BP Deepwater Horizon Oil Spill: An Industry Perspective

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18 August 2011

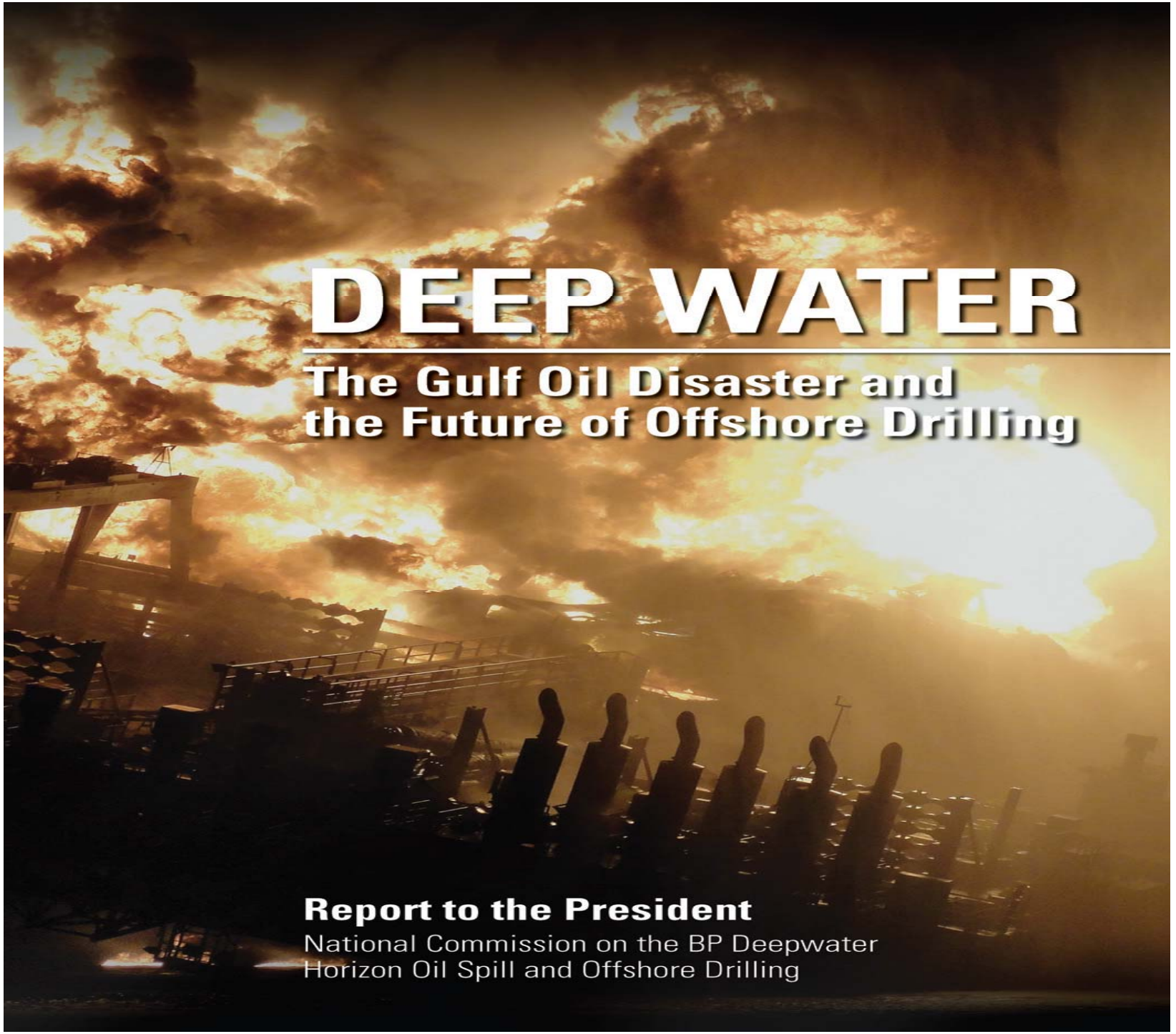
Deepwater Horizon

Introduction to the Spill & the Oil Spill Report

- **Lessons Learned**
  - **Operational Discipline**
  - **Safety Culture**
  - **Value of Measurement/Testing**

Deepwater Technology

Monitoring


DEEP WATER
The Gulf Oil Disaster and the Future of Offshore Drilling
Report to the President
National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling

Deepwater Horizon
in Memoriam - April 20, 2010

Jason Anderson

Aaron Dale Burkeen

Donald Clark

Stephen Curtis

Gordon Jones

Roy Wyatt Kemp

Karl Dale Kleppinger Jr.

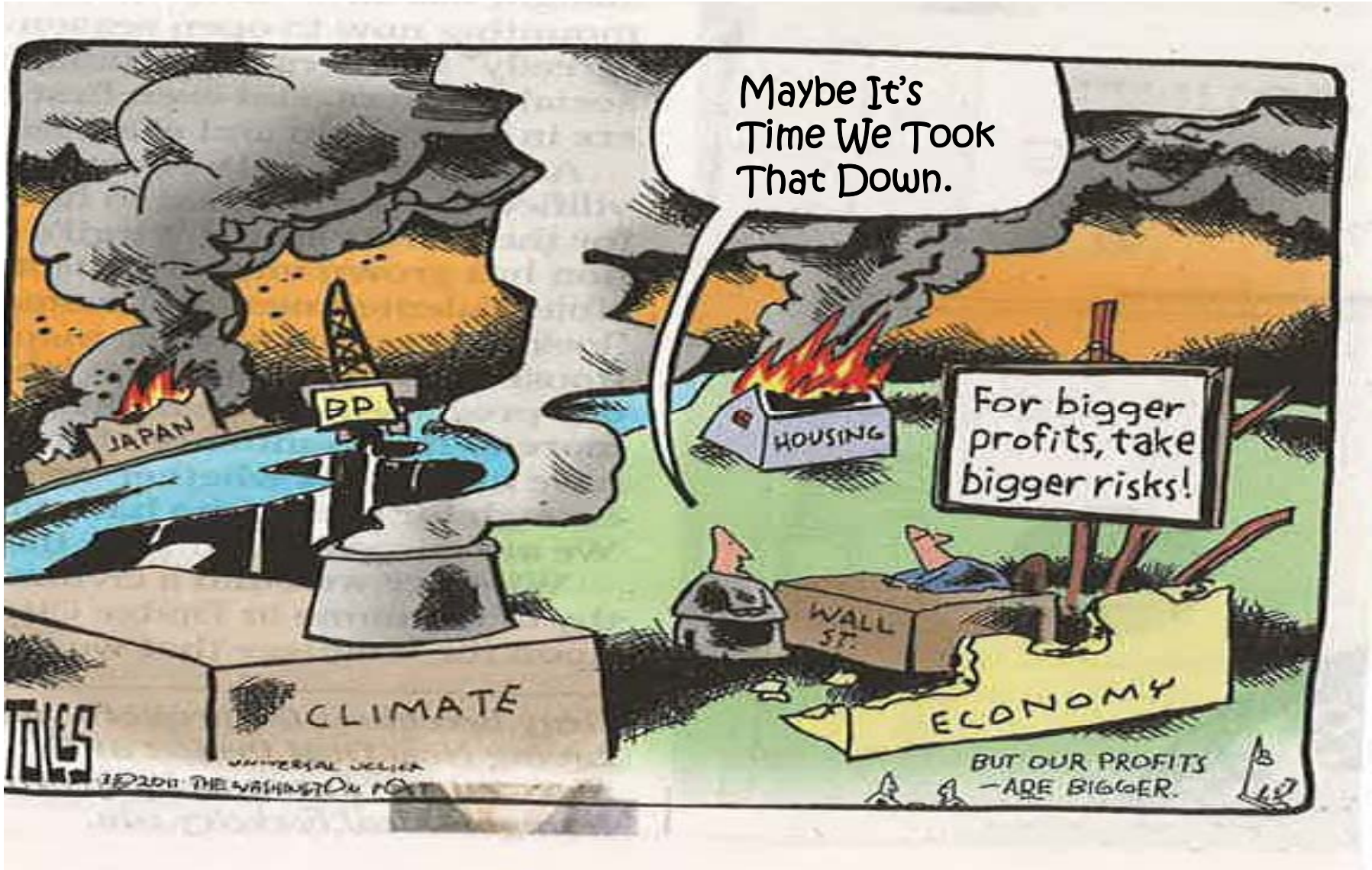
Blair Manual

Dewey Revette

Shane Roshto

Adam Weise

For Bigger Profits Take Bigger Risks



“Safety on the Cheap Invites Disaster”

“The national commission appointed to investigate the giant oil spill in the Gulf of Mexico last April recently concluded that **BP failed to adequately supervise Halliburton Co.'s work on installing the well**.

This was the case even though BP knew Halliburton lacked experience in testing cement to prevent blowouts and hadn't performed adequately before on a similar job. In short: **Neither company bothered to spend the money to ensure adequate testing**.(emphasis add)”

Robert Reich, “**Scrimping on regulators puts public safety at risk”**
– San Francisco Chronicle 3/27/11 F-8

KEY OIL SPILL COMMISSION FINDINGS (6 of 11)

SUMMARY: The Commission found that the *Deepwater Horizon* disaster was foreseeable and preventable. Errors and misjudgments by three major oil drilling companies—BP, Halliburton, and Transocean—played key roles in the disaster. Government regulation was ineffective, and failed to keep pace with technology advancements in offshore drilling.

1. The Macondo well blowout was the product of human error, engineering mistakes, and management failures

2. These errors, mistakes, and management failures were not the product of a single, rogue company, but instead reveal both failures and inadequate safety procedures by three key industry players that have a large presence in offshore oil and gas drilling throughout the world.

3. Government oversight failed to reduce the risks of such a well blowout. .

5. Both industry and government were unprepared to contain a deepwater well blowout.

6. Both industry and government were unprepared to respond to a massive deepwater oil spill, even though such a spill was foreseeable.

7. The environmental damage of the spill to the Gulf will take decades to fully assess. The government estimates that more than 170 million gallons of oil went into the Gulf, with some portion remaining in the ocean and possibly settling to the sea floor.

