conservation District

John Marshal Soil and Water Conservation District

Time Bondelid Consulting Engineer

Caroline County (Outside of Study Area, in Lower Rappahannock)

C.3. Comments from Local Government Officials

Culpeper County

Fauquier County

City of Fredericksburg

Greene County

Madison County

Orange County

Rappahannock County

Spotsylvania County

Stafford County

C.1. Comments from Agencies

United States Geological Survey (USGS)

In addition to presenting at the initial study meeting and providing technical support throughout the study, USGS staff provided the following information:

1. USGS staff provided links to two reports that support the need for continuous water-quality data collection, versus monitoring on a regular basis. These reports include *Nutrient and Suspended-Sediment Trends, Loads, and Yields and Development of an Indicator of Streamwater Quality at Nontidal Sites in the Chesapeake Bay Watershed, 1985–2010* and *A Comparison of Turbidity-Based and Streamflow-Based Estimates of Suspended-Sediment Concentrations in Three Chesapeake Bay Tributaries*.
2. Parameters that can be collected by continuous water-quality gauges include: water temperature, specific conductance, dissolved oxygen, pH, turbidity, and nitrate. Paired with these continuous data are manual water-quality samples (typically 12 monthly samples and about 8 storm samples) that are analyzed for dissolved and particulate forms of nitrogen and phosphorus as well as suspended sediment. The goal of the continuous data is to use them as surrogates to predict water-quality constituents by developing the relationship with field samples (total nitrogen, total phosphorus, and suspended sediment). From these predictions monthly and annual loads, and determine long-term trends can be computed.
3. Currently, the USGS collects 20 water-quality samples per year (consisting of 12 scheduled monthly samples and 8 targeted storm flow samples) at the following 3 stations:
 - a) Rappahannock River near Fredericksburg (USGS Station ID 01668000)
 - b) Rapidan River near Culpeper (USGS Station ID 01667500)
 - c) Rappahannock River at Remington (USGS Station ID 01664000)

USGS can compute nutrient and sediment loads and determine long-term trends at each of these 3 locations.

4. There was a real time water quality gauge on the Rappahannock River, 5 miles upstream of interstate 95, at Motts run, where the water intake structures for the City of Fredericksburg are located. This real time water quality gauge was associated with the long term stream gauge near the City of Fredericksburg on the Rappahannock River. The gauge was in place for 3 years – refer to the report *Nutrient and Suspended-Sediment Trends, Loads, and Yields and Development of an Indicator of Streamwater Quality at Nontidal Sites in the Chesapeake Bay Watershed, 1985–2010*. This gauge was placed on a buoy system due to the lack of a bridge crossing in this area and after three years was washed out by a storm. If the gauge were to be replaced, USGS would want permission from the City of Fredericksburg to place the gauge on the water intake structure itself. The gauge enabled the parameters of total suspended sediment (TSS), total nitrogen (TN), and total phosphorus (TP) to be estimated by using utility turbidity.
5. Important questions to answer, what percentage of load is coming from Rapidan or Rappahannock? Localities may want to break Rapidan into smaller watersheds to monitor

existing pollutants. Localities are most interested in quantifying loads for TN, TP, and sediment leaving streams at jurisdiction boundaries. To find these loads a full range of hydrographs needs to be sampled. Also, the Chesapeake Bay TMDL and MS4 permits target loads from storm events, so data needs to be collected for these times. This is not such an issue doing manual monitoring for bigger areas, but for smaller streams it is hard to do, especially smaller streams with steeper slopes when the event is short.

6. Real-time gauges take continuous data and can be uploaded about every 15 minutes. VA DEQ trend stations take one sample a month. USGS have trend and load stations, may take more than one sample a month. VA DEQ station currently at Rappahannock at Remington helps to determine if a pollutant load is from Rapidan or Remington.
7. EPA should accept data that is collected by either VA DEQ or USGS, volunteer collections may vary. It is useful to the localities to know what the actual loads from their part of the stream or tributary are, instead of using the estimates from EPA models. EPA model typically takes average values and applies them to whole areas.
8. The gauges should be placed in strategic locations of monitoring, providing load outputs for each localities. Typically gauges need to take temperature, pH, specific conductance, DO, and turbidity.
9. The Chesapeake Bay Watershed Model used to establish loads by the EPA will be rebuilt in 2017. Typically trend/load station need 5 years of data to be useful, but continuous data could be useful in about 2 years with real time data and extrapolating based on relationships. USGS has an abbreviated sweep and expanded sweep of parameters that they can take at their stations. The parameters are taken in terms of what the gauges can measure and then water quality sampling is done to establish the relationship between these items and the needed values of TN, TP, TSS.
10. Recommend finding the top water quality issues in the basin, then see if existing data collection can solve the problem, and then identify what is needed to solve any remaining issues.
11. Keep in mind IFLOWS only currently takes stage, but discharge values are needed for water quality data. Load measurement needs the volume of water, therefore only USGS stream gauges (management is helped by VA DEQ) have been set up this way currently.
12. USGS does have a 50/50 cost share program [Water Coop Program]; however it is typically only funded at 10, 20, or 30 percent Federal funding. State and local funds must be used to cover the rest (non-Federal cost share matching funds). This funding can be used for trend/load stations or real time continuous stations. USGS has the capability to work on any new water quality monitoring sites, funding provided.
13. Real time continuous water quality gauges also require manual sampling to develop the relationship between the parameters taken and desired. For example, the gauge may measure turbidity, but the desired parameter is nitrate.
14. Limited funding is provided for the USGS Water Coop Program. The highest Federal cost sharing percentage for current projects in Virginia is 30%.

15. New individual stream gauge with transmitter (continuous real time stream gauge to measure stage and produce flow parameters and includes any permitting) will cost \$17,000 for locations in Virginia. The exception to this is tidal gauges which can cost more, however no tidal gauges are recommended in this study. The operation and maintenance cost for a new stream gauge of this type is \$15,000 per year. Stream gauges that include monitoring for water quality parameters, with one sample each month and 8 targeted storm samples per year will cost \$35,000 per stream gauge site to operate and maintain. Additionally, adding water quality equipment to produce real-time continuous water quality data cost \$12,000 for the monitoring sonde and additional \$6,000 for other equipment and installation materials (\$18,000 in addition to the stream gauge cost). In order to operate and maintain a water quality gauge and perform the monitoring, one sample each month and 8 targeted storm samples per year to establish relationships between measure and desired parameters, the cost is around \$50,000 to \$60,000 per site. This cost includes any lab analysis needed for the water quality data, however sites maintained by VA DEQ may cost a little less since VA DEQ performs water quality tests at their own lab facility. All of these costs are for installation and operation and maintenance of a single gauge, grouping gauges together can decrease operation and maintenance cost. The decrease could come from reduced travel time of agency personal to perform monitoring and maintenance of gauges in the same area.

