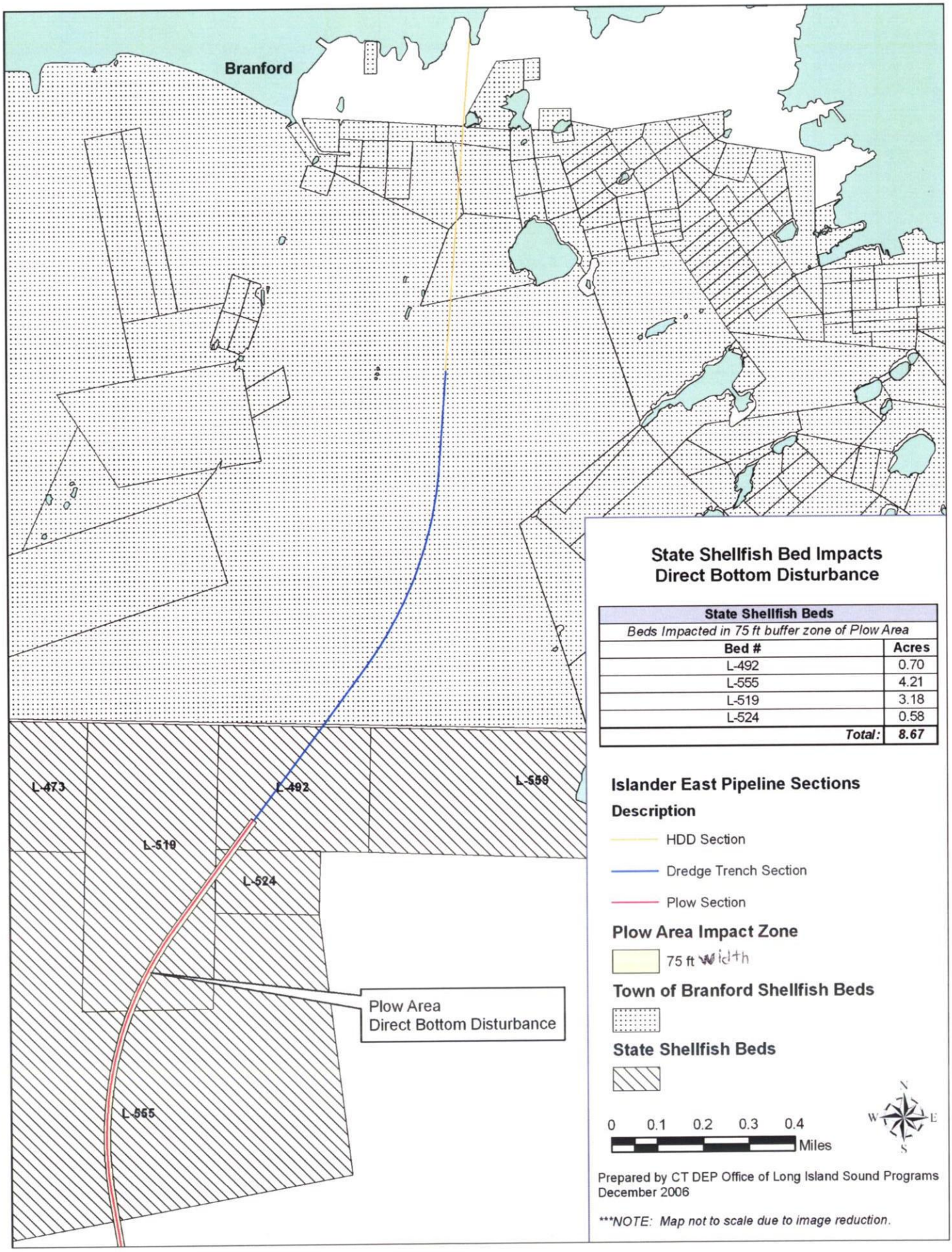

State Shellfish Bed Impacts
Direct Bottom Disturbance

State Shellfish Beds	
Beds Impacted in 75 ft buffer zone of Plow Area	
Bed #	**Acres**
L-492	0.70
L-555	4.21
L-519	3.18
L-524	0.58
Total:	***8.67***

Islander East Pipeline Sections

Description

HDD Section

Dredge Trench Section

Plow Section

Plow Area Impact Zone

75 ft width

Town of Branford Shellfish Beds

State Shellfish Beds

Prepared by CT DEP Office of Long Island Sound Programs
December 2006

****NOTE: Map not to scale due to image reduction.*

APPENDIX H

September 29, 2003 electronic mail from Michael Ludwig (NMFS)

