

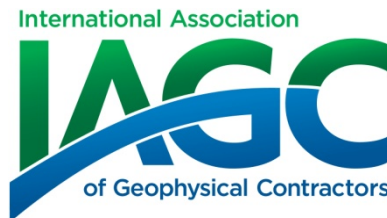


Overview of Seismic Survey

Marine Mammal Commission Annual Meeting

Wednesday, 6 May, 2015
Charleston SC

Ken Wells, President
International Association of Geophysical Contractors
ken.wells@iagc.org



THE VOICE OF THE GEOPHYSICAL INDUSTRY SINCE 1971

Seismic

Seismic acquisition combines advanced sciences of geology and acoustics with cutting edge computer technology.

It allow us to travel back in history to the formation of our planet.

Exploration - Then

Finding oil meant

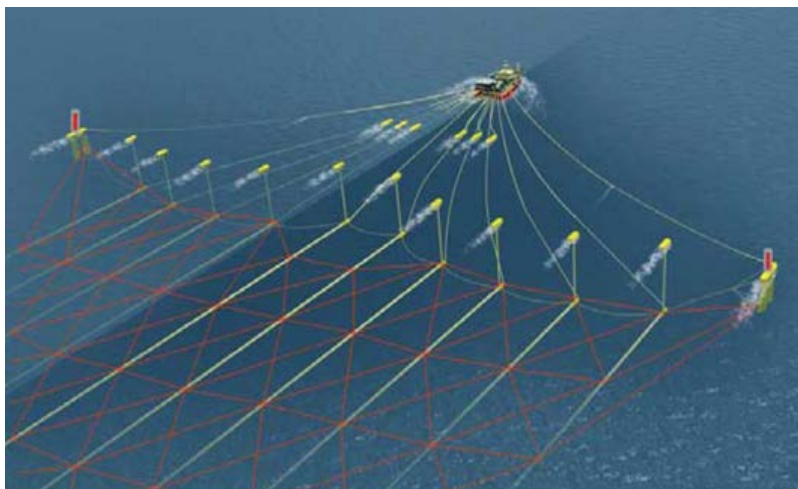
1. Visually identifying prospects
2. Drilling a lot of wells
3. Hoping for the best



Huntington Beach, CA

Exploration - Now

All of the “easy” reserves have been found.

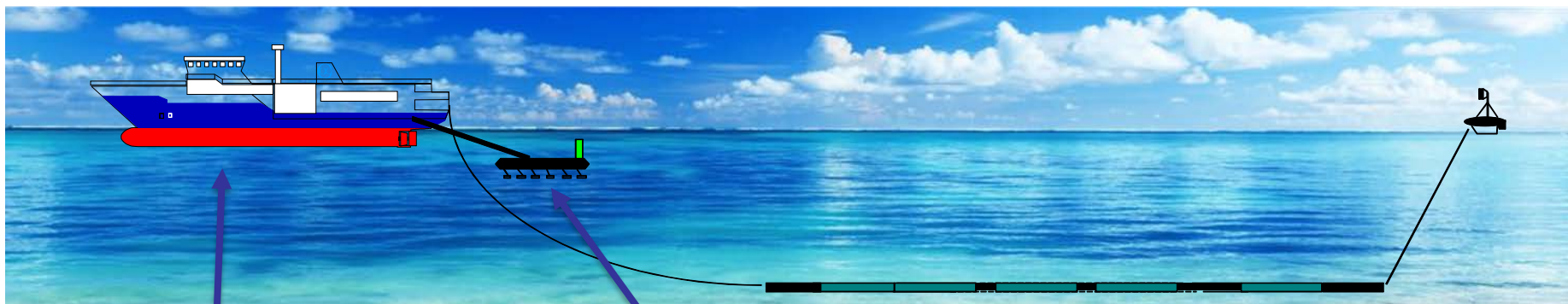


Surveys let us:

1. Identify prospects
2. Rule out non-prospects
3. Reduce exploration footprint

Marine Seismic Survey

- Sound source emits an air bubble about every 10 seconds
- Sound energy enters the earth and is reflected back to the surface
- Hydrophones record the echoes

