FRAMEWORK TO DEVELOP AN EFFLUENT MONITORING PLAN

Georgia Pacific Pipeline Task Force

May 24, 2009

Executive Summary

The Georgic Pacific Pipeline Task Force recommends that the City of Newport allot most or all funds from the pipeline license fee to monitor possible health, environmental, and economic impacts of the effluent plume off of Nye Beach. The monitoring program is designed to help address questions and concerns expressed by the public during the Newport City Council hearings on the pipeline. The Task Force recommends that the Newport City Council appoint a technical advisory group to oversee a modular, tiered monitoring program designed toward the highest possible cost effectiveness. The top priority is to analyze fish tissue in long-lived reef fish and commercially harvested species (e.g., flatfish, Dungeness crabs, razor clams) for health abnormalities and possible bioaccumulation of toxins. A research vessel contracted to sample fish could simultaneously measure turbidity and procure water samples for analysis of microorganisms and suspended particulates. The Task Force recommends that the City of Newport implement the monitoring program autonomously retaining rights to any data collected. The results should be made available to the public and posted on the City's website. The Task Force recommends that the City immediately appoint a technical advisory team and charge the group with finalizing the details of a monitoring plan.

Introduction

Currently there is no direct monitoring of the effluent flowing into the Nye Beach littoral cell from the Georgia Pacific Paper Mill in Toledo. This report is intended to assist the City of Newport in deliberations on the possible use of pipeline license fees in developing and implementing a monitoring plan. The framework is intended to guide development of a plan which is neutral, relevant, scientifically objective, and cost effective.

Public comments and concerns about the Georgia Pacific effluent have been expressed at the Newport City Council, the local newspaper (Newport News-Times) and Oregon Department of Environmental Quality public hearings on the NPDES permit renewal. The Georgia Pacific Pipeline Task Force reviewed these concerns and proposes monitoring programs most relevant to the interests of the City of Newport. These programs are delineated into three main categories: 1) human health, 2) environment, and 3) economic. Preference was given to programs that are likely to fall within the range of the annual fee that the City of Newport could assess in its license agreement with Georgia Pacific, (the Task Force has recommended an annual fee of $55,000/year). Programs exceeding the annual fee are discussed but given lower priority due to their relatively higher costs.

Objectives

The specific goal of this project is to develop a neutral and objective framework for designing and executing a science-based monitoring plan. The task force recommends that the City of Newport appoint a technical advisory committee to develop operational procedures including:
1) establishing sampling protocols; 2) obtaining proposals from potential contractors; 3) conducting analysis; 4) compiling reports; 5) recommending follow-up studies; and, 6) submitting additional funding requests or forging appropriate research alliances. In addition the advisory group should coordinate the monitoring plan with routine monitoring carried out by Georgia Pacific including the 1) Annual Dive Report; 2) Annual Toxic Release Inventory; 3) the Monthly Discharge Monitoring Report; and, 4) monitoring plans required by the DEQ permit amendment. The Task Force also recommends that to the extent practical, local resources including vessels, students, and citizens, participate in the monitoring program. The Task Force recommends that the City of Newport implement the monitoring program while autonomously retaining the rights to any data or analysis. The

results should be made available to the public as soon as they are available and posted on the City's website. The web page should include a "blog" or comment and discussion area to facilitate public discourse and participation.

The recommendations are framed in terms of four main questions representing public concerns. A cost assessment of monitoring modules (page 11) divides cost estimates into: 1) ship-based studies, 2) diver-based studies, 3) stationary moored instrument packages and 4) health and public opinion polls.

The framework presents individual monitoring modules designed to help address public concerns and weighted according to an arbitrary cost-to-benefit ratio estimated by considering 1) relevancy to citizen concerns, 2) science-related effectiveness in addressing specific questions, and 3) module cost. Each module stands alone but can be combined with other modules to develop a monitoring plan that makes the best use of available funds. The monitoring modules are ranked according to four priority categories: "top", "high", "moderate", or "low".

A bathymetry map (Figure 1) is included to help the reader visualize sampling strategies discussed in this report. The map shows the location of the outfall and possible transects for monitoring turbidity and fish sampling. The purple arrow illustrates the wind direction during the winter (Southwest) with the resulting plume oval extending north of the outfall. The green arrow shows the wind direction during the summer (Northwest) with the plume oval extending south.

Public Concern 1 Does eating seafood from the area affect human health?

Rating: This concern is given top priority because relevant studies are cost effective, and long-lived fish and target species are likely to be sensitive indicators of time-averaged biomagnification of toxins.