DEP R. 103

Sue Jacobson - Re: bentonite releases and shellfish

DEP R. 103

From: mludwig@clam.mi.nmfs.gov
To: Sue Jacobson <susan.jacobson@po.state.ct.us>
Date: 9/29/2003 11:39 AM
Subject: Re: bentonite releases and shellfish
CC: <mludwig@clam.mi.nmfs.gov>, Charlie Evans <charles.evans@po.state.ct.us>, David Blatt <david.blatt@po.state.ct.us>, Elke Sutt <elke.sutt@po.state.ct.us>, George Wisker <george.wisker@po.state.ct.us>, Harry Yamalis <harry.yamalis@po.state.ct.us>, John Gaucher <john.gaucher@po.state.ct.us>, Kate Brown <kate.brown@po.state.ct.us>, Kevin Zawoy <kevin.zawoy@po.state.ct.us>, Kristen Bellantuono <kristen.bellantuono@po.state.ct.us>, Laurie Valente <laurie.valente@po.state.ct.us>, Lori Benoit <lori.benoit@po.state.ct.us>, Marcy Balint <marcia.balint@po.state.ct.us>, Margaret Welch <margaret.welch@po.state.ct.us>, Mary-beth Hart <marybeth.hart@po.state.ct.us>, Micheal Grzywinski <micheal.grzywinski@po.state.ct.us>, Nancy Lent <nancy.lent@po.state.ct.us>, Peter Francis <peter.francis@po.state.ct.us>, Rick Huntley <rick.huntley@po.state.ct.us>, Robin Bray <robin.bray@po.state.ct.us>, Ron Rozsa <ron.rozsa@po.state.ct.us>, Rosemary Malley <rosemary.malley@po.state.ct.us>, Sue Gradante <sue.gradante@po.state.ct.us>, Tom Ouellette <tom.ouellette@po.state.ct.us>, <citakkelly@snet.net>, <davcarey@snet.net>

Sue: If ONLY it was that easy! Drilling mud impacts on benthic communities is a relatively new concern (hey, we were told that there were no such thing as "frac outs"!). Frank Bohlen may know more than virtually everyone about the consequences of frac outs because he went on a search and did some work for the pipeline industry on the topic. A couple of things I can provide; See the references and articles I've attached below and remember that drilling mud is made up from freshwater and bentonite clays. As a result the stuff tends to be resistant to dispersion when placed in saline waters. Its BOTH the freshwater and the clay that can create the suffocation. Shellfish can close down for several days to almost two weeks dependent on water temperature. The warmer the water the higher the metabolism rate of the organism and the shorter the time it can "hold its breath." BUT, it's not holding its breath, even in the dead of winter. Rather they are trying to use the overlying water to get oxygen. It samples the water, senses the freshwater and re-closes. During the sampling some clay is pulled in and settles on the gills and abrades them. This causes the organism to try and clear the clay by forming "pseudo feces" wrapped in "mucus." The effort to clear the lamellibranch gill structures requires energy and further increases the metabolic needs of the organism. Some times the clearing looks like/ is related to the "coughing" action in humans. Each cough draws in more drilling mud mixture. These events continue until the frac out problem is resolved by removal or dispersion or the shellfish exhausts its internal supplies of oxygen and suffocates. Compounding these problems is the fact that warmer water holds less oxygen so the shellfish can start the process already stressed. For softer bodied organisms such as worms and crustaceans there are fewer options. After a modest and highly variable metabolic slowdown or "shutdown," the organism must chose flight or death from the freshwater and clay. Climbing upward is possible for some but the density of the drilling mud isn't sufficient to support them all. One of my favorite questions about the flight option is how does a worm determine which way is out? The worms and to a variable extent crabs don't osmoadapt to

lowered salinity too well if at all. So, moving through the freshwater based drilling mud is killing them as they move. EPA and Battelle have a number of references on this topic see
< http://www.cnsopb.ns.ca/Generalinfo/EFFECTSOFDRILLINGWASTES.html >
< http://www.epa.gov/GED/publica/c0467.htm >
< http://www.epa.gov/GED/publica/c1499.htm >
< http://www.battelle.org/environment/australia.stm >,
< http://www.offshore-technology.com/contractors/drilling/rogaland/ >,
< http://www.ec.gc.ca/press/2003/030219b_n_e.htm >
and the following; Research Products

Tagatz, M.E., J.M. Ivey, H.K. Lehman and J.L. Oglesby. 1978. Effects of a Lignosulfonate-Type Drilling Mud on Development of Experimental Estuarine Macrobenthic
Communities. EPA-600/J-78-069. Northeast Gulf Sci. 2(1):35-42. (ERL,GB 370). (Avail. from
NTIS, Springfield, VA: PB-290 040)

