Gannett Fleming

DATE: August 8, 2008

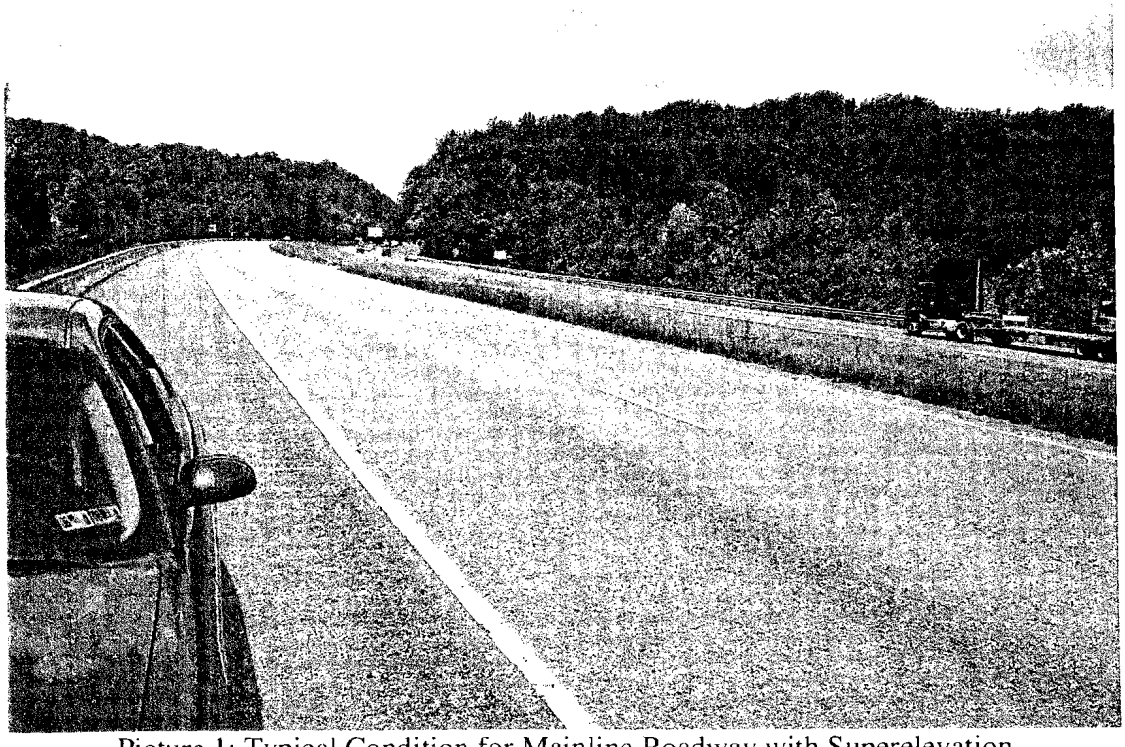
TO:

FROM:

RE: Spill Containment Analysis

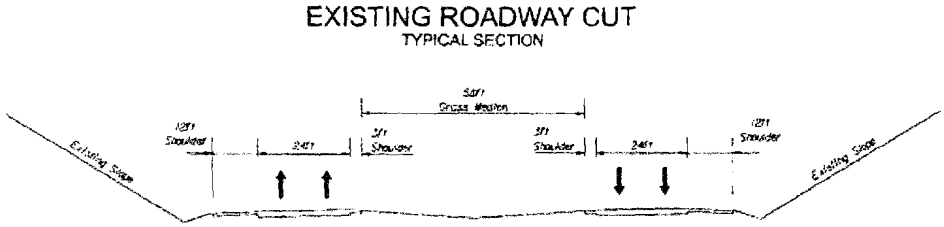
OVERVIEW AND EXISTING CONDITIONS

As a part of this project, Gannett Fleming has been tasked with developing and analyzing alternatives for hazardous materials spill containment along the Interstate-64 corridor with regards to the Ragged Mountain Reservoir. The length of the I-64 corridor in which the drainage pattern outfall leads into the Ragged Mountain Reservoir is approximately 1.07 miles. This section of the I-64 corridor (Pic. 1) is composed of a 4-lane highway (2 lanes in each direction) separated by a grass median.