Rationale: Information is presently inadequate to address this concern. Bioaccumulation of fat-soluble pollutants is a known health concern but no analysis has been conducted of tissue from fish caught near the outfall. According to annual toxic release inventories filed with EPA, Georgia Pacific emits up to a ton of lead a year into the Nye Beach littoral zone. The effluent also contains PAHs (including carcinogenic polycyclic aromatic hydrocarbons similar to those in cigarette smoke), cyanide, phenols,

halogenated hydrocarbons, resin acids and heavy metals such as lead and mercury that could possibly bioaccumulate in fish tissue and build up in the sand around the outfall. Monitoring of edible fish caught in commercial and recreational fisheries for various chemicals and heavy metals would help protect both health and economic interests of the residents of Newport.

In addition OAR 340-041-0053(c)(C**)** stipulates that DEQ must define a mixing zone in the area of wastewater discharge to "minimize adverse effects on the indigenous biological community, especially when species are present that warrant special protection for their economic importance, tribal significance, ecological uniqueness, or other similar reasons determined by the department." The task force recommends analysis of long-lived reef fish caught by hook and line on the bounding reef that separates the outfall from the open ocean.

Relevant Monitoring Modules

Hook and Line Hook and line fishing from GPS navigated vessels could sample rockfish (including blue, black, canary, widow, yellowtail, shortbelly, and dark-blotched) wolf eels, lingcod, and cabezon that populate the bounding reef near the outfall. Analysis of specimens caught near the outfall would be compared to those caught in control areas of relatively pristine sea water

Rating: <u>Top priority</u> especially for certain rockfish species and cabezon because of ease of sampling, longevity of species, and long term local residency.

Bottom Trawls Bottom trawls from GPS navigated vessels can sample indigenous sole, flounder, skates, cabezon, sand lances, and speckled sand dab among other species of fish. Additional analysis of other target species such as flatfish, shellfish, and surfperch should be employed through alternate or concurrent sampling strategies.

Rating: Top priority for cabezon because of longevity of species and long term local residency.

Microorganisms and Bacteria by Niskin Bottle Nye and Agate Beaches are frequently closed because of high levels of bacteria. Although there are numerous possible sources of bacteria, testing may determine if any bacteria can be attributable to GP effluent. As an adjunct to fish sampling, shipboard samples of seawater recovered by

Niskin bottle can be tested for bacteria as part of the bacteria-monitoring program.

Rating: <u>Top Priority</u> because of high health concerns and cost effectiveness of sampling and bacterial analysis.

The technical advisory committee by the City of Newport should compile a list of priority target species, develop a scientifically sound sampling plan, contract a vessel for sampling fish, and enlist trained students and volunteers to carry out the sampling. The same vessel could also be used for sampling water, measuring physical properties of the effluent, and sampling bottom in fauna in grab cores.

<u>Public Concern 2</u> Is the effluent causing damage to the health of marine ecosystems?

Rating: *This question is given **<u>Top Priority</u>** on the issue of turbidity because the 1986 CH2M Hill study shows high turbidity correlated with suspended particulates near the outfall, and turbidity studies are relatively cost effective.*

Rationale: There are no studies that adequately address this concern. The effluent could be impacting the environment in four ways: 1) lack of light penetration due to enhanced turbidity; 2) accumulation of toxins in sand obstructing the outfall ports; 3) bioaccumulation of toxins harmful to marine organisms; and, 4) direct contact with the effluent. No effluent concentration studies have been made around the outfall. A 2003 analysis based on a single dye study models concentrations assuming a uniform rate of dilution of effluent in a prescribed mixing zone. At the time of the dye study, oceanographic conditions were unusually calm and effluent flow rate was particularly low. Thus, it is unknown if the effluent is within water quality standards outside the mixing zone during turbulent conditions or chaotic events such as strong waves, rip currents, and tidal reversals.

Relevant Monitoring Modules

Turbidity Turbidity decreases light transmittance which could impact a variety of biological communities. Turbidity is, at least in part, responsible for the dark shadow in the water that is visible from the

hotels in the Nye Beach area and that shows up on aerial views such as the Google Maps satellite view of Newport.

OAR 340-041-0036 stipulates that DEQ must require the permittee to maintain the turbidity at the outfall within ten percent of the receiving water.

The 1986 CH2M Hill study shows that The Georgia Pacific effluent can contain up to 300 ppm of suspended solids as opposed to around 3 ppm for normal seawater. The study shows that a decrease of 22% light transmittance corresponds to an increase of 5 ppm in suspended solids.

It would be useful to simultaneously collect water samples for suspended particulates to determine their degree of correlation with turbidity as compared to the effect from the dissolved elements such as tannins, copper, iron, and manganese.

Commercial divers have reported impacts to the macro flora, seaweeds and grasses surrounding the outfall. Testing may help determine the extent that turbidity from the effluent impacts the ecosystem. No in situ monitoring of plume turbidity has ever been carried out.