Drilling mud, as used in exploratory drilling for oil offshore, affected the composition of estuarine communities that developed from planktonic larvae in aquaria containing sand and flowing estuarine water. Aquaria contained: sand only; a mixture (by volume) of 1 part mud and 10 parts sand; 1 part mud and 5 parts sand; or sand covered by 0.2 cm mud. For all
environments, annelids, mollusks, arthropods, and coelenterates were the numerically
dominant phyla collected in a 1 mm mesh sieve after eight weeks exposure; a total of 1,025
animals, representing 45 species, was collected. Annelids and coelenterates were
significantly fewer (a=0.05) in aquaria containing drilling mud than in the control aquaria.
Arthropods were significantly affected only by mud cover over sand; mollusks also were
diminished in this environment, but not significantly. Exposure to concentrations of drilling mud reduced not only the number of individuals, but also the frequency of occurence of macrobenthic species. Thus, the average number of annelid species in 1 part mud: 5 parts sand aquaria or in mud-covered aquaria was significantly less than in control aquaria. The average number of arthropod species per aquarium was also significantly less in mud-cover exposure than in the control. Discharge of large quantities of drilling mud at levels tested in the laboratory could adversely affect the colonization of various substrata by benthic animals in nature.
XXXXX

Derby, Charles D. and Jelle Atema. 1981. Influence of Drilling Muds on the Primary
Chemosensory Neurons in Walking Legs of the Lobster, Homarus americanus. EPA-600/J-81-128. Can. J. Fish. Aquat. Sci. 38(3):268-274. (ERL,GB X241). (Avail. from NTIS, Springfield, VA: PB82-128190)

The effects of whole drilling muds on the normal activity of walking leg chemosensory
neurons of the lobster, Homarus americanus, were examined using extracellular

neurophysiological recording techniques. Exposure of legs for 3-5 min to 10-mg/L drilling
mud suspended in seawater altered responses to food odors of 29 percent of the
chemoreceptors examined (data pooled for the two drilling muds tested); similar exposure to 100-mg/L drilling mud resulted in interference with 44 percent of all receptors studied. The effects of both of these concentrations are statistically significant, although they are not different from each other. Interference was usually manifested as a marked reduction in the number of action potentials in a response. In one preparation, the exposure to drilling mud caused a change in the temporal pattern of the spikes without affecting the total number of spikes. Other chemosensory neurons were excited by 10-mg/L drilling mud itself. However, not all chemoreceptors are affected by these drilling muds since responses to feeding stimuli were recorded from the legs of lobsters that had been exposed to drilling mud for 4-8 d before the neurophysiological experiments.
XXX.

Alaska Science Forum, May 7, 1984. (NOTE that the report relies on "dispersion" to limit impacts.)

Drilling Mud Poses Little Environmental Hazard
Article #664

by Larry Gedney

This article is provided as a public service by the Geophysical Institute, University of Alaska Fairbanks, in cooperation with the UAF research community. Larry Gedney is a seismologist at the Institute.

"Roughneck" drillers are all too familiar with the gunk that messes oil rigs up--they call it "drilling mud."

Mostly composed of ground-up rock and water, lubricating fluid is pumped down the center of the hollow drill stem, and emerges again at the surface, carrying the pulverized rock and other unspeakable things. This is necessary to lubricate the drill shaft, cool the hole, and carry away the detritus that the drilling has created. And thereby comes the controversy. Namely: does this practice damage the environment, specifically, does it foul the ocean-bottom surface when applied to offshore drilling? It now appears that the answer is no.

Recently, a research council panel, formed at the request of the Department of the Interior, studied the question to determine just how serious a threat to the environment is posed by the "dumping" of approximately two million metric gallons of drilling fluid components now released annually on the outer continental shelf in the Gulf of Mexico (note that this does not include Alaskan waters). A specific recommendation was that the "flushing fluid" not contain more than four percent diesel, which seemed to contribute significantly to the toxicity of the drilling fluids which contain it.

Their report concluded that the toxic effects were minimal, that soon after the drilling mud was returned to the ocean floor, and after an insubstantial amount of time, currents dissipated the fluids to levels

that were innocuous--the level of the initial "plume" being diluted by a factor of 10,000 or more in less than an hour.

Despite man's efforts to the contrary, it appears that nature refuses to release her hold over the natural
order of things.
XXXXX
Anything else we can do?

