"The mission of the Council is to represent the citizens of Cook Inlet in promoting environmentally safe marine transportation and oil facility operations in Cook Inlet."

31 May 2006

Mr. Michael Gearheard, Director
Office of Water and Watersheds
U.S. EPA Region X
1200 6th Avenue, OWW-130
Seattle, WA 98101

Dear Mr. Gearheard,

The Cook Inlet Regional Citizens Advisory Council (RCAC) is responding to your call for comments regarding the Proposed NPDES General Permit for Oil and Gas Exploration, Development, and Production Facilities Located in State and Federal Waters in Cook Inlet (AKG-31-5000). This permit is in regards to discharges associated with oil and gas exploration, development, and production activities in Cook Inlet's coastal, territorial, and offshore waters. This proposed rule would apply to existing as well as new source discharges.

The proposed geographic area, activities, and facilities covered in this draft permit is within our area of concern and, as such, this letter and attached comments address our concerns specific to the draft permit and its association documents (*e.g.* Fact Sheet, Mixing Zone Application, Ocean Discharge Criteria Evaluation, Environmental Assessment and Finding of No Significant Impact, Biological Evaluation, and Essential Fish Habitat Assessment).

The Cook Inlet Regional Citizens Advisory Council (RCAC) is a citizen oversight council for oil industry operations in the Cook Inlet region and was established according to Section 5002 of the Oil Pollution Act of 1990 (OPA 90). Our organization represents local governments and interest groups in Cook Inlet and nearby areas who have the potential to be impacted by crude oil industry operations in Cook Inlet. One of our many tasks under OPA 90 includes providing "*advice and recommendations on policies, permits, and site-specific regulations relating to the operation and maintenance of terminal facilities and crude oil tankers which affects or may affect the environment in the vicinity of the terminal facilities.*" Thus, through this congressional mandate, we are providing you with these comments.

On 19 May 2006, our Board of Directors met and passed a resolution regarding the proposed NPDES permits that states that:

> *"… the Cook Inlet RCAC does hereby oppose the issuance of an NPDES General Permit for Oil and Gas operations in Cook Inlet that would allow more pollution to be discharged than is currently permitted and the Cook Inlet RCAC supports the goal of zero discharge."*

Although stopping short of requesting "zero discharge" for all facilities in this permit cycle, the resolution language articulates Cook Inlet RCAC's stance that the proposed permit limits and mixing zones should be reevaluated and recalculated to ensure that the total concentrations and pollutant loadings do not increase from the current permit and that every effort be made to move

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towards zero discharge in the future. Recent successful efforts by some Cook Inlet operators[1] to re-inject drill fluids and cuttings and produced water discharges have shown that re-injection is feasible. These same efforts should be applied to some portion of the discharges identified in the draft permit to ensure that the total discharged pollutant loads do not increase. While we support the increased mixing and dilution that will be provided by the addition of a multi-port diffuser at the Trading Bay Production Facility, this facility will still account for over 95% of the produced discharges to Cook Inlet and the total loadings of pollutants should not increase.

Our attached comments address our other major concerns, as well as details in the proposed permit and associated documents. In general, we do not believe that the mixing zone modeling has been shown to be conservative as was claimed in the Mixing Zone Application and Fact Sheet. Many of the produced water limits were based on only one number and some of the assumptions made during the CORMIX modeling do not match our knowledge of Cook Inlet's physical oceanographic environment. The CORMIX modeling effort should be reexamined for the effects of vertical structure and incorporate more realistic ambient conditions.

We were surprised at the number of errors found in the draft permit and the lack of good data integration in some of the supporting documents, especially after waiting two years to review this draft. For example, the oceanography section in the Environmental Assessment is very weak and focuses on the lower inlet with little effort to incorporate information available for the upper inlet. In that same document, descriptions of the upper Inlet environment were based on only a few data sources, and missed an opportunity to compile and integrate numerous other data. Also, a significant amount of the background information provided by TetraTech in the supporting documents and reports was paraphrased or quoted directly from MMS's Environmental Impact Statement for the Cook Inlet Oil and Gas Lease Sales 191 and 199[2]. This MMS document provides references to almost all of Cook Inlet RCAC funded studies[3] that were designed specifically to assess potential impacts of Cook Inlet oil industry discharges, yet the supporting documents made no references to these data. We have since provided electronic copies of our reports to your staff.

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[1] Since 2002, Forest Oil has been injecting produced water and drilling fluids/cuttings from its Osprey platform (not covered under this permit); In 2004, the Tyonek A platform was converted by ConocoPhillips for zero discharge of produced water; In 2005, Platform Anna was converted by re-injection by Chevron/Unocal.

[2] MMS (Minerals Management Service). 2003. Cook Inlet Planning Area. Oil and Gas Lease Sales 191 and 199. Final Environmental Impact Statement. OCS EIS/EA MMS 94-0066. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf, Anchorage, AK.

[3] MBC Applied Environmental Sciences. 1992. A comprehensive monitoring program for Cook Inlet, Alaska. Final Report submitted to Cook Inlet Regional Citizens advisory Council, 11355 Frontage Rd., Kenai, AK 99611.

Arthur D. Little, Inc. 1995a. Cook Inlet pilot monitoring study final report: phase I of an overall program entitled, "Design and Implementation of a Prototype Environmental Sampling Program for Cook Inlet, Alaska:. Prepared for Cook Inlet Regional Citizens Advisory Council, Kenai, Alaska.

Arthur D. Little, Inc. 1995b. Cook Inlet pilot monitoring study final report: phase II of an overall program entitled, "Design and Implementation of a Prototype Environmental Sampling Program for Cook Inlet, Alaska:. Prepared for Cook Inlet Regional Citizens Advisory Council, Kenai, Alaska.

Kinnetic Laboratories, Inc. 1996a. Cook Inlet Environmental Monitoring Program. Final monitoring report-1995. Prepared for the Cook Inlet Regional Citizens Advisory Council Environmental Monitoring Committee.

Kinnetic Laboratories, Inc. 1996b. Lake Clark Bivalve Analyses. Data Summary Report-1996. Prepared for Cook Inlet Regional Citizens Advisory Council Environmental Monitoring Committee.

Kinnetic Laboratories, Inc. 1997. Cook Inlet Shelikof Strait Project. Final report-1996. Prepared for the Cook Inlet Regional Citizens Advisory Council Environmental Monitoring Committee.

Kinnetic Laboratories, Inc. 1998. 1997 Cook Inlet Sediment Toxicity and Hydrocarbon Study. Prepared for Cook Inlet Regional Citizens Advisory Council.

Lees, D.C., J. R. Payne, and W. B. Driskell. 2000. Technical Evaluation of the Environmental Monitoring Program for Cook Inlet Regional Citizens Advisory Council. Final report submitted to CIRCAC, Kenai, AK.

Lees, D.C., W. B. Driskell., and J. R. Payne. 2004. Intertidal Reconnaissance Surveys in Cook Inlet. Draft Report to Cook Inlet Regional Citizens Advisory Council, Kenai, AK.

The lack of summarized DMR data made it difficult to follow the process used for determining maximum reasonable concentrations for determining permitted effluent limits. The Fact Sheet noted that many tribal members requested that the public be continuously informed regarding platform reporting and compliance and we agree that EPA needs to make a much greater effort to compile and provide discharge data throughout the life of the permit. We request that EPA require industry to submit these data into a publicly accessible database or in an easily accessible electronic format.

We support EPA's inclusion of environmental monitoring associated with new exploration and existing large dischargers in Cook Inlet. We have provided general comments on recommendations for such monitoring efforts and have been in discussions with the state, EPA, and industry to determine whether such an environmental monitoring program can be coordinated with our mandated monitoring efforts. This is a new component of the permit with a final sampling plan to be submitted for approval by EPA at a later date. We will continue to work with EPA, ADEC, and industry to ensure that thoughtful, realistic, and useful final sampling plans are prepared.

Finally, thank you for being responsive to requests for an extension of the comment period associated with this draft permit. The extra time was critical to our review of the draft permit and numerous associated documents prepared by your staff and contractors. We also appreciate the hard work by your staff in coordinating the public hearings and reviews of this draft permit. If you have any questions regarding our comments, please contact me or our Director of Science and Research, Susan Saupe, at the number below or at our respective e-mails, munger@circac.org or saupe@circac.org.

Sincerely,

Michael Munger
Executive Director

cc: Hanh Shaw via *shaw.hanh.epa.gov*
Ms. Sharmon Stambaugh, ADEC

Most of the following comments apply to both the Draft Permit and the Fact Sheet, as much of the material in the Fact Sheet, including figures and tables, have been taken verbatim from the Draft Permit. It has been noted when comments are directed to only one of the documents.

General Permit and Fact Sheet Comments

1) Figure 1: Area of Coverage – The description is confusing for the Upper Northern Cook Inlet area. The draft permit authorizes "discharges from exploratory facilities and existing development and production facilities." The way it is currently written implies that permit doesn't allow new source development discharges in Upper Cook Inlet which doesn't make sense if exploratory facilities are allowed. The difference between upper and lower Cook Inlet is "Coastal" versus "Offshore Territorial Seas and Federal Waters", however the description for the allowable discharges within each of these areas should be similar with the exception that the Upper Cook Inlet has "existing facilities".

