STATE OF ALASKA

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
WASTEWATER DISCHARGE PROGRAM

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RE: §401 Certification of NPDES Permit No. AKG-31-5000 (formerly AKG-28-5000) Cook Inlet Oil and Gas Exploration, Development and Production Facilities located in State and Federal Waters

In accordance with Section 401 of the Clean Water Act and with Alaska Administrative Code 18 AAC 15, 18 AAC 70 (Water Quality Standards) and 18 AAC 72 (Wastewater Discharge), the Department of Environmental Conservation issues the enclosed final Certificate of Reasonable Assurance for the reissue of NPDES General Permit AKG31-5000, regulating discharges from oil and gas exploration, development and production facilities at on-shore and off-shore locations in Cook Inlet, Alaska. The department reviewed the existing and proposed wastewater discharges with respect to the standards and antidegradation requirements of the Alaska Water Quality Standards and finds any reduction in natural water quality of Cook Inlet to be in accord with the requirements of 18 AAC 70.015, Antidegradation Policy (see Attachment 2).

To prepare this 401 certification, the department reviewed the *Mixing Zone Application for Cook Inlet Oil and Gas Operators (NPDES Permit No. AKG-28-5000* prepared for Unocal/Chevron, Conoco Phillips Alaska, Inc. and XTO Energy Inc., by Parametrix, dated August 5, 2004 and amended October 20, 2005, the NPDES permit applications, and the preliminary draft and final NPDES permits provided by the Environmental Protection Agency (EPA). The department also cooperated with EPA on agency response to comments received from the public.

The department submitted a draft certification to EPA on October 28, 2005. This final certification reflects changes to effluent limits in the final permit based on the agencies' joint review of effluent data, public comment, and a change of method to determine reasonable potential to exceed water quality standards.

This certification includes mixing zones for produced water from existing facilities in state waters (Discharge 015). The methodology for specifying metals limits in the final permit changed from that used in the draft permit. In the draft permit the dilution required for the metal needing the greatest dilution was used to back-calculate the permit limits for all other metals. This resulted in less stringent effluent limits that theoretically allowed

higher levels of these metals to be discharged. The final permit maximum daily limits for metals have been set at the Reasonable Maximum Concentration (also termed the Maximum Expected Effluent Concentration). This determination uses multipliers from EPA's *Technical Support Document for Water-Quality-based Toxics Control (EPA, March 1991)* statistical analysis.

When there are a large number of sample results, the maximum recorded concentration is multiplied by a number far smaller than when there is a limited number of sample results. These multipliers range from a low of 1.6 when there are a large number of sample results to a high of 13.2, when there is just one sample result. Many of the existing facility effluent limits are based on a single data point so a very conservative multiplier is used. This is just one of several conservative assumptions made on setting water quality based limits and how DEC determined mixing zone sizes in this certification.

This 401 certification includes mixing zones for sanitary discharges (Discharge 003) and produced water (Discharge 015) at existing facilities. Attachment 1 of the 401 certification gives rationale for produced water discharges (Discharge 015), and how mixing zones for those discharges are based on oceanographic conditions in Cook Inlet. This certification also has provisions for new facilities to apply for sanitary discharges through the permit Notice of Intent (NOI) process.

Throughout the reissuance of this permit, the department has considered this a complex general permit since it covers existing facilities in upper Cook Inlet, requires modification of an existing facility's discharge outfall, prohibits discharge of produced water from new facilities in state waters, covers new exploration and development facilities in federal waters, and includes mixing zones. Because a different computer model was used for determining mixing zones for the reissuance, comparisons of effluent quality under the previous permit may be difficult. The department's approach in this certification included our evaluation of risk posed to aquatic organisms in Cook Inlet. It also follows conservative approaches to determine mixing zone sizes, reasonable potential to exceed water quality standards and potential impacts to state waters and resources.

If you have any questions regarding this 401certification please contact me at 907-269-7565 (Sharmon_Stambaugh@dec.state.ak.us) or Kenwyn George at 907-465-5313 (Kenwyn_George@dec.state.ak.us).

Sincerely,

Sharmon M. Stambaugh
Program Manager
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Enclosures: Certificate of Reasonable Assurance for NPDES General Permits AKG-31-5000 and Attachments

cc: via e-mail

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STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, as required by Section 401 of the Clean Water Act, was requested by EPA, Region 10, for NPDES General Permit No. AKG-31-5000, COOK INLET OIL AND GAS EXPLORATION, DEVELOPMENT AND PRODUCTION FACILITIES. This permit was formerly issued as AKG-28-5000. Water quality certification is required for the proposed activities because the activities will be authorized by an EPA permit identified as No. AKG-31-5000 and discharge(s) may result from the proposed activities.