Source: Press Briefing Packet on Oil Spill Commission Report 1/11/11; Underlining Added

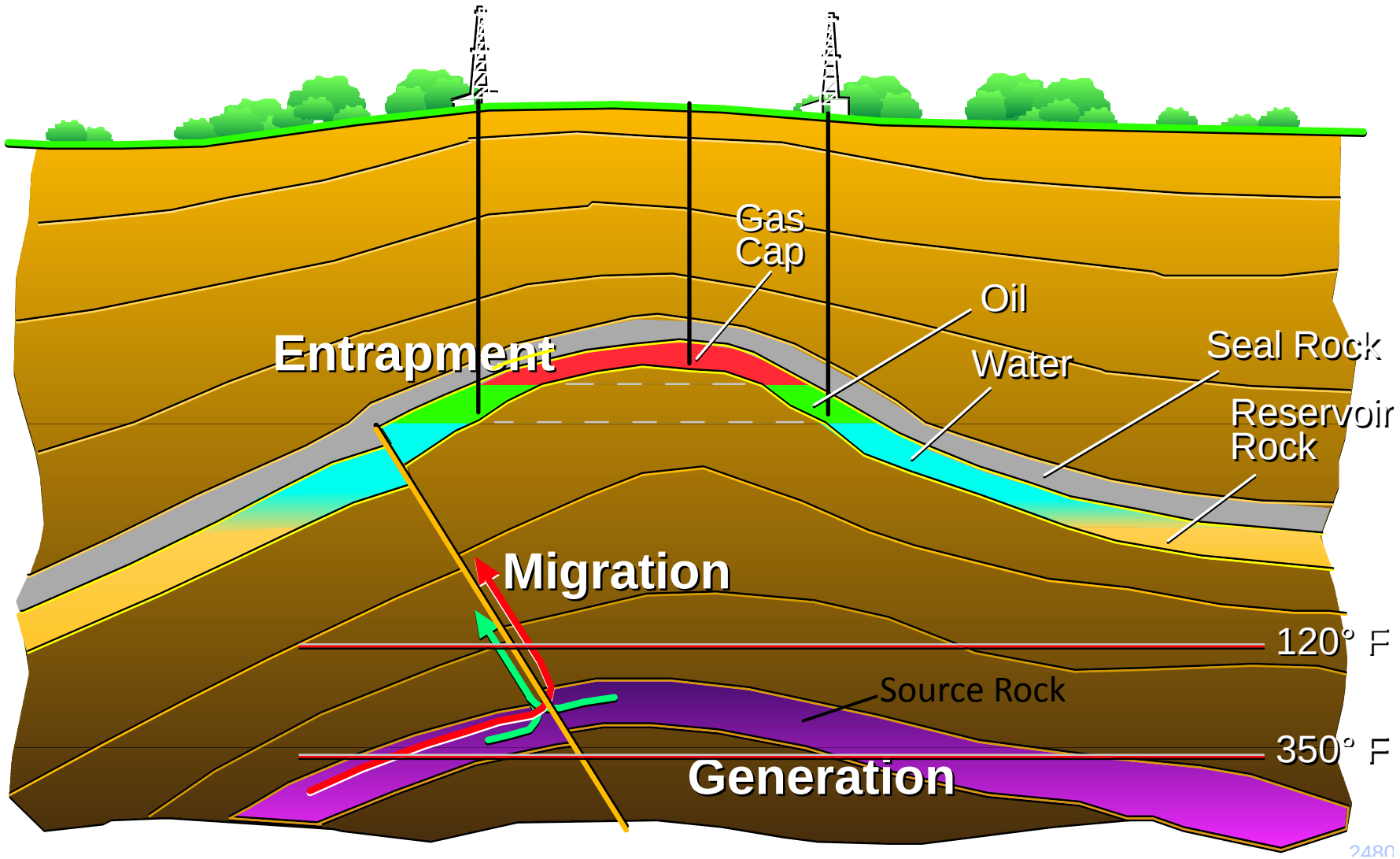
Deepwater Horizon Lessons Learned

- **Safety is not proprietary“(8)**
- **Develop options for guarding against, and mitigating the impact of, oil spills associated with offshore drilling.“(9)**
- **People and Culture - “Not consistent with Normal Industry Practices” – Management Failure Jay Hakes, Director Oil Spill Commission, Tyler Priest, Snr. Policy**
- **Technology – “Same (cleanup) Technology as Valdez with low Efficiency” F.G. Beineke, Member; Terry D. Garcia**
- **Marine Well Containment Co.**