2) The Draft Permit proposes the prohibition for discharges within 1,000 meters of coastal marsh, river delta, etc. be expanded to 4,000 meters to afford better protection of these sensitive areas. CIRCAC supports the monitoring requirements for all new facilities and believes that environmental impacts would be reduced by discharging into deeper waters (*i.e.* further offshore) by reducing the chance that fine particulates can accumulate in intertidal depositional areas. The study plans submitted for these discharges of drilling muds and/or cuttings need to be carefully designed to provide the most valuable data. For example, study designs will most likely differ in different parts of the inlet to account for the varying current regimes which would affect whether discharged particulates could accumulate in the benthic environment or be mixed with the high suspended sediment loads in upper Cook Inlet, diluted, and swept downstream. Few assessments have been made[4] on the potential impacts of discharged drill muds and cuttings to benthic community structure in the immediate area of the discharges while the discharges are taking place. These data will increase our knowledge such that assessments can be made for future issues based on Cook Inlet data.

   During the recent South-central Alaska Coastal Assessment for the EPA Environmental Monitoring and Assessment Program[5], benthic infaunal communities in middle and upper Cook Inlet tended to be less rich and diverse than in other areas. This was most likely associated with the high suspended sediments and the fact that surface sediments are continually reworked and scoured in the upper Inlet. However, the lack of ambient data on community assemblages in these environments makes it difficult to evaluate the benthic condition in these areas within the context of the larger Cook Inlet or Gulf of Alaska context. By requiring that the analyses must include potential impacts to the benthic community, EPA can help fill these data gaps while providing information to evaluate potential impacts from the discharges.

[4] Dames and Moore. 1978. Drilling Fluid Dispersion and Biological Effects Study for the Lower Cook Inlet C.O.S.T. Well. Anchorage, AK; Atlantic Richfield Company, 109 pp.

[5] Saupe, S.M., J. Gendron, and D. Dasher. In Press. National Coastal Assessment Program: The Condition of Southcentral Alaska's Bays and Estuaries Technical Report and Statistical Summary. Final report to Alaska Department of Environmental Conservation, Anchorage, AK.

3) Drilling muds, fluids, and cuttings discharges – New Sources: The description of allowable drilling muds, fluids, and cuttings discharges is inconsistent between the Fact Sheet and a number of places in the Draft Permit. New sources are defined to include both development and production operations which exclude exploratory operations. The Draft Permit (page 7 of 139) stipulates that "New Sources…. are **not** authorized to discharge produced water, drilling fluids, or drilling cuttings". However, the Fact Sheet (page 9 of 73) states that: "Discharges associated with development operations include all those listed above for exploratory operations. In addition, generally, facilities engaged in development operations discharge produced water and well treatment fluids." This wording needs to be changed since these discharges are specifically **not** authorized for new source development activities which would include pretty much all development activities in Cook Inlet. Another section this applies to is Section 5. Environmental Monitoring, a. New Facilities in the Draft Permit. This section specifies a monitoring program for New Facilities that are discharging drilling muds and/or cuttings. This section should read "New Exploratory Facilities", since these types of discharges are not allowed for new development and new production facilities.

4) CIRCAC supports the decision in the Draft Permit to not allow the discharge of produced water, drilling fluids, or drilling cuttings from new sources that are defined as new development or new production facilities. However, no reasoning is given for not extending this discharge restriction for drilling fluids and cuttings to also include new exploratory. The Environmental Assessment (EA) states that an "evaluation of requiring reinjection of drilling fluids and cuttings resulting in zero discharge of these waste streams was conducted by EPA and was determined to be technically infeasible for many of the formations underlying and adjacent to Cook Inlet." If reinjection is technically infeasible for exploration based on geological formations, why is reinjection feasible for new development and production facilities? Further explanation needs to be provided in the Fact Sheet for this decision to not also include new exploratory facilities as new sources. If there is technically no reason for a distinction between exploratory and development or production facilities, then this discharge restriction should also be extended to those exploratory facilities.

   The coastal subcategory exemption from zero-discharge for water-based drilling fluids and cuttings in coastal Cook Inlet was based on several factors, including the small volumes of discharges expected, weather and logistics problems, economic considerations, and other factors. The exemption from zero-discharge for produced water in coastal Cook Inlet was based on the technical infeasibility of reinjecting produced waters (due to the inappropriate geological formations, scaling and hydrogen sulfide formation in piping, reservoir plugging and souring) and economic considerations (lack of cost-effective alternative to reach zero-discharge)[6].

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[6] Prentki, R. T. 1995. The "Alaska Exemption for Offshore Oil and Gas Industry Discharges under National Pollutant Discharge Elimination System (NPDES). Alaska OCS Region Briefing Paper.
Federal Register. 1996. Final Effluent Limitations Guidelines and Standards for the Coastal Subcategory of the Oil and Gas Extraction Point Source Category. 61 Federal Register 242, 66085-66130.
Federal Register. 1999. Final NPDES General Permit for Oil and Gas Exploration. Development and Production Facilities in Cook Inlet, [AL] (AKG285000). 64 Federal Register 46, 11885-11098.

Since the ruling that provided for the Cook Inlet exemption, there has been additional information available that led the EPA to not provide for the standard Cook Inlet exemption for the discharge for synthetic-based drilling fluids to coastal waters[7]. The EPA identified that many Cook Inlet operators in Coastal waters are successfully using cutting reinjections for oil-based and synthetic-based drilling fluids. In addition, the exploratory Osprey platform in Cook Inlet is reinjecting drilling fluids and will reinject produced water during production. The technology is clearly available for zero-discharge in many instances and all future post-lease activities should employ re-injection well technology, either on-site or on-shore. A more recent example was presented at the recent Cook Inlet RCAC Board of Director's Meeting on 19 May 2006 when a representative from Escopeta Oil announced that they will injects drilling wastes associated with their exploration, development, and production activities.

5) CIRCAC supports the decision in the Draft Permit to require a consistent list of analytes to be monitored between facilities (*e.g*., produced water monitoring of: TAH, TAqH, ammonia, copper, mercury, manganese, nickel, zinc, and WET), which will make permit conditions and compliance much easier to track for both the industry and regulatory agencies. However, as described below, we do not support the removal of any metal that is included in the existing permit.

6) Although not consistent between facilities, the old permit also required monitoring of lead, silver, and arsenic in produced water effluent at some facilities. The Fact Sheet should provide a basis for removing these parameters by providing a summary of data that shows levels with respect to Alaska Water Quality Standards (AWQS), permit compliance, or some other basis for no longer requiring this monitoring. The Fact Sheet states that these parameters were removed based on recent discharge monitoring reports that indicated there is no reasonable potential for exceedance of water quality criteria. However, summary data presented in the *Mixing Zone Application for Cook Inlet Oil and Gas Operators* indicated that the hazard quotient, defined as the dilution necessary to meet AWQS, ranged from 10.49 to 38.23 for arsenic, from 1.5 to 61.05 for lead, and from 4.53 to 64.5 for silver for those facilities where data was reported. In the case of the East Forelands Treatment Facility, silver was found to have the highest dilution requirement for any metal based on AWQS aquatic life acute criteria, and lead was found to have a higher dilution requirement than any of the other metals for which monitoring is currently required in the draft permit.

Based on these numbers, it is clear that these facilities do **<u>not</u>** meet AWQS at end of pipe for these three metals and therefore they should be required to monitor these parameters as a permit requirement even if they are not given effluent limitations. The incremental cost required to add additional metals parameters for a sample would be fairly minor given the fact that metals analyses are typically performed by ICP or ICPMS techniques.

7) The analysis of selenium in produced water should also be monitored as a permit monitoring requirement. Summary data presented in the *Mixing Zone Application for Cook Inlet Oil and Gas Operators* indicated that the dilution necessary to meet AWQS for

[7] Federal Register. 2001. Effluent Limitations Guidelines and New Source Performance Standards for the Oil and Gas Extraction Point Source Category; OMB Approval under the Paperwork Reduction Act: Technical Amendment Final Rule. 66 Federal Register 14, 6850-6919.

selenium ranged from 14.01 to 55.11 for six of the eight facilities that reported on this parameter. In the case of the East Forelands Treatment Facility, selenium was found to have the highest dilution requirement for any metal based on aquatic life chronic criteria in the AWQS.

8) Fact Sheet, Table 2, Tyonek A discharge rate. The maximum projected rate and the current discharge rate are the same. Is this correct?

9) Whole Effluent Toxicity (WET) – Many of the typical testing and reporting requirements for the WET testing are for the most part absent and are not consistent with requirements that are typically included in NPDES permits for other dischargers in Region 10. Request the following clarifications and requirements be added to the permit:

   - For static renewal testing, the effluent water used in the toxicity tests must be renewed daily. However, a fresh 24-hr composite sample need only be collected every other day (i.e., days 1, 3, and 5) except in the event that weather and/or shipping difficulties prevent delivery to the laboratory.

   - Complete results of the WET testing shall be submitted with the DMR for the month following the completion of the tests.

   - Reports of the toxicity testing results shall include all relevant information outlined in Section 10, Report Preparation, in *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, the Third Edition* (EPA-821-R-02-014). The permittee shall include: (1) the results of the test(s), (2) the dates of sample collections and initiation of each toxicity test, (3) discharge rate, (4) results of any chemical specific testing performed in conjunction with the toxicity test(s), and (5) all raw data and statistical analyses from the tests, including reference toxicant data.

   - All quality assurance and statistical analyses shall be in accordance with *Quality Assurance Guidelines for Biological Testing*, EPA/600/4-78-043, *Quality Assurance Bibliography*, EPA/600/4-89-001, and other EPA Region 10 approved protocols.