Public Notice of the application for this certification was made in accordance with 18 AAC 15.140 through an EPA notice dated March 1, 2006 that includes information on DEC's intent to review and certify this permit.

Having reviewed the preliminary final permit, the Alaska Department of Environmental Conservation certifies that there is reasonable assurance that the proposed activities, as well as any discharge that may result, are in compliance with the requirements of Section 401 of the Clean Water Act, which includes the Alaska Water Quality Standards (18 AAC 70), provided that the following stipulations are adhered to.

Mixing Zone and Dilutions

Discharge 003 (Sanitary Wastes)

Mixing zones and effluent limits for existing and new sanitary waste are established in Table 1 below.

Table 1. Platform sanitary mixing zones and effluent limits

Platform	Treatment	Pollutant	Limit (Daily maximum)	Length (m)	Width (m)
Bruce	M9IM Biological	TRC	2.25 mg/l	120	2
Dillon	M9IM Biological	TRC	0.66 mg/l	60	2
Baker	M9IM Biological	TRC	2.25 mg/l	120	2
Granite Point	M9IM MSD	TRC	7.68 mg/l	360	2
Tyonek A	M10 MSD	TRC	13.35 mg/l	520	2.6
Dolly Varden	M9IM MSD	TRC	13.35 mg/l	100 m radius	
Platform A	M9IM MSD	TRC	13.35 mg/l	100 m radius	
Platform C	M9IM MSD	TRC	13.35 mg/l	100 m radius	
All other facilities	All types	TRC	See rationale below	100m radius per NOI	

Notes for Table 1: Mixing zone size for existing facilities for Total Residual Chlorine (TRC) is based on meeting most stringent applicable Alaska Water Quality Standard, the chronic chlorine standard for marine aquatic life. NOI means "Notice of Intent".

Rationale: EPA effluent guidelines (40 CFR 435) for oil exploration and production subdivide facilities into two categories: those with over 10 people continuously occupying the facility (M10) and those with up to 10 people and intermittent use (M9IM). Some of the platform facilities have intermittent use, and some have wide ranges of discharge volumes depending on changes to on-site staffing.

EPA's review draft of this permit specified a 100-meter radius mixing zone for chlorine in sanitary wastewater. For existing upper Cook Inlet facilities listed in Table 1, DEC determined site-specific mixing zones based on maximum daily chlorine residual values. The previous Cook Inlet permit included technology-based limits. A revised Alaska Water Quality Standard for chlorine was used in a comparison of technology-based and water quality based effluent limits. These mixing zones and chlorine limits are based on water quality standards, risk analysis and the protection of aquatic organisms. In general, a length and width specification provides a better approximation of the behavior of a discharge plume in Cook Inlet than a circle because of currents and tides.

The maximum distance required for compliance with water quality standards is one-half the length of the mixing zones in Table 1. The mixing zone lengths are doubled to account for reversals of plume direction with tidal cycles in Cook Inlet. The narrow mixing zones proposed in Table 1 comply with State Regulations 18 AAC 70.240-270. The Department has authority to designate mixing zones in permits or certifications and specify that they are as small as practicable.

The applicable and most stringent Alaska water quality standards for chlorine in marine water are 13 µg/l (acute) and 7.5 µg/l (chronic) for the aquatic life use (See 18 AAC 70.020(b) and DEC's Alaska Water Quality Manual for Toxic and Other Deleterious Organic and Inorganic Substances., May 2003). Chlorine can cause acute and chronic effects to marine aquatic organisms. To be protected from acute effects, a drifting organism must not be exposed to pollutants at concentrations greater than the acute water quality standard for more than 15 minutes. (See. EPA Technical Support Document For Water Quality-based Toxics Control, Section 2.2.2)

Based on available chlorine concentration data from platform permit monitoring and Cook Inlet current data, the maximum expected Total Residual Chlorine (TRC) concentration is 13.35 mg/l. At this concentration the greatest period a drifting organism is exposed to pollutants at greater than acute levels at the 10th percentile (low) current is 4 minutes, and at levels greater than chronic effects at the 90th percentile (high) current is 2 minutes. Drifting organisms are protected against acute and chronic effects at a TRC concentration of 13.35 mg/l due to these limited exposure times. (Source: Parametrix mixing zone application for Cook Inlet platforms with DEC review. This analysis combined all platform chlorine data available at the time of the original mixing zone application.)