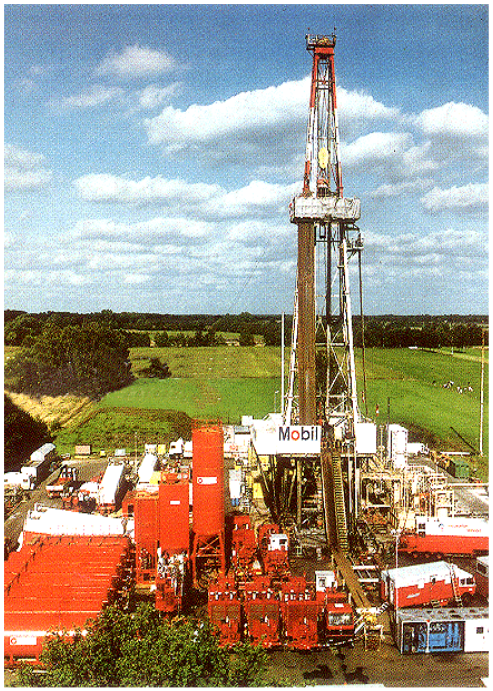
(#) = Chapter # Final Report 01/11/2011

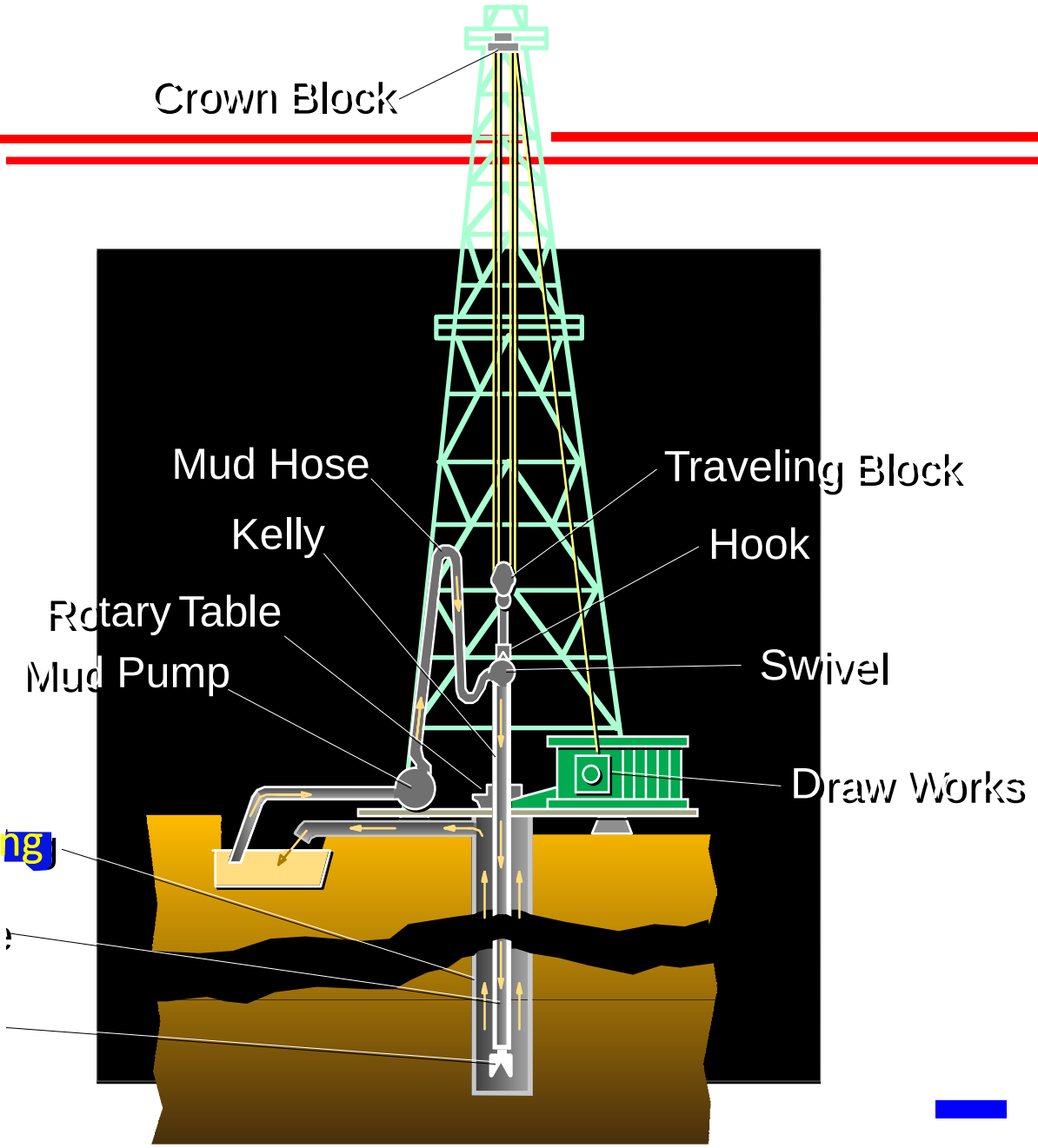
Petroleum System – Elements & Processes

It is ALL or nothing



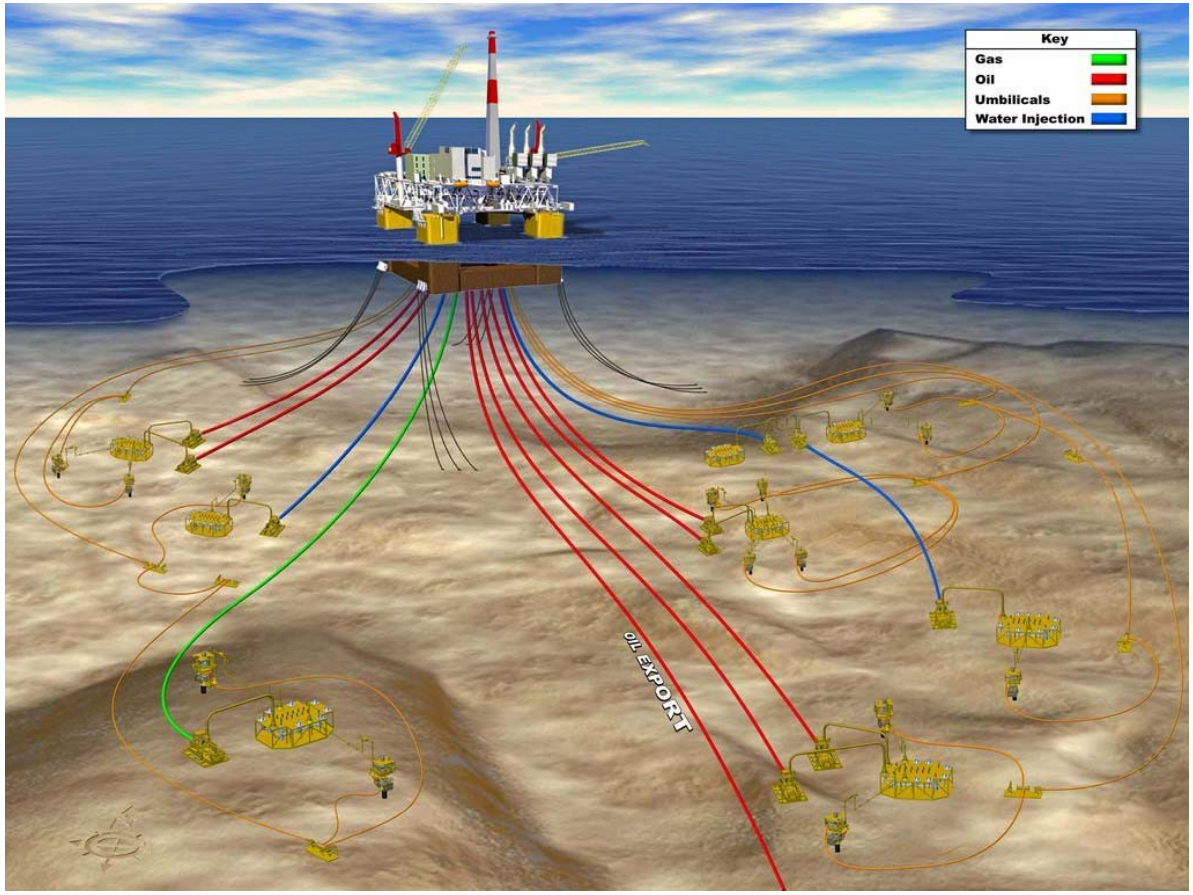
Drilling Rig



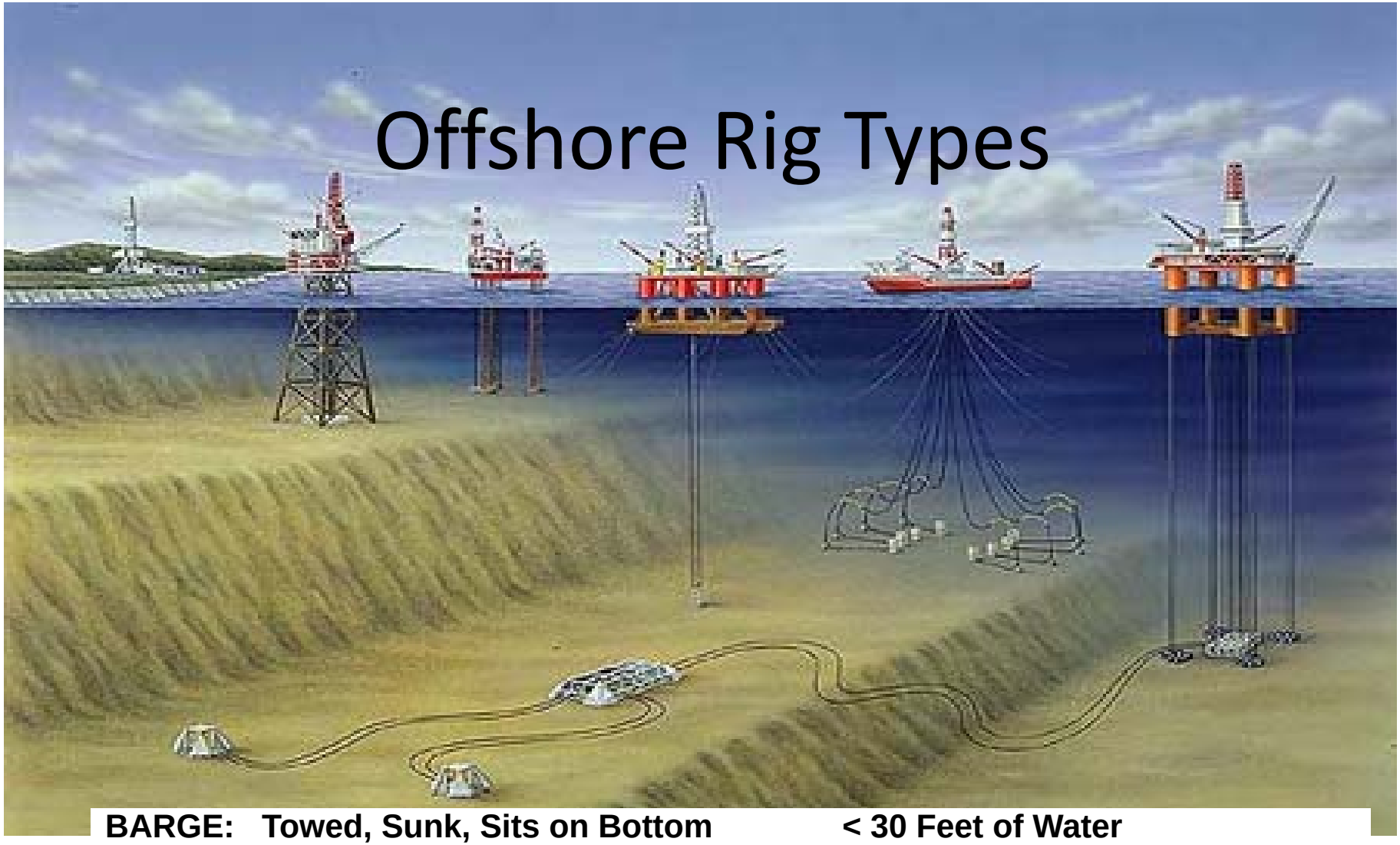


What does
"Weight on Bit" mean?

Typical Deepwater Development



Offshore Rig Types



BARGE:	**Towed, Sunk, Sits on Bottom**	**< 30 Feet of Water**
Jacket:	**1+ Wells, Small/Cantilevered Rig**	**Calm/Shallow**
JACK-UP:	**Towed, Jacked-up,**	**15 to 650 Feet**
SEMI-SUBMERSIBLE	**Anchored over Drill Site**	**4000 Feet**
	Dynamic Positioning	**6500 Feet**
Drill Ships:	**Automatic Positioning**	**10000+ Feet**

Deepwater Horizon - semisubmersible

Key Data

Location
Mississippi Canyon block 252, offshore Louisiana, Gulf of Mexico, USA

Project type
Deepwater Horizon rig

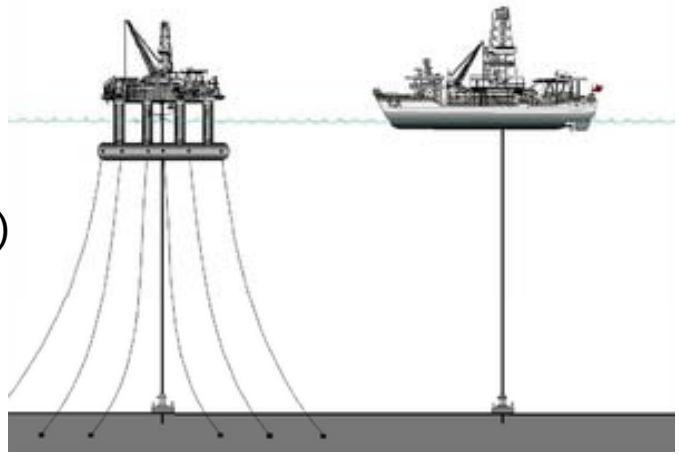
Water depth
5,000ft (approximately)

Name
Deepwater Horizon

Owner
Transocean

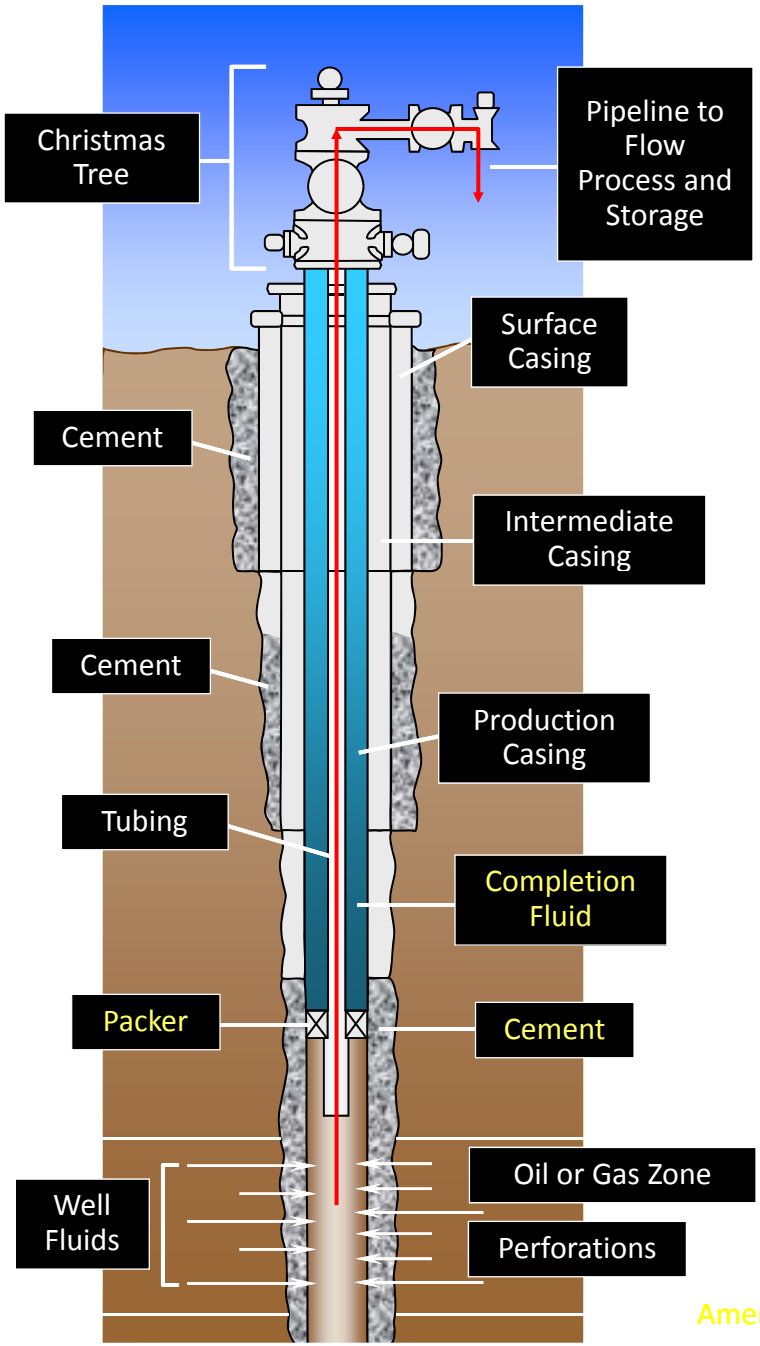
Rig length
396ft

Rig width
256ft



Generation	Water Depth		Dates
First	about 600 ft	200 m	Early 1960s
Second	about 1000 ft	300 m	1969–1974
Third	about 1500 ft	500 m	Early 1980s
Fourth	about 3000 ft	1000 m	1990's
Fifth	about 7500 ft	2500 m	1998–2004
Sixth	about 10000 ft	3000 m	2005–2010

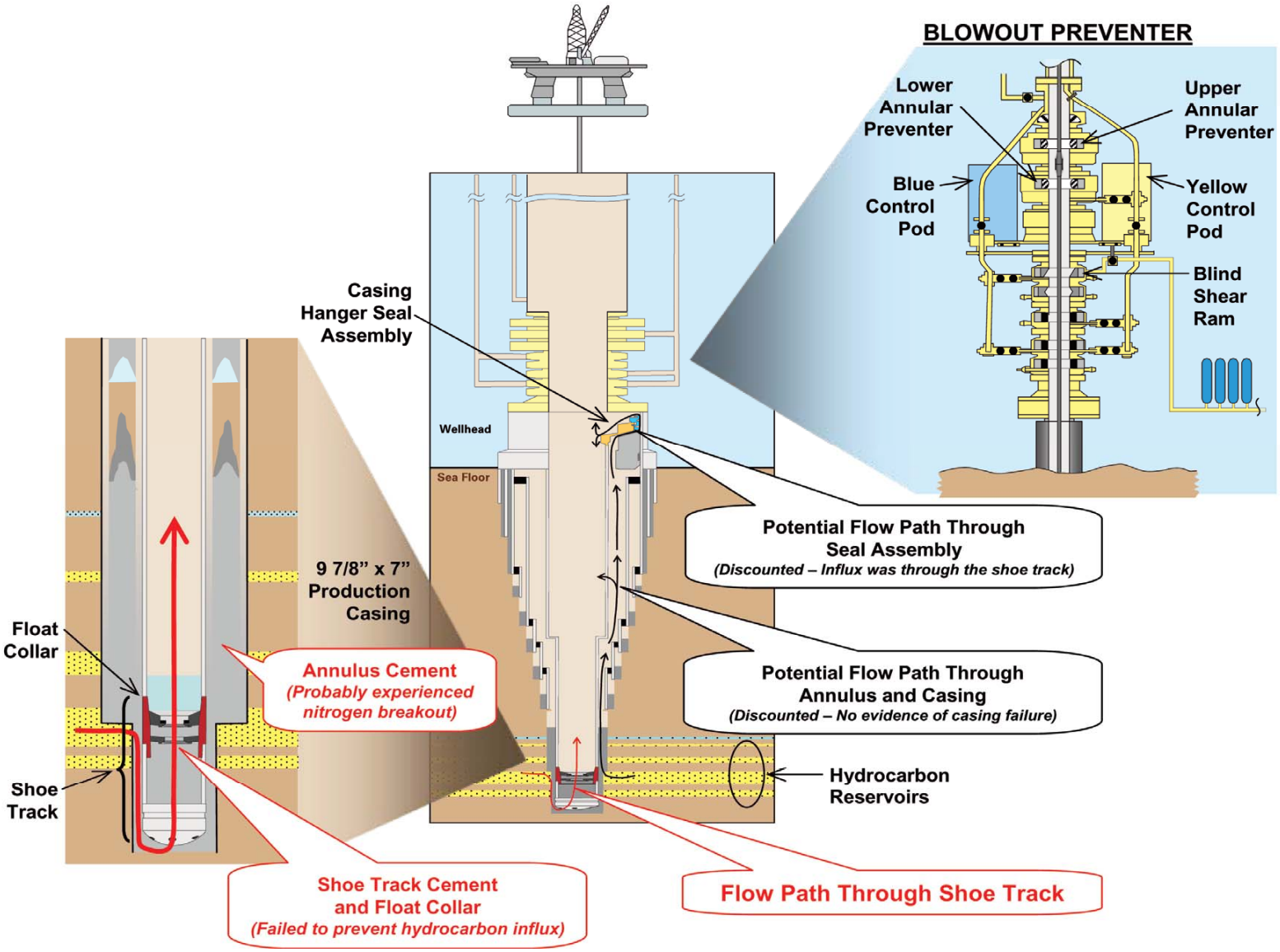
Completed Oil Well



- Water Drive - Hydrostatic pressure pushes oil and gas to surface
- Gas-Cap Drive - Expansion of gas under pressure pushes oil to surface
- Dissolved-Gas Drive - Gas disseminated in oil; usually requires pumping