National Weather Service (NWS)

In addition to presenting at the initial study meeting and providing technical support throughout the study, upon initiation of this study NWS staff provided a spatially attributed file with suggestions for additional rain gauges needed in the Rappahannock River Basin. Although this background information was not presented at the September 18th Study Meeting, a basic consensus for rain gauge needs from meeting participants matched this initial assessment. The rain gauges listed in the file include (documented in Section 4.0, in the Identified Gauge Locations Table):

1. Hartwood Stream Gauge
2. Hunting Run River Gauge
3. Locust Grove Rain and Stream Gauge
4. Richardsville Rain Gauge and Stream Gauge

Other additional comments provided by NWS staff:

1. On October 2nd, 2012, during the study period, there was a flood event in the un-gauged Mountain Run Basin in Culpeper County. There was a report of water from Mountain Run almost over the road and rising.
2. USGS may have stream gauging sites that are inactive or active and not all active sites have real time data transmission.
3. It is not a top priority to install a rain gauge at Remington, since NWS has one there plus the Culpeper Airport is nearby.

Virginia Department of Emergency Management (VDEM)

In addition to presenting at the September 18th, 2012 study meeting and providing technical support throughout the study, upon initiation of this study VDEM staff provided a spatially attributed file with suggestions for additional rain and stream gauges needed in the Rappahannock River Basin from an emergency management standpoint.

From file:

1. Mountain Run & Stones Mill Rd Stream Gauge
2. Rapidan River @ Locust Grove Rain and Stream Gauge
3. Rappahannock River @ Kemper's Ford Rain and Stream Gauge
4. Rappahannock River below Confluence Stream Gauge
5. Motts Run
6. Mountain Run @ Culpeper Rain and Stream Gauge
7. Rapidan USGS add Rain Gauge
8. Po River USGS gauge add Rain Gauge (outside of basin, but rain information could provide warnings to basin area)
9. Partlow USGS gauge add Rain Gauge (outside of basin, but rain information could provide warnings to basin area)
10. North Ana River (outside of basin, but rain information could provide warnings to basin area)

VDEM staff provided the following additional information:

1. Recommended priorities are:
 - 1) Install real-time rain gauges at existing stream gauge sites such as Battle Run at Laurel Mills;
 - 2) Install a new stream gauge upriver from Fredericksburg at the confluence of the Rapidan and Rappahannock Rivers.
2. IFLOWS gauges could be operated in the future in combination with water quality equipment. Currently, IFLOWS gauges do not have rating curves developed, which are flow values for the recorded stages at each gauge. A rating curve and monitoring required to translate continuously measured parameters to desired pollutant concentrations would need to be added in addition to water quality equipment.
3. The IFLOWS program has typically used tipping bucket rain gauges. For stream gauges, the program has used some optical sensor gauges, but mainly uses pressure transducer gauges. The IFLOWS gauges give river stage. The QA/QC requirements for the IFLOWS program are less than that required for USGS or NWS gauges. Additionally, the IFLOWS program currently does not develop rating curves to develop cubic feet per second (CFS) values for the recorded stages.

4. The IFLOWS program has taken advantage of available grants, such as Hazard Mitigation Grant Program (HMGP) funds for gauge installation. Typically the state of Virginia will fund the operation and maintenance of gauges in the IFLOWS program after installation. There are a few exceptions where gauges have been included in the IFLOWS program, but operation and maintenance cost are paid by the locality. Examples include gauges in the Cities of Franklin and Richmond, and Rockingham County. These communities used HMGP funds to pay for installation, but operate and maintain the gauges themselves.
5. Usually the IFLOWS program will install both a rain and stream gauge on one site and the typical installation costs of the program are about \$20,000, including the cost of the transmitter needed for real-time data reporting. The IFLOWS program typically obtains a land-owners agreement to place a gauge on the site. This agreement is not binding and enforceable by law, like an easement, but the program does not pay any fees to the landowner. However, if a gauge is to be located on VDOT property, such as from a bridge, coordination and a permit from VDOT must be obtained first.
6. For water quality gauges there are several grant programs that can be considered to find funding for water quality gauges. Examples include the Chesapeake Bay Program Grant Funds and Water Quality Improvement Act (Clean Water Act, EPA).

Virginia Department of Environmental Quality (VA DEQ)

In addition to presenting at the September 18th, 2012 study meeting and providing technical support throughout the study, VA DEQ staff provided the following information:

1. VA DEQ develops a monitoring plan for the state of Virginia; they are currently working on a plan for monitoring for 2013. It is important to note, not all the TMDL monitoring VA DEQ performs is based on the TMDL Implementation Plans.
2. VA DEQ staff suggests a priority location for a real-time continuous water quality gauge on Mountain Run, near the bottom of the watershed.

Virginia Department of Conservation and Recreation (VA DCR)

VA DCR staff provided support throughout this study as the cost sharing partner. Staff helped monitor study progress and attended study meetings. Additionally, staff provided a database of the Virginia Dam Inventory and information on developing a DamWatch program, see Section 3.1, Dams.

Virginia Department of Game and Inland Fisheries (DGIF)

VA DGIF interest would most likely lie in the potential to use gauge data to help determine rainfall near their dams.

Virginia Department of Health (VDH)

During high rainfall events that might lead to flooding in the Rappahannock River, the Virginia Department of Health may monitor many of the inland river gauges, but specifically the Rappahannock River near Fredericksburg, USGS Gauge Number 01668000.

From the division of Shellfish Sanitation, heavy inland rainfall events that cause flooding in the tidal portions of these watersheds may affect water quality by flushing fecal bacteria, etc. into shellfish harvesting waters causing VDH to issue Emergency Shellfish Closures. The river gauge above is the primary guard used by VDH to measure the potential impact downstream in the Rappahannock.

Virginia Farm Bureau Federation

There could be one of several purposes for the gauging analysis and the location might vary with the purpose. For example:

1. Additional monitoring for currently impaired waters: for this purpose, additional stations would attempt to pin down the location(s) of nutrients or bacteria that are causing a stream segment to be impaired. That would mean working upstream from the impaired segment with monitoring stations at each confluence to determine where an issue originates. It may be worthwhile to look at the listing of impaired waters in the study area and overlay those on the map of current monitoring stations to see where additional stations would be helpful.
2. Additional monitoring to provide baseline data prior to anticipated land conversion or other activity. In this scenario, monitoring stations are needed both upstream and downstream of the drainage area where land conversion or development is anticipated to occur. It is not enough to just go downstream as that would only prove that the water quality changed after conversion but would not necessarily prove causation.
3. Additional monitoring to provide generalized baseline data- this is the simplest scenario as it's filling holes in existing monitoring. However, while this would look very nice on a map, it may be tough to economically justify.

Obviously these scenarios are not mutually exclusive except for the economic cost. If unlimited funding was available, all of the above could be done. However, funding is always limited therefore a combination of scenario 1 and 2 could be used. If a locality has an impaired stream but does not have a good handle on why the impairment is occurring, they would probably want to have monitoring above the segment to pin down the cause. If a locality does not currently have impaired waters, but they anticipate changes in the land use, (including changes upstream of the locality), they could be interested in the second option.

Virginia Department of Transportation (VDOT)

Stream flow gauges are sometimes installed with bridges, along with other environmental monitoring equipment. Currently, VDOT bridge replacements are dictated primarily by condition and VDOT at this time is not considering establishing any new gages within the watershed.

