Storm Water Modeling Tool for Navy Facilities

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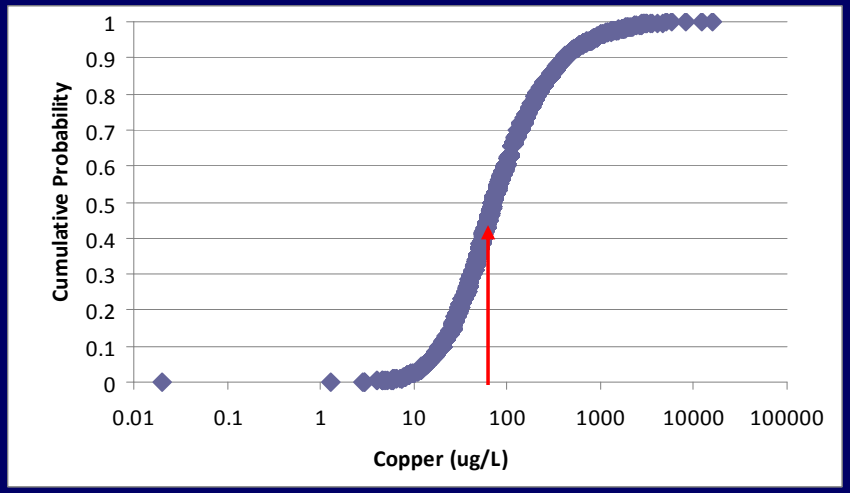
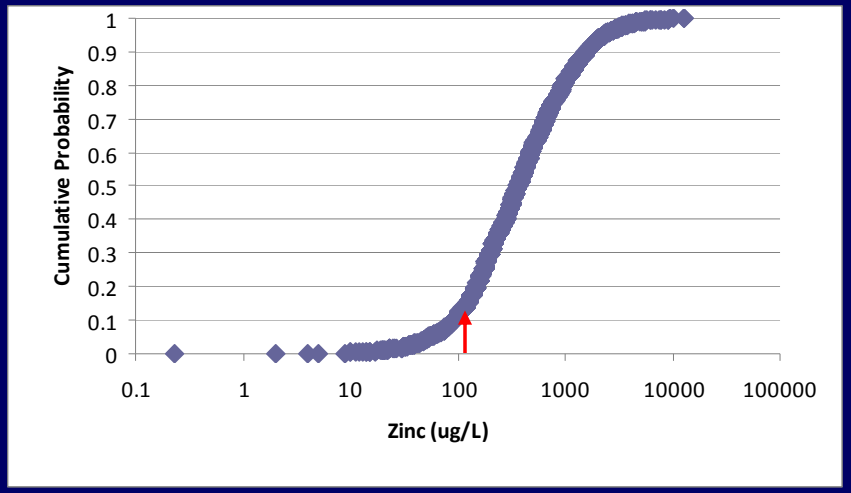
Background

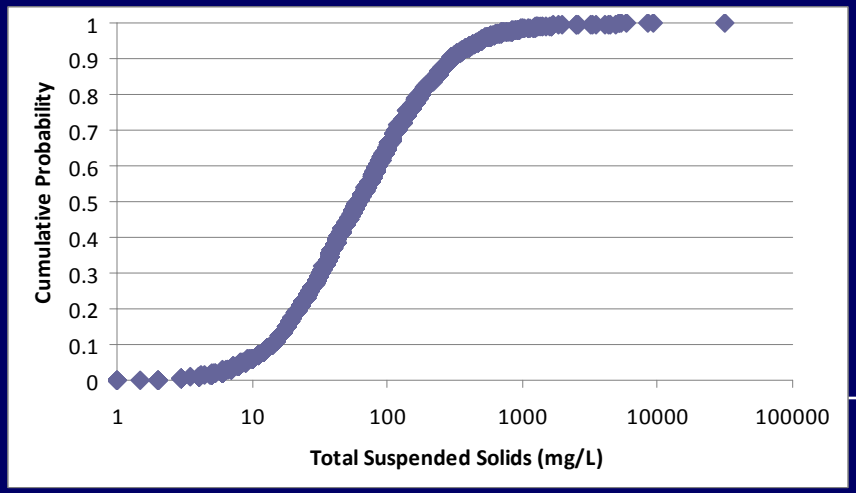
- Navy facilities are typically areas of high imperviousness, condensed industrial operations, and high vehicular traffic
- Navy industrial storm water commonly exceeds end-of-pipe concentration benchmarks for copper and zinc (63.6 and 117 ppb, respectively)
- End-of-pipe storm water toxicity was found to be primarily a result of elevated copper and zinc
- Sources of elevated copper and zinc in Navy facility runoff have not yet been identified or quantified