10) WET testing requirement inconsistency needs clarification. In Section II.G.6.a.2 - Increased Monitoring, the permit specifies increased WET monitoring to increase to once per month for a period of three months should the permit limit be exceeded. However, Sections III.A.7 and III.A.8 already specify a rigorous accelerated testing program should a WET test exceed the permit limits and that if the accelerated testing indicates no toxicity, then the permittee may return to **normal** testing frequency. Suggest deleting the increased monitoring requirement for WET testing in Section II.G.6.a.2 since it is already covered in Sections III.7 and III.8. Also, change the wording **normal** in Section III.8 to **quarterly** which would ensure that WET testing reverted back to the original testing requirement during the first year of the permit for an additional one year period following a permit exceedence.

11) Section III.D. – Polynuclear Aromatic Hydrocarbons (PAH). It should be made clear that this test method required for PAH only applies to the testing of drilling fluids and drill cuttings (Discharge 001). The State of Alaska test method for the PAH portion of TAqH as cited in the Alaska Standards, 18 AAC 70.020(b) is by EPA Method 610, EPA Method 625, or other ADEC-approved methodology.

12) Tables 7 Potential Errors. There appear to be a number of errors in Tables 7B1-7B9 in the Draft Permit and in the corresponding Tables in Appendix B of the Fact Sheet. Potential errors that were found are the following:

- Table 7-B2: The East Forelands Facility. The TAqH limits are less than the TAH limits which does not make sense, since TAH is included in the determination of TAqH (TAqH = TAH + PAHs). Also, the limits for TAqH and ammonia are identical which indicates a potential error in the table. Based on data presented in the mixing zone application, the daily maximum effluent limits for TAqH and ammonia should be 26.06 mg/L and 23.63 mg/L, respectively, rather than 24.2 mg/L.

- Table 7-B4: Platform Bruce. The daily maximum limit for total zinc appears to be an order of magnitude too high based on the monthly average. Should the daily maximum be 44.6 mg/L rather than 446 mg/L?

- Table 7-B5: Platform Baker. The monthly and daily limits for total copper appear to have the wrong units. Should these limits be µg/L rather than mg/L?

- Table 7-B6: Platform Dillon. The monthly and daily limits for total copper appear to have the wrong units. Should these limits be µg/L rather than mg/L?

- Table 7-B6: Platform Dillon. The daily maximum for total nickel appears to be an order of magnitude too high. Should this limit be 210 µg/L rather than 2.1 mg/L?

- Table 7-B9: Granite Point Platform. The monthly and daily limits for total nickel appear to have the wrong units. Should these limits be µg/L rather than mg/L?

13) **Section VII – Environmental Study Requirements.** CIRCAC supports the requirement for an ambient monitoring program for facilities that discharge over 100,000 gallons per day; however, the purpose and scope of these environmental studies needs to be better defined in the Draft Permit. There appear to be two separate components to this monitoring program; water quality and sediment, which we have commented on separately.

<u>Water Quality Component</u>

- First, it is important that any environmental study related to discharges in Cook Inlet includes periodic inventory and reporting of a full suite of chemical analytes in the produced water from the large dischargers – including analytes that may not be listed in the draft permit. These periodic analyses should include a full suite of PAHs, aliphatic hydrocarbons, a full suite of metals, other organic compounds (*e.g.* selected alkyl-phenols and polychlorinated hydrocarbons).

- With respect to the water quality component, the plan calls for sampling in the water column "at 50 meter intervals over a grid extending a distance of 2000 meters both north and south of the discharge point and 100 meters in width". The way we interpret this requirement is that there will be three station transects with 80 stations per transect for a total of 240 stations. Assuming the water samples are taken at the mid-depth, and bottom, there will be a total of 480 water samples to be analyzed for TAH, TAqH, copper, manganese, lead, nickel, and zinc. Assuming potential costs of $500 to $1,000/sample, this would equate to a cost of $240,000 to $480,000 for laboratory analyses of the water samples alone, not including field sampling, data and statistical analysis, database, reporting, or the sediment quality component. As currently designed, this study will be extremely costly with no clear assurance that any useful information will be obtained.

- If the purpose of the water quality component of this study is to ascertain the dispersion and dilution of the effluent plume in the receiving water, then a properly designed effluent dilution study utilizing dye or other tracer coupled with a much more limited water quality study would better serve this purpose. The information from a dilution study would allow an assessment of general dilution rates and would also enable a direct determination of receiving water chemistry from measurements obtained in the effluent. As currently designed there is no assurance that the receiving water samples obtained would even be within effluent plume.

- Based on extensive experience in obtaining water samples in Cook Inlet, obtaining samples from fixed stations by either anchoring or vessel station keeping is nearly impossible given the high currents and resulting large scope in sampling lines for either a discrete water sampler (e.g., Niskin bottle or equivalent) or pumped water sample. A better method that has been utilized by the Municipality of Anchorage in the John M. Asplund NPDES receiving water sampling program at Point Woronzof, and approved by ADEC and EPA, is to obtain water samples while drifting along the effluent plume's path. A current drogue is first deployed at the discharge point which drifts with the effluent and receiving water at the desired depth in the water column. Water samples are then obtained at various distances along the drogue's path and the location of each determined by a global positioning system (GPS) are recorded. After having drifted for a predetermined distance from the effluent discharge point, the drogue is then picked up and redeployed at the starting location and the process is repeated for the desired number of times. This sampling method assures that water samples are obtained from within the dispersed effluent plume, allows direct measurement of currents, allows a comparison for different points during the tidal cycle (ebb, flood, slack, etc.), and enables statistical analyses to be performed between station groupings as a function of distance from the effluent diffuser for the determination of statistically significant differences and impacts. This same type of sampling can be utilized in an effluent dilution study and was successfully used by MOA during their permit reapplication effort for the John M. Asplund WWTF in 1988.

- The draft study requirement includes sampling for lead which is **not** one of the parameters that is currently required in the Draft Permit for any of the produced water discharges (although see # 6, above). Also, the draft study requirements do not include mercury which **is** a produced water effluent monitoring requirement. CIRCAC suggests including mercury as a receiving water monitoring requirement to be consistent with the effluent monitoring requirements for produced water. In the event that other metals are added to the produced water effluent monitoring requirements, then those parameters should also be included in this ambient water quality study.

- The water quality sampling plan should include the analysis of both total recoverable and dissolved metals. Due to the highly turbid water conditions in Cook Inlet, it has been shown by past studies that total recoverable metals are directly correlated with the total suspended sediment (TSS) concentrations with TSS accounting for approximately 80-90% of the background metal concentrations. Therefore, the analysis of dissolved metals will be necessary to determine any effluent impacts. In addition, the AWQS for receiving water are now based on dissolved metals criteria. The analysis of TSS should also be included in the environmental monitoring program which will allow better interpretation of the metals monitoring data.

- The water quality program should also include *in situ* hydrographic measurements of the water column to define the vertical structure and confirm assumptions made during the effluent dilution CORMIX modeling efforts. Measurements typically would include: conductivity (salinity), temperature, and pressure (depth) with optional measurements of pH, dissolved oxygen, and turbidity. In addition, a hull mounted or towed Acoustic Doppler Current Profiler (ADCP) will allow better interpretation of existing current speeds and directions, especially relative to the dilution axis, during the discharge plume study. This will greatly improve our ability to interpret the results of the plume study.

- Based on our comments for the receiving water quality monitoring presented above, we propose that the monitoring program should include an effluent dilution study that would obtain sufficient receiving water data and information that would enable confirmation of CORMIX modeling results. The study would also substantially reduce the number of water quality samples that would be collected in conjunction with the dilution study, add dissolved metals and TSS to the suite of analyses, analyze for mercury rather than lead (unless lead was included in the effluent monitoring, as noted above), and include hydrographic profiles of the water column. Samples should also be obtained of the effluent at the time of the receiving water monitoring to allow a direct comparison of pollutants being discharged to those measured in the receiving water.

<u>Sediment Quality Component</u>

- Sediment quality study requirements. CIRCAC has similar concerns with respect to the study requirements for the sediment quality portion of the environmental monitoring as we had for the water quality portion. Again, the number of stations and samples currently specified is 240, which is excessive when compared to a typical NPDES discharge study that would include near-field stations at the outfall, within the mixing zone or zone of initial dilution (ZID) stations, on the mixing zone or ZID boundary stations, and far-field stations outside of the mixing zone and a control location. A typical program of this type might include 30-60 stations/samples.

- Rather than collecting more samples, it would be more beneficial to collect better information at the locations that are sampled. Additional measurements that should be taken which would be very valuable for data analysis include: sediment grain size, total organic carbon, and aluminum. Also the TAqH should include a broader suit of PAHs that would include the alkylated homologues in addition to the parent compounds,. This extended suite of PAHs would allow a forensic determination of the PAHs that resulted from the effluent discharge versus those that exist in the Cook Inlet marine environment from natural and other anthropogenic sources along with the degree of biodegradation and weathering. Other optional measurements that should be strongly considered for the program include sediment toxicity, total petroleum hydrocarbons (TPH), aliphatic hydrocarbons (C_{10}-C_{34}), the unresolved complex mixture (UCM), and select hydrocarbon biomarkers.

- Total aromatic hydrocarbons (TAH) should be eliminated from the sediment analyses since they don't typically accumulate in marine sediments due to their volatile nature and the monies saved could be better spent on other pollutants that would more likely accumulate in marine sediments.

- Due to the high currents in Cook Inlet, sediment sampling usually has to be conducted near slack tide in order to successfully obtain a sample with a van Veen grab, box core, or other marine sediment sampling device. The tidal window for sediment sampling is typically only about 2 hours in length. Again, due to the limited time, it is best not to anchor, but to have the captain of the vessel station-keep over the desired sampling location while the sampling device is lowered to the bottom. Again, due to the limited time available for sampling during each day, it would be better to sample fewer locations but with broader suite of analyses.