Additional mixing zone data was submitted for Tyonek A and the two XTO platforms (A & C) after DEC reviewed the Parametrix risk analysis and modeling. The Tyonek A Platform modeling resulted in a 148 meter long mixing zone (296 meters total length

to account for tidal reversal), with a reasonable potential analysis maximum concentration for TRC of 17.5 mg/l. However, since the risk analysis described above is based on a maximum concentration of 13.35 mg/l TRC, DEC is limiting discharge of TRC to 13.35 mg/l. The XTO platform data also included some chlorine results above 13.35 mg/l. DEC chose to restrict chlorine to 13.35 mg/l for these platforms since no site-specific risk analysis is available. A 100 meter radius mixing zone is also assigned for lack of specific modeling.

DEC did not have sufficient data to evaluate a site-specific mixing zone for TRC for the Dolly Varden platform. There are no comparable systems on other Cook Inlet platforms. A default mixing zone of 100 meters radius and the 13.35 mg/l TRC daily maximum limit are specified for this facility

For the final permit certification of new facilities, DEC adopts the100 meter radius mixing zone from guidance and definitions in federal Ocean Discharge Criteria regulations (40 CFR 125, Subpart M), exercising Best Professional Judgment (BPJ). Since new exploration and development platforms, including floating platforms, can move from state to federal waters of Cook Inlet, DEC chose to be consistent with federal requirements and with previous department decisions on the Arctic Oil and Gas NPDES permit (AKG28-0000) which also includes coverage in both state and federal waters. New facilities can apply for a mixing zone from DEC as part of the Notice of Intent (NOI) to discharge procedure. The limits that will apply for a 100 meter mixing zone are: 1 mg/l TRC for a monthly maximum value.

Facilities not applying for a mixing zone will be held to the Alaska Water Quality Standards for TRC of 7.5 µg/l (chronic) for the aquatic life use in 18 AAC 70.020(b). Because of method detection limitations, DEC and EPA routinely accept .1 mg/l as the reporting limit on NPDES and state-authorized permits.

Discharges 005 – 014 (Miscellaneous Discharges)

These discharges represent the combined discharge of several types of waste streams typical of operations on oil and gas platforms such as boiler blowdown, non-contact cooling water, and waterflooding discharges. This certification approves the use of WET (whole effluent toxicity) testing and trigger levels to monitor the potential impacts of these discharges to aquatic life in Cook Inlet. Whole effluent toxicity shall be expressed in Toxic Chronic Units (TU_c) required in 18 AAC 70.020(b).

Rationale: The draft 401 certification established mixing zones and dilution factors for miscellaneous discharges. DEC had concerns about the methods used in the proposed permit using CORMIX model and difficulty in facilities collecting representative samples from these varied, short-duration and intermittent discharges.

DEC's primary concern this permit cycle is to determine any additional toxicity from these miscellaneous discharges from facilities covered by this permit. Targeted WET testing with trigger levels and inventories of chemical/biocide additives will provide the information necessary to evaluate the need for effluent limits in the next permit cycle. These trigger levels are based on the dilution factors obtained from DEC's draft 401 certification.

Discharge 015 (Produced Water)

The Department authorizes mixing zones for produced water discharges from the existing facilities for:

1. Aquatic life: Total Aromatic Hydrocarbons (TAH) and Total Aqueous Hydrocarbons (TAqH)], metals, ammonia and Whole Effluent Toxicity (WET)

2. Human Health – Metals and organic compounds

The tables and rationale associated with mixing zones are shown in **Attachment 1** to this certification and are as follows:

- Table 2a : Mixing Zone Sizes for Produced Water Discharge 015 (Except Trading Bay)
- Table 2b: Mixing Zone Sizes for Trading Bay Produced Water Discharge 015
- Table 2c: Dilution required for Discharge 015 to meet water quality standards. For all metals needing limits, except manganese, the criterion is the dissolved portion of the metal.

Other Provisions

New construction or modifications for diffusers or any other appurtenances for domestic or non-domestic wastewater treatment, conveyance and/or disposal is subject to plan review by the department.