American Petroleum Institute, 1986

Macondo Well Safety Systems



Typical Costs & Values

Deepwater Drilling Rig	$500,000 per day
Production Well (2-10 wells per project)	$100,000,000 each
Production Platform	$2,000,000,000
Pipeline to Shore	$500,000,000
Crude Oil	$85.00 per 42 gallon barrel
Natural Gas	$6.00 per MCF (million cubic feet)
Reserves per well	2,000,000 – 10,000,000 Bbls per well

Monitoring

“Based on the robust sampling effort, the expert analysis of data …there is no actionable oil in the water or sediments of the deep water or offshore zones. Ongoing removal operations will continue where oil remains in nearshore sediments and shorelines.”

Operational Science Advisory Team Report

17 Dec 2010

Operational Science Advisory Team Report 17 Dec 2010 Key Findings

1. No deposits of liquid-phase MC252 oil were identified in sediments beyond the shoreline.

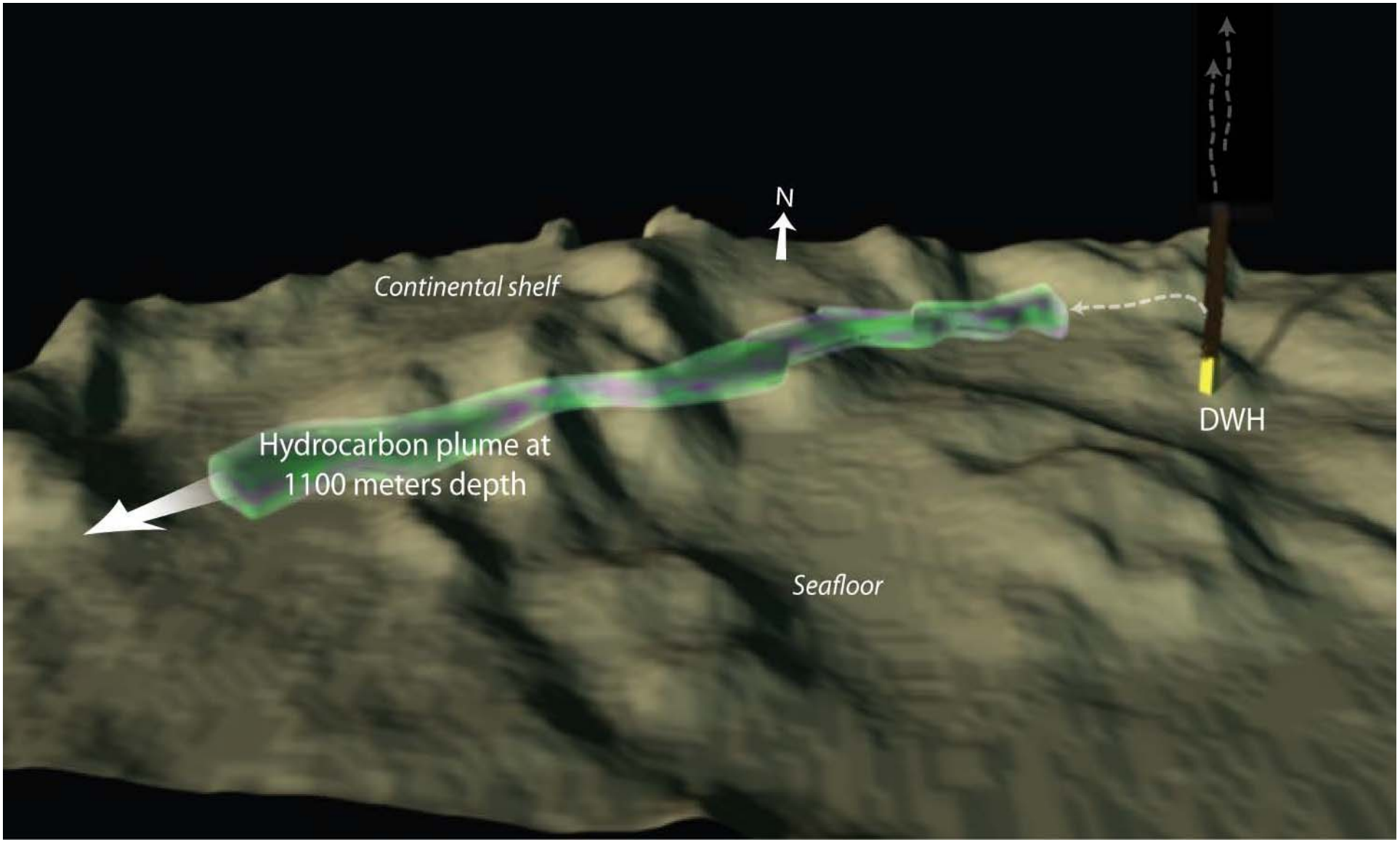
2./3. No exceedances of EPA's Human Health benchmark or EPA's dispersant benchmarks were observed.

4. Since 3 August 2010, <1% of water samples and ~1% of sediment samples exceeded EPA's Aquatic Life benchmarks for polycyclic aromatic hydrocarbons (PAHs). Analysis of individual samples indicated that none of the water sample exceedances were consistent with MC252. Of the sediment exceedances, only those within 3 km of the wellhead were consistent with MC252.

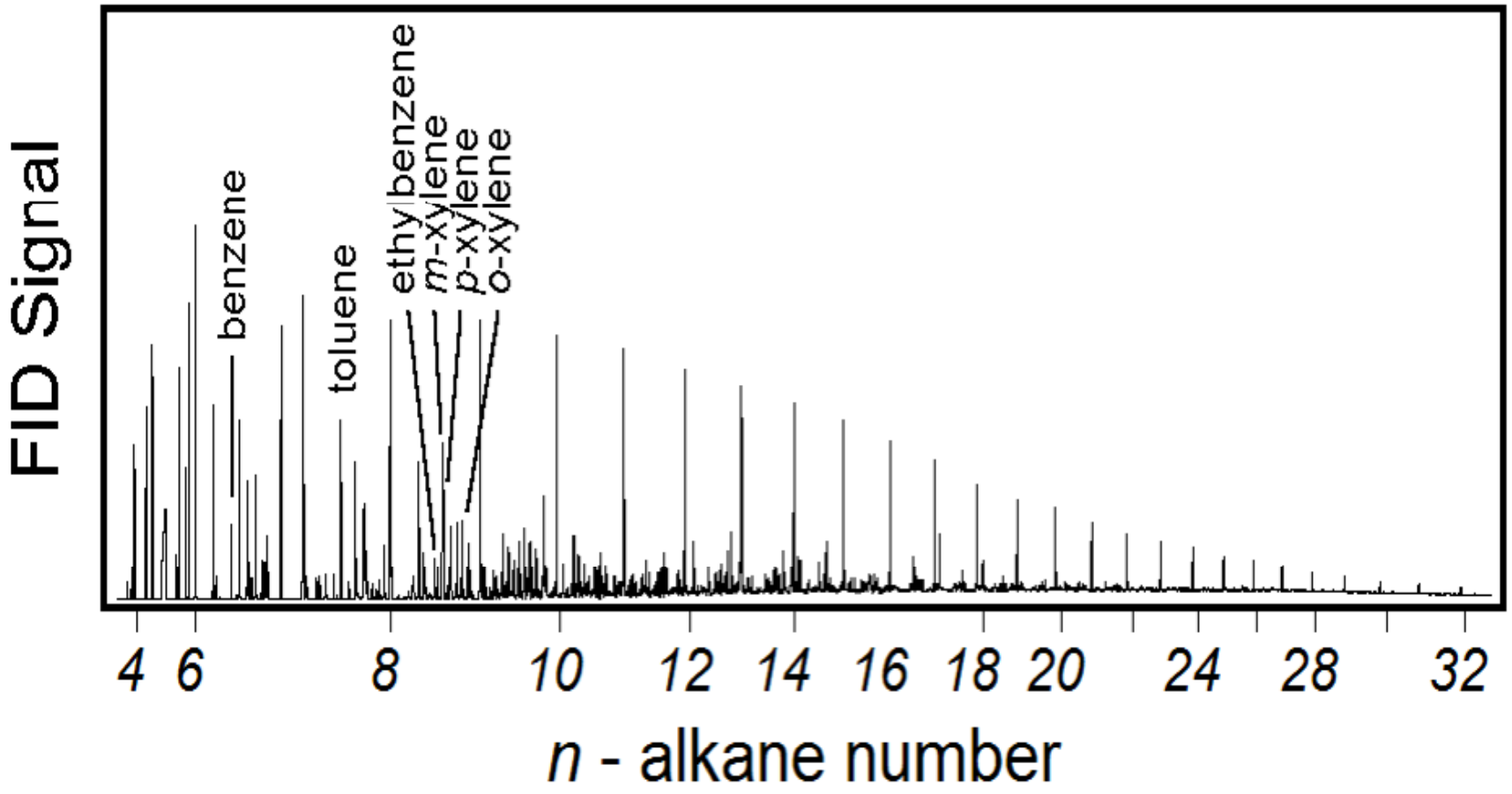
5. Published research indicates that MC252 oil is weathering and biodegrading undernatural conditions. Estimates of weathering and degradation rates vary, precluding theuse of simple empirical models to assess the persistence of residual MC252 oil.

7. Quantitative results indicate that deposits of drilling mud-entrained oil remain near the wellhead. Seven sediment samples within 3 km of the wellhead collected since 3 August 2010 exceed aquatic life benchmarks for PAHs, with oil concentrations of 2000-5000 parts per million.