- A further consideration for the sediment sampling program is the bottom type. Based on experience of sampling throughout Cook Inlet, many locations are scoured with each tidal cycle and no net accumulation of sediments occurs. The sediment sampling program may not even be possible, as the bottom may consist entirely of cobble, large gravel, or very coarse sediments. Typically the accumulation of pollutants in the marine environment is associated with fine-grained sediments. Thus, if the sediment program is in a net erosional environment, it is expected that sampling will be difficult or impossible and pollutants will not be accumulating in these areas. Results of recent Minerals Management Service (MMS) monitoring programs indicate that with the exception of protected bays, much of Cook Inlet is erosional with sediment deposition occurring in the Lower Shelikof Strait region. If sediment sampling is not possible, then some type of sampling such as a pipe dredge should be undertaken to document the bottom type.

- At the present time, there are only two facilities (Trading Bay and East Forelands) that exceed the 100,000 gpd requirement for a study, and both are onshore facilities. Since subtidal sediment sampling may not be possible due to sediment type, an intertidal sediment sampling program should be considered as accumulations of pollutants may be occurring in these areas. For example, the MOA discovered at Point Woronzof that the subtidal area consisted entirely of cobble and could not be sampled for sediments;

however, some of the adjacent intertidal area consisted of fine-grained silt and mud and could be easily sampled. Also, the intertidal areas are not continuously scoured by currents and have the potential to be long-term repositories of discharged pollutants.

14) The Draft NPDES Permit, Fact Sheet, and AWQS all specify a chronic limit of 35 µg/L for ammonia in the receiving waters. However, the mixing zone application modeling effort used a chronic limit of 2,200 µg/L for ammonia in the receiving waters which resulted in low dilutions and small mixing zones. This incorrect information in the mixing zone application was then carried over into both the Draft Permit and Fact Sheet when the dilution factor was calculated as presented in the Fact Sheet (Table 4) and when the mixing zone size was calculated for ammonia. This apparent error resulted in much lower dilutions than actually required and much smaller mixing zones than actually required in order to achieve AWQS limits at the mixing zone boundary. The reasonable maximum effluent concentration that was presented in the mixing application and subsequently taken as the maximum daily effluent concentration limit in the Draft Permit was used as the starting point in determining the magnitude of this error. This error and resulting affect for chronic ammonia is shown in the following table. This apparent error resulted in underestimating the required effluent dilution for ammonia by a factor of 62.86 (2200/35) as seen in Table 1. To determine the approximate magnitude of the error on the sizes of mixing zone, estimates were made from both ADEC's CORMIX modeling efforts and from the mixing zone application based on model runs, graphics, and mixing zone sizes for other parameters that had similar dilution requirements.

Table 1. Draft Permit Ammonia Limits versus Required Limits to Meet AWQS.

Facility	Reasonable Maximum Effluent Conc. - Daily Max. Eff. Limit (µg/L)	Draft Permit and Fact Sheet Specified Dilution Factor	Concentration at MZ Boundary Based on Specified Dilution (µg/L)	Draft Permit and Fact Sheet Specified Mixing Zone (m)	Required Dilution to Meet MZ Boundary Limit of 35 µg/L	Required Mixing Zone to Meet 35 µg/L Limit (m)
Granite Point TF	198,000	90	2200	53	5657	~2100
Trading Bay PF	158,000	72	2194	1	4514	~3000
East Foreland	23,628	11	2148	21	675	~1200
Tyonek A	24,200	11.8	2050	4	691	~150
Anna	514,000	234	2197	102	14685	~3000
Bruce	237,600	108	2200	61	6789	~1450
Baker	317,000	144	2201	197	9057	~2250

Dillon	2,200	1	2200	0	63	~40
Granite Pt. Platform	198,000	90	2200	35	5657	~1450

Due to the very high dilutions and large mixing zones that will be now required for ammonia, the CORMIX modeling effort for this parameter should be reexamined and accurate mixing zone sizes for ammonia determined for each produced water discharge. In many cases, it appears that ammonia will now require the largest mixing zone for individual produced water discharges.

15) Although the 'reasonable maximum concentration' approach to setting effluent limits is conservative in that it sets the limits high enough that statistically there is little likelihood that they will ever be exceeded by individual discharges, this method in effect rewards discharges that have historically either exceeded their permit limits or have done a poor job of consistently removing pollutants from their influent water prior to discharge. Similarly, this method penalizes discharges that have done a great job of removing pollutants by setting their effluent limits at much lower levels than would be the case if the facility had been operating at low efficiency levels.

For example, the Granite Point Tank Farm (GPTF) currently has a WET daily maximum limit of 133 TUc and a monthly average limit of 91 TUc in the existing NPDES permit for their produced water discharge. In their October 2005 discharge monitoring report (DMR), GPTF reported preliminary results that their WET testing was not within permit limits. As a result of this permit exceedance, accelerated testing of four bi-weekly WET tests was initiated. The November 2005 DMR reports that the first of these four tests also was not within permit limits. The December 2005 DMR reports that the fourth test of the four test series also exceeded permit limitations. The January 2006 DMR reported that an additional WET test was performed and that preliminary results indicated the test was within permit limits and that a toxicity identification evaluation (TIE) had been initiated in order to determine the source of the toxicity.

Rather than waiting for the results of the TIE to become available, the Draft NPDES Permit proposes to increase the produced water WET limit for GPTF by a factor of 12 to a daily maximum limit of 1,638 TUc and a monthly average limit of 1,092 TUc. By raising the WET limit, GPTF's problem of meeting effluent limitations for WET testing essentially disappears. Since GPTF was conducting a TIE, the results of this should be implemented by the facility and those facts should be incorporated into the Draft Permit when setting effluent limits. This is just one example for one discharge for one parameter where permit limit conditions have been proposed to be relaxed for a discharge that has a history of noncompliance. As can be seen in the following table, effluent WET limits with the exception of Tyonek A have been relaxed for all produced water discharges covered by this permit, in some cases, substantially.

Table 2. Comparison of Produced Water WET Limits Between Old and Draft NPDES Permits.

Facility	Daily Maximum			Monthly Average		
	Old Permit	New Permit	Percent Increase	Old Permit	New Permit	Percent Increase
Anna	486	701	44	333	467	40
Baker	100	210	110	72	140	94
Bruce	912	2625	188	625	1750	180
Dillon	174	358	106	119	239	101
East Foreland	115	1476	1183	79	984	1146
Granite Pt. TF	133	1638	1132	91	1092	1100
Granite Pt. Platform	N/A	1638	N/A	N/A	1092	N/A
Trading Bay	140	346	147	96	231	141
Tyonek A	912	327	-64	625	218	-65

N/A - not applicable

16) Appendix 1 summarizes total potential contaminant loadings from the original permit (at the time of issuance) and the maximum possible loadings in the new DRAFT permit. These data show that based on changes to discharge limits and volumes, the new DRAFT permit allows significantly higher contaminant loadings to Cook Inlet than did the previous (current) permit. Cook Inlet RCAC is opposed to a new permit that will allow increases to the total potential pollutant loads to Cook Inlet.

17) Tables 3 through 6 provide a similar comparison for produced water discharges between the old permit and new Draft Permit for TAqH, TAH, copper, and mercury for the nine facilities that are currently covered by the new permit. No comparison can be made for manganese, nickel, zinc, and ammonia as there weren't any monitoring requirements for those parameters under the old permit. For TAqH, with the exception of Platform Anna where limits increased approximately 45% between the old and new permit, the other facilities have either decreased or they did not have an effluent limitation in the prior permit (Table 3). Similar results were seen for TAH, where with the exception of Platform Anna and the GPTF where limits increased, the other facilities have either decreased or they did not have an effluent limitation in the prior permit (Table 4). For copper, Platform Anna's effluent limitations for copper increased by an order of magnitude (~1000%), East Foreland Facility increased by 36-39%, and Trading Bay Production Facility by over 300%. The effluent limits for the other facilities either decreased or they did not have an effluent limitation in the prior permit (Table 5). For mercury, both the East Foreland Facility and GPTF effluent limitations increased by approximately 20-25%, whereas Platform Anna decreased by 60% and Tyonek A decreased by over 99% so that the produced water effluent will be meeting the AWQS at end of pipe.

Table 3. Comparison of Produced Water TAqH Limits Between Old and Draft NPDES Permits.

Facility	Daily Maximum			Monthly Average		
	Old Permit	New Permit	Percent Increase	Old Permit	New Permit	Percent Increase
Anna	129,000	187,600	45	88,400	125,080	41
Baker	N/A	226,000	N/A	N/A	150,700	N/A
Bruce	N/A	137,000	N/A	N/A	91,700	N/A
Dillon	88,900	50,800	-43	61,000	33,900	-44
East Foreland	92,700	24,200	-74	63,500	16,100	-75
GPTF	N/A	116,340	N/A	N/A	77,560	N/A
G. Pt. Platform	N/A	116,000	N/A	N/A	77,560	N/A
Trading Bay	36,800	29,550	-20	18,300	19,700	8
Tyonek A	448,000	2,630	-99	307,000	1,750	-99

N/A - not applicable

Table 4. Comparison of Produced Water TAH Limits Between Old and Draft NPDES Permits.