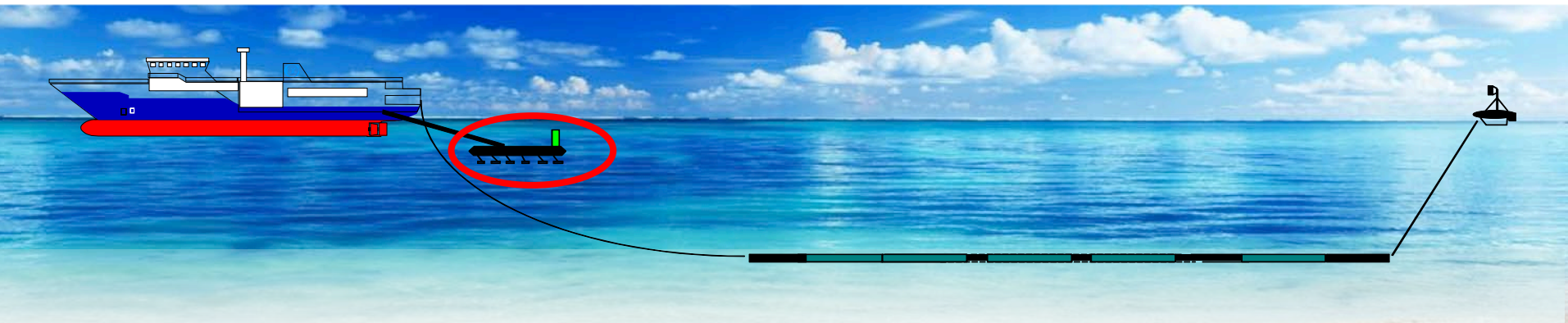


Survey Vessel

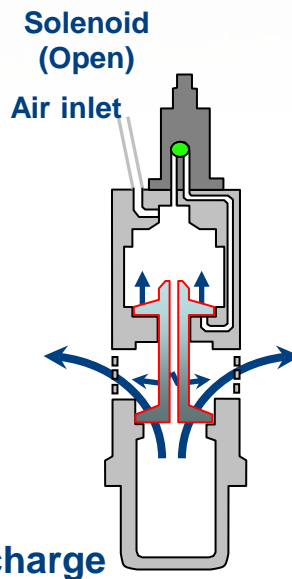
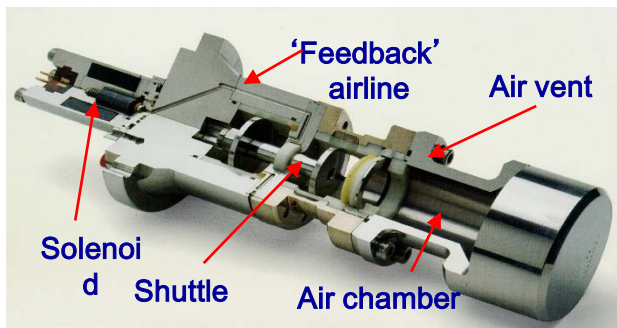
Seismic Array