C.2. Comments from Local Groups

Rappahannock River Basin Technical Committee

Rappahannock River Basin Staff and Technical Committee participants provided support throughout this study in several ways: helped initiate the study, provided support and input at their monthly meetings, provided work-in-kind estimates for the localities of the basin to fund the study, organized cash contributions from localities in the study, reserved meeting spaces to hold study meetings, and helped provide information for this report.

USACE staff attended the RRB Technical Committee on June 27, 2012, here are several comments that were provided at the meeting:

1. Suggested contacting the local environmental groups up and down the basin who do different monitoring. Suggested contacts include: agencies involved with the National Flood Insurance Program, Department of Health and the Bureau of Shellfish Sanitation, Culpeper Soil and Water Conservation District, Trout Unlimited, Friends of the Rappahannock (FOR), RappFlow, REAP, private environmental firms, UMW, local government and environmental departments, local resource providers, county administrators of the basin, local grazing groups, VIMS, and Virginia Outdoor Funds.
2. Other items to consider include: the ideal layout for proposed gauges should be uniform throughout the basin. There are four TMDL Implementation Plans in the upper basin that should be reviewed in the research.
3. There was discussion about the scope of the study and lead to the conclusion that the study should be limited to the upper and middle portions of the Rappahannock River Basin, but information and processes developed in this study will help with any future work for identifying gauging needs in the lower portion of the basin.

USACE Staff Attended the RRB Technical Committee on October 24, 2012, here are several comments that were provided at the meeting:

1. Suggested if there was a TMDL implementation plan on a particular stream that might be one place where a gauge is needed.
2. Ideally to have water quality gauges at all the major tributaries.
3. DCR is attempting to define what a runoff-producing event is. Stream gauges are a better indicator of a runoff producing event requirement. There is a real need to have onsite rain gauges at every runoff site, as well as to use some kind of a regional rain gage.
4. It would be good to know where the load is coming from for each jurisdiction, which could break down implementation on a local government level for the funding part, because it makes more sense to the jurisdiction.

Rappahannock-Rapidan Regional Commission Land Use and Environmental Committee

The commission staff provided contact list and information, and assisted in coordination during the study. Current TMDL IP plans were obtained from the commission's web-page. Additionally several gauge suggestions were obtained at the November 15th Land Use and Environmental Committee Meeting, as noted in the "Source" column in Table 4.1, Identified Locations.

Culpeper Soil and Water Conservation District

There are 3 main criteria this effort should support and not ignore, neither in the short term or long term;

1. DEQ surface water monitoring programs and protocols.
2. Local TMDL implementation plans such as the Upper Hazel project and those projects needs (per DCR/DEQ).
3. Long term locality water supply plans.

It seems that if these three topics are well incorporated into any new planning efforts then a good baseline is established for the study. Two suggestions to be considered: in Orange County, north of Route 20, east of the Town of Orange, there are 2 small watersheds, each of which has a completed TMDL on them. These two drain about 60 percent of the county and drain north to the Rapidan River. These are Mountain Run and Mine Run. Just so as not to get confused, there is another Mountain Run in Orange County, also a TMDL stream but it drains to the York River.

Proposed Locations:

1. Rapidan River at Route 29. This may be a water intake site for Rapidan Service Authority. It could be both a stream flow gauge (or rainfall) and water quality too. This would also support a TMDL implementation for an impaired section of the Rapidan, upstream from this site.
2. Robinson River at Route 614. The Robinson is the major tributary to the Rapidan and also is under a TMDL implementation effort, mostly by this District. A gauge for water quality and rainfall/flow would be very useful here.
3. The confluence of the Thornton and Hazel Rivers at Butlers Store Road at Monumental Mills in Culpeper County. These are two major tributaries to the Rappahannock from the Blue Ridge and water quality gauges here would greatly support TMDL implementations underway. Additionally, water flow/rainfall gauges here would be useful to both Rappahannock and Culpeper Counties, not to mention, Fredericksburg.
4. Beautiful Run in southern Madison County; water quality at the mouth or at Route 620 would greatly benefit future water quality initiatives as it is an impaired stream.

Other strong options;

5. The mouth of the Hughes River; TMDL implementation support primarily with water quality gauges.

6. The mouth of the Rush river; TMDL implementation support as above for the Hughes.

NOTE: The Upper Hazel TMDL Implementation Plan includes several TMDL rivers; the Hughes, Hazel and Rush and upper section of Thornton (above Monumental Mills).

Currently there are 2 TMDL implementation plans that are active; the Upper Hazel project and the Robinson River/Little Dark Run project in Madison County. Both can be found there at the Regional Commission web-page. They are current and will not likely change for a 10 or 15 year period since that is the planning timeframe embraced by the plans. The other report that could be reviewed, but are still at the TMDL Report stage include the Rapidan River TMDL, which includes impairments for 2 sections of the Rapidan and an unnamed tributary, Blue Run, Marsh Run, and Cedar Run. Collectively, all these reports cover most all of the upper basin area of the Rappahannock.

John Marshal Soil and Water Conservation District

In November 2012, staff presented a list of proposed locations, in cooperation with Fauquier County, possible gauging/rainfall/water quality stations:

1. Rappahannock River, confluence of Jordan and Rappahannock Rivers, Rt. 647 bridge (Flint Hill Quad) to provide some baseline data from a mainly agriculture and forestry portion of watershed.
2. Rappahannock River at Rt. 635 bridge (Flint Hill Quad) to provide baseline data from a mainly agriculture and forestry portion of watershed.
3. Thumb Run at Rt. 688 (Leeds Manor Rd) bridge (Orlean Quad). Current TMDL.
4. Cater Run at Rt. 719 bridge (Marshall Quad). Downstream of Marshall WWTP.
5. Carter Run at Rt. 688 (Leeds Manor Road) bridge. Current TMDL.
6. Rappahannock River at Rt. 211 bridge (Jeffersonton Quad) augment current gauging station with rainfall and water quality monitoring (build baseline data from a mainly agriculture and forestry portion of the watershed).
7. Rappahannock River at Rt. 802 bridge (Warrenton Quad). Downstream of two golf courses and discharge point from Fauquier Springs Country Club WWTP.
8. Great Run at Rt. 802 bridge (Warrenton Quad). Downstream of Warrenton WWTP, plus some stormwater discharge from Warrenton, downstream of Warrenton Training Center.
9. Great Run at Rt. 687 bridge (Warrenton Quad). Same.
10. Confluence of Hazel and Rappahannock River (Remington Quad).
11. Add water quality and rainfall monitoring to Rappahannock River gauge at Rt. 29 bridge in Remington. Upstream of Remington stormwater discharge and WWTP discharge.