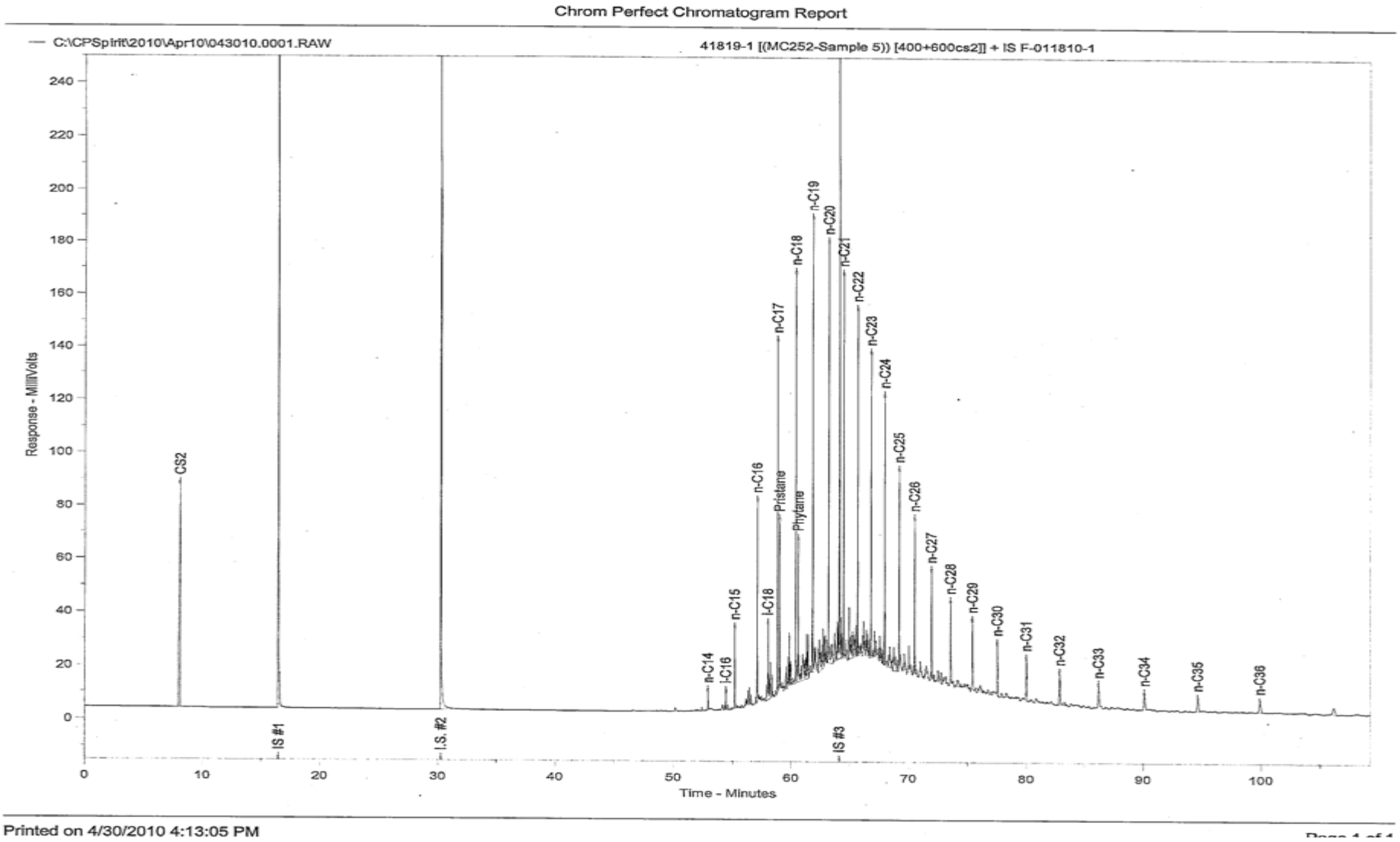
Hydrocarbon Plume @ 1100 m d



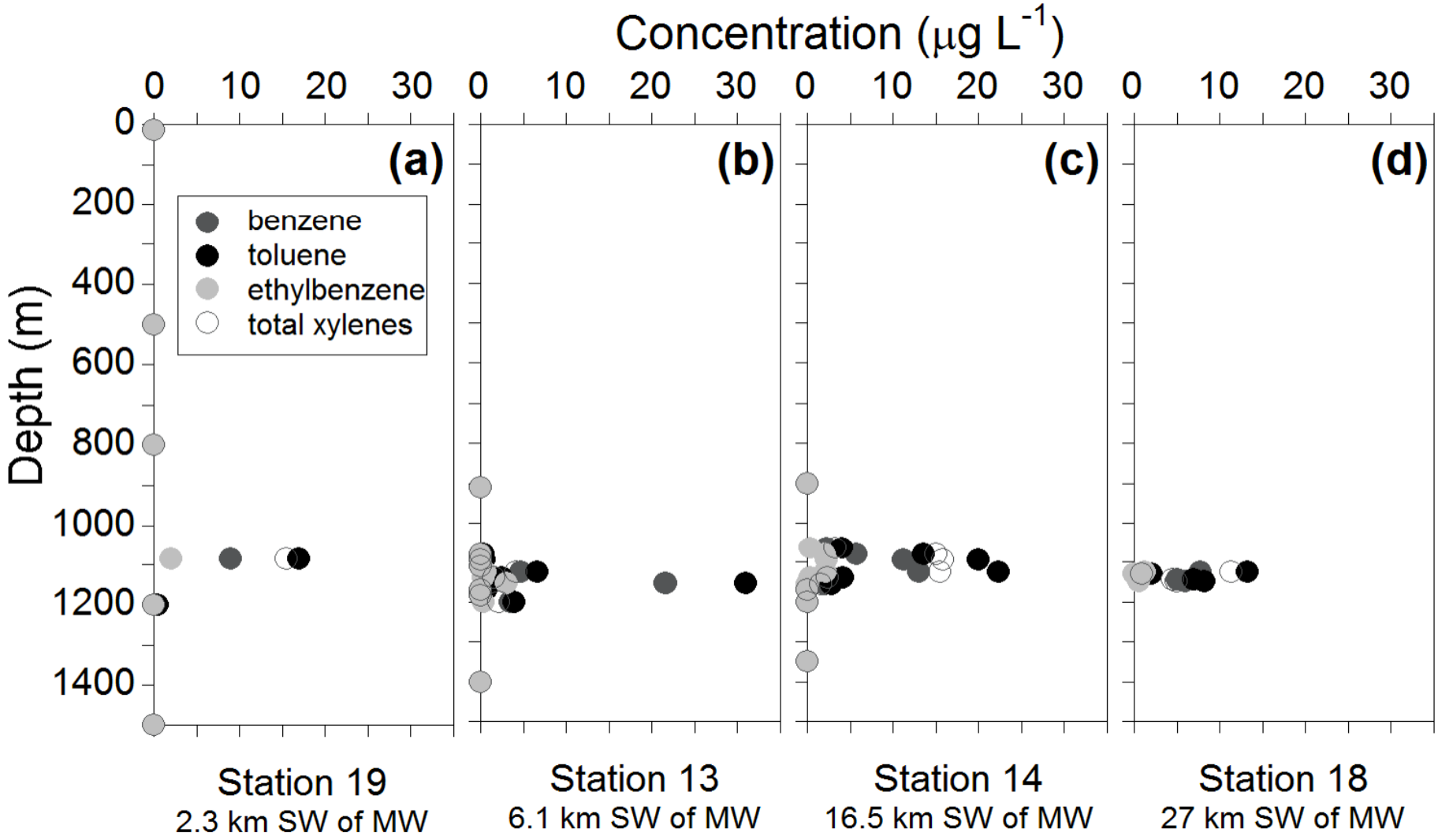
Deepwater Horizon Oil



Weathered Macondo 252



What's in the Plume?



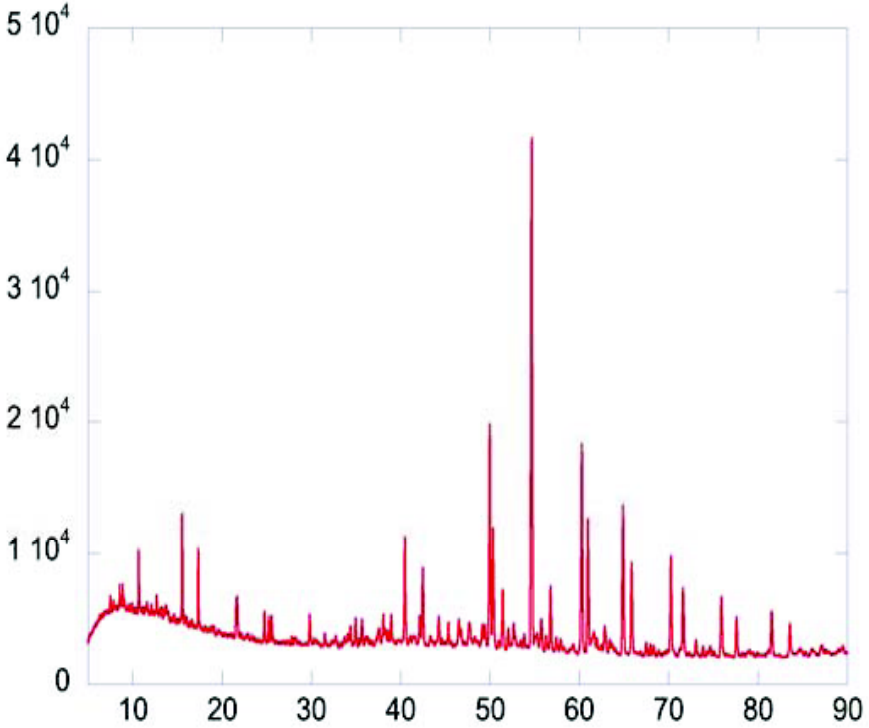
Number of Results in Concentration Ranges for Samples at 1000- 1300 m depth

Concentration	Total VOA (ppb)	TPH (ppb)
<10 ppb	1141	1138
10 – 100 ppb	84	23
100– 1,000 ppb	111	0
>1,000 ppb	10	0

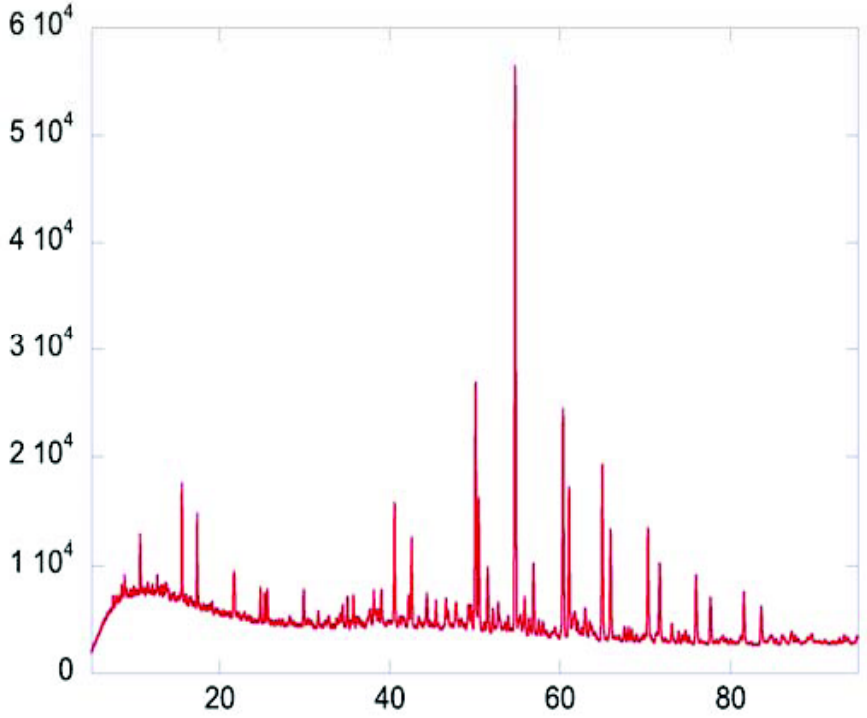
N = 2118 samples

Chromatograms of M-1 well oil and sediment extract AL-8.
Selected ion monitoring (SIM) chromatograms of 191, Hopanes