Turbidity Monitored From Research Vessel Turbidity can be measured from a research vessel at the same time fish species are sampled for bioaccumulation studies. The least expensive method is by Secchi disc from a drop line. Continuous transects through the plume can be mapped by GPS and land based video imaging.

Rating: Top priority for cost effectiveness and ease of measurement.

Turbidity Monitored from Moored Instrument Packages. Ocean bottom monitoring laboratories can continuously measure turbidity along with temperature, salinity, and oxygen. In the intense wave environment off of Newport instrument packages would need to be anchored at depths out of wave reach. They would also need to be recovered using expensive timed release technologies. Continuous deployment requires two instruments, one anchored within the plume and one anchored in pure receiving water. The configuration of the plume relative to the moored stations can be time-correlated using land based video imaging.

Rating: <u>High priority</u> but is not as cost effective as a towed package deployed simultaneously while collecting biological and water samples.

Objectionable Deposits in Sand Covering Outfall

Effluent compounds could be building up in the sand that blocks eight ports of the diffuser array. Bottom currents and wave action could redistribute the sand. Toxic compounds could possibly be accumulating in the local benthic fauna. No analysis of sand cores has ever been conducted.

OAR 340-041-0053(2)(a)(B) mandates that DEQ may suspend or reduce water quality standards in mixing zones provided that materials will not settle to the bottom to form objectionable deposits. Sand deposits that migrate over the outlet have never been assayed. DEQ has suggested that additional ports will not become blocked because the increased velocity of discharge sweeps away the sand. However, both effluent flow velocity and sand accumulation rates are variable.

Divers with shrimp guns could collect sand and fauna from on top of the diffuser array for chemical analysis.

Rating: <u>High Priority</u> because of high benefit to cost ratio.

Benthic In fauna Sediment coring by diver hand-held shrimp guns could sample a broad spectrum of benthic in fauna living in the sand surrounding the outfall. Siphon feeding worms and clams living in the sand near the outfall can provide an indication of contaminants precipitating from seawater. Other species of in fauna include isopods, and amphipods. Resin acids that coat the gills and suffocate juvenile members of populations could harm these species.

Rating<u>: High Priority</u> because it could be carried out simultaneously with collection of sand for investigation of deposits.

Land Based Video Monitoring

Video monitoring is relevant to health and economic concerns. Some sections of the pipeline may be subjected to stress from wave action, tides, and bottom currents in the proximity of Nye Beach. Currently there is no way of detecting an underwater pipe break.

In addition, tidal reversals and rip currents can breach the plume integrity and deflect pods of concentrated effluent some distance from the main plume body.

A high angle video camera mounted on, for example, a small tower on top of the Visual Arts Center or at Don Davis Park, could help detect effluent concentrations approaching the beach. One model for this approach would be the ARGUS video array that collects time lapsed images of Agate Beach from Yaquina Head. A thermal imaging function may help detect concentrated effluent at night and in other periods of poor lighting.

Land based video monitoring can be used to assist monitoring of turbidity by recording the plume configuration relative to sampling transects and moored instrument arrays.

Rating: <u>High priority</u> given cost benefit ratio and application in concert with turbidity studies.

Detailed Bioassays

Comprehensive bioassays that compare control areas with the area of the outfall is necessary to assess the health of the biological communities and would combine video mapping by polecam with bottom trawls and sediment cores taken from GPS navigated research vessels. Detailed bioassays would compare detailed GPS video maps of macro flora (seaweed and sea grasses) and habitat of benthic in fauna, groundfish, flatfish, rockfish, and macro invertebrates within an area of pristine ocean. To be statistically valid, hundreds of samples taken under multiple environmental conditions at least four times a year would be required.

Because the survey would have to be repeated at reasonable time intervals that reflect seasonal variation and migration of the effluent plume, the study is probably coast prohibitive for the City of Newport unless the City secures or allocates additional funds. A limited sampling of bottom trawls from GPS navigated commercial fishing boats following ODFW protocols would probably be more economical.

Subsurface Video Monitoring of Biology Subsurface biology can be monitored using video cameras attached to fixed moorings, hand held by divers, towed behind a GPS navigated boat, mounted on an untethered Remotely Operated Vehicle (ROV), or mounted on a pole (polecam) attached to a GPS navigated boat or Zodiac. Of these, the best image control would be achieved with the polecam because it enables large numbers of precisely navigated, overlapping images to be mosaicked into base maps that can be used for assessing sea bed biological communities and locating specimens for testing of bioaccumulation of priority pollutants.

Rating: Low priority because of high costs.

Macro Flora could be surveyed by a GPS navigated polecam followed up by diver collection of individual specimens for further analysis. Impacts to the macro flora community surrounding the outfall might be the result of impaired sun light penetration into the turbid effluent plume.

Rating: Moderate priority because of high cost to benefit ratio.

Public Concern 3 Is there a health risk for humans in long-term contact with the effluent?