> *Rationale: For domestic wastewater, under18 AAC 72.200, a person must submit a plan to the department and obtain approval of that plan before constructing, installing, or modifying any part of a domestic wastewater collection, treatment, or disposal system. To obtain approval, a person shall provide to the department the information required by 18 AAC 72.205.*
>
> *Under 18 AAC 72.600, a person who constructs, alters, installs, modifies, or operates any part of a non-domestic wastewater treatment works or disposal system must first have written department approval of engineering plans submitted under this section.*

Shore-based facilities must place legible signs on both sides of an outfall pipe to notify the public that a mixing zone exists at the site and that trespassing and collection of shellfish or other aquatic life for human consumption is not advised at those locations. Signs must include the name and phone number of a facility owner and/or local contact.

> *Rationale: Stringent human health criteria for mercury and manganese [18 AAC 70.020(b)] and potential for bioaccumulation of these metals in biota require that the public avoid consumption of aquatic life used as food sources in these areas. See Attachment 1 for more information on mercury and manganese.*

ATTACHMENT 1. TABLES AND RATIONALES FOR DISCHARGE 015 (PRODUCED WATER)

Rationale: In accordance with State Regulations 18 AAC 70.240-270, the Department has authority to designate mixing zones in permits or certifications. These mixing zones will ensure that the water quality standards are met at all points outside the zones. In the previous permit issued in 1999, the mixing zones were defined as cylinders because of the lack of site-specific water current direction information at the discharging facilities and because EPA'S PLUMES modeling software was used. The mixing zones in this 401 certification are based on the CORMIX model using site-specific current, temperature, and salinity data to more accurately reflect the dispersion of pollutants into Cook Inlet from these facilities. For all except the proposed diffuser at the Trading Bay facility, the mixing zones are long and narrow, due to the strong currents of Cook Inlet.

If a mixing zone is restricted by the size of the waterbody, DEC determines the dilution at the boundary of that mixing zone and bases permit limits on that dilution. If water quality criteria can be met in a mixing zone that is smaller than the water body would allow under regulations, then the size of the mixing zone is restricted to that required to meet the water quality standard. In order to meet the "small as practicable" requirement, DEC considers the treatment system technology. When determining mixing zones for metals, sample results are reported as Total Recoverable metals; however water quality standards for the metals driving mixing zone sizes are expressed in dissolved metals. The dilutions at the mixing zone boundaries are determined by taking the total recoverable metals Reasonable Maximum Concentration (RMC) multiplied by the total-to-dissolved multiplier, and dividing this by the water quality standard.

Because of the large size of Cook Inlet, mixing zone sizes were determined from the Reasonable Maximum Concentration (RMC) of the pollutant needing the greatest dilution, taking into account compliance with risk and the protection of all uses of the water body. Mixing zones for metals are based on either the aquatic life or human health criteria, whichever requires the greatest dilution. Permit limits for metals are based on the dilution factor and the applicable water quality standard. If there is a reasonable potential for a metal to exceed the water quality standard at any one facility, then limits are included for that metal at all facilities. For other than the metal needing the greatest dilution, the permit limit is based on the RMC. Basing the permit limit on the RMC is more stringent than not specifying a permit limit; dischargers in the reissued permit must now ensure that there is no increase in a given pollutant over historic values. EPA did not specify limits for a metal if there was no potential for it to exceed its water quality criterion at the mixing zone boundary at any one of the facilities.

The largest mixing zones are associated with TAH/TAqH. The applicable water quality standards for hydrocarbons in the receiving water are no more than 10 µg/l for Total Aromatic Hydrocarbons, and no more than 15 ug/l for Total Aqueous Hydrocarbons. These parameters are defined in the State Water Quality Standards, 18 AAC 70.020 (b) and are based on chronic toxicity testing. These mixing zones are necessary to ensure compliance with State Water Quality Standards, 18 AAC 70.020(b) (Growth and Propagation of Fish, Shellfish, Aquatic Life, and Wildlife.

The department has reviewed the Mixing Zone Application for Cook Inlet Oil and Gas Operators (NPDES Permit No. AKG-28-5000 prepared for Unocal/Chevron, Conoco Phillips Alaska, Inc. and XTO Energy Inc., by Parametrix, dated August 5, 2004 and amended October 20, 2005. This document used data from the facilities and the CORMIX model for determining mixing zones and times of exposure for organisms in the discharge plume. This document constitutes the operators' applications and justification for the mixing zones. The Department used information in this document and the NPDES permit application to run CORMIX models for verification of the results. The Department concurs with the conclusions presented in that document, specifically those concerning mixing zone modeling, fate of chemical constituents, the aquatic life risk analysis, and the human health risk analysis.