12. Tinpot Run at Rt. 651 bridge (Remington Quad). Downstream of Remington WWTP, frequent local flooding.
13. Confluence of Tinpot Run and Rappahannock River (Remington Quad) to comparison with #12 to determine impacts of Remington stormwater and WWTP.
14. Marsh Run at Rt. 17 bridge (Remington Quad). Downstream of Bealeton and Midland Service Districts and Airport Industrial Park.
15. Craig Run and Bowen Run confluence at Rt 656 bridge (Remington Quad). Local flooding due to constriction of floodplain by railroad bridge. Downstream of Bealeton Service District.
16. Marsh Run at Rt. 668 (Savannah Branch Rd) bridge (Remington Quad). TMDL. Also WWTP for mobile home park.
17. Marsh Run at Rt. 651 bridge (Germanna Bridge Quad). Background data for largely an agricultural watershed.
18. Rappahannock River at Rt. 620 bridge (Germanna Bridge Quad).
19. Confluence of Rappahannock River and Mountain Run (Germanna Bridge Quad).
20. Harpers Run at Rt. 17 bridge (Midland Quad), Downstream of large subdivision with online pond.
21. Browns Run at Rt. 17 bridge (Midland Quad). Background data from a largely agricultural watershed.
22. Sumerduck Run at Rt. 651 bridge (Richardsville Quad). Background data from a largely agricultural watershed.
23. Rock Run at Rt. 17 bridge (Richardsville Quad). Background data from a largely agricultural watershed.
24. Deep Run at Rt. 17 bridge (Richardsville Quad). TMDL.

Tim Bondelid Consulting Engineer

Provided information on ground water monitoring, a topic which was considered for this study. Additionally, several suggestions were provided:

The Rappahannock County Water Supply Plan [written by Tim Bondelid] has many anecdotal observations that indicated significant changes in the water resources for this area, but there is very little hard data. Rappahannock County is the headwaters of the basin, so it is important for the entire basin that there is better data in the county. Rappahannock County's groundwater and precipitation patterns are quite complex. In this area, groundwater comes from a fractured bedrock formation. A better understanding of the groundwater status and trends is important for the basin as a whole. Rappahannock County's groundwater is "up-gradient" of the rest of the basin and is most likely a significant component of base flow, both within the county and downstream. Rappahannock County's precipitation patterns are complicated by the shadow effects of the mountains. For example, if there is a major thunderstorm in some places and no

rainfall at all in other places. There need to be several strategically placed rain gages in the County to better understand these patterns as well as helping to determine flood risks.

Two high priority data collection items are:

1. Well monitoring, and
2. Meteorological data.

In addition, there are needs for analyses of existing data that can be very helpful, such as updated base flow and trends analyses at the Battle Run and Hazel River flow gages and analyses of the meteorological data at Big Meadows. One reason the Big Meadows data is important is because it will help to better understand snowpack in the mountains, which is significant in regards to groundwater recharge as well as spring thaws and potential flooding.

Proposed gauge locations would be the upper Rappahannock River. Another would be a headwater gage just below the Park. There is also a need to focus on meteorological stations, groundwater levels, springs, and it would be really good to get data on groundwater withdrawal trends "down slope" from us, the County.

Caroline County (Outside of Study Area, in Lower Rappahannock)

Two items of interest in recent discussions of the VSMP Construction General Permit (open for revision) which involve rainfall monitoring:

1. Construction sites will have to monitor rainfall, either by on-site rain gauge or use local rainfall data.
2. VA DCR is proposing a minimum definition for a 'runoff-producing rain event' which will trigger a site inspection. Initially, they suggested 0.25" rain (assume in a 24 hr period). Caroline County suggested they reconsider, to include rainfall amount and intensity, along with local program determination.

It would helpful to know 'who does what' in the watershed, related to water (rainfall, runoff, discharge, etc):

VA DEQ: water quality monitoring (as discussed), stream TMDL methodology and implementation plans, list of impaired stream segments in the watershed, and overview of (point-source) discharge permitting program(s).

Wetlands: VA DEQ and USACE, map of existing/identified wetlands, mitigation banks, etc.

VA DCR/Dam Safety: overview of program, regulated sites, and stormwater program.

C.3. Comments from Local Governments

Culpeper County and Town of Culpeper

Town of Culpeper and Culpeper County staff provided several suggestions for the Gauging analysis:

1. There was an existing stream gauge between Mountain Run and Lake Pelham. When replacing this gauge it would make more sense to be downstream of Lake Pelham dam, as to not be located between two regulated impoundments where the flow is known. Town of Culpeper offered that any transmission equipment that needed protection could be placed near the building for the Lake Pelham reservoir.
2. Water quality testing in Lake Pelham and downstream of Culpeper WWTP is already conducted for NPDES permits and could not be replaced by a water quality gauge as testing requires some pollutants to be measured in amounts of PPM or PPB.
3. The east side of Culpeper between Route 3 and Route 29.
4. Clevengers WWTP outfall, northern tip of Culpeper County.
5. TMDL for Mountain Run.
6. Emerald Hill WWTP discharges into Muddy Run, which also has an established TMDL.

Fauquier County

See the previous section John Marshall Soil and Water Conservation District. Staff provided suggestions at the September study meeting and the November 15th, Rappahannock-Rapidan Regional Commission Land-Use and Environmental Committee meeting.

City of Fredericksburg

Staff correspondence noted that stream and rain gauge information needed for flood warning for the City of Fredericksburg was added to the proposed gauge locations at the September 18th, 2012 study meeting. Additionally, staff noted that initial comments for more efficient forecast services have been addressed through the study process.

In regards to water quality gauges, staff indicated that a water quality gauge could be stationed to monitor just for the City of Fredericksburg. However, since several sub-watersheds and jurisdictions drain through the City of Fredericksburg it is hard to isolate data for runoff. Staff recommended looking at existing water quality data and stations and analyzing smaller watershed segments.

Greene County

Staff had no additional suggestions to add to the project other than what was already identified for the project by other participants.

Madison County

Staff did not have specifically identified areas for additional suggestions for real-time gauges.

Orange County

Staff from Orange County provided suggestions for ambient monitoring/flow gauges at the following locations:

1. Sub-watersheds of the Robinson and Rapidan, perhaps near the confluences of both major water bodies with the respective creeks of those sub-watersheds;
2. Flow gauges located on Mountain Run;
3. Flow gauges located on Mine Run; and
4. Flow gauges located on Flat Run.

It is also noted that groundwater monitoring in these locations is needed. Additionally, it is noted that staff is most concerned with vulnerable water bodies susceptible to agricultural activity run-off, and run-off from impervious surfaces.

Rappahannock County

Rappahannock County Staff coordinated with other groups during the study, to include RappFLOW, Time Bondelid Consulting Engineer, and Culpeper SWCD, and gave the following additional suggestions:

1. Stream flow gauge on South Fork of the Thornton at the Rt. 522 bridge in Sperryville along with a meteorological station should be added. There are many businesses and homes along the corridor, and some are in the 100-year flood plain.
2. A meteorological station (rain gauge) in the park near the headwaters of the S. Fork of the Thornton would be good; flooding can be caused by heavy rain on a snowpack. A meteorological station right where Rt. 211 and the Park entrance intersect would work. This is flooding-related, and it is a great place for drought monitoring

Spotsylvania County

Spotsylvania County staff provided the following information about their needs for additional data:

1. Spotsylvania County is in need of accurate rainfall data, but regionally since they have been getting some major disparity in reporting information using localized stations such as WeatherBug and Weather Underground.
2. Spotsylvania County needs to establish a runoff potential rate that will produce potential flood estimates, as well as, be able to provide a turbidity estimate based on sediment loads provided with sensory water quality equipment.
3. The County was originally looking at obtaining some portable gauges that could be placed below construction sites to establish a pre-during and post sediment and potential pollutant loads of a specific land disturbance activity. That is still being considered with some help from the development community.
4. There are several potential locations for potential water quality /floodplain management monitoring within the basin.

