Monitoring Crude Oil Spill Components with the ORSANCO Organics Detection System

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Ohio River Valley Water Sanitation Commission
Ohio River Basin

Length – 981 miles
Area – 220,000 mi.²
Flow: 46 – 268 KCFS
Stage: 13 – 39 ft
Pop. 25,000,000

Ohio River Basin
Navigation Dams

20 High-lift with locks

>260,000,000 tons annually
Ohio River – Industrialized River

- >600 permitted discharges
- 1350 combined sewage overflows
- Hundreds of tank farms, pipelines and chemical barges

- 33 drinking water intakes
- Provide drinking water to >5,000,000
- 144 industrial intakes
Spill Detection Program, Volatile Organics

ORSANCO ODS Benzene Detections
February 2 - 19, 2003

MCL Benzene, 5 ug/L
Perchloroethylene Detections
January 30 - February 3, 2004

ODS Spill Detection

Conc. PERC, ug/l

MCL 5 ppb

THO 1 ppm
Mid Valley Pipeline Spill

- Break occurred on 1/26/05 at 0100 hrs.
- First reports to local emergency management personnel from citizens reporting strong odor
- Confirmation of problem at daylight from helicopter flyover
- Remote pressure sensor tripped pumps within 10 minutes of break
Event Information

- Initial reports estimate loss at 63,000 gallons
- Quickly updated to 80,000 gallons
- Final estimate was 262,542 gallons released over a four day period
- Estimated 167,454 gallons recovered
Pipeline Characteristics

- 22” diameter
- Longview, TX to Toledo, Ohio
  - 1,000 miles
- Light Louisiana Sweet Crude
- 900 psi
- 195,000 bbls/day
- Break located 50’ from rivers edge
Pipeline Characteristics

- Break caused by erosion of soil around pipeline under stream bed and shore
- Subsidence caused pipe to bend, then break at weld seam
- Took approximately 4 days to secure leak and replace broken section of pipe
Response Actions

- Booming operations contain oil in Kentucky River
- Oil travels 11 miles first day, @ 0.5 mph
- Recovery operations set up at several locations but access to river limited
- Use Lock & Dam 1 for containment and recovery
Response Actions

- Containment of oil successful until flows increase in Kentucky River on 1/30 – 1/31 following a rain event
- Increased debris loads break booms
- Oil escapes to Ohio River 1/31
Ohio River Markland Dam Flow & Velocity
January 26 - February 10

Flow KCFS

Date

Velocity, MPH

Flow KCFS

Date

Velocity, MPH
Threat to Drinking Water Utilities

- No drinking water intakes on Kentucky River downstream of spill site
- Ten drinking water intakes on Ohio River downstream of Kentucky River confluence
- First utility downstream, Louisville, Kentucky, 48 miles, participant in ORSANCO ODS
- Upstream of Ohio River McAlpine dam
Louisville Intakes
Newburgh L&D
Evansville Intake
Paducah Intake
McAlpine L & D
Cannelton L&D
Downstream Sampling

- Louisville Water Co. begins shore-based sampling activities from several locations immediately following release notification.
- Analysis finds BTX compounds in Ohio River ahead of any noticeable sheens.
- First BTX detection 13 miles downstream of confluence, Jan. 27, 1200 hrs. in Ohio River, 7ppb.
  - Booming operations held until 1/31.
Downstream Sampling

- Detections confirm projections based on flow/velocity information
- 0.5 mph for Kentucky River
- 2.7 mph for Ohio River
- Louisville Water ODS detects low levels of BTX for weeks
- Evansville Water detects BTX on 1/31
**BTX PLUME**

- ORM 721: 1/31/2005, 0.2 ppb
- ORM 621: 1/28/05
- ORM 607: Dam
- ORM 557: 1/27/2005, 7 ppb
- ORM 546

**OHIO RIVER**

Intake

1/26/05

Kentucky River

**SURFACE OIL PLUME**

- 2/2/05
- 2/1/05
- 1/31/05

**OHIO RIVER**

Intake

1/26 - 1/30/05

Kentucky River
Kentucky River Crude Spill

- BTX compounds picked up by ODS
  - Louisville, Evansville, Paducah
  - Louisville up to 7 ppb
  - Evansville, < 0.2; Paducah, <0.1
- On-river tracking efforts undertaken with fluorometry, Turner 10-AU
- New, hand held fluorometers purchased for use at utilities, TD 500
Louisville Intakes
Newburgh L&D
Evansville Intake
Paducah Intake
McAlpine L & D
Cannelton L&D

Map showing locations of various water intakes along the Ohio River, including Louisville, Newburgh, Evansville, Paducah, McAlpine, and Cannelton.
Conclusion

- There’s more to oil spills than surface sheens
- The ORSANCO Organics Detection System protects drinking water utilities from known and unknown spills/contaminants
- Coordinated efforts between utilities provide the best source water protection
- ORSANCO spill detection model applicable to any (industrialized) river system
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Questions?