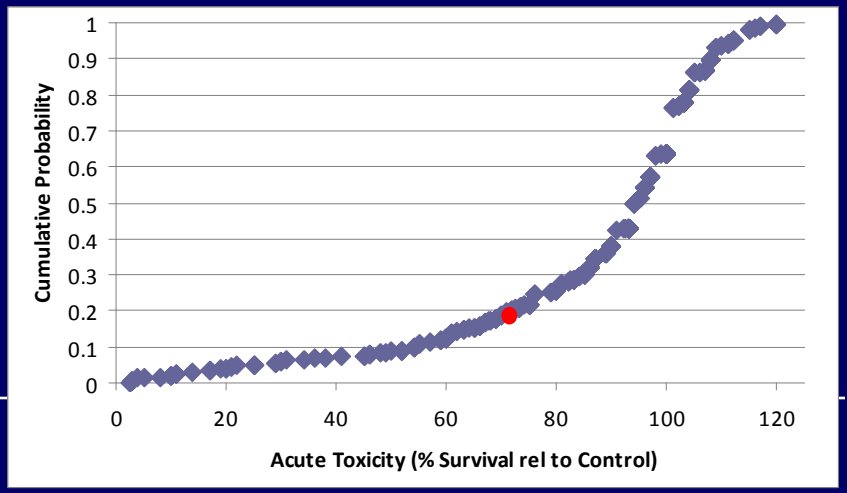
Navy Facilities Characteristics

Storm Water Characteristics









Project Goals

- Identify and quantify potential sources of metals in Navy facility storm water runoff
- Develop a modeling tool that provides facility managers a link between sources, landuses, and storm water concentrations
- Implement the ability to quantify reductions in copper and zinc concentrations as a result of applying Best Management Practices (BMPs)