Stafford County

Stafford County staff provided the following existing information and requests for the gauging analysis:

1. Stafford County currently has gauging equipment stationed at the pump station near the Rocky Pen Reservoir (currently under construction).
2. Regarding monitoring, any data that would assist Stafford County meeting permit requirements would be very beneficial, extent of the permit requirements can change until they are approved at the state level.
3. On the Rappahannock River, the primary concern would be early warning for flood events for the public safety personnel and citizens. This is particularly relevant for the portions of the river that the public accesses frequently along the banks in Stafford County and the City of Fredericksburg (Generally between the Route 95 and Route 3 Bridges).
4. Flow and water quality data on the main part of the Rappahannock River is of less interest to Stafford County than some other group members.
5. Flow data in and of itself on the major tributaries to the Rappahannock in Stafford is of limited value. On the other hand, water quality monitoring data on these tributaries would be quite valuable. Of the ten major tributaries, the four most urbanized sub-watersheds (Claiborne Run, Falls Run, England Run, and Little Falls Run) should be prioritized above the other six less urbanized sub-watersheds.

APPENDIX D – PROPOSED GAUGE SHAPEFILE

D.1. Shapefile Field Definitions

D.2. Shapefile Table

D.1. Shapefile Field Definitions

FID – point id

Shape – shape type

Id – assigned ID

Issue – problem that can be solved with upgraded or new gauge

Prob_locat – problem location, name of any existing gauges

Type- upgraded or new stream rainfall or water quality gauge

Organzati – name of person/group that contributed the point

Jurisdicti – Jurisdiction where gauge is located

Latitude – latitude, decimal degrees

Longitude – longitude, decimal degrees

Com_or_Rem – combine or remove

C_R_Explan – combine or remove explanation

FW_1 – flood warning criteria one

FW_2 – flood warning criteria two

ProirityRS – Rain and Stream gauge priority ranking

Pollutant – Pollutant identified

WQ_ALT1 – water quality alternative one

Exist_Mon – existing long term monitoring by VA DEQ or USGS

Exist_SG – existing stream gauge from USGS or IFLOWS

WQ_ALT2 – water quality alternative two

WQ_ALT3 – water quality alternative three

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|--|--|---|----------|------------|------------|---|------|---|------------|
| 1 | need real time rain gauge for flooding predictions | at stream gauge, battle run near Laurel Mills, VA | New Rain Gauge | | 38.6546 | -78.0738 | VDEM, Sept 18 Meeting | | | YES |
| 2 | real time stream and rain gauges to predict flooding in the Mountain Run Area, NWS documents reports of flooding on Oct 2, 2012 | at historic stream gauge Mountain Run near Culpeper, VA | New Rain Gauge, New Stream Gauge | | 38.4765 | -78.0495 | NWS, Sept 18 Meeting and Nov 15 Meeting | | | YES |
| 3 | real time rain gauge for flooding predictions, water quality gauge | at stream gauge Rapidan River near Culpeper, VA | New Rain Gauge, Water Quality Gauge | 8 | 38.3497 | -77.9754 | VDEM, Sept 18 Meeting | YES | At existing stream gauge. | NO |
| 4 | real time stream and rain gauges to predict flooding, also water quality monitoring mainly to build baseline data from an agricultural and forestry portion of the watershed | Rappahannock River at Route 211 Bridge, at historic stream gauge Rappahannock River near Warrenton, VA | New Rain Gauge, New Stream Gauge, Water Quality | 10 | 38.6829 | -77.9030 | Sept 18 Meeting and Fauquier, J.M. SWCD | YES | No stream gauges | NO |
| 5 | Extreme need for rain gauge east of Ruckersville in the RRB, real time stream and rain gauges to predict flooding, water quality data | Locust Grove, Route 3, Germanna Hwy, crossing of Rapidan River | New Rain Gauge, New Stream Gauge, Water Quality | 1 | 38.3793 | -77.7853 | VDEM, NWS, Sept 18 Meeting, Nov 15 Meeting, and Orange County | YES | Requested by four organizations, on Rappahannock, extreme need for rainfall data listed in comment. | NO |
| 7 | real time stream and rain gauges to predict flooding | confluence of Mountain Run and Flat Run | New Rain Gauge, New Stream Gauge | | 38.4681 | -77.8260 | VDEM, Sept 18 Meeting | | | YES |
| 6 | real time stream and rain gauges to predict flooding, water quality | upriver from Fredericksburg, below the confluence of Rappahannock and Rapidan River, VDEM proirity for additional stream gauge | New Rain Gauge, New Stream Gauge, Water Quality | 9 | 38.3617 | -77.6126 | VDEM, NWS, Sept 18 Meeting and Nov 15 Meeting | YES | Requested by four organizations, on Rappahannock. | NO |
| 8 | real time stream and rain gauges to predict flooding, NWS documents reports of flooding on Oct 2, 2012 | Rappahannock River at Route 620 Bridge | New Rain Gauge, New Stream Gauge, Water Quality | | 38.4777 | -77.7802 | Sept 18 Meeting and Fauquier, J.M. SWCD | | | YES |
| 9 | Water Quality Gauge | on Mountain Run before confluence with Rappahannock River or at confluence | Water Quality Gauge | | 38.4556 | -77.7706 | Sept 18 Meeting and Fauquier, J.M. SWCD | | | NO |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|---|---|---------------------------------------|----------|------------|------------|--|------|--|------------|