Hydrophone Streamers

Generalized Boat Diagram



SOURCE



Each source element is about the size/volume of a large bottle of coke

Elements are combined to form larger arrays

Mitigation Measures

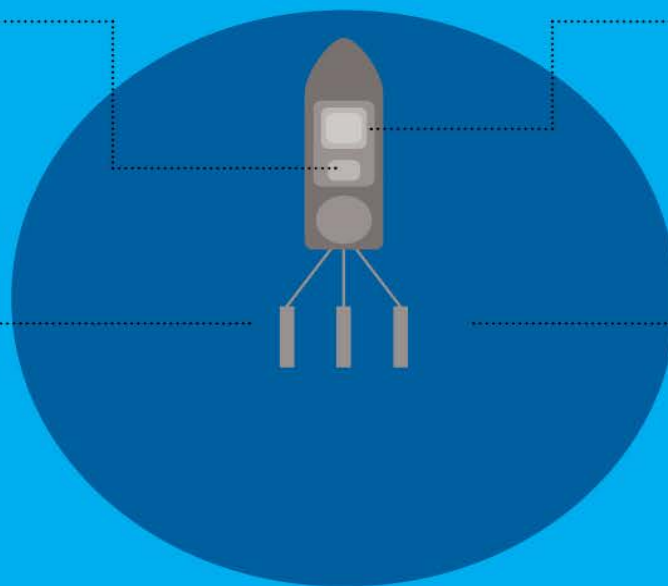
EXCLUSION ZONE

PASSIVE ACOUSTIC MONITORING (PAM)

Operators listen to underwater microphones to monitor marine mammals at night or during low visibility.

SOFT STARTS

Operations don't start all at once. For example, the operator may start with one seismic source element and gradually increase the number of source elements to warn animals and give them time to leave the area.



PROTECTED SPECIES OBSERVERS (PSO)

Trained lookouts monitor the seas around a seismic boat in case marine life wander into the area.

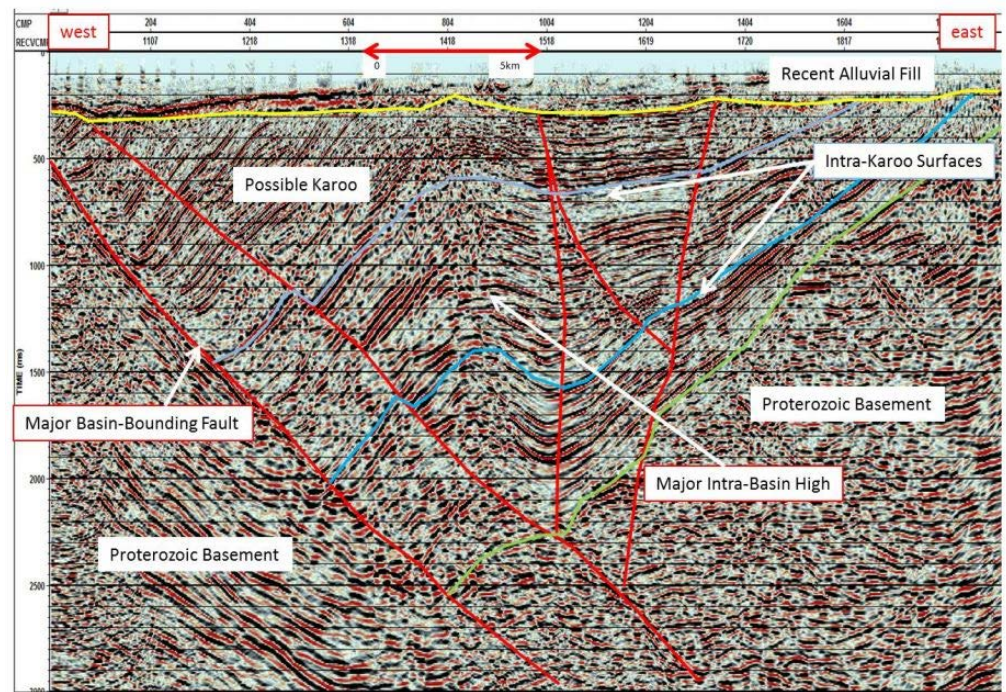
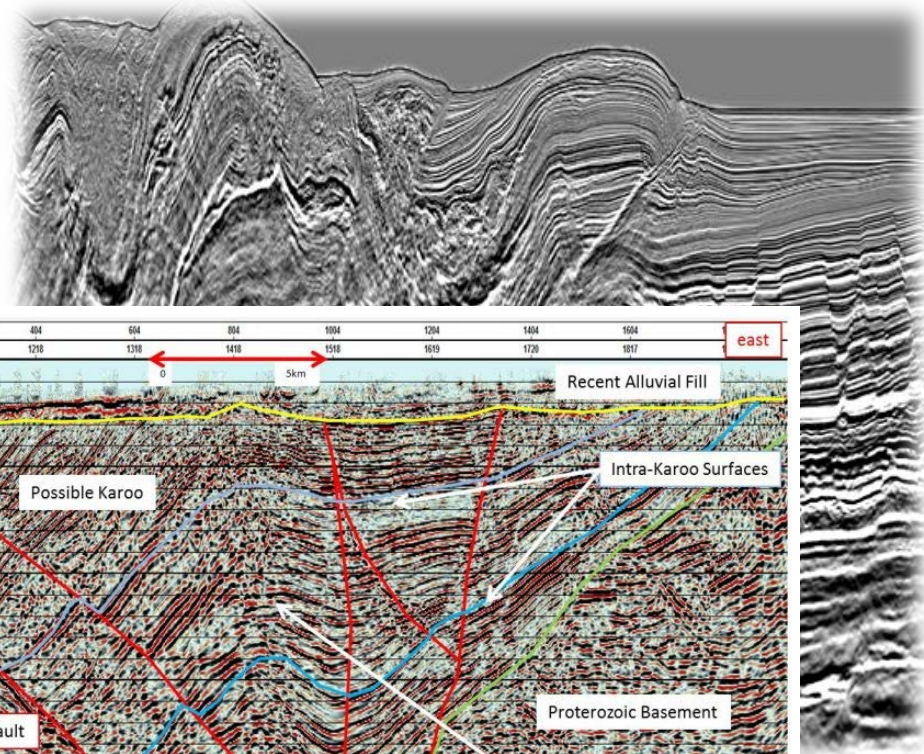
SHUTDOWNS