Facility	Daily Maximum			Monthly Average		
	Old Permit	New Permit	Percent Increase	Old Permit	New Permit	Percent Increase
Anna	86,000	125,090	45	58,900	83,400	42
Baker	N/A	150,700	N/A	N/A	100,000	N/A
Bruce	298,000	91,700	-69	205,000	61,000	-70
Dillon	59,300	33,860	-43	40,600	22,570	-44
East Foreland	61,800	25,560	-59	42,400	17,000	-60
GPTF	63,700	77,560	22	43,700	51,700	18
G. Pt. Platform	N/A	77,560	N/A	N/A	51,700	N/A
Trading Bay	24,500	19,700	-20	12,200	13,130	8
Tyonek A	298,000	1,750	-99	205,000	1,170	-99

N/A - not applicable

Table 5. Comparison of Produced Water Copper Limits Between Old and Draft NPDES Permits.

Facility	Daily Maximum			Monthly Average		
	Old Permit	New Permit	Percent Increase	Old Permit	New Permit	Percent Increase
Anna	209	2,060	886	143	1,376	862
Baker	N/A	521	N/A	N/A	347	N/A
Bruce	N/A	1,700	N/A	N/A	1,140	N/A
Dillon	244	80.6	-67	167	53.7	-68
East Foreland	122	170	39	84	114	36
GPTF	238	111	-53	163	74	-55
G. Pt. Platform	N/A	111	N/A	N/A	74	N/A
Trading Bay	136	568	318	93	379	306
Tyonek A	N/A	858	N/A	N/A	572	N/A

N/A - not applicable

Table 6. Comparison of Produced Water Mercury Limits Between Old and Draft NPDES Permits.

Facility	Daily Maximum			Monthly Average		
	Old Permit	New Permit	Percent Increase	Old Permit	New Permit	Percent Increase
Anna	8.23	3.72	-55	5.64	2.48	-56
Baker	N/A	3.57	N/A	N/A	2.38	N/A
Bruce	N/A	3.60	N/A	N/A	2.40	N/A
Dillon	N/A	0.51	N/A	N/A	0.34	N/A
East Foreland	3.37	4.00	19	2.31	2.65	15
G. Point TF	2.42	3.00	24	1.66	2.00	20
G. Pt. Platform	N/A	3.08	N/A	N/A	2.05	N/A
Trading Bay	N/A	12.70	N/A	N/A	8.50	N/A
Tyonek A	21.90	0.051	-99.8	15.00	0.034	-99.8

N/A - not applicable

Unfortunately, many of the produced water limits that were set in the Draft Permit are based on a single sample analysis. Of the eight facilities where produced water effluent chemistry data are available, 25 of 55 (45%) of the effluent limits for metals, ammonia, and hydrocarbons that were set in the Draft Permit were based on a single effluent sample as presented in the mixing application. With only a single sample, no statistical analysis of variability is possible, and use of the ‘maximum reasonable concentration’ approach resulted in the effluent limit being set at 13.2 times the sample analysis result. For example, if the single effluent sample was found to have a concentration of 10 mg/L, then by the maximum reasonable concentration approach, the effluent limit would be set at 132 mg/L, and the dilution factor necessary to meet AWQS and mixing zone modeling would be based on that number.

Although the maximum reasonable concentration approach might be considered conservative, it ensures that the mixing zone sizes are very large. Alaska Administrative Code (18 AAC 70.240) requires that when mixing zones are authorized, “the mixing zone will be as small as practicable”. The application of the maximum reasonable approach to a single sample could result in a mixing zone size that was much larger than necessary. Additional analyses should have been conducted and utilized for those discharges where insufficient data existed to ensure that the mixing zone size was as small as practicable.

18) In specifying effluent limits for produced water, EPA/ADEC applied the maximum reasonable concentration to the monthly average effluent concentration limit. CIRCAC feels that it would have been more appropriate to apply the maximum reasonable concentration in setting the daily maximum effluent limit, since the method was designed to predict the maximum possible sample concentration that might be seen in the effluent based on the statistic distribution of past monitoring samples. This would in affect lower the limits for the maximum daily to that predicted as the maximum reasonable concentration and the monthly limits would also be lowered. By applying this method on a sample basis as it was intended, the mixing zone sizes could also be reduced to accommodate the lower effluent limits.

19) As was shown in the tables for WET, TAqH, TAH, copper, and mercury, many of the produced water effluent limitations have substantially increased between the old permit and the new Draft Permit. This fact coupled with the fact that produced water discharge rates have been increasing over time could result in a substantial increase in total pollutant loading to Cook Inlet. As seen in Table 7, produced water discharge rates have increased by 80% between the previous and current discharge conditions and by 203% between the previous and maximum predicted discharge rates. The increase between the current and maximum predicted is 69%. CIRCAC realizes that as oil fields mature, the ratio of produced water to produced oil will naturally increase; however, this fact should be taken into account in drafting a discharge permit. No limits have been set in the draft permit with respect to discharge rates, and since many pollutant limits have been relaxed from those in the prior permit, it can be expected that total pollutant loading to Cook Inlet could substantially increase from levels previously seen.

Table 7. Comparison of Produced Water Discharge Rates Between Old and Draft NPDES Permits.

Facility	Produced Water Discharge Rates (gpd)		
	Previous	Current	Maximum
Anna	44,874	51,000	84,000
Baker	44,042	0	45,000
Bruce	6,467	11,500	25,200
Dillon	126,103	0	193,500
East Foreland	200,459	167,040	840,000
Granite Pt. TF	96,986	7,000	193,200
Granite Pt. Platform	0	0	84,000
Trading Bay PF	2,742,660	5,598,600	8,400,000
Tyonek A	1,811	31,066	31,066
Total Discharge (mgd)	3,263,402	5,866,206	9,895,966
Increase from previous (%)		80%	203%
Increase from current (%)			69%

20) Given the fact that pollutant loading levels from oil and gas operations in Cook Inlet are expected to potentially increase substantially over the coming years, a thorough review of past monitoring data and compliance history should have been performed as part of the permitting process. Other than the data presented in the mixing zone application, no discharge monitoring data are presented in the Fact Sheet, EA, or Ocean Discharge Criteria Evaluation. The limited monitoring data that are presented in the EA is from *Cook Inlet Discharge Monitoring Study* that gives a source as MMS (2002) with no accompanying reference. Other data in the EA has been pulled from MMS (2003) which is the Final EIS for the *Cook Inlet Planning Area, Oil and Gas Leases 191 and 192*. The oil and gas industry has collected a large amount of pollutant information for their effluent discharges into Cook Inlet which has been reported in monthly DMRs as part of their NPDES permits. These data and information should have been thoroughly reviewed, synthesized, and summarized in at least one of the documents that were prepared for this Draft Permit. The data should have been clearly laid out and summarized and past compliance history compared with new effluent limits that are proposed in the Draft Permit.

21) The Fact Sheet states that “The main reasons for these larger mixing zones are that a more conservative model was used in the mixing zone applications for the proposed permit (CORMIX versus Plumes) and that mixing zones were established for reasonable worst-case conditions.” (page 37 of 73). To test the first part of this statement, the model Visual Plumes was run for three of the produced water discharges using the same effluent, outfall characteristics, and background ambient receiving water conditions. Results of this modeling effort are presented in Table 8 which shows the required dilution necessary in order to meet AWQS based on the maximum expected reasonable effluent concentration and the predicted mixing zones using CORMIX (Fact Sheet and Draft Permit) and the Visual Plumes model. Mixing zone distances were based on worst-case effluent plume centerline concentrations and not on average dilution requirements.

Table 8. Comparison of Mixing Zone Calculations between CORMIX and Plumes Models.

Facility/WQS	Required Dilution	Fact Sheet (CORMIX) Mixing Zone (m)	Plumes Model Mixing Zone (m)
Platform Anna			
TAqH/TAH	12509	2734	3275
Acute Metals	599	239	327
Chronic Metals	666	262	354
WET	701	274	368
Human Health	73	32	58
Platform Dillon			
TAqH/TAH	3386	2121	1860
Acute Metals	24	11	13
Chronic Metals	26	13	15
WET	358	210	333
Human Health	22	10	11.5
East Foreland TF			
TAqH/TAH	2556	1794	5880
Acute Metals	65	142	125
Chronic Metals	55	121	107
WET	1476	1742	3680
Human Health	78	172	147

Fairly good agreement was found between the CORMIX and Visual Plumes models in the near-field initial mixing region that is dominated by momentum and buoyancy flux mixing processes. For Platform Anna, the Plumes model was found to predict slightly larger and more conservative mixing zones while for Platform Dillon the Plumes model predicted larger mixing zones closer to the outfall and a smaller mixing zone for TAqH/TAH that had the largest dilution requirement.

The near-field mixing zone region (~ 700 m) for the East Forelands was also found to be very similar between the two models; however, the mixing zones for TAqH/TAH and WET located in the far-field region were found to be vastly different. The far-field region is defined as the region outside of the jet mixing and buoyant spreading regions of the plume and is dominated by turbulent processes in the ambient receiving water environment which is the main mixing mechanism at large distances from the outfall. A critical input factor in the far-field region is the diffusion coefficient which can range from 0.0001 to 0.0005 $m^{2/3}$/sec, with higher coefficients found in coastal or other regions with high energy and turbulence, and lower coefficients found in areas with low turbulence (EPA, 1994 and 2001[8]). These models are highly sensitive to this parameter and predict vastly different dilutions depending on what coefficient value is selected. For the Plumes Model comparison case of the East Forelands, the diffusion coefficient was taken to be 0.0005

[8] EPA. 1994. Dilution Models for Effluent Discharges, Third Edition. Office of Research and Development, U.S. Environmental Protection Agency. EPA/600/R-94/086.
EPA. 2001. Dilution Models for Effluent Discharges, Fourth Edition (Visual Plumes), Draft. Environmental Research Division, U.S. Environmental Protection Agency.