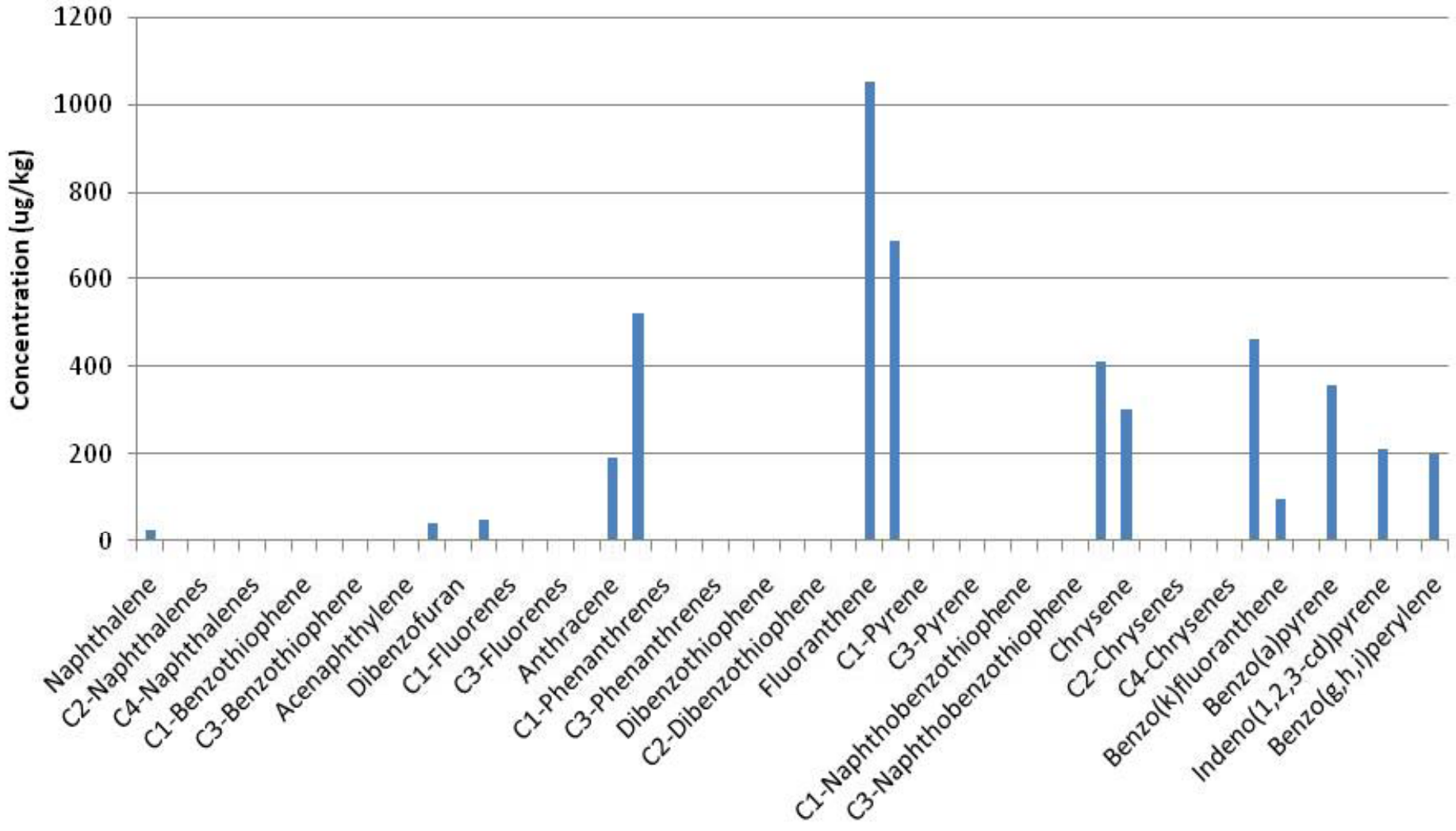
Macondo = 1 (m/z 191)



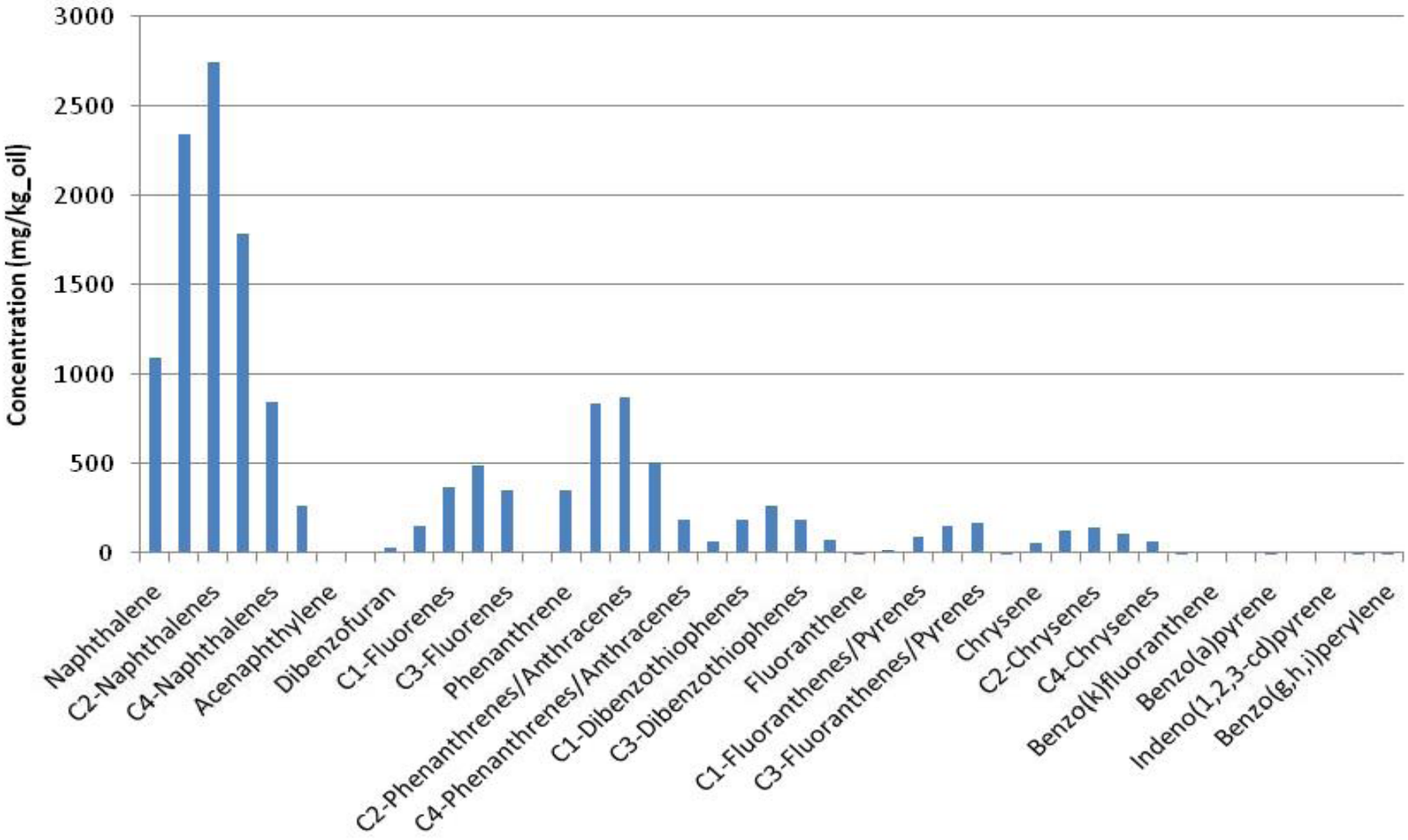
AL-8 (m/z 191)



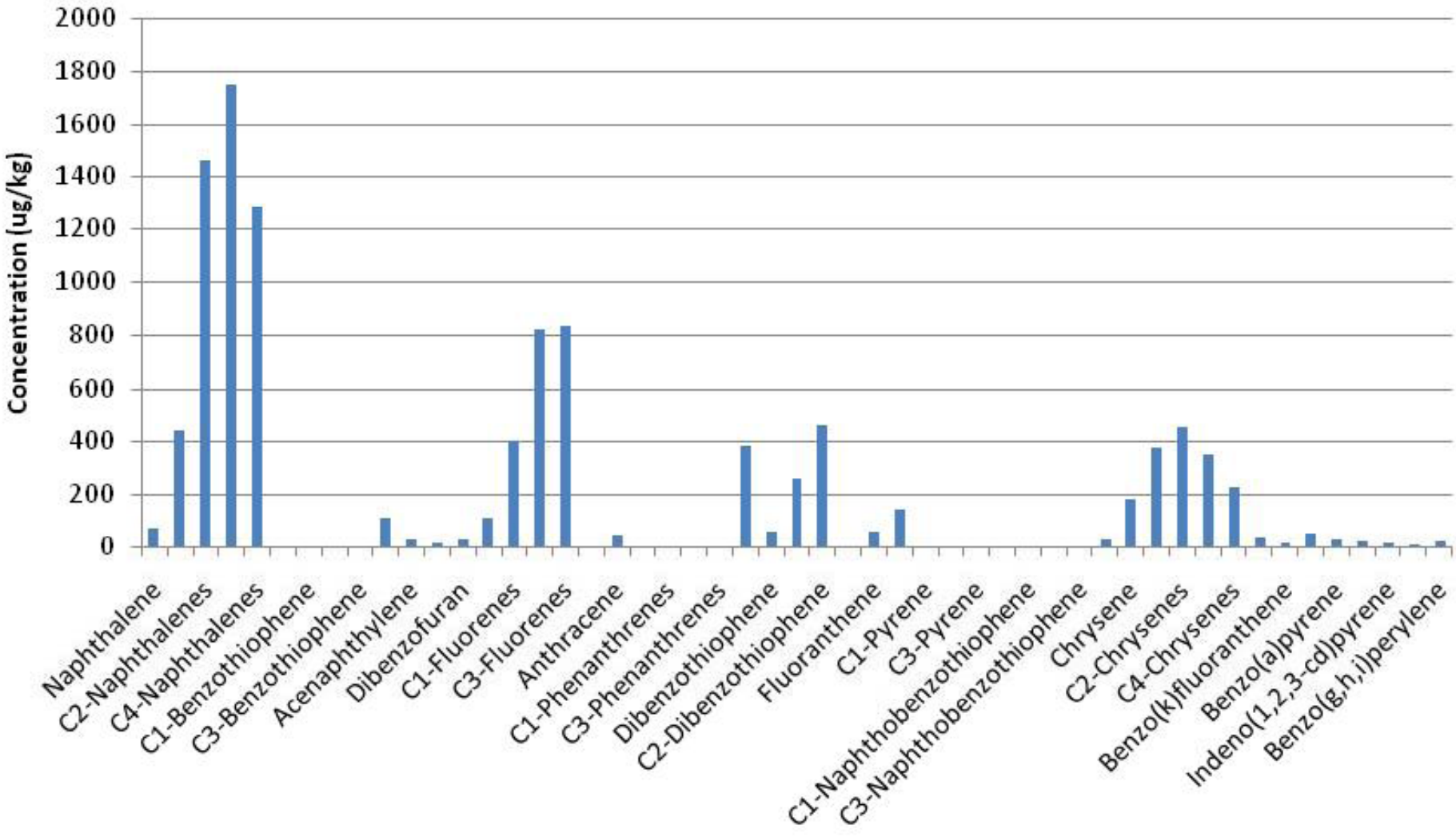
Histogram of PAHs pyrogenic sediment sample.