| 10 | Frequent Local Flooding and Water Quality Gauge Downstream of Remington WWTP, Water Quality for TINPOT Run. | Tin Pot Run at Remington, Route 651 Bridge | New Rain Gauge, Water Quality Gauge | | 38.5283 | -77.8062 | Nov 15 Meeting and Fauquier, J.M. SWCD and VA DEQ Proirity | | | NO |
| 11 | Current TMDL | Carters Run at Route 688 | Water Quality Gauge | | 38.7020 | -77.9057 | Nov 15 Meeting and Fauquier, J.M. SWCD | | | NO |
| 12 | Water Quality Gauge, TMDL | Deep Run at Route 17 | Water Quality Gauge | | 38.4298 | -77.6298 | Nov 15 Meeting and Fauquier, J.M. SWCD | | | NO |
| 13 | Downstream of Warrenton WWTP, plus some stormwater discharge from Warrenton, downstream of Warrenton Training Center | Great Run at Opal Road, Route 687 | Water Quality Gauge | | 38.6424 | -77.8591 | Nov 15 Meeting and Fauquier, J.M. SWCD | | | NO |
| 14 | Water Quality Gauge and Rainfall, upstream of Remington stormwater discharge and WWTP discharge | Major Outfall, at DEQ Non-tidal station, 3-RTP 147.49, 3-RAP030.21, and USGS Remington Stream Gauge | New Rain Gauge, Water Quality Gauge | 14 | 38.5291 | -77.8198 | Nov 15 Meeting and Fauquier, J.M. SWCD | NO | | NO |
| 15 | Current TMDL | Thumb Run at Route 688, Leeds Manor Rd | Water Quality Gauge | | 38.7656 | -77.9768 | Nov 15 Meeting and Fauquier, J.M. SWCD | | | NO |
| 16 | Stream Gauge, Water Quality Gauge | Water Intake just about Route 15, need for Stream Gauge | New Stream Gauge, Water Quality Gauge | | 38.2781 | -78.1396 | Nov 15 Meeting | | | YES |
| 17 | Water Quality Gauge | Greene County, below Rapidan, near Ruckersville | Water Quality Gauge | | 38.2338 | -78.2512 | Nov 15 Meeting | | | YES |
| 18 | Stream gauge to capture flow from Jordan River, at Crest Hill Road or below , Baseline data needed from a mainly agricultural and forestry portion of the watershed | Rappahannock River, confluence of Jordan and Rappahannock Rivers, Rt 647 Crest Hill Road Bridge | New Stream Gauge, Water Quality Gauge | 6 | 38.7593 | -78.0276 | NWS, Fauquier, J.M. SWCD, Tim Bodelid Consulting Engineer | YES | Need for flow gauge in upper portion of basin. | NO |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|--|--|---------------------------------------|----------|------------|------------|--|------|------|------------|
| 19 | Baseline data needed from a mainly agricultural and forestry portion of the watershed. Baseline flow data needed for water supply. | Rappahannock River at Route 635 Bridge | New Stream Gauge, Water Quality Gauge | | 38.8381 | -78.1057 | Fauquier, J.M. SWCD, Tim Bodelid Consulting Engineer | | | YES |
| 20 | Downstream of Marshall WWTP | Carter Run at 719 Bridge | Water Quality Gauge | | 38.8405 | -77.8627 | Fauquier, J.M. SWCD | | | YES |
| 21 | Downstream of two golf courses and discharge point from Fauquier Springs Country Club WWTP | Rappahannock River at Route 802 Bridge | Water Quality Gauge | | 38.6490 | -77.8728 | Fauquier, J.M. SWCD | | | YES |
| 22 | Downstream of Warrenton WWTP, plus some stormwater discharge from Warrenton, downstream of Warrenton Training Center | Great Run at Route 802 Bridge | Water Quality Gauge | | 38.6937 | -77.8301 | Fauquier, J.M. SWCD | | | YES |
| 23 | Water Quality Gauge | Confluence of Hazel River and Rappahannock River | Water Quality Gauge | | 38.5526 | -77.8495 | Fauquier, J.M. SWCD | | | YES |
| 24 | Water Quality Gauge to have a comparison with Hazel River and Rappahannock WQ Gauge, to measure effects of the Remginton stormwater and WWTP | Confluence of Tinpot Run and Rappahannock River | Water Quality Gauge | | 38.5269 | -77.8118 | Fauquier, J.M. SWCD | | | YES |
| 25 | Water Quality downstream of Bealeton and Midland Service Districts and Airport Industrial Park, Water Quality Gauge for Craigs Run (303 d stream with no long term monitoring) | Marsh Run at Route 17 Bridge | Water Quality Gauge | | 38.5667 | -77.7572 | Fauquier, J.M. SWCD, and Craigs Run TMDL IP | | | YES |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|---|---|---|----------|------------|------------|--|------|--|------------|
| 26 | Local flooding due to constriction of floodplain by railroad bridge. Water Quality Gauge for Craigs Run (303 d stream with no long term monitoring) | Craig Run and Bowen Run confluence at Route 656 Bridge. Downstream of Bealeton Service District | New Rain Gauge, New Stream Gauge | | 38.5667 | -77.7716 | Fauquier, J.M. SWCD, and Craigs Run TMDL IP | | | YES |
| 27 | TMDL and WWTP for mobile home park | Marsh Run at Route 668 (Savannah Branch Rd) bridge | Water Quality Gauge | | 38.5082 | -77.7642 | Fauquier, J.M. SWCD and Marsh Run TMDL IP | | | YES |
| 28 | Background data for a largely agricultural watershed. Bottom of watershed for Marsh Run, 303d impaired, which has no long term monitoring. | Marsh Run at Route 651 (Germanna Bridge Quad) bridge | Water Quality Gauge | | 38.4751 | -77.7726 | Fauquier, J.M. SWCD | | | NO |
| 29 | Downstream of large subdivision with online pond. | Harpers Run at Route 17 Bridge | Water Quality Gauge | | 38.5167 | -77.7190 | Fauquier, J.M. SWCD | | | YES |
| 30 | Background data from a largely agricultural watershed. | Browns Run at Route 17 Bridge | Water Quality Gauge | | 38.5433 | -77.7310 | Fauquier, J.M. SWCD | | | YES |
| 31 | Background data from a largely agricultural watershed. | Sumerduck Run at Route 651 Bridge | Water Quality Gauge | | 38.4468 | -77.6933 | Fauquier, J.M. SWCD | | | NO |
| 32 | Background data from a largely agricultural watershed. | Rock Run at Route 17 Bridge. | Water Quality Gauge | | 38.4685 | -77.6791 | Fauquier, J.M. SWCD | | | NO |
