VULNERABLE SITES TO POTENTIAL HAZARDOUS MATERIAL SPILLS IN THE DOG RIVER WATERSHED

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Hazardous materials are transported through residential and business areas every day. The constant threat of a technological disaster that results in a contaminated watershed is one that probably goes unnoticed, and maybe is not even realized. The research that was conducted was aimed towards revealing and analyzing the most vulnerable points along hazardous material transport routes through Mobile that could potentially cause waterway contamination in the event of a technological disaster, or “spill.” The importance of revealing the vulnerable points is high. The health and purity of not only the immediate rivers and streams but also any connecting rivers, bays, or possibly the Gulf of Mexico rely on clean waters feeding into them. The analytical data from ArcMaps and the in person study of the landscapes, presents solid evidence and information to aid in the community’s decision to push for stronger emphasis on transportation spills and their prevention, emergency reaction, and cleanup.

Keywords: spill, hazardous materials, transportation, contamination, water.

Introduction

The transportation of hazardous materials being concentrated on major roads and railroads that cross over or are in close proximity to exposed water avenues demonstrates high potential for severe water contamination in the event of a technological disaster (Zimmerman, 1985). The health of the Dog River Watershed and connected bodies of water rely on the protection of these avenues. Information from the research and analysis this investigation will bring can assist in the proper preventative actions be taken to secure the purity of our local waterways.

Hazardous materials are defined as goods possessing qualities such as stated by the United Nations in their classification; “These hazardous materials are mainly flammable and/or toxic liquids and liquefied gases, reactive chemicals and explosives” (P.A. Davies, F.P. Lees, 1992). Take into consideration the events that have recently
occurred along our own Gulf Coast, “More than 3000 residents of Lafayette (Louisiana), USA were evacuated on May 17, 2008, when a BNSF train derailed, spilling 10,000 gallons of hydrochloric acid from two of the six derailed cars” (Manish, 2011). In this instance displayed below, Figure 1, 10,000 gallons of hydrochloric acid, a compound that if ingested can cause severe or fatal burns to human tissue, is spilled from a derailed train. The sheer number of hazardous material shipments that travel on US roads or railways is a surprising amount. “There are 800,000 daily shipments of hazardous materials (hazmat) in the United States, of which 96% are carried by trucks” (Manish, 2011).

![Figure 1- Emergency response workers are placing lime on the hydrochloric acid spill in L.A.](http://blog.nola.com/news_impact/2008-05/large_18train.JPG)

**Research Questions**

Where are the most vulnerable points in the transportation routes of hazardous materials through the Dog River Watershed? Do railroads or interstate transportation routes pose the largest risk?
Methods

I performed landscape analysis, utilizing the Arcmaps software to investigate the structure of the vulnerable points. A GIS approach provides risk assessment for road and rail transport of hazardous materials (Bubbico et al., 2004). In Arcmaps I used these data layers: major roads, railroads, city limits, stream centerline, and water bodies. Layers were provided by the City of Mobile website. To determine which locations were the most at-risk I began by intersecting the layers city limits and stream centerlines so that I would only be dealing with streams inside the city limits. Next, I added a 1,000-foot buffer around the major roads and railroads so that I would be able to pinpoint which streams or ditches flowed in close proximity to one of the major transport routes. When performed, over 25 at risk locations were identified. I narrowed this number down by analyzing the landscape visible by aerial photos to six specific spots that I analyzed in person as shown in Map 1. Locations that were selected were most at-risk because of their close proximity to the transport routes, with most of them crossing over the streams.