Under the mixing zone regulation 18 AAC 70.240(a)(2), the mixing zone must be as small as practicable. 18 AAC 70.240(a)(3) also states that an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements. In discussions with EPA and Chevron/Unocal, it was determined that the Trading Bay Production Facility (TBPF) discharge would benefit from additional dispersion. This facility treats produced water from several platforms. According to the EPA Fact Sheet for the draft permit, the TBPF discharge volume represents 95.4% of the total amount of produced water entering Cook Inlet from the existing facilities. This is also a shore-based facility, not a platform discharge. The existing outfall line and diffuser was modeled with CORMIX, and EPA determined that modifications to the diffuser design would improve mixing and reduce the size of the mixing zone. DEC will review and approve engineering plans for this diffuser.

The agencies agreed that the potential for impact to the near-shore aquatic resources of Cook Inlet from existing facility discharge was greatest at the Trading Bay location. DEC concurs that the permit renewal should include a modification of the Trading Bay outfall diffuser to improve instantaneous mixing and reduce the size of the mixing zone. Although the actual amount of produced-water hydrocarbon entering Cook Inlet will not be changed, the impacted area of discharge and dispersal is smaller.

In addition to technology requirements for treatment of discharges, and the requirement that a mixing zone be "as small as practicable", ADEC considered whether there was any risk to aquatic organisms. Under 18 AAC 70.250(a)(1), the department will not authorize a mixing zone if the department finds that available evidence reasonably demonstrates that the pollutants discharged could bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels, based on consideration of bioaccumulation and bioconcentration factors, toxicity, and exposure.

The operators' application referenced above included a risk analysis of these discharges to aquatic organisms. The Department reviewed this risk analysis and conducted additional CORMIX model runs to confirm the exposure durations. DEC concluded that the greatest risk to drifting aquatic organisms occurs within the acute zone. Acute effects are based on a 1-hour exposure at the acute concentration; the time of exposure in the proposed mixing zones is always less than 15 minutes, therefore no acute effects are expected.

Chronic exposure times for Whole Effluent Toxicity (WET), ammonia, metals and hydrocarbons were also determined and compared against the time period for chronic exposure testing, which is either 48 or 96-hours. The effects of hydrocarbons at the chronic limit may take weeks, rather than days; exposure to concentrations above chronic values in the mixing zones is less than five hours (or eight hours considering tidal reversals.

For all but the Trading Bay Production Facility (with a diffuser), the longest chronic mixing zones occurred at the 90th percentile current for TAH/TAqH. Platform Baker had the longest mixing zone, and the time of exposure within the plume does not exceed 22 minutes. At Trading Bay, when the diffuser is in place, the largest mixing zone occurs at the 10th percentile current, and the time of exposure is less than 4 hours. Prior to the completion of the diffuser, a conditional mixing zone size of 3,596m long x 231m wide is authorized. Completion of the diffuser is expected to occur within 18 months of the issuance of the permit. For this discharge, the time of exposure with a diffuser in place was determined by taking increments in the ambient current every 1.2 hours (1/10th the tidal cycle). The results are as follows:

Table 3. Exposure Calculations

Time (hrs)	Current (m/s)	Distance (m)	Incremental DF	DF	CL Conc (ug/l)	Flux Avg. multiplier	Flux avg. conc.
0		0	0	0	19700	1	19700
1.2	0.2	864	610	610	32	1.7	19
2.4	0.38	2506	1.35	824	24	1.9	13
3.6	0.5	4666	1.64	1351	15	2	7
4.8	0.64	7430	1.47	1985	10	2	5

Source: DEC CORMIX model runs

CORMIX generally shows modeled dilutions in the farfield as centerline dilutions. The mixing zone application is based on these centerline dilutions, which are lower than bulk or flux average dilutions. In the farfield, EPA uses the "flux average" concentration, not the centerline concentration. The flux average concentration varies from 100% of the centerline concentration at the transition from the near field to 50% of the centerline concentration when the chronic water quality standard is met. From the above table it can be seen that for Trading Bay (with a diffuser), a drifting organism will therefore not be exposed for more than 3.5 hours to concentrations greater than the TAH water quality standard. Should an organism remain at the very centerline for the whole distance (which is not likely), then the total time of exposure is 4.8 hours. Since the criterion is based on an exposure of greater than 48 hours, there is no risk posed the organism. Furthermore, should an organism be within the plume for a complete tidal reversal, then the greatest length of time the organism might remain in the plume is less than 8 hours (assuming it drifts within the width of the plume and is not always at the centerline).