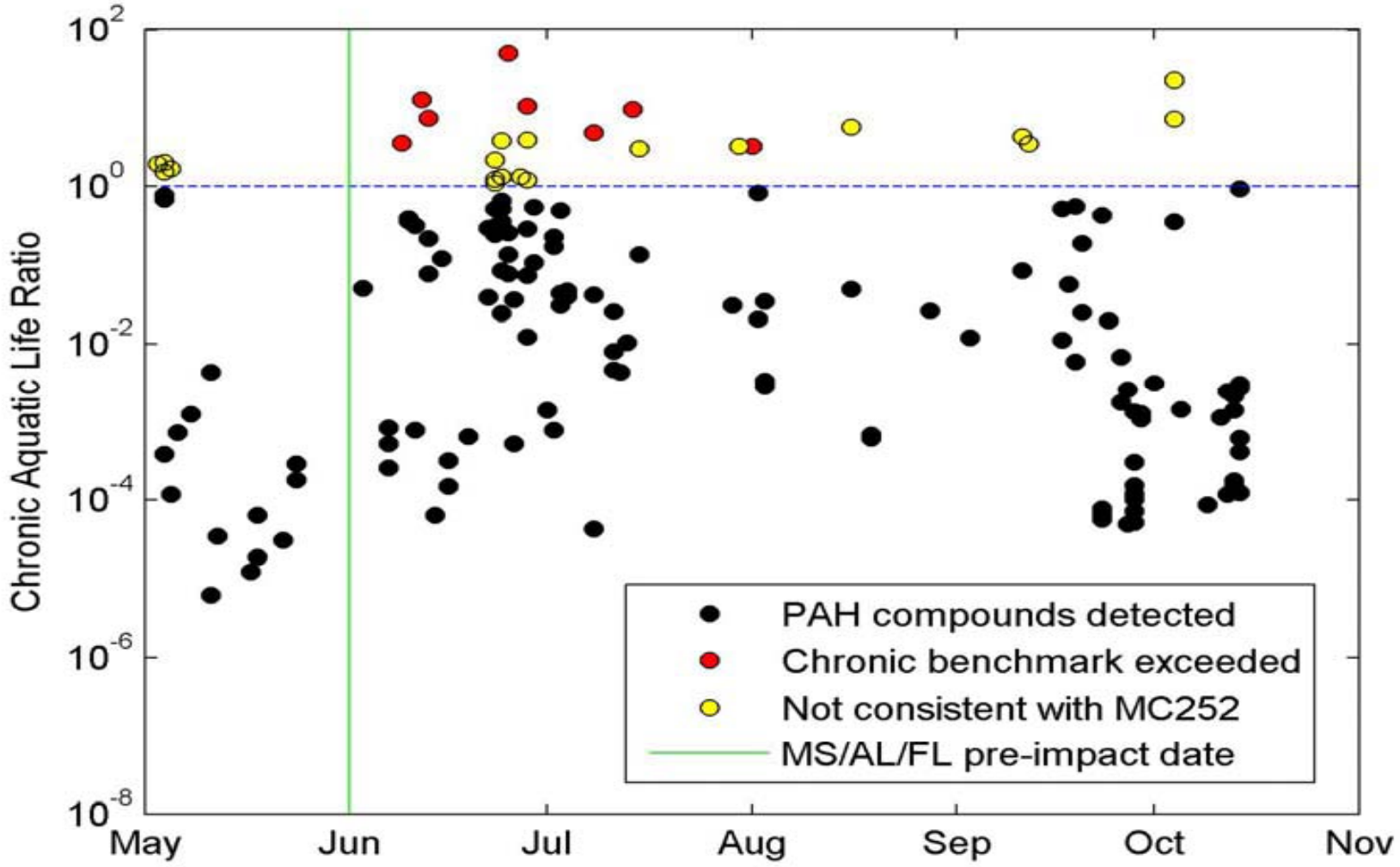
Histogram of PAHs in the Q4000 MC252 control oil.



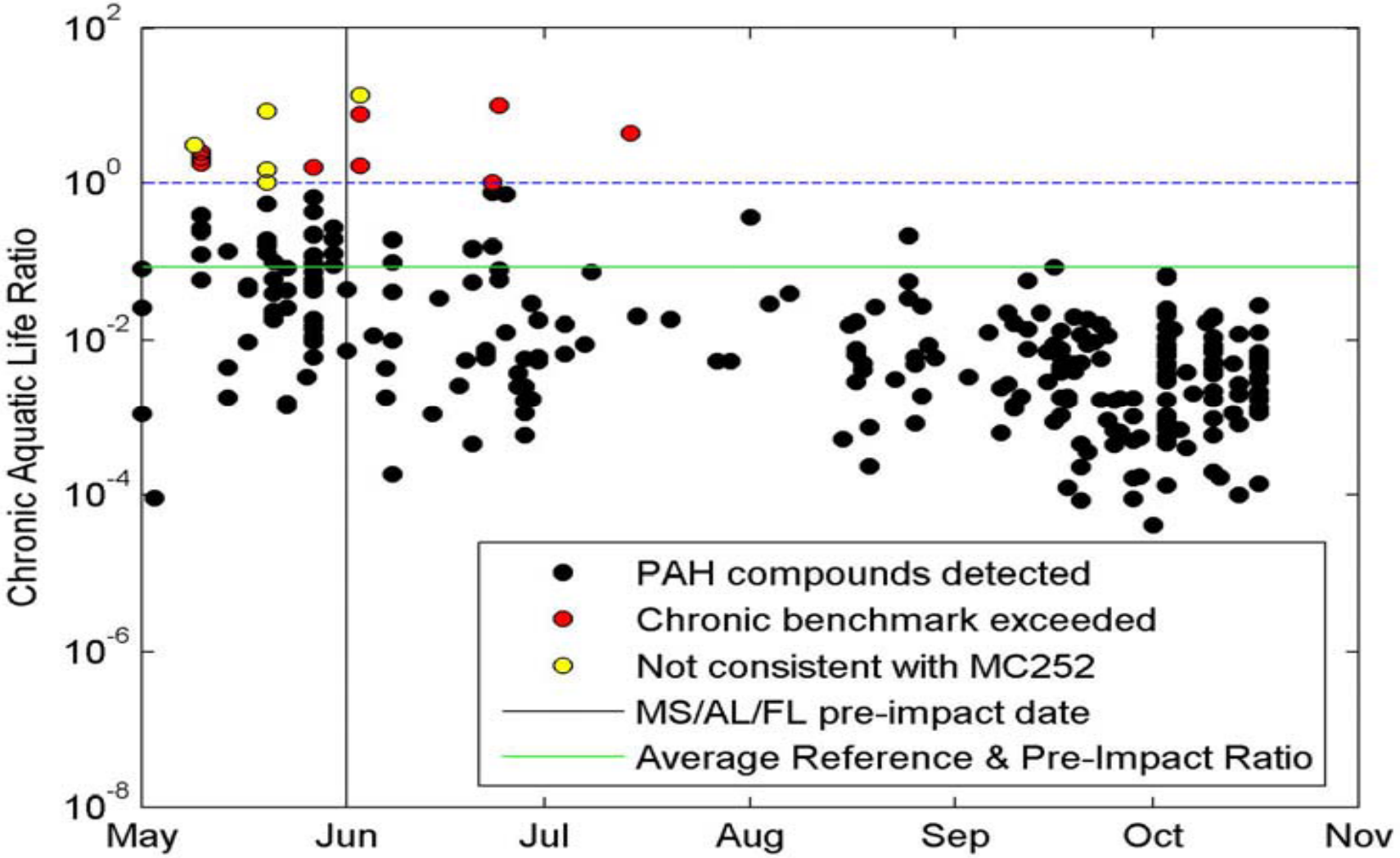
Histogram of PAHs in a sediment sample consistent with MC252 oil within 3 km of the wellhead.



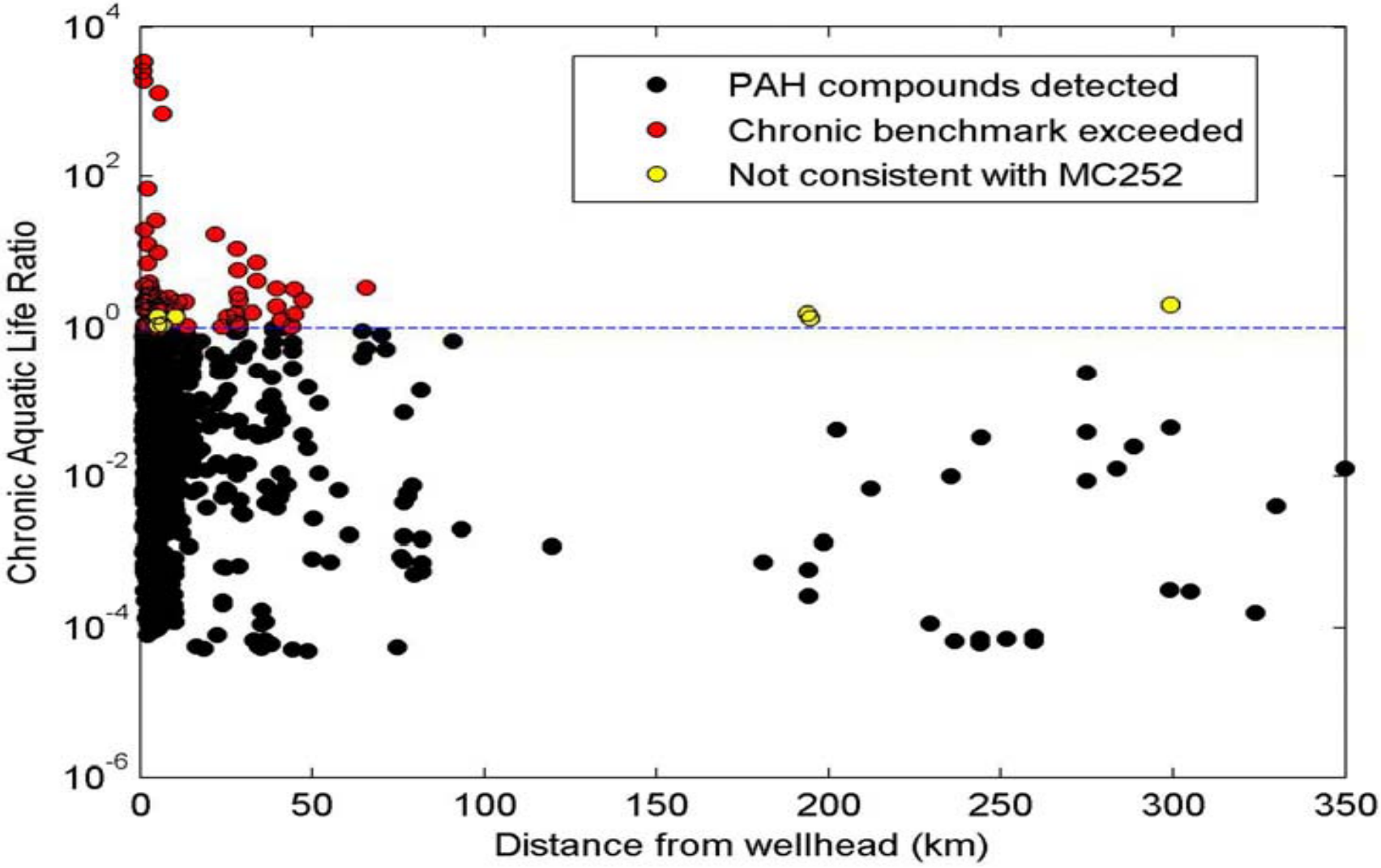
Temporal distribution of chronic aquatic life ratios for PAHs in Region 4 (AL, MS & FL) nearshore water samples