Rating: *Despite the importance of this question it is given* ***low priority*** *because relevant studies are beyond the financial means of the City of Newport.*

Rationale: Surfers, beach, and ocean recreational users are longtime users of Nye Beach. Surfers are known to incidentally ingest significant quantities of seawater and are concerned about possible long term effects.

The effluent composition is highly variable and some published samples exceed water quality standards for lead, mercury, and cyanide. The effluent

contains many compounds of unknown long-term chronic toxicity. Length and amount of exposure may be particularly important variables. Long-term studies of chronic exposure to effluent on humans or animals are not available. Long term studies of the effect of effluent on laboratory animals or humans are cost prohibitive.

Monitoring Module

Health polls of Surfers and other Frequent Users of Nye Beach.

Statistically meaningful health surveys of frequent users would require several years to establish a baseline. Anecdotal accounts could be collected on a website with follow-up questionnaires compiled by medical advisors.

Public Concern 4 Are there negative economic impacts to the local community due to the effluent?

Rating: Despite the potential importance of this question it is given a low priority because preliminary evidence suggests a relatively low impact, and studies are relatively expensive and difficult to design given the sensitive nature of the issue.

Rationale There have been no studies to determine the direct and indirect economic impacts associated with the high visibility of the plume and concerns over edibility of fish and shellfish caught in the Nye Beach littoral zone. The economic assessment recently commissioned by the City of Newport to determine the fair market value of the Georgia Pacific effluent pipeline discusses the possible economic impacts due to the loss in tourism or other effects on the economic welfare of local residents. The study noted that without an appropriate survey and analysis the impacts could not be measured. Informal surveys with a handful of owners of Nye Beach tourist establishments suggested the impact may be relatively small.

Monitoring Module

Surveys of workers in the tourist industry, visitors to Nye Beach, and local residents.

Economic- based surveys of visitors to Nye Beach and local residents and owners of tourist establishments would require one to two years to complete. The survey would need to be carefully designed given the complex and sensitive nature of the questions, the need to sample both on and off site, and possible problems associated with information bias.

Monitoring Cost Assessment

Monitoring costs are organized using two approaches. The first approach summarizes costs based on specific cost items. The second approach lists costs by module-related component.

Approach 1: Specific Cost Item Estimates

Ship Based Monitoring

Daily ship rental fees	$2,000-5,000
Storage and preparation of Samples	500
Chemical Scans of Fish Tissues/sample	100-200
Turbidity measurement by Secchi Disc	200
Turbidity by Light Transmittance	10,000
Water samples by Niskin Bottle	500
Bacteria Analysis/sample	100
Suspended particulates/sample	100
Particulates by Optical Back Scatter	2,000
Land based video monitoring of plume configuration	4,000

Moored Instrument Packages

Turbidity by light transmittance	10,000
Particulates by Optical Back Scatter	2,000
Plume configuration by land based video	4,000
Mooring rigging	2,000
Mooring deployment by ship /year	4,000-10,000
Yearly maintenance of instruments	10,000

Subsurface Sampling by Divers

Daily ship rental fees	2,000-5,000
Diver time/day	2,000-6,000
Chemical scan of infauna/sample	100-200
Chemical scan of sand/sample	100-200

Health and Public Opinion Polls

Health survey	5,000-10,000
Economic survey/analysis	20,000-30,000

Approach 2: Costs Based on Monitoring Module Rankings

Besides laboratory costs these estimates include ship time or diver time assuming ten samples per ship or diver/day. The monitoring modules are ranked according to four priority categories: "top", "high", "moderate", or "low". The modules are weighted according to an arbitrary cost-to-benefit ratio estimated by considering 1) relevancy to citizen concerns, 2) science-related effectiveness in addressing specific questions, and 3) module cost. Each module stands alone but can be combined with other modules to develop a monitoring plan that makes the best use of available funds.

Monitoring Module	Ranking	Approximate Estimate of Cost
Bioaccumulation in fish tissue	Top priority	$750/sample
Turbidity by Secchi disc	Top priority	200/measurement
Turbidity by towed instrument	Top priority	4,000/transect
Turbidity by moored instrument	High priority	20,000/year
Particulates by Niskin bottle	Top priority	400/sample
Particulates by Optical Backscatter	High priority	4,000/year
Bacteria by Niskin bottle	Top Priority	400/sample
Plume configuration by video	High Piority	1,000-4,000/year
Objectionable deposits in sand	High Priority	800/sample
Chemical scan of infauna	High Priority	800/sample
Subsurface video of macro flora by polecam	Moderate priority	1,500/transect
Detailed Bioassay including subsurface video	Low Priority	300,000/study
Health survey of frequent users	Low Priority	10,000
Economic survey of economic impacts to health and tourist industries	Low Priority	20,000-30,000