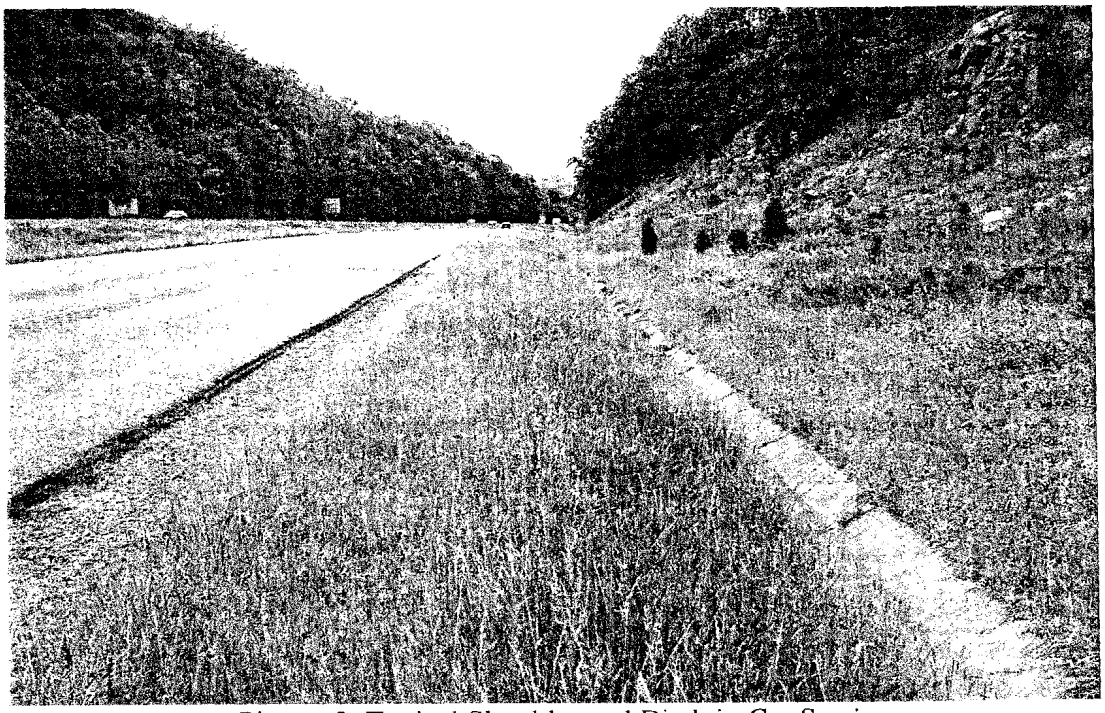


Picture 1: Typical Condition for Mainline Roadway with Superelevation

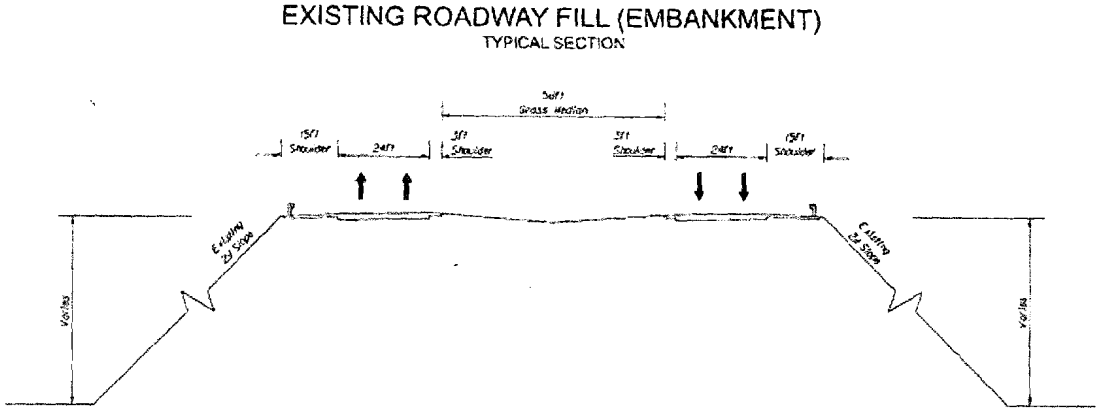
Both directions of travel lanes have a 3' paved inside shoulder and an approximate 12' paved outside shoulder (See Ex. 1 & Pic. 2). In areas of steep embankment, guardrail borders the outside paved shoulders. A graded shoulder extends behind the guardrail approximately 2' feet in these areas. Existing embankment side slopes are 2:1 throughout the entire corridor leading to the Ragged Mountain Reservoir (See Ex. 2 & Pic. 3).