| 33 | Stream Gauge downstream of Lake Pelham Dam. real time stream and rain gauges to predict flooding in the Mountain Run Area, NWS documents reports of flooding on Oct 2, 2012 | Downstream of Lake Pelham Dam. | New Rain Gauge, New Stream Gauge | 2 | 38.4685 | -78.0114 | VDEM, Town of Culpepper, NWS, Sept 18 Meeting and Nov 15 Meeting | YES | Many comments on the needs for Mountain Run, 3 organizations requested | NO |
| 34 | Water Quality Gauge for Hazel River | Bottom of Hazel River Watershed | New Rain Gauge, Water Quality Gauge | 7 | 38.5905 | -77.9644 | Culpepper County, VDEM Sept 18 Meeting | YES | At existing stream gauge. | NO |
| 35 | Water Quality Gauge for Thorton River | Thorton River at Hazel River, Butler store road and Monumental Mills Road, for TMDL and water supply planning | New Rain Gauge, New Stream Gauge, Water Quality | | 38.6036 | -78.0063 | Culpepper County, Culpepper SWCD | | | YES |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|--|--|-------------------------------------|----------|------------|------------|---|------|---------------------------|------------|
| 36 | Water Quality Gauge for Rush River (303 d stream with no long term monitoring), for TMDL IP | bottom of Rush River watershed | Water Quality Gauge | | 38.6621 | -78.1341 | Upper Hazel River TMDL IP, Culpepper SWCD | | | YES |
| 37 | Water Quality Gauge for Browns Run (303 d stream with no long term monitoring) | bottom of Browns Run watershed | Water Quality Gauge | | 38.5247 | -77.7603 | Browns Run TMDL IP | | | YES |
| 38 | Water Quality for Rappahannock River at Fredericksburg, only previous continous water quality gauge was located here, but has been washed out by a storm. City of Fredericksburg would like to capture water quality runoff from the City. | 5 miles upstream of I-95, near Motts Run, to be installed at the intake structure for the City of Fredericksburg | New Rain Gauge, Water Quality Gauge | 4 | 38.3064 | -77.5289 | USGS, City of Fredericksburg, VDEM | YES | At existing stream gauge. | NO |
| 39 | Water quality gauge for 303(d) stream with TMDL that drains a large portion of Orange County. | At bottom of Mines Run watershed. | Water Quality Gauge | | 38.3427 | -77.8592 | Culpepper SWCD, Orange County | | | YES |
| 40 | Water quality gauge for 303(d) stream with TMDL that drains a large portion of Orange County. | At the bottom of Mountain Run watershed, draings in Rapidan, in Orange County. | Water Quality Gauge | | 38.3728 | -77.8414 | Culpepper SWCD, Orange County | | | NO |
| 41 | Stream and Water quality gauge, to support water intake site for Rapidan Service Authority and support TMDL IP for 303d portions of Rapidan. | Rapidan River at Route 29 | Water Quality Gauge | | 38.2784 | -78.3426 | Culpepper SWCD | | | NO |
| 42 | Water quality for Robinson River at rt 614. Robinson river is a major tributary of the Rapidan. Robinson river is undergoing a TMDL effort. | Robinson River at Route 614 | Water Quality Gauge | | 38.3127 | -78.1083 | Culpepper SWCD, Orange County | | | NO |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|--|---|---|----------|------------|------------|---------------------|------|---|------------|
| 43 | Water Quality for Beautiful Run at Route 620, a 303 d stream, would help and future water quality intiatives. | Beautiful Run at Route 620 | Water Quality Gauge | | 38.2765 | -78.1814 | Culpepper SWCD | | | NO |
| 44 | Water Quality for TMDL IP support for Hughes River | Bottom of Hughes River watershed | Water Quality Gauge | | 38.5234 | -78.1698 | Culpepper SWCD | | | YES |
| 45 | Water quality gauge for flat run | At bottom of Flat Run watershed. | Water Quality Gauge | | 38.3737 | -77.7355 | Orange County | | | NO |
| 46 | Stream and Rain gauge on South Fork of the Thorton, Sperryville, several homes in business, some in 1 % annual chance flood plain. | South fork of Thorton River, at Rt 522 Bridge, Sperryville | New Rain Gauge, New Stream Gauge | 3 | 38.6583 | -78.2273 | Rappahannock County | YES | No rain gauges in this area, also stream gauge needed on Thorton River for flooding concerns. | NO |
| 47 | Rain gauge in the Park near the headwaters of South Fork of the Thorn, flooding can be caused by heavy rain on snowpack. This is helpful for flooding related issues, but also for drought monitoring. | Headwaters of the South for of the Thorton River, at Route 211 and the Park entrance. | New Rain Gauge | | 38.6633 | -78.3167 | Rappahannock County | | | YES |
| 48 | Water quality gauge for urbanized area and 303d stream - Clairborne Run | At bottom of Clairborne Run watershed. | Water Quality Gauge | | 38.3038 | -77.4498 | Stafford County | | | NO |
| 49 | Water quality gauge for urbanized area - Falls Run | At bottom of Falls Run watershed. | Water Quality Gauge | | 38.3230 | -77.4714 | Stafford County | | | NO |
| 50 | Water quality gauge for urbanized area - England Run | At bottom of England Run watershed. | Water Quality Gauge | | 38.3293 | -77.5073 | Stafford County | | | NO |
| 51 | Water quality gauge for urbanized area - Little Falls Run | At bottom of Little Falls Run. | Water Quality Gauge | | 38.2652 | -77.4193 | Stafford County | | | NO |
| 52 | Rain and Stream gauge for Flood Warning, Water Quality Data | At Rappahannock River Kemper's Ford or Richardsville | New Rain Gauge, New Stream Gauge, Water Quality | 5 | 38.4139 | -77.7324 | NWS, VDEM | YES | Between 2 and 3, additional forecast data. | NO |