If a marine mammal enters the buffer zone (usually about 500 meters around the seismic source equipment), the acoustic source is immediately shut down and will not restart for at least twenty minutes.

As a result of industry efforts, more than four decades of operations indicate that the risk of direct physical injury to marine mammals and fish is extremely low, and no scientific evidence demonstrates significant biological impacts on marine populations.

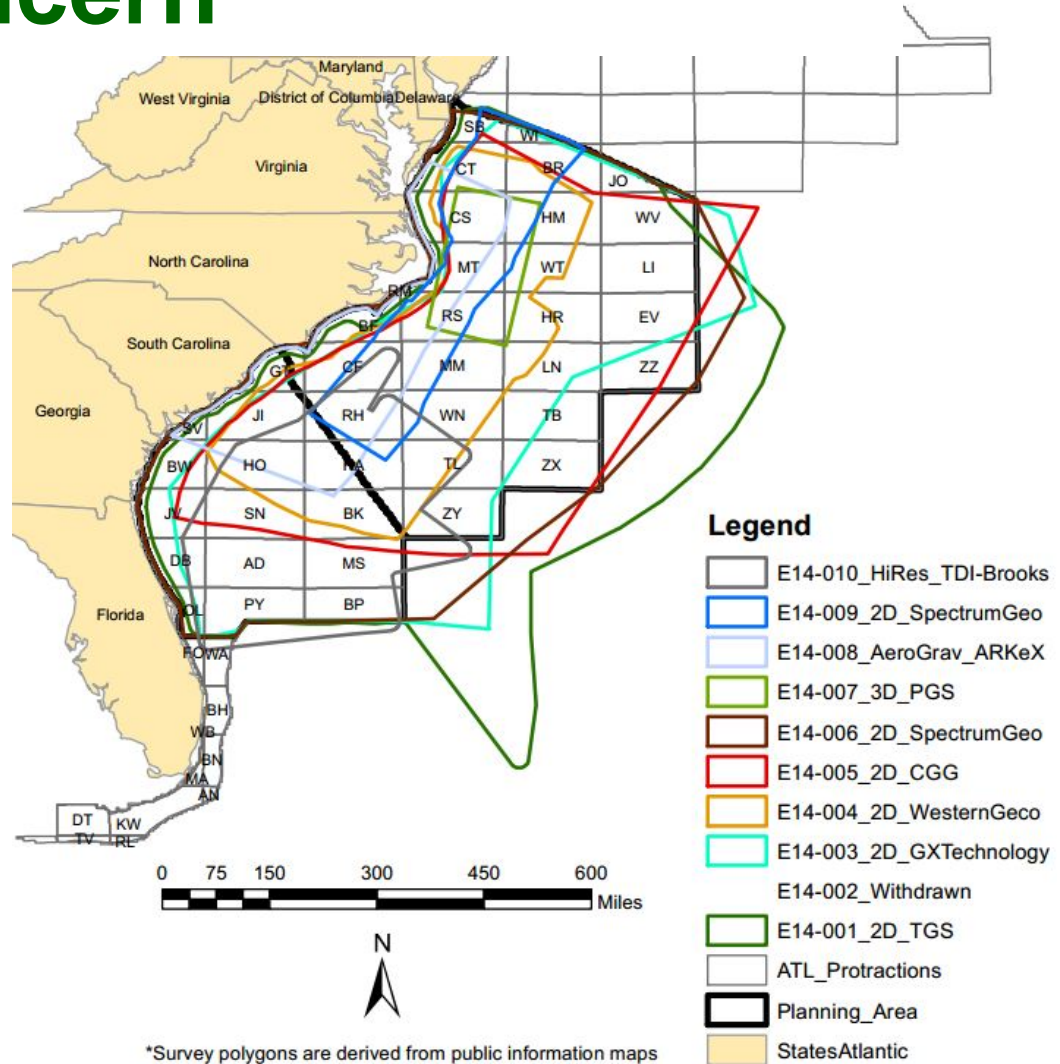
Marine Seismic Survey

- The data is processed into a final image
- The level of detail depends on the type of survey and the level of processing.



The Concern

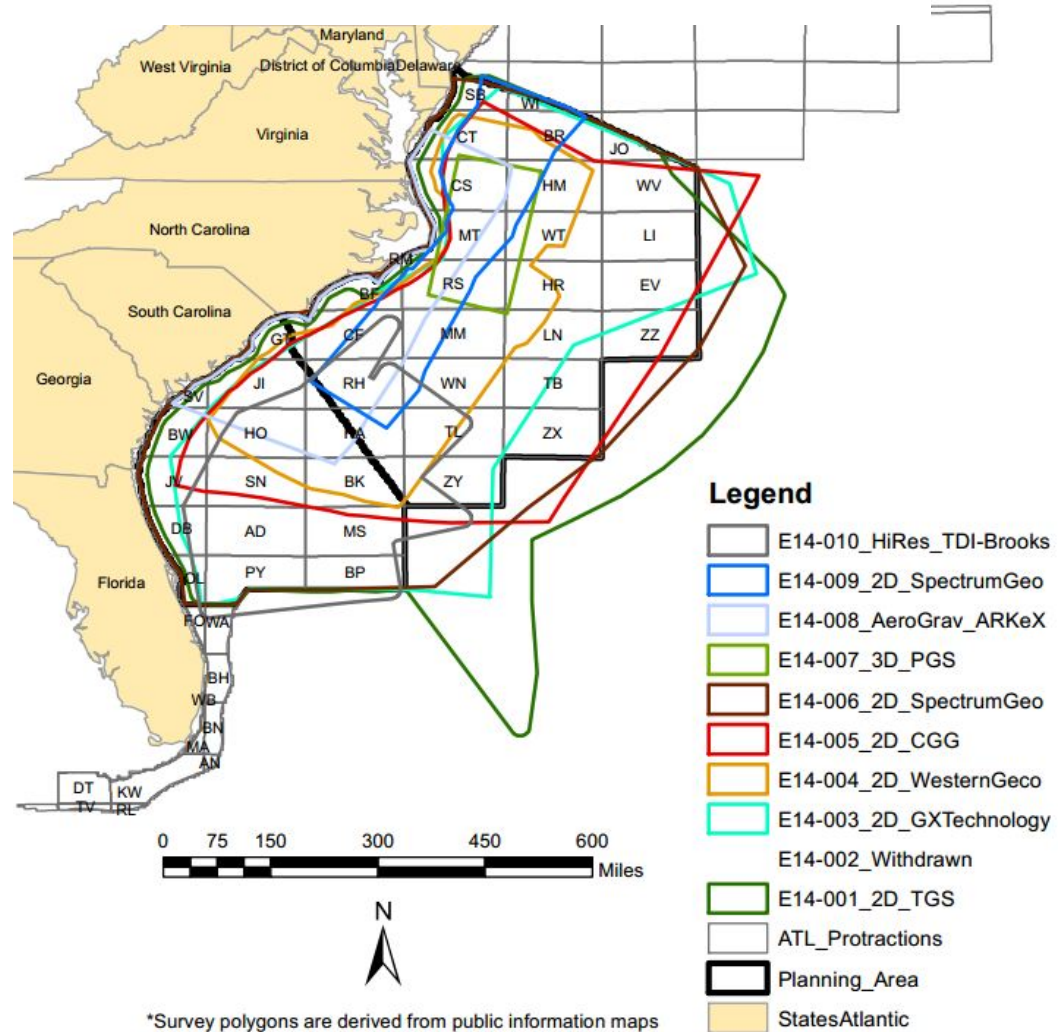
BOEM has received 8 applications for Atlantic seismic surveys