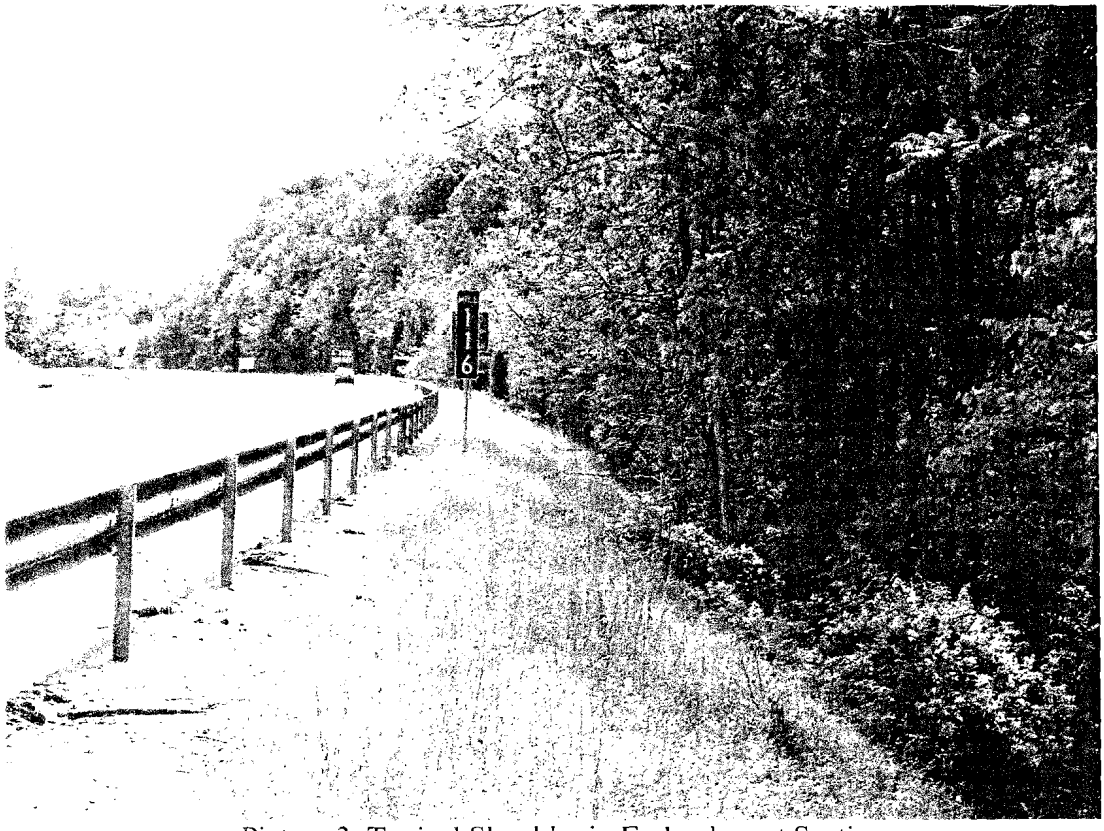
Ex. 1



Picture 2: Typical Shoulder and Ditch in Cut Section



Ex. 2



Picture 3: Typical Shoulder in Embankment Section

The entire 1.07-mile section of the I-64 corridor runs up a positive profile grade westbound and is in superelevation banking to the right in the westbound direction.