Following the Arcmaps analysis I visited the locations to evaluate the conditions of the environment to a further extent, scoring them on a three point severity scale; 1 being the least severe and 3 being the most severe. Location 1 is just north of Dauphin Street where it crosses I-65, Eslava Creek runs right up to and under the interstate. (Coordinates for Location 1 are 30° 41’ 39.9” N and 88° 07’ 28.6” W) Location 2 is in the midtown suburban area of Mobile that drains into Eslava Creek. This location has a very large ditch running along and under a railroad. (Coordinates for Location 2 are 30° 40’ 46.5” N and 88° 05’ 34” W) Location 3 is where the parking lot for Hank Aaron Stadium along I-65 drains into Bolton Branch and Eslava Creek that passes directly under
the interstate. (Coordinates for location 3 are 30° 38’ 37.2” N and 88° 07’ 06.9” W)

Location 4 is along I-10, west of the I-10/I-65 crossing where I-10 crosses over Moore Creek and the Montlimar Canal. (Coordinates for location 4 are 30° 37’ 23” N and 88° 7’ 42” W.) Locations 5 and 6 were just east of the I-10/I-65 crossing and it was where both the railroad and I-10 crossed over Eslava Creek. (Coordinates for location 2 are 30° 38’ 14” N and 88° 5’ 34” W.)

Map 1- Locations 1 through 6 in the northeast portion of the Dog River Watershed that were analyzed and recorded

**Results**

All locations analyzed were points at which transport routes and water bodies crossed over or under the other. Data collected is shown in Table 1 below. At location 1 the water ran under the transport route, it was very exposed with landscape sloping
towards the ditch opening. At location 2 the water ran alongside and under the railroad. The railroad was passing, on raised ground, through a midtown suburban area which is densely populated and would be difficult to lock down and secure in a hazardous material spill situation. At location 3 the water ran under I-65 and is open to any contaminate spills that drain off the steep slope from the interstate above. At location 4, I observed that I-10 directly passes over the stream via bridges. The only obstruction to a spill flowing into the stream is the concrete siding to the bridge. The landscape in the area is all sloping down towards the stream from the higher standing roadway. At locations 5 and 6, both the railroad and I-10 cross over Eslava Creek within 125 feet of each other. The interstate has one obstruction to the flow of a spill and that is the concrete walls of the bridge. The railroad however utilizes no structure to act as an obstruction. The large rocks and medium gravel dominate both the interstate and the railroad areas as they slope towards the river. The railroad’s surrounding area’s slope quickly increases from steep to almost a drop off at the point of crossing the river. This railroad crosses over the river on a bridge that is 200 feet away from a neighborhood where at least six houses are waterfront property within the 1,000-foot buffer zone. As I was making observations, rail cars carrying chlorine and molten sulfur passed by, as seen in Figure 3.

![Figure 3- Rail cars containing chlorine and molten sulfur](image-url)
Conclusion

Each of the documented weak points presents a vulnerable spot for contaminants to be potentially spilled into the Dog River Watershed. The analysis revealed that there is realistically nothing standing in the way of spill runoff entering the watershed. Anything from hazardous substances to the common cigarette butt can find its way into the rivers and streams. Due to the network of water-bodies, those contaminants could eventually find their way to the bay from any of the bridges and overpasses in our watershed.

Recognition and comprehension of these risks can aid in the implementation of proper
management in an effort to preserve the natural resources our local community enjoys and values.

Though each site proved to be a contamination risk to the Dog River Watershed, sites 2 and 6 were the most at risk. The transportation route that proved to have the most potential to contaminate the watershed was the railroad. Locations 2 and 6 were both railroad transportation as well as located in a suburban setting, both of these factors hurt their emergency response accessibility.

If this study were to be conducted again I would want a data file containing the storm drains and their outlets to be added to the map file as well as obtain permission to access private property for analyzing certain locations. I could not add this storm drain file during this analysis because it is held by the City of Mobile and there is a fee to access this data. While this data is not vital to making a conclusion about contamination through spill by proximity, it would provide a better understanding of where spill substances may end up after they pass through the storm drain systems. To make the conclusion more persuasive, more evidence should be added to the results. Many of the locations found on Arcmaps were on private property and it would be trespassing to have visited them. To make the data collection more complete, the study should be done again if and when permission is granted to visit those spots.

**References Cited**


United States Environmental Protection Agency. *Getting up to Speed, Ground Water Contamination*. (1-10).