The Facts

Surveys will

- Not all be done.
- Not all take place at once.
- Not all cover the same areas.



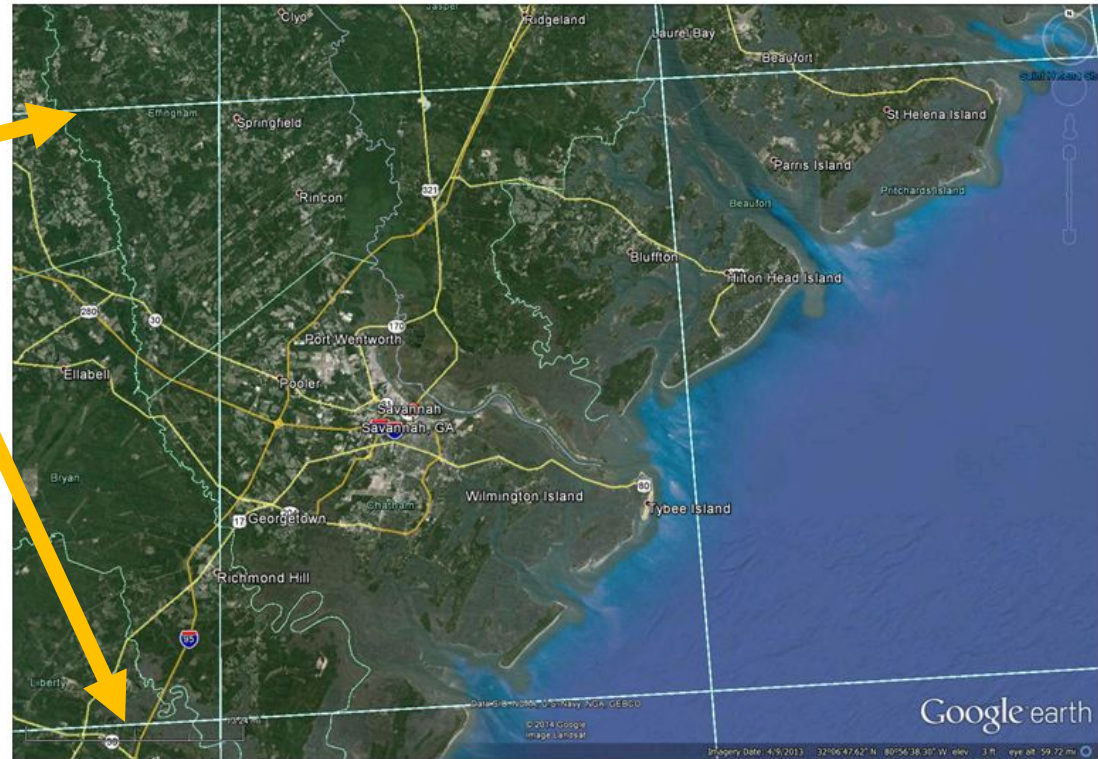
A Typical 2D Survey

30 mile by 40 mile 2D Seismic Grid

View of Savannah, GA

Vessel tracklines are many miles apart

The adjacent line won't be surveyed until many days or weeks after the nearest previous line



Factors

- The marketplace discourages surveys that just provide the same information.
- 2-D: Large scale, courser grid, primarily rules out areas that are not viable.
- 3-D: Finer scale, more precise, defines potential reserves.