ALTERNATIVES

Four alternatives will be addressed in response for the need to contain hazardous materials spills within the project limits and are as follows:

1. No change ("do nothing")
2. Roadside Lagoons
3. Capture and Divert to Adjacent Watershed
4. Hazardous Material Response Team

Alternative 1 – No Change

The first alternative developed and analyzed was the "do nothing" alternative. In this alternative no improvements to the existing roadway or drainage system would be done. In compiling data from 2006, Gannett Fleming has determined that the possibility of an accident resulting in a hazardous materials spill occurring on I-64 along the lane-miles within the watershed that outfall into the Ragged Mountain Reservoir would be approximately 1 in 24.85 million. Table 1.1 includes a summary of data used in developing this probability.

DATA TITLE	VALUE	SOURCE
Total Number of Recorded Traffic Accidents Involving Hazardous Materials Within The State of Virginia (2006)	178	United States Department of Transportation
Total Number of Recorded Traffic Accidents Within The State of Virginia (2006)	151,692	Virginia Department of Motor Vehicles
Lane Miles Within The Project Limits (2006)	4.28	Gannett Fleming, Inc.
Lane Miles Maintained By The Virginia Department of Transportation (VDOT) (2006)	124,811.25	Virginia Department of Transportation

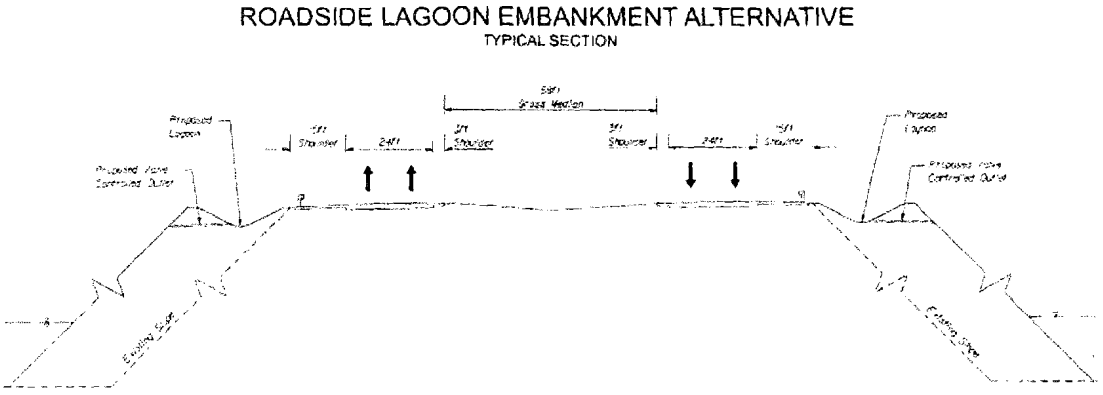
Table 1.1 Data Associated With Risk of Hazardous Materials Spill

This simplified probability was generated using the data above and the assumption that the likelihood of a traffic accident leading to a hazardous material spill was equal over every lane mile of VDOT maintained roadway within the state of Virginia. This low probability of an accident resulting in a hazardous materials spill within the Ragged Mountain Reservoir's watershed could be used as justification that no I-64 roadway or drainage improvements are necessary.

Alternative 2 – Roadside Lagoons

The next alternative examined in this study is the implementation of impermeable lined lagoons alongside the embankments located along the I-64 corridor throughout the reservoir's watershed. These lagoons would serve as temporary storage for any hazardous materials spills released onto the roadway throughout the I-64 corridor. The spilled materials would be intercepted in the lagoons and held there until a hazmat

response team could arrive on the scene and perform their cleanup. These lagoons would be designed to accommodate the runoff generated by a 10-year storm in addition to a fully loaded tanker truck. The lagoons would be discharged through a valve controlled outlet leading into the reservoir. In a normal operating condition these valves would remain open allowing any pooled runoff from rainstorms to be discharged to the reservoir. Upon a hazardous materials spill, these valves would need to be shut off thereby containing all runoff and spilled materials inside the lagoons until appropriate personnel arrive on the scene to handle the situation. The lagoons would need to be constructed up beside the roadway in order to provide adequate containment (See Ex. 3).