$m^{2/3}$/sec and the "4/3 law" of diffusion was utilized where the diffusivity is governed by the plume size which results in accelerating plume growth. Even when this high turbulence assumption was utilized for Cook Inlet in the Visual Plumes simulation, the predicted dilutions were far less and mixing zones far larger than those derived from the CORMIX model as presented in the Fact Sheet. The reason for this large difference is not readily apparent since the assumptions used in the CORMIX model for the farfield region were not presented in either the Mixing Zone Application or the Fact Sheet. However, given the sensitivity of these models to the selected diffusion coefficient, the accuracy of any dilution predictions in the far-field for these passive diffusion processes are suspect without some empirical data for Cook Inlet on which to base one's assumptions.

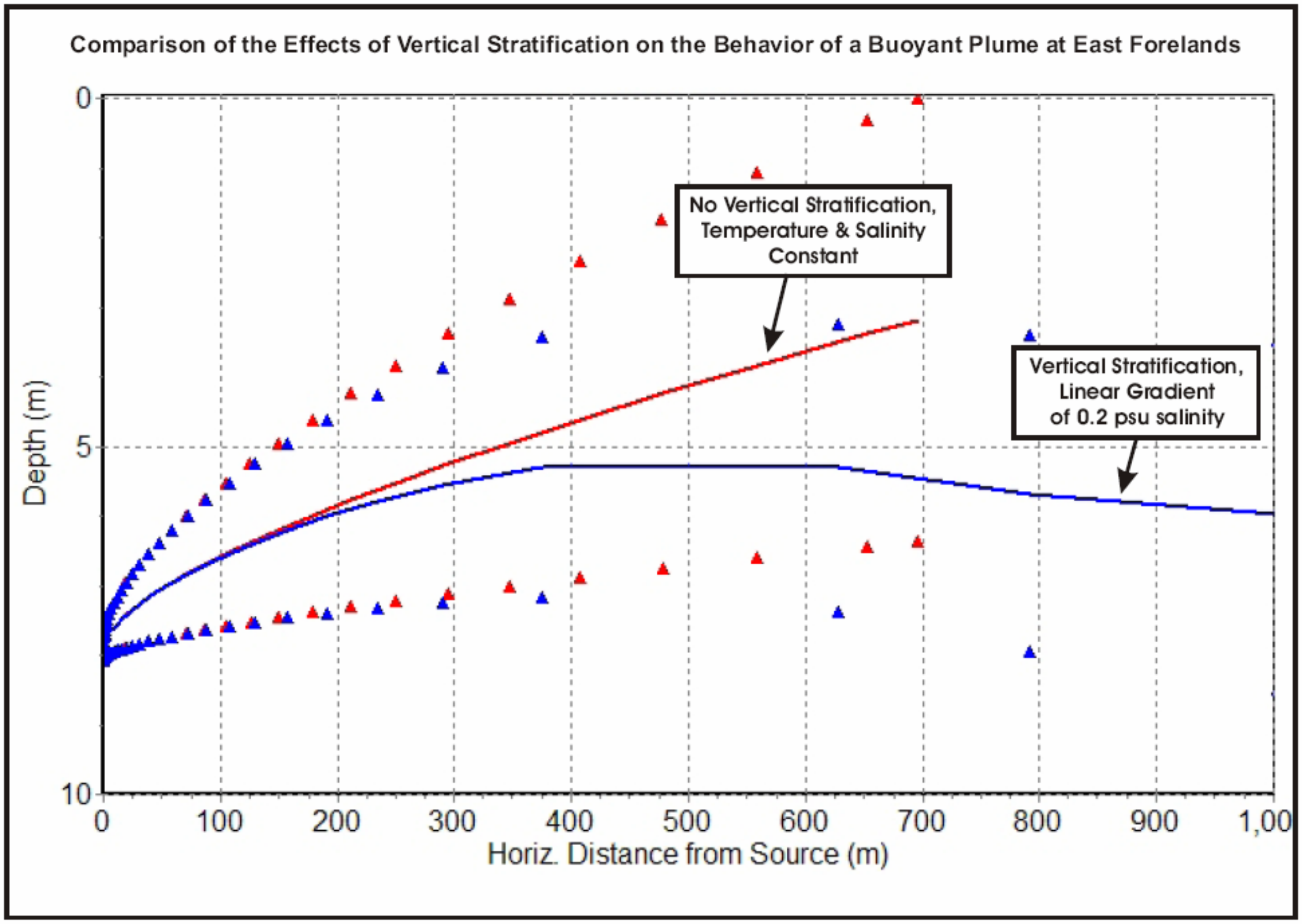
Except for the far-field mixing differences that need to be resolved, model calculations performed with Visual Plume were found to be in fairly good agreement with those determined by CORMIX. Therefore it would seem that one of the main reasons for differences between mixing zone sizes between the old and new Draft Permit is not differences between the two models as stated in the Fact Sheet, but general increases in the allowable effluent pollutant concentrations as determined by the maximum reasonable concentration approach.

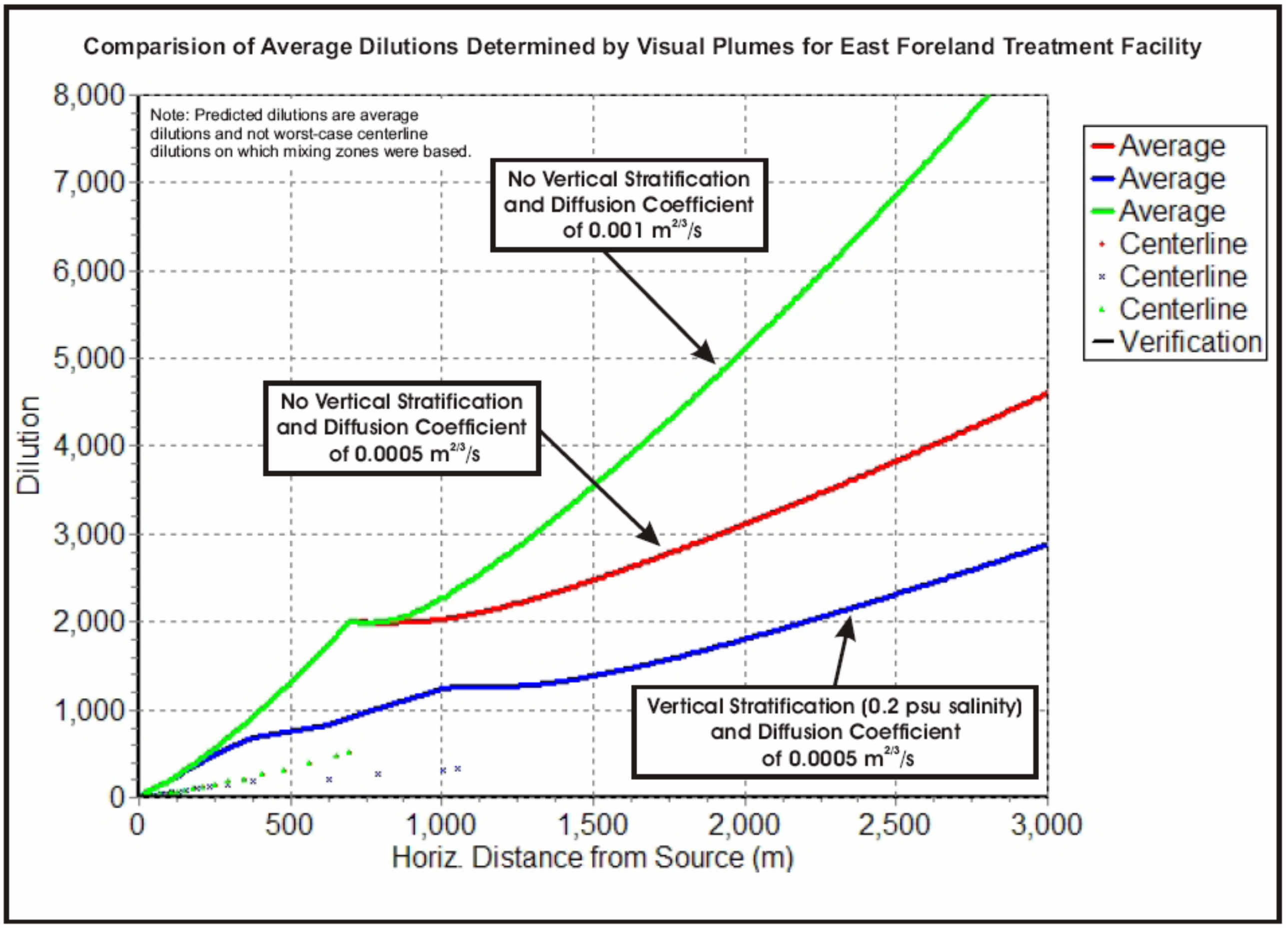
22) Another assumption that was used in the CORMIX modeling effort that can have profound affect on dilution and mixing zone size calculations is that the vertical structure of the receiving waters is isohaline and isothermal (*i.e*., no salinity or temperature differences are shown between the top and bottom of the water column). While numerous studies in Cook Inlet have shown that the water column is generally well mixed, there are still noticeable differences between the top and bottom. Recent hydrographic work by Okkonen and Howell (2003)[9] that was conducted in Central Cook Inlet during both the spring and fall indicated temperature differences of 0.2 to 0.4 °C and salinity differences of 0.2 to 4.0 psu between the surface and the bottom of the water column. Vertical changes for both temperature and salinity were found to vary linearly with no thermocline or halocline development. Although these differences seem small, in the case of a rising positively buoyant plume, the plume will eventually reach an equilibrium level where it will become trapped, thus reducing vertical mixing as the plume rises.