What Factors Must be in place to create a “Cumulative Effect?”

Is There Evidence of Harm?

No.

After millions of dollars of research and years of daily reports, the case has not been made that surveys have any lasting, negative effects on marine animal populations.

What Factors Must be in place to create a “Cumulative Effect?”

Is There Excessive Short Term Exposure?

No.

Vessels are moving, animals are moving and sound decays rapidly.

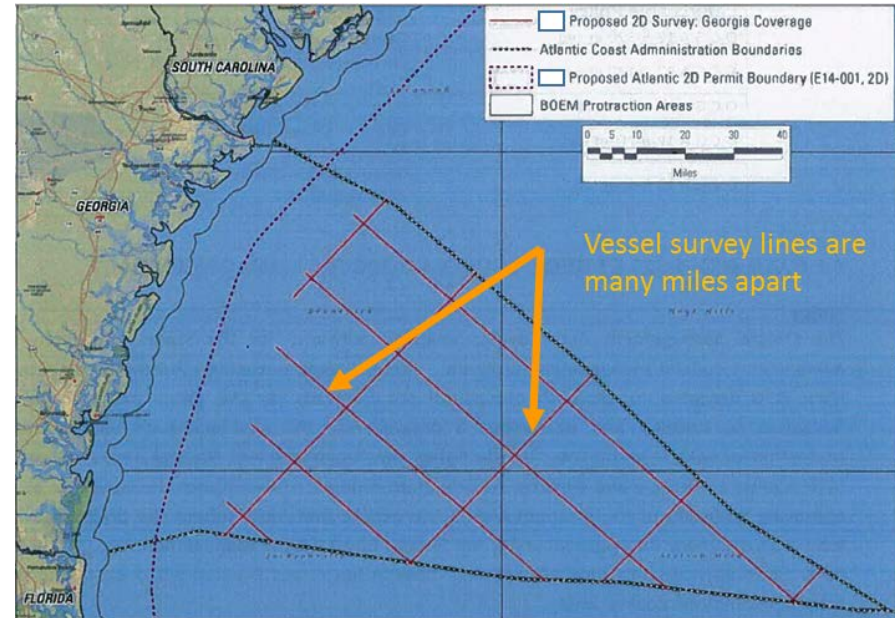
That means exposure is limited to seconds or minutes.

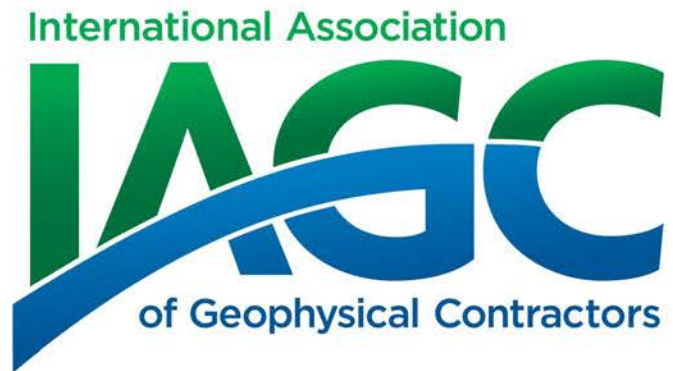
What Factors Must be in place to create a “Cumulative Effect?”

Is There Repeated Exposure Over Time

No.

Survey lines are never repeated. Adjacent lines are traveled many days or weeks apart for 2D seismic surveys or many hours for 3D seismic.





THE VOICE OF THE GEOPHYSICAL INDUSTRY SINCE 1971

www.iagc.org