Ex. 3

The existing embankment side slopes present a challenge for constructing lagoons. The embankments range up to 150' in height from the roadway surface to the floor of the reservoir. Construction of the lagoons down the slopes of the embankment would not provide adequate containment of a spill due to the possibility of infiltration of the hazardous materials into the ground before reaching the lagoon. This need for the lagoons to be constructed alongside the roadway incurs significant cost and diminishes capacity of the reservoir due to the amount of fill material required for construction.

Picture 4: Typical Condition on Embankment Side Slope.

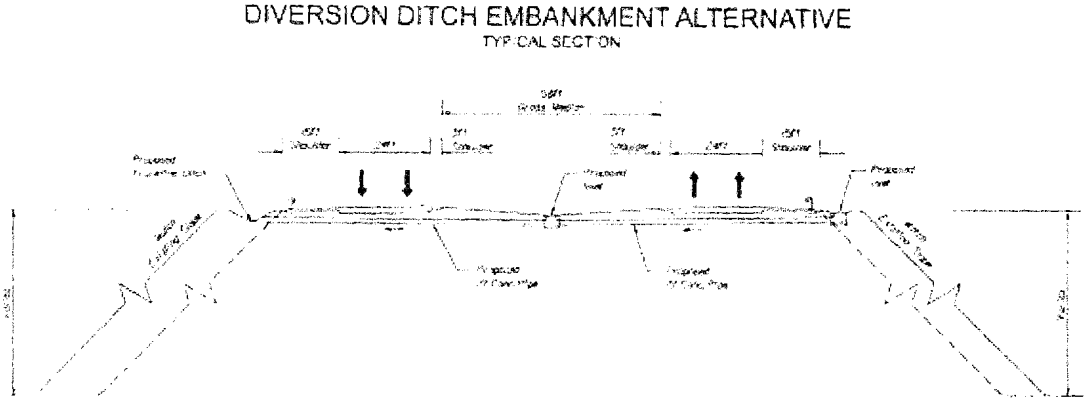
Alternative 3 – Divert Hazmat Spill to Adjacent Watershed

Another alternative examined in this study is the modification of the existing drainage infrastructure to divert runoff and spilled materials into an adjacent watershed. This alternative, similar to the construction of lagoons alternative, involves construction along the embankments throughout the I-64 corridor. In this alternative, roadside ditches will be constructed alongside the embankments and connected to the existing ditches with the purpose of capturing flow of spilled materials before they can enter the reservoir. This captured runoff will travel down the newly constructed roadside ditches and the existing ditches where it will be directed into the adjacent watershed and discharged on the slopes. Hazmat teams would then be dispersed to clean up the spill in that adjacent watershed, thereby avoiding contamination of the reservoir.

The existing median was examined as a possible means of transporting the runoff down to the adjacent watershed, but due to the superelevation of the road and shallowness of the median throughout this section it was deemed unusable because of its inability to handle the design capacity.

The existing shoulders in the embankment sections also were deemed unusable in their current condition in regards to constructing ditches with enough capacity to handle the design flows. This makes it necessary to construct the ditches using fill material alongside the existing shoulders which will affect the capacity of the reservoir. The ditch constructed along the westbound lanes will serve as the trunkline of the modified drainage system and be responsible for carrying all of the runoff and possible spilled contaminants collected from the other branches of the system down to the adjacent watershed.

Runoff from the ditch along the east bound lanes will be collected through a series of drop inlets and carried through 15" concrete pipes to another set of drop inlets located in the existing median. The total runoff from both the existing median and the eastbound ditch will then be directed through another series of 15" concrete pipes outfalling in the westbound ditch. The concept for collecting a spill and directing it to the westbound ditch is depicted below in Ex. 4. A plan and a profile were prepared to show the westbound ditch that conveys the spill to the adjacent watershed. The plan and profile are provided as Attachment 1 and Attachment 2.