To determine what affect vertical structure would have on model dilution calculations, the vertical structure of the water column was given a salinity gradient of 0.2 psu between the surface and the bottom and temperature was kept the same for the East Forelands case modeled with Visual Plumes. As expected, this change was found to have little effect in the immediate vicinity of the diffuser where mixing is primarily due to momentum differences (jet mixing) but that as buoyancy differences took over, mixing of the plume was substantially reduced compared to that seen with an isohaline water column structure and the effluent plume became trapped at mid-depth. Dilutions were found to be reduced by 40-50 % resulting in mixing zones that were nearly twice as large. Based on actual hydrographic data and this limited modeling effort, it appears that the CORMIX modeling

[9] Okkonen, S.R. and S.S. Howell. 2003. Measurements of Temperature, Salinity and Circulation in Cook Inlet, Alaska. University of Alaska, Coastal Marine Institute. Final Report. OCS Study MMS 2003-036.

effort should be reexamined for the effects of vertical structure and that more realistic ambient conditions should be utilized in the mixing zone calculation efforts.




Comparision of Average Dilutions Determined by Visual Plumes for East Foreland Treatment Facility
Note: Predicted dilutions are average dilutions and not worst-case centerline dilutions on which mixing zones were based.
No Vertical Stratification and Diffusion Coefficient of 0.001 m2/3/s
No Vertical Stratification and Diffusion Coefficient of 0.0005 m2/3/s
Vertical Stratification (0.2 psu salinity) and Diffusion Coefficient of 0.0005 m2/3/s
Dilution
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
500
1,000
1,500
2,000
2,500
3,000
Horiz. Distance from Source (m)
Average
Average
Average
Centerline
Centerline
Centerline
Verification

APPENDIX 1

Cook Inlet - Produced Water Discharges

Individual	Old Permit Limits	New Draft Limits	units	Old Volume gpd	Max. Volume gpd	Old Loading (kg)	Max Loading (kg)	iff. Loadin (kg)	Reported Values
Granite Point Tank Farm									
Total Arom	63700	77560	ug/L	96986	193200	24.71	59.94	35.23	Daily Max
	43700	51700	ug/L	96986	193200	16.95	39.95	23.00	Month Avg
Total Aque	N/A	116340	ug/L	96986	193200	N/A	89.91		Daily Max
	N/A	77560	ug/L	96986	193200	N/A	59.94		Month Avg
Ammonia	N/A	198	mg/L	96986	193200	N/A	0.15		Daily Max
	N/A	132	mg/L	96986	193200	N/A	0.10		Month Avg
Copper	238	111	µg/L	96986	193200	0.09	0.09	-0.01	Daily Max
	163	74	µg/L	96986	193200	0.06	0.06	-0.01	Month Avg
Mercury	2.42	3.0	µg/L	96986	193200	0.00	0.00	0.00	Daily Max
	1.66	2.0	µg/L	96986	193200	0.00	0.00	0.00	Month Avg
Manganese	N/A	6.0	mg/L	96986	193200	N/A	0.00		Daily Max
	N/A	4.0	µg/L	96986	193200	N/A	0.00		Month Avg
Nickel	N/A	294	µg/L	96986	193200	N/A	0.23		Daily Max
	N/A	196	µg/L	96986	193200	N/A	0.15		Month Avg
Zinc	N/A	2.91	mg/L	96986	193200	N/A	0.00		Daily Max
.	N/A	1.94	mg/L	96986	193200	N/A	0.00		Month Avg
Whole Efflu	133	1638	TUc	96986	193200	0.05	1.27	1.21	Daily Max
	91	1092	TUc	96986	193200	0.04	0.84	0.81	Month Avg
Lead	543	N/A	µg/L	96986	193200	0.21	N/A		Daily Max
	372	N/A	µg/L	96986	193200	0.14	N/A		Month Avg
Discharge	previous	current	maximum	96986	193200				
Discharge	96,986	7,000	193,200	96986	193200				gallon/day
Trading Bay Production Facility									
Total Arom	24500	19700	µg/L	2742660	8400000	268.78	661.92	393.14	Daily Max
	12200	13130	µg/L	2742660	8400000	133.84	441.17	307.33	Month Avg
Total Aque	36800	29550	µg/L	2742660	8400000	403.72	992.88	589.16	Daily Max
	18300	19700	µg/L	2742660	8400000	200.76	661.92	461.16	Month Avg
Ammonia	N/A	158	mg/L	2742660	8400000	N/A	5.31		Daily Max
	N/A	106	mg/L	2742660	8400000	N/A	3.56		Month Avg
Copper	136	568	µg/L	2742660	8400000	1.49	19.08	17.59	Daily Max
	93.4	379	µg/L	2742660	8400000	1.02	12.73	11.71	Month Avg
Mercury	N/A	12.7	µg/L	2742660	8400000	N/A	0.43		Daily Max
	N/A	8.5	µg/L	2742660	8400000	N/A	0.29		Month Avg
Manganese	N/A	25.0	mg/L	2742660	8400000	N/A	0.84		Daily Max
	N/A	16.6	mg/L	2742660	8400000	N/A	0.56		Month Avg
Nickel	N/A	1490	µg/L	2742660	8400000	N/A	50.06		Daily Max
	N/A	1000	µg/L	2742660	8400000	N/A	33.60		Month Avg
Zinc	N/A	19.85	mg/L	2742660	8400000	N/A	0.67		Daily Max
	N/A	9.9	mg/L	2742660	8400000	N/A	0.33		Month Avg
Whole Efflu	140	346	TUc	2742660	8400000	1.54	11.63	10.09	Daily Max
	96	231	TUc	2742660	8400000	1.05	7.76	6.71	Month Avg
Lead	883	N/A	µg/L	2742660	8400000	9.69	N/A		Daily Max
	605	N/A	µg/L	2742660	8400000	6.64	N/A		Month Avg
Discharge	previous	current	maximum	2742660	8400000				
Discharge	2,742,660	5,598,600	8,400,000	2742660	8400000				gallon/day
East Forelands Facility									
Total Arom	61800	25560	µg/L	200459	840000	49.55	85.88	36.33	Daily Max
	42400	17000	µg/L	200459	840000	34.00	57.12	23.12	Month Avg
Total Aque	92700	24200	µg/L	200459	840000	74.33	81.31	6.98	Daily Max
	63500	16100	µg/L	200459	840000	50.92	54.10	3.18	Month Avg
Ammonia	N/A	24.2	mg/L	200459	840000	N/A	0.08		Daily Max
	N/A	16.1	mg/L	200459	840000	N/A	0.05		Month Avg
Copper	122	170	µg/L	200459	840000	0.10	0.57	0.47	Daily Max
	84	114	µg/L	200459	840000	0.07	0.38	0.32	Month Avg
Mercury	3.37	4.0	µg/L	200459	840000	0.00	0.01	0.01	Daily Max
	2.31	2.65	µg/L	200459	840000	0.00	0.01	0.01	Month Avg
Manganese	N/A	7.8	mg/L	200459	840000	N/A	0.03		Daily Max
	N/A	5.2	mg/L	200459	840000	N/A	0.02		Month Avg
Nickel	N/A	542	µg/L	200459	840000	N/A	1.82		Daily Max
	N/A	301	µg/L	200459	840000	N/A	1.01		Month Avg
Zinc	N/A	4.46	mg/L	200459	840000	N/A	0.01		Daily Max
	N/A	2.97	mg/L	200459	840000	N/A	0.01		Month Avg
Whole Efflu	115	1476	TUc	200459	840000	0.09	4.96	4.87	Daily Max
	79	984	TUc	200459	840000	0.06	3.31	3.24	Month Avg
Arsenic	2900	N/A	µg/L	200459	840000	2.33	N/A		Daily Max
	1990	N/A	µg/L	200459	840000	1.60	N/A		Month Avg
Silver	97	N/A	µg/L	200459	840000	0.08	N/A		Daily Max
	66	N/A	µg/L	200459	840000	0.05	N/A		Month Avg