| Id | Issue | Prob_Locat | Type | Proirity | Latitude_1 | Longitude_ | Organizati | FW_1 | FW_2 | Com_or_Rem |
|----|--|--|----------------|----------|------------|------------|------------|------|---|------------|
| 53 | Rain Gauge for flood prediction | Hunington Run | New Rain Gauge | | 38.3525 | -77.6402 | NWS | | | YES |
| 54 | Motts Run rain gauge | Motts Run | New Rain Gauge | | 38.3124 | -77.5452 | VDEM | | | YES |
| 55 | Po River USGS gauge add Rain Gauge (outside of Basin, but rain information could provide warnings to Basin area) | Po River USGS Gauge | New Rain Gauge | 11 | 38.1969 | -77.8615 | VDEM | YES | outside of RRB, but rain gauge needed for flood warning | NO |
| 56 | Partlow USGS gauge add Rain Gauge (outside of Basin, but rain information could provide warnings to Basin area) | Partlow USGS Gauge | New Rain Gauge | 12 | 38.1618 | -77.5961 | VDEM | YES | outside of RRB, but rain gauge needed for flood warning | NO |
| 57 | North Ana River (outside of Basin, but rain information could provide warnings to Basin area) | North Ana River, or close to this area | New Rain Gauge | 13 | 38.0053 | -77.7016 | VDEM | YES | outside of RRB, but rain gauge needed for flood warning | NO |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdiction | Exist_Mon | Exist_SG | ALT3 |
|----|---|------|------|---|--------------------------------------|-----------|----------|---|
| 1 | Rain gauge can be co-located with water quality gauge at Hazel River at Rixeyville. Allow for WQ data near bottom of Hazel River. | | | | Rappahannock County | | | |
| 2 | Location is between two dams. Combined with 33, downstream of Dams, just upstream of Town of Culpeper. | | | | Culpeper County | | | |
| 3 | | YES | YES | TN, TP, TSS, E-coli, Fecal Coliform, Benthic-Macro invertebrate Bioassessments | Culpeper County, Orange County | YES | USGS | Culpeper County, Greene County, Madison County, Orange County |
| 4 | | YES | | TN, TP, TSS, E-coli | Culpeper County, Fauquier County | | PROPOSED | Culpeper County, Fauquier County, Rappahannock County |
| 5 | | YES | | TN, TP, TSS, E-coli, Fecal Coliform, Benthic-Macro invertebrate Bioassessments | Culpeper County, Orange County | | PROPOSED | Culpeper County, Orange County |
| 7 | WQ gauge site requested on M. Run near confluence, this would be secondary site. New rain and stream gauge recommended higher in watershed. | | | | Culpeper County | | | |
| 6 | | | | TN, TP, TSS, Benthic-Macro invertebrate Bioassessments, E-coli, PCB in Fish Tissue, pH, Mercury in Fish Tissue, DO, Water Temperature, Fecal Coliform | Spotsylvania County, Stafford County | | | Culpeper County, Fauquier County, City of Fredericksburg, Orange County, Stafford County, Spotsylvania County |
| 8 | WQ, Rain Gauge recommended five miles upstream at Rappahannock at Remington existing SG. | | | | Culpeper County, Fauquier County | | | |
| 9 | | YES | | E-coli, PCB in Fish Tissue, Benthic Macroinvertebrates Bioassessments | Culpeper County | YES | | Culpeper County |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdiction | Exist_Mon | Exist_SG | ALT3 |
|----|--|------|------|--|--------------------------------------|-----------|----------|--------------------------------------|
| 10 | TIN POT run small tributary with small area of impairment. Recommendations at USGS Remington SG are near confluence of TIN POT and Rappahannock. | | | E-coli | Fauquier County | | | Fauquier County |
| 11 | | | | E-coli | Fauquier County | | | Fauquier County |
| 12 | | | | E-coli, Fecal Coliform | Fauquier County, Stafford County | YES | | Fauquier County, Stafford County |
| 13 | No current impairment on this tributary. | | | E-coli, Benthic-Macroinvertebrate Bioassessments | Fauquier County | | | Fauquier County |
| 14 | | YES | YES | TN, TP, TSS, E-coli, Benthic-Macroinvertebrate Bioassessments, Water Temperature | Culpeper County, Fauquier County | YES | USGS | Culpeper County, Fauquier County |
| 15 | | | | E-coli | Fauquier County | | | Fauquier County |
| 16 | 12 river miles upstream, 15 river miles downstream of existing USGS stream gauges with water quality recommendations. | | | | Madison County, Orange County | | | |
| 17 | Less than 8 miles downstream of USGS rapidan near ruckersville, has WQ recommendation. | | | | Madison County, Orange County | | | |
| 18 | | YES | | TN, TP, TSS, E-coli | Fauquier County, Rappahannock County | YES | PROPOSED | Fauquier County, Rappahannock County |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdiction | Exist_Mon | Exist_SG | ALT3 |
|----|--|------|------|-----------|--------------------------------------|-----------|----------|------|
| 19 | Combined with 18, serve same purpose, need for flow and water quality data in upstream portion. | | | | Fauquier County, Rappahannock County | | | |
| 20 | Point 11, at bottom of carter run watershed can provide water quality data for the entire watershed before confluence with Rappahannock. | | | | Fauquier County | | | |
| 21 | Combined with 4 for water quality data. | | | | Culpeper County, Fauquier County | | | |
| 22 | No current impairments on Great Run tributary. | | | | Fauquier County | | | |
| 23 | 2.5 miles upstream of Rappahannock River at Remington USGS gauge with recommendations, also less than 10 mi from Hazel River at Rixeyville USGS gauge. | | | | Culpeper County, Fauquier County | | | |
| 24 | Combined with 14, rain gauge recommendation. | | | | Culpeper County, Fauquier County | | | |
| 25 | Water quality recommended on Marsh Run closer to confluence. | | | | Fauquier County | | | |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdic | Exist_Mon | Exist_SG | ALT3 |
|----|---|------|------|---------------------------|-----------------|-----------|----------|-----------------|
| 26 | Small tributaries, although impairment on Craig Run, feeds into Marsh Run where there is water quality recommendation further downstream. | | | | Fauquier County | | | |
| 27 | Water quality recommended at point 28, further downstream on Marsh Run. | | | | Fauquier County | | | |
| 28 | | | | E-coli, DO | Fauquier County | | | Fauquier County |
| 29 | No impairment on Harpers Run, feeds into Marsh Run. | | | | Fauquier County | | | |
| 30 | Impairment downstream of this location on Browns Run, feeds into Marsh Run. | | | | Fauquier County | | | |
| 31 | | | | E-coli | Fauquier County | | | Fauquier County |
| 32 | No impairment on tributary Rock Run. | | | None Identified | Fauquier County | | | Fauquier County |
| 33 | | | | | Culpeper County | | | |
| 34 | New Rain Gauge, Move to Hazel River at Rixeyville Stream Gauge. | YES | YES | E-coli, Water Temperature | Culpeper County | YES | USGS | Culpeper County |
| 35 | Combined with 34, Thorton is a tributary of the Hazel River. | | | | Culpeper County | | | |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdicți | Exist_Mon | Exist_SG | ALT3 |
|----|---|------|------|---|--|-----------|----------|---|
| 36 | Combined with 34, Rush River is a tributary of the Hazel River. | | | | Rappahannock County | | | |
| 37 | Combined with 28, Browns Run is a tributary of Marsh Run. | | | | Fauquier County | | | |
| 38 | Move to existing stream gauge at City of Fredericksburg | YES | YES | TN, TP, TSS, Benthic-Macro invertebrate Bioassessments, E-coli, PCB in Fish Tissue, pH, Mercury in Fish Tissue, DO, Water Temperature, Fecal Coliform | City of Fredericksburg, Spotsylvania County, Stafford County | YES | USGS | Culpeper County, Fauquier County, City of Fredericksburg, Orange County, Stafford County, Spotsylvania County |
| 39 | Combined with 40, bottom of Moutain Run (Culpepper) | | | | Orange County | | | |
| 40 | | | | E-coli | Orange County | | | Orange County |
| 41 | | YES | YES | TN, TP, TSS, Benthic-Macro invertebrate Bioassessments | Greene County, Madison County | YES | USGS | Green County, Madison County, Orange County |
| 42 | | | | E-coli | Madison County | | | Madison County |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdiction | Exist_Mon | Exist_SG | ALT3 |
|----|--|------|------|--|--------------------------------------|-----------|----------|----------------------------------|
| 43 | Tributary of the Rapidan with no impaired sections. | | | E-coli | Madison County | | | Madison County |
| 44 | Combined with 34, Hughes River is tributary of Hazel River. | | | | Culpeper County, Rappahannock County | | | |
| 45 | | | | None Identified | Culpeper County, Orange County | | | Orange County |
| 46 | | | | | Rappahannock County | | | |
| 47 | Combined with 46, for rain predictions for Thorton River. | | | | Rappahannock County | | | |
| 48 | | | | E-coli, PCB in Fish Tissue | Stafford County | | | Stafford County |
| 49 | Falls run watershed currently no impaired stream segments. | | | None Identified | Stafford County | | | Stafford County |
| 50 | England run watershed currently no impaired stream segments. | | | None Identified | Stafford County | | | Stafford County |
| 51 | | | | None Identified | Spotsylvania County, Stafford County | | | Stafford County |
| 52 | | YES | | TN, TP, TSS, E-coli, Benthic-Macroinvertebrate Bioassessments, Water Temperature, DO, PCB in Fish Tissue | Culpeper County, Fauquier County | | PROPOSED | Culpeper County, Fauquier County |

| Id | C_R_Explan | ALT1 | ALT2 | Pollutant | Jurisdic | Exist_Mon | Exist_SG | ALT3 |
|----|--|------|------|-----------|------------------------------------|-----------|----------|------|
| 53 | Combined with 6, for rain predictions in the area. | | | | Spotsylvania County | | | |
| 54 | Combine with water quality request, Move to existing stream gauge at City of Fredericksburg. | | | | Spotsylvania County | | | |
| 55 | | | | | Spotsylvania County | | | |
| 56 | | | | | Spotsylvania County | | | |
| 57 | | | | | Louisa County, Spotsylvania County | | | |