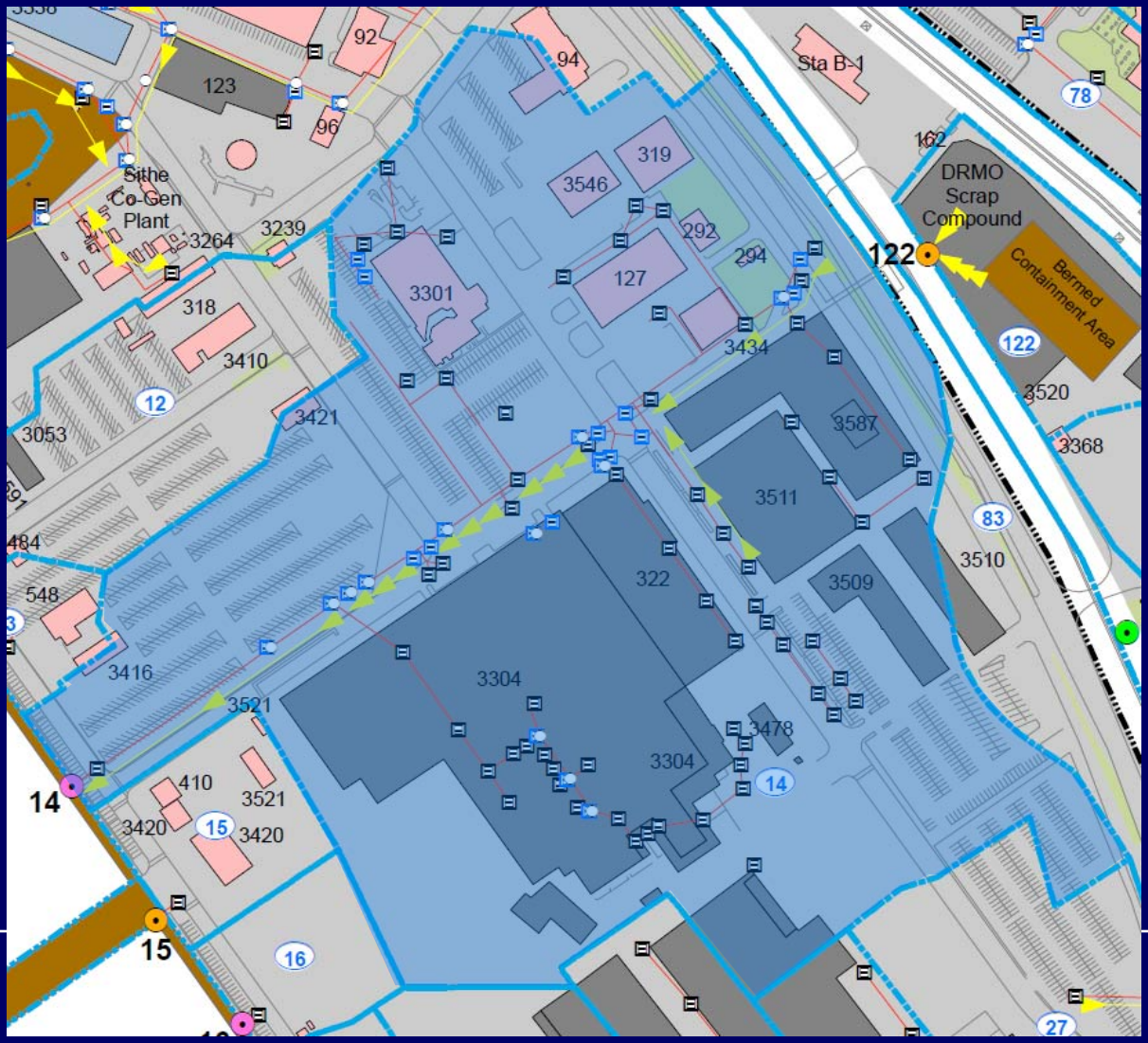
Planned Efforts

- Work with Bob Pitt (PV & Associates) to enhance and validate his Source Loading and Management Model (WinSLAMM) for use at Navy Facilities
  - Conduct intensive site characterization evaluations
  - Identify and quantify source strengths of various landuses
  - Develop Navy facility-specific calibration files for use in WinSLAMM
  - Use WinSLAMM's built-in BMP files for assessing efficacy of implementation for different landuses