Mike Ludwig
NOAA/NMFS

Sue Jacobson wrote:
>
> ** High Priority **
>
> Hi all,
> Does anyone know if we have had any proven shellfish losses or other resource damages from bentonite releases? A shellfish survey after such an incident would be wonderful to put our hands on!
>
> Susan Jacobson
> Environmental Analyst
> Permitting and Enforcement Section
> Office of Long Island Sound Programs
> 79 Elm Street
> Hartford, CT 06106-5127
> phone 860-424-3034
> fax 860-424-4054
> susan.jacobson@po.state.ct.us

APPENDIX I

DEPARTMENT'S HISTORY OF COASTAL HDD PROJECTS

Project Name	Waterbody Name	Drilling Mud Release
UI	Pequonnock-Bridgeport	Yes
SNET	Housatonic River	No
Algonquin	CT River	No
Greenwich	Mianus River	No
MCI	Madison	No
SNET	Yellow Mill-Bridgeport	Yes
SNET	Thames River	Yes
MCI	Shaws Cove-New London	Yes
Iroquois	Housatonic River	Yes
Cross Sound	New Haven	Yes
AT&T	East Haven	No
AT&T	North Haven	No

APPENDIX J

January 27, 2003 electronic mail from Dr. Roman Zajac

From DEP R. 60

Memorandum

Environmental Consulting
Roman N. Zajac, Ph.D.

January 27, 2003

TO: Paul Martin, TRC Environmental

From: Roman Zajac, Environmental Consultant

RE: Comments on potential impacts of alternative construction techniques along the proposed Islander East gas pipeline

Pursuant to our conversations regarding alterative construction techniques along the proposed Islander East gas pipeline, I provide a preliminary, and general assessment of potential impacts to the benthic habitats and organisms relative to two scenarios: removal of sediment that eventually will allow an a) 18 inch burial, and b) a 3 ft burial of the pipeline, in the section extending from the HDD exit area to MP 12.9, from where plowing construction techniques will be used into the deep water section of Long Island Sound. In both cases it is assumed that sediments will be removed using a clam shell dredge and loaded into hopper barges for eventual disposal away from the site. This will also include sediments dredged to construct the HDD exit pit. The assessment is based on the Applied Science Associates report, "Results of SSFATE model Simulations, Nearshore Connecticut, Long Island Sound," dated December 2002, in which the predicted areas and thicknesses of sediment deposition for the two scenarios are given.

For both scenarios, the potential impacts to the benthos of these alternative construction techniques will likely be much reduced relative to the previously proposed techniques which leave the sediments in place in mounds surrounding the HDD exit hole and along the pipeline trench. The main benefits accrue from several changes to the spectrum of potential impacts:

1) There will be no burial and smothering of sea floor areas adjacent to the HDD exit area and the dredge portion of the pipeline with the dredge spoil, reducing the overall area of direct, severe impact.

2) The removal of the dredge spoils will eliminate winnowing of sediment on a continual basis to the surrounding habitats, and more critically the potential for severe erosion in the case of a storm event during the constriction period.

3) The amount sediment which is predicted to be deposited onto the sea floor is considerably less than in previous construction scenarios. In the new scenarios, it is predicted that no areas will have deposits > 5 mm in thickness, and in the case of the 18 inch cover it is predicted that no areas will have > 3 mm in thickness. Considering only the maximums, and if these predictions are correct, this degree of sediment deposition onto the sea floor should have little impact on sea floor habitats and communities, and may approach background/ natural levels of sediment

resuspension and deposition in the area. This assessment is based on the following considerations:

a) Because constructions will be occurring in winter months, most benthic species will not be recruiting during this time and as such there should be little burial of any newly settled individuals.

b) Based on the literature reviewed in previous assessment, the 1 - 5 mm deposition thicknesses predicted should allow adult infaunal organisms to adjust their living position, with little to no stress effects. This may be particularly the case if the depositional events are not sudden, which is likely the case as sediments are disturbed by the dredge in small areas at a time and lost to some extent from the dredge during operations. Mobile epibenthic forms may either move away from the area during depositional events, or ne little affected by them.

c) If the trench is dug shallower, to accommodate an 18 inch cover, there may be even fewer direct impacts, as there likely will be less slumping of the sides of the trench, and therefore less disturbance to habitats and communities along the trench and HDD exit area. Note that in previous scenarios these areas would buried and likely extirpated, but in these alternative cases they would only be impacted by local deposition and construction operations.

d) The predicted pattern of deposition indicates that suspended sediments will be deposited on the sea floor in a patchy manner. In the 3 ft scenario, although there is a continuous band of deposited sediments along the pipeline trench, there are areas where the deposition is minimal and where the area covered narrows toward the trench. These areas may impacted very little and, if any mortality occurs in the depositional areas, may act as a source of colonists to the depositional areas and the area of the trench itself following pipeline burial. In the 18 inch scenario, sediment deposition is predicted to be even patchier, with deposition thicknesses > approximately 2 mm confined to the HDD exit area. Along the trench, the area of sea floor receiving minimal deposition increases, potentially further reducing impacts to the benthic communities.

The potential impacts of alternative pipeline dredging and sediment removal scenarios discussed here do not take into account the disposal of the sediment, which is assumed to be off site, nor habitat changes / benthic organism impacts associated with filling in of the trench after the pipeline in is place. These also need to be considered in order to get a full and integrated assessment of the alternative construction scenarios.