APPENDIX 1

Individual	Old Permit Limits	New Draft Limits	units	Old Volume gpd	Max. Volume gpd	Old Loading (kg)	Max Loading (kg)	Diff. Loadin (kg)	Reported Values
Lead	754	N/A	µg/L	200459	840000	0.60	N/A		Daily Max
	517	N/A	µg/L	200459	840000	0.41	N/A		Month Avg
Discharge	previous	current	maximum						
Discharge	200,459	167,040	840,000						gallon/day
Platform Anna									
Total Arom	86000	125090	µg/L	44874	84000	15.44	42.03	26.59	Daily Max
	58900	83400	µg/L	44874	84000	10.57	28.02	17.45	Month Avg
Total Aque	129000	187600	µg/L	44874	84000	23.15	63.03	39.88	Daily Max
	88400	125080	µg/L	44874	84000	15.87	42.03	26.16	Month Avg
Ammonia	N/A	514	mg/L	44874	84000	N/A	0.17		Daily Max
	N/A	343	mg/L	44874	84000	N/A	0.12		Month Avg
Copper	209	2060	µg/L	44874	84000	0.04	0.69	0.65	Daily Max
	143	1376	µg/L	44874	84000	0.03	0.46	0.44	Month Avg
Mercury	8.23	3.72	µg/L	44874	84000	0.00	0.00	0.00	Daily Max
	5.64	2.48	µg/L	44874	84000	0.00	0.00	0.00	Month Avg
Manganese	N/A	7.25	mg/L	44874	84000	N/A	0.00		Daily Max
	N/A	4.86	mg/L	44874	84000	N/A	0.00		Month Avg
Nickel	N/A	5460	µg/L	44874	84000	N/A	1.83		Daily Max
	N/A	3640	µg/L	44874	84000	N/A	1.22		Month Avg
Zinc	N/A	53.9	mg/L	44874	84000	N/A	0.02		Daily Max
	N/A	35.9	mg/L	44874	84000	N/A	0.01		Month Avg
Whole Efflu	486	701	TUc	44874	84000	0.09	0.24	0.15	Daily Max
	333	467	TUc	44874	84000	0.06	0.16	0.10	Month Avg
Discharge	previous	current	maximum						
Discharge	44,874	51,000	84,000						gallon/day
Platform Baker									
Total Arom	N/A	150700	µg/L	44042	45000	N/A	27.13		Daily Max
	N/A	100000	µg/L	44042	45000	N/A	18.00		Month Avg
Total Aque	N/A	226000	µg/L	44042	45000	N/A	40.68		Daily Max
	N/A	150700	µg/L	44042	45000	N/A	27.13		Month Avg
Ammonia	N/A	317	mg/L	44042	45000	N/A	0.06		Daily Max
	N/A	211	mg/L	44042	45000	N/A	0.04		Month Avg
Copper	N/A	521	µg/L	44042	45000	N/A	0.09		Daily Max
	N/A	347	µg/L	44042	45000	N/A	0.06		Month Avg
Mercury	N/A	3.57	µg/L	44042	45000	N/A	0.00		Daily Max
	N/A	2.38	µg/L	44042	45000	N/A	0.00		Month Avg
Manganese	N/A	7.0	mg/L	44042	45000	N/A	0.00		Daily Max
	N/A	4.67	mg/L	44042	45000	N/A	0.00		Month Avg
Nickel	N/A	1360	µg/L	44042	45000	N/A	0.24		Daily Max
	N/A	907	µg/L	44042	45000	N/A	0.16		Month Avg
Zinc	16.7	13.6	mg/L	44042	45000	0.00	0.00	0.00	Daily Max
	5.33	9.07	mg/L	44042	45000	0.00	0.00	0.00	Month Avg
Whole Efflu	100	210	TUc	44042	45000	0.02	0.04	0.02	Daily Max
	72	140	TUc	44042	45000	0.01	0.03	0.01	Month Avg
Discharge	previous	current	maximum						
Discharge	44,042	0	45,000						gallon/day
Platform Bruce									
Total Arom	298000	91700	µg/L	6467	25200	7.71	9.24	1.53	Daily Max
	205000	61000	µg/L	6467	25200	5.30	6.15	0.85	Month Avg
Total Aque	N/A	137000	µg/L	6467	25200	N/A	13.81		Daily Max
	N/A	91700	µg/L	6467	25200	N/A	9.24		Month Avg
Ammonia	N/A	237.6	mg/L	6467	25200	N/A	0.02		Daily Max
	N/A	158	mg/L	6467	25200	N/A	0.02		Month Avg
Copper	N/A	1700	µg/L	6467	25200	N/A	0.17		Daily Max
	N/A	1140	µg/L	6467	25200	N/A	0.11		Month Avg
Mercury	N/A	3.6	µg/L	6467	25200	N/A	0.00		Daily Max
	N/A	2.4	µg/L	6467	25200	N/A	0.00		Month Avg
Manganese	N/A	7.06	mg/L	6467	25200	N/A	0.00		Daily Max
	N/A	4.7	mg/L	6467	25200	N/A	0.00		Month Avg
Nickel	N/A	4520	µg/L	6467	25200	N/A	0.46		Daily Max
	N/A	3010	µg/L	6467	25200	N/A	0.30		Month Avg
Zinc	N/A	44.6	mg/L	6467	25200	N/A	0.00		Daily Max
	N/A	29.7	mg/L	6467	25200	N/A	0.00		Month Avg
Whole Efflu	912	2625	TUc	6467	25200	0.02	0.26	0.24	Daily Max
	625	1750	TUc	6467	25200	0.02	0.18	0.16	Month Avg
Silver	766	N/A	µg/L	6467	25200	0.02	N/A		Daily Max
	525	N/A	µg/L	6467	25200	0.01	N/A		Month Avg
Discharge	previous	current	maximum						
Discharge	6,467	11,500	25,200						gallon/day
Platform Dillon									
Total Arom	59300	33860	µg/L	126103	193500	29.91	26.21	-3.70	Daily Max

APPENDIX 1

Individual	Old Permit Limits	New Draft Limits	units	Old Volume gpd	Max. Volume gpd	Old Loading (kg)	Max Loading (kg)	iff. Loadin (kg)	Reported Values
	40600	22570	µg/L	126103	193500	20.48	17.47	-3.01	Month Avg
Total Aque	88900	50800	µg/L	126103	193500	44.84	39.32	-5.52	Daily Max
	61000	33900	µg/L	126103	193500	30.77	26.24	-4.53	Month Avg
Ammonia	N/A	2.2	mg/L	126103	193500	N/A	0.00		Daily Max
	N/A	1.46	mg/L	126103	193500	N/A	0.00		Month Avg
Copper	244	80.6	µg/L	126103	193500	0.12	0.06	-0.06	Daily Max
	167	53.7	µg/L	126103	193500	0.08	0.04	-0.04	Month Avg
Mercury	N/A	0.51	µg/L	126103	193500	N/A	0.00		Daily Max
	N/A	0.34	µg/L	126103	193500	N/A	0.00		Month Avg
Manganese	N/A	1.0	mg/L	126103	193500	N/A	0.00		Daily Max
	N/A	0.67	mg/L	126103	193500	N/A	0.00		Month Avg
Nickel	N/A	210	µg/L	126103	193500	N/A	0.16		Daily Max
	N/A	140	µg/L	126103	193500	N/A	0.11		Month Avg
Zinc	7980	2.1	mg/L	126103	193500	4.03	0.00	-4.02	Daily Max
	5470	1.4	mg/L	126103	193500	2.76	0.00	-2.76	Month Avg
Whole Efflu	174	358	TUc	126103	193500	0.09	0.28	0.19	Daily Max
	119	239	TUc	126103	193500	0.06	0.18	0.12	Month Avg
Lead	1030	N/A	µg/L	126103	193500	0.52	N/A		Daily Max
	706	N/A	µg/L	126103	193500	0.36	N/A		Month Avg
Discharge	previous	current	maximum						
Discharge	126,103	0	193,500						gallon/day
Tyonek A - crude									
Total Arom	298000	1750	µg/L	1811	31066	2.16	0.22	-1.94	Daily Max
	205000	1170	µg/L	1811	31066	1.49	0.15	-1.34	Month Avg
Total Aque	448000	2630	µg/L	1811	31066	3.25	0.33	-2.92	Daily Max
	307000	1750	µg/L	1811	31066	2.22	0.22	-2.01	Month Avg
Ammonia	N/A	24.2	mg/L	1811	31066	N/A	0.00		Daily Max
	N/A	16.1	mg/L	1811	31066	N/A	0.00		Month Avg
Copper	N/A	858	µg/L	1811	31066	N/A	0.11		Daily Max
	N/A	572	µg/L	1811	31066	N/A	0.07		Month Avg
Mercury	21.9	0.051	µg/L	1811	31066	0.00	0.00	0.00	Daily Max
	15.0	0.034	µg/L	1811	31066	0.00	0.00	0.00	Month Avg
Manganese	N/A	100	mg/L	1811	31066	N/A	0.01		Daily Max
	N/A	66	mg/L	1811	31066	N/A	0.01		Month Avg
Nickel	N/A	2240	µg/L	1811	31066	N/A	0.28		Daily Max
	N/A	1500	µg/L	1811	31066	N/A	0.19		Month Avg
Zinc	N/A	22.4	mg/L	1811	31066	N/A	0.00		Daily Max
	N/A	14.6	mg/L	1811	31066	N/A	0.00		Month Avg
Whole Efflu	912	327	TUc	1811	31066	0.01	0.04	0.03	Daily Max
	625	218	TUc	1811	31066	0.00	0.03	0.02	Month Avg
Silver	766	N/A	µg/L	1811	31066	0.01	N/A		Daily Max
	525	N/A	µg/L	1811	31066	0.00	N/A		Month Avg
Discharge	previous	current	maximum						
Discharge	1,811	31,066	31,066						gallon/day
Granite Point Platform									
Total Arom	N/A	77560	µg/L	0					Daily Max
	N/A	51700	µg/L						Month Avg
Total Aque	N/A	116000	µg/L						Daily Max
	N/A	77560	µg/L						Month Avg
Ammonia	N/A	198	mg/L						Daily Max
	N/A	132	mg/L						Month Avg
Copper	N/A	111	µg/L						Daily Max
	N/A	74	µg/L						Month Avg
Mercury	N/A	3.08	µg/L						Daily Max
	N/A	2.05	µg/L						Month Avg
Manganese	N/A	6.04	mg/L						Daily Max
	N/A	4.03	mg/L						Month Avg
Nickel	N/A	290	µg/L						Daily Max
	N/A	193	µg/L						Month Avg
Zinc	N/A	2.9	mg/L						Daily Max
	N/A	1.94	mg/L						Month Avg
Whole Efflu	N/A	1638	TUc						Daily Max
	N/A	1092	TUc						Month Avg
Discharge	previous	current	maximum						
Discharge	0	0							gallon/day
All Facilities									
Oil and Gre	42	42	mg/L						Daily Max
	29	29	mg/L						Month Avg