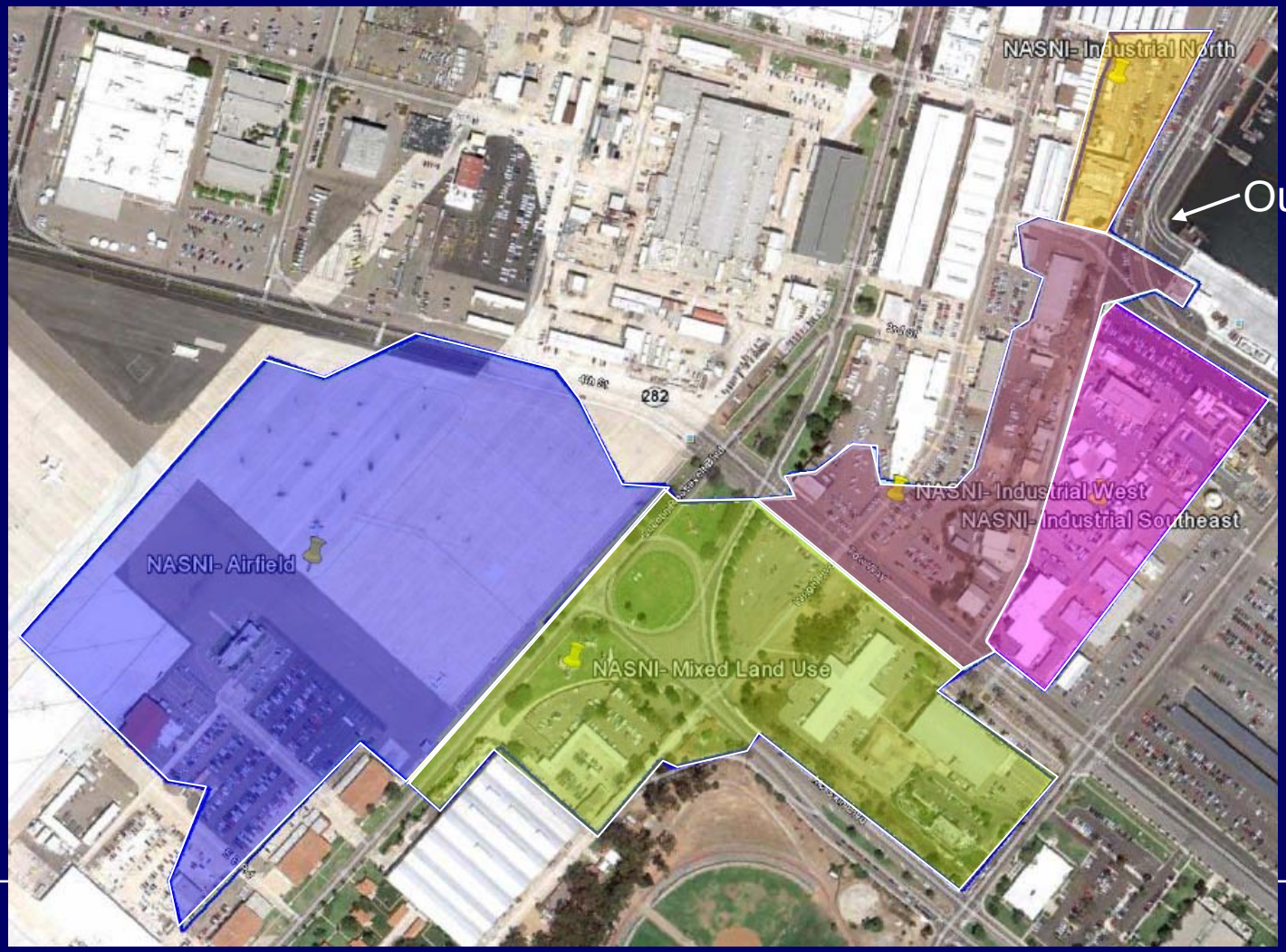
Site Characterization

- Identify drainage boundaries from facility datasets
- Divide drainages into landuse areas to aid in site visit
- Calculate plan-view areas of buildings, streets, parking lots, etc. using Google Maps Tools (http://www.freemaptools.com/area-calculator.htm)
- Perform site visit – inventory materials and characteristics

Drainage Boundaries



Sub-Area Delineations



Area Calculations with Google Maps Tool

Measure an Area

Area Output

2130.738 m²
0.002 km²
0.527 Acres

Site Visit Inventory

- Walk site, measure, and note:
  - Building types (office, industrial, commercial)
  - Building materials, roof slopes, and connectivity
  - Pavement type, slope, wear
  - Differentiate loading docks, parking lots, streets, sidewalks
  - Lay-down areas and type of materials present
  - Activity level (traffic, parking, operations

Examples – pavement surfaces


1306- Loading Dock 4


1288- Loading Dock 6


1296- Bldg 322

Examples – Roof Connectivity

1292- Bldg 3478

1302- Bldg 3301

Examples – Laydown Areas

Example – Operational Activities

Example Characterization Summary

Summary of Aerial Coverage			Percentage of total Area
Land-use	Area		
	Sq. Ft.	Acres	
Asphalt	1278028	29.3	57.7%
Building	735423	16.9	33.2%
Concrete	134870	3.1	6.1%
Pervious Surfaces	46822	1.1	2.1%
Concrete Walkway	9416	0.2	0.4%
Concrete Sidewalk	3449	0.1	0.2%
Brick/Pavers	1982	0.0	0.1%
Secondary Containment	2763	0.1	0.1%
Artificial Turf	364	0.0	0.0%
Totals	2213117	50.8	100.0%

All ground slopes 0-2%

Possible Contaminant Source Materials	Quantity	Unit
Galv. Roof	6736	sq. ft.
Galv. Fence	4834	LF
Galv. Guard Rails	314	LF
Galv. Hand Rails	163	LF
Galv. Turnstile	2	ea
Galv. Light Poles	29	ea
Galv. stop/street pole	19	ea
Galv. Bike Racks	3	ea
Galv. Picnic Tables	1	ea
Galv. Trash Cans	5	ea
Galv. Scaffolding	1	ea
Large Galv. Light	1	ea
Metal Cabinets	4	ea
Scrap Metal Bin	5	ea
Conex Boxes	960	sq. ft.
Dumpsters	17	ea
Roll-off Bins	5	ea

Source Strength Quantitation

- X-Ray Fluorometery Screening**
- Perform leachate testing of common materials
- Use standardized methods to assess
  - Relative leachability vs. runoff “truth”
  - Variability of materials (wear)
  - Leachability over time

** Effort on hold

WinSLAMM Calibration-Validation

- Develop Navy facility-specific calibration files from site characterizations, and source strength and runoff data
- Conduct WinSLAMM modeling calibration datasets
- Validate WinSLAMM with additional drainage area datasets

Planned Timeline

- Jun 2011 – Complete Site Characterizations
- Jul 2011 – Complete leachability studies
- Sep 2011 – Complete model calibration runs
- Jun 2012 – Complete model validation runs
- Sep 2012 – Begin implementation
- Sep 2013 - Complete implementation

Acknowledgments

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Questions?