As part of the application of most stringent water quality standards, EPA calculations showed Reasonable Potential to exceed two Human Health Criteria: mercury and manganese (See Attachment A of the reissued permit). In the 1999 permit, mercury was limited at some facilities; manganese was not limited at any of the facilities. Based on mixing zones and dilution factors, reasonable potential (RP) to exceed

mercury was shown at Dillon platform and manganese to exceed at the Tyonek A platform. The manganese RP was based on one data point with a very conservative coefficient of variation (CV) of 13.2. The applicable human health concentration for manganese is 100 ug/l. The mercury human health criterion is .051 ug/l; the RP shows a mixing zone concentration of .058 ug/l (based on more available data at Tyonek A platform).

EPA decided if reasonable potential to exceed was shown at any existing facility, it would be limited at all existing facilities. Therefore, the reissued permit has mercury and manganese limits for all existing facilities. Currently Dillon platform is not discharging produced water. ConocoPhillips converted the Tyonek platform to zero discharge for its produced water in 2004. Therefore existing facilities with no current produced water discharge are driving stringent limits for mercury and manganese. Despite a showing of reasonable potential to exceed at these two platforms, mercury and manganese will not exceed the human health criteria outside of the authorized mixing zones at any of the existing facilities.

DEC has reviewed the EPA criterion documents for manganese and mercury and available information on bioaccumulation of mercury for this certification. The manganese human health criterion is based on studies showing that manganese can accumulate in shellfish. DEC reasons that shellfish collection would occur only at shore-based facilities. Therefore DEC is conditioning this certification such that shore-based facilities must post warning signs on collection of shellfish for consumption at these locations.

For mercury, the reasonable potential analysis does not factor in background concentrations in the receiving waters, which is a conservative assumption. This certification outlines the conservative risk and exposure durations on which the mixing zones for produced water are based. Multiple conservative assumptions were used to develop the EPA mercury criterion and this permit's effluent limits. DEC does not have conclusive evidence that mercury will bio-accumulate in any biota in Cook Inlet used for human consumption caused from discharge of produced water. Planned ambient monitoring of both receiving waters and sediment in the reissued permit will provide additional data on mercury in Cook Inlet.

However, DEC has stated at public meetings for this permit that mercury monitoring, but not necessarily establishing effluent limits, is advisable for this permit issuance. This condition fits into the department's broad goal of monitoring fish tissues and ambient waters state-wide for bio-accumulative substances. DEC's Fish Tissue Testing Program was put in place to determine the safety of Alaskan seafood, including subsistence species. With funding from EPA and NOAA, DEC has sampled state-wide over 2,000 salmon, halibut, Pacific cod, sablefish, rockfish, lingcod, pollock, sharks, and several species of freshwater fish, for heavy metals. A sub-set of those fish are analyzed for dioxins and furans, pesticides, PCBs, and PBDEs (flame retardants).

Results for the program so far include tissue samples from 119 fish from Cook Inlet: six Pacific cod, 28 Pacific halibut, 18 lingcod, 11 walleye pollock, seven rockfish, 26 salmon, and one spiny dogfish. Tissue samples were analyzed for arsenic, cadmium, chromium, nickel, lead, selenium, methylmercury and total mercury. In almost every case, statewide average and median metal concentrations were higher than those from Cook Inlet. The only notable exception was yelloweye rockfish, which had

higher methylmercury and total mercury concentrations than the statewide average. The higher methyl- and total mercury concentrations were not, however, significantly higher than the statewide average. (Source: DEC Fish Tissue study results) Because Cook Inlet mercury concentrations were in most cases lower than state-wide ones, there is no conclusive evidence that activities covered in this permit have contributed to bioaccumulation of mercury or other bio-accumulative substances.

DEC reviewed these proposed mixing zones since they are larger than those in the 1999 permit, may result in less stringent end-of-pipe effluent limits based on water quality. Because the previous permit modeling was based on a different modeling software package (PLUMES) with comparatively little data to support the modeling, and given that there is new data from the current permit's monitoring results, DEC does not believe that direct comparison of the effluent limits in this permit can be made to those of the previous 1999 permit.

In the 1999 permit, mixing zones were based on maximum recorded effluent values whereas in the 2005 draft