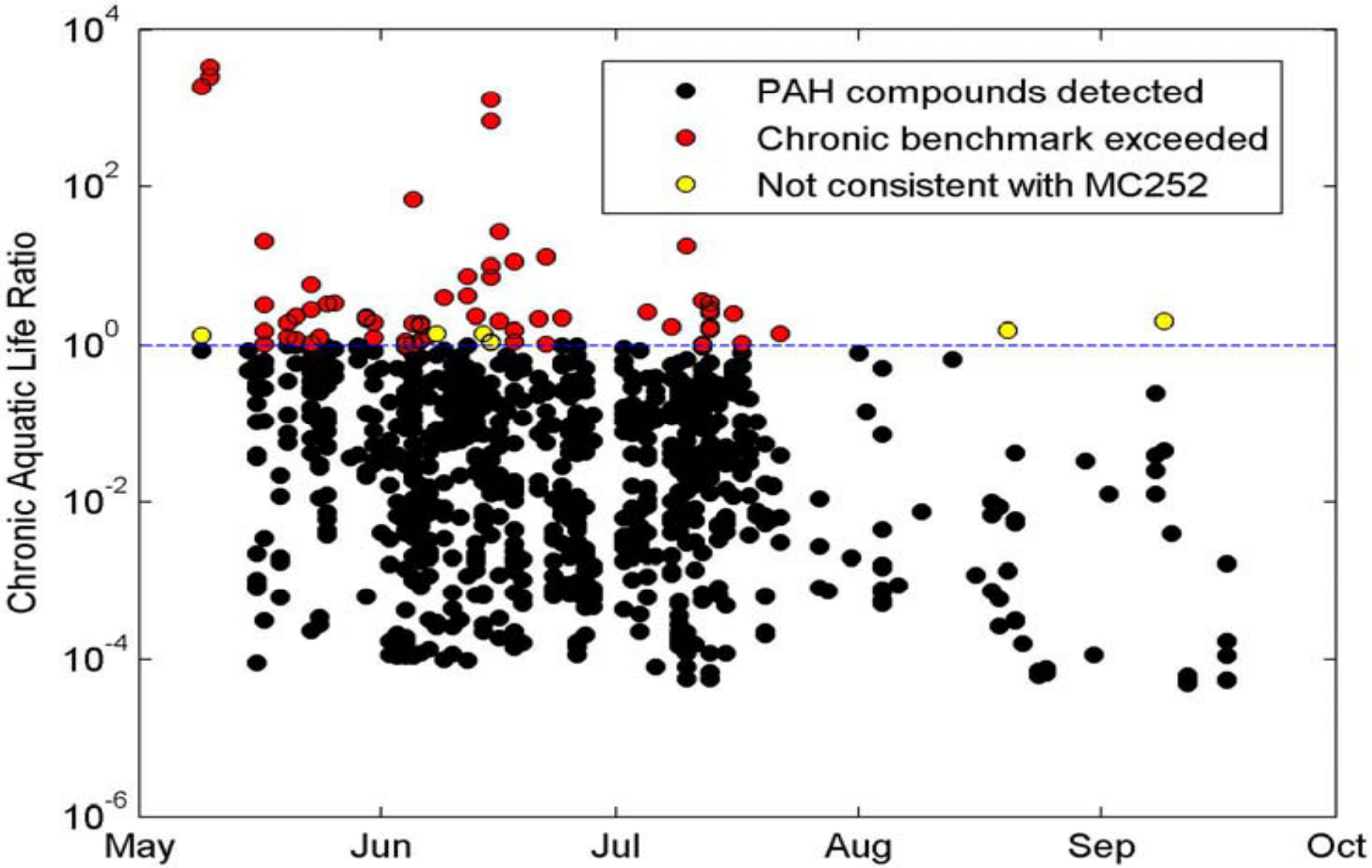
Temporal distribution of chronic aquatic life ratios for PAHs in Region 4 (AL, MS & FL) nearshore sediment samples



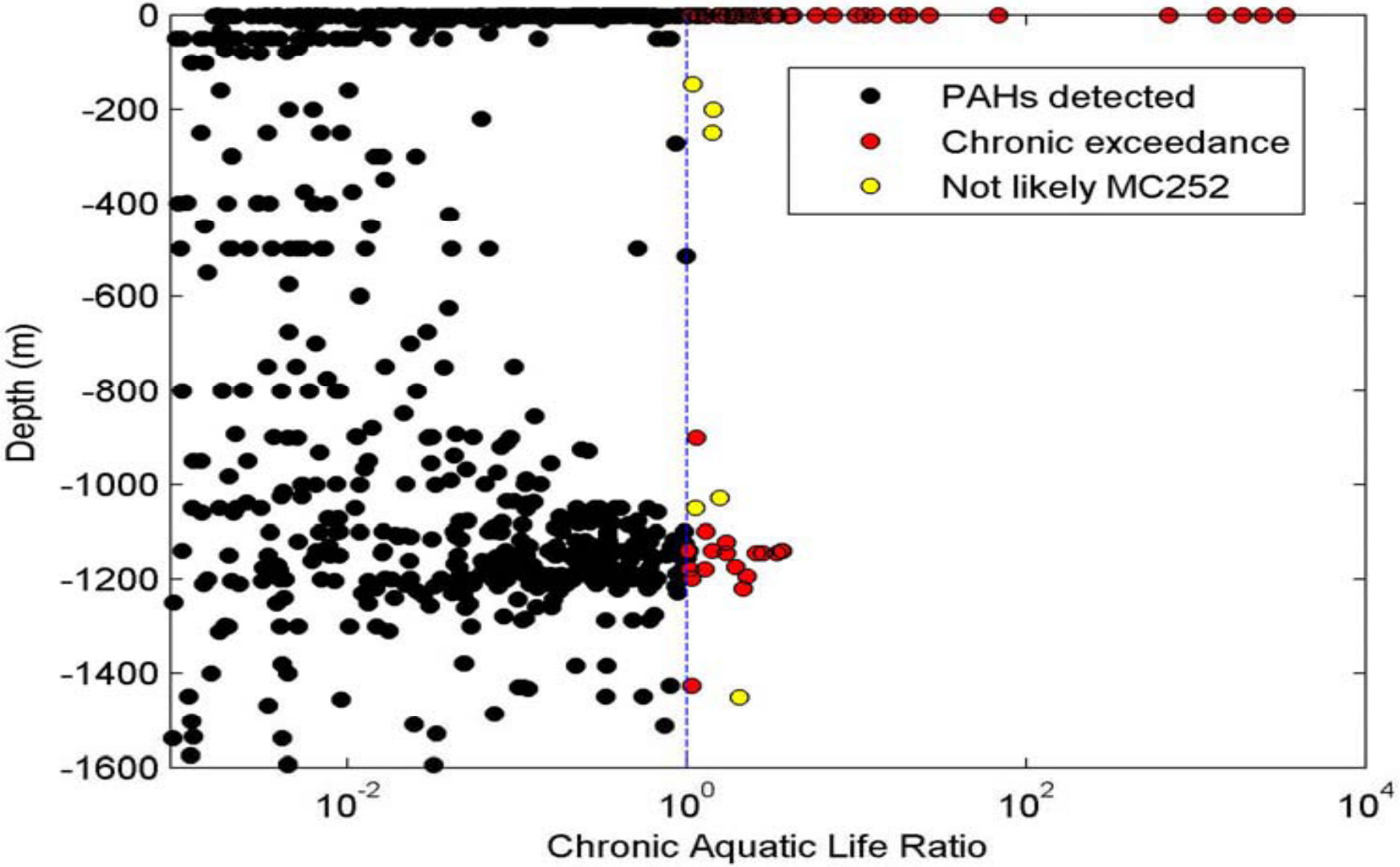
Chronic aquatic life ratios as a function of distance from the wellhead.



Chronic aquatic life ratios as a function of time



Chronic aquatic life ratios as a function of depth



Heros – Operational Discipline

May our thoughts and prayers be with the
Fukushima Daiichi nuclear power plant workers
Who understand the grave personal risk and
Continue to protect the safety of others.

Acknowledgements

Mr. Jerry Parr, TNI/NELAC
Dr. Bob Haddad, NOAA
Dr. Chris Reddy, Woods Hole Oceanigraphic Institute
Dan Villalanti, Triton Analytical

Disclosure & Disclaimer

The Views Expressed In this Presentation

DO NOT represent those of my former employer

Chevron Corporation or the American Petroleum

Institute for whom I consult.

Questions and Maybe Some Answers

Resources

Overview - http://www.oilspillcommission.gov/
Media with Videos
http://www.oilspillcommission.gov/media/the-event/index.html
- Introduction; History; Event; Response; Restoration; Going Forward

Staff Working Papers
http://www.oilspillcommission.gov/resources#staff-working-papers
NOAA Deepwater Site
http://www.noaa.gov/deepwaterhorizon/
NOAA Deepwater Horizon Data Archive
http://www.noaa.gov/deepwaterhorizon/data/subsurface_ocean.html
Sub-sea and Sub-surface Oil and Dispersant Detection: Sampling and Monitoring
http://www.restorethegulf.gov/sites/default/files/documents/pdf/
OSAT_Report_FINAL_17DEC.pdf
Inter-Agency Joint Analysis Group (JAG)
http://www.noaa.gov/sciencemissions/bpoilspill.html#jag
http://ecowatch.ncddc.noaa.gov/JAG/index.html
NOAA 100 Days http://www.noaa.gov/100days/NOAA_Science_Informs.html
USGS http://pubs.usgs.gov/of/2010/1290/of2010-1290.pdf
RestoreTheGulf.gov http://www.deepwaterhorizonresponse.com
Open Source Websites http://www.restorethegulf.gov/sites/default/
files/documents/pdf/cg-foia-open-source-websites.pdf

Resources - Continued

Deepwater Horizon MC 252 Response Unified Area Command (UAC). 2010b. Strategic Plan for Sub-sea and Sub-surface oil and Dispersant Detection, Sampling, and Monitoring. Dated 13 November, 2010.
http://www.restorethegulf.gov/sites/default/files/documents/pdf/13_NOV_2010_SMU_Strategic_Plan.pdf
Deepwater Horizon National Incident Command Joint Analysis Group (JAG). 2010. Review of Preliminary Data to Examine Oxygen Levels In the Vicinity of MC252#1 May 8 to August 9, 2010. August 2010.
http://ecowatch.ncddc.noaa.gov/JAG/files/JAG_Oxygen_Report%20FINAL%20090410.pdf
Deepwater Horizon National Incident Command Joint Analysis Group (JAG). 2010a. Review of R/V Brooks McCall Data to Examine Sub-surface Oil. June 2010. Available at:
http://www.noaa.gov/sciencemissions/PDFs/JAG_Report_1_BrooksMcCall_Final_June20.pdf
Deepwater Horizon National Incident Command Joint Analysis Group (JAG). 2010b. Review of Preliminary Data to Examine Sub-surface Oil In the Vicinity of MC252#1 May 19 to June 19, 2010. July 2010 Available at:
http://ecowatch.ncddc.noaa.gov/JAG/files/JAG%20Data%20Report%202%20FINAL.pdf
Deepwater Horizon National Incident Command Joint Analysis Group (JAG). 2010c. Initial Quality Control of Analytical Chemistry Data from Water Samples Taken in the Vicinity of MC252#1. August 2010. Available at:
http://ecowatch.ncddc.noaa.gov/JAG/files/Chemistry%20report_QA_QC_Summary_V7.pdf

Resources - Continued

API In-Situ Burning: Fate of Burned Oil
http://www.api.org/ehs/water/upload/Pub4735-FateOfBurnedOil-4-2004.pdf
BP http://www.bp.com/bodycopyarticle.do?categoryId=1&contentId=7052055
Drilling
http://www.osha.gov/SLTC/etools/oilandgas/drilling/drilling.html