Ex. 4

The ditches will be covered with an impermeable liner in order to prevent hazardous materials from infiltrating the ground until removed from the reservoir's watershed. The cost of this alternative would be approximately $1,500,000 and is largely due to the amount of fill material needed to construct the ditches alongside the steep embankments.

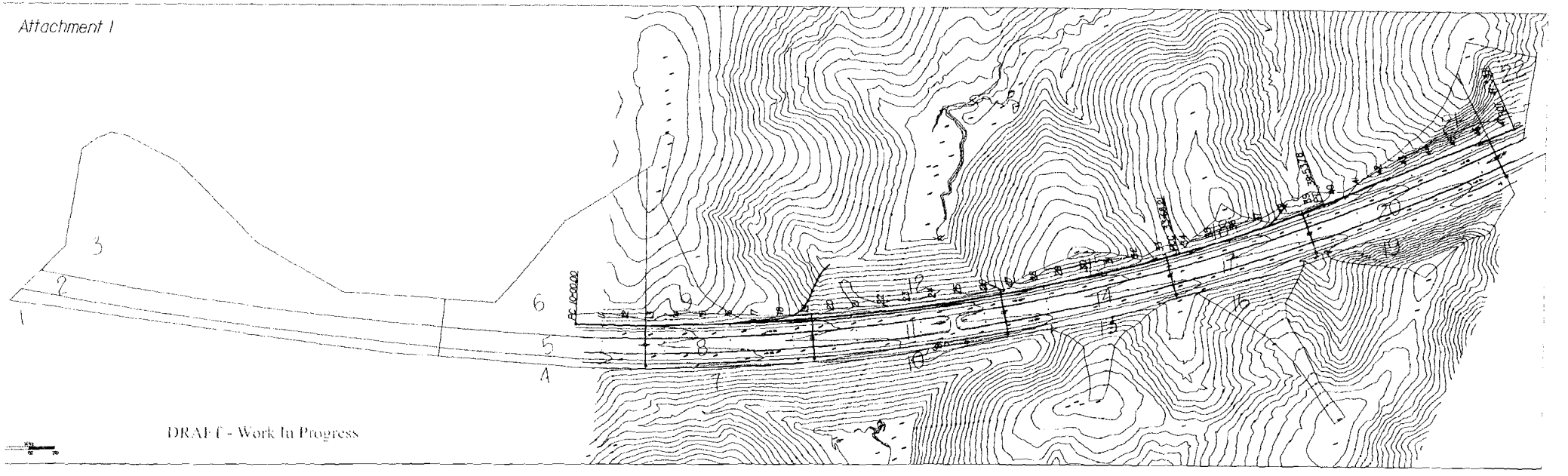
Alternative 4 – Hazmat Response Team

An alternative we were also asked to look into was the assembly of a local hazmat team. This alternative places a hazmat team close enough in proximity to the reservoir, that upon the occurrence of a spill, they are able to be dispatched and on the scene within enough time to prevent major contamination of the reservoir. Currently the closest hazmat teams in proximity to the Rivanna Reservoir are located in Richmond and Harrisonburg, Virginia. Each of these locations requires at least 1-hour of travel time from their departure before arriving at the reservoir. This 1-hour of travel time would be required in addition to any time needed for preparation and assembly of the team upon receiving notification of the spill. This alternative might not totally prevent a spill from entering the reservoir unless used in combination with some other preventative measure. The goal would be to minimize the contamination by having appropriate personnel arrive at the scene and begin the cleanup in a timely manner. The Ragged Mountain reservoir would have to be isolated from the rest of the water system to allow for cleanup while the other sources are still on line.

Conclusion

In summary, the narrow existing shoulders, shallow existing median and steep embankments along the I-64 corridor make constructing runoff/spill material storage or diversion alternatives a costly endeavor. The "do nothing" alternative or the local hazmat team alternative might be more reasonable if isolating the Ragged Mountain reservoir for clean up is feasible.

Attachment 1



DRAFT - Work In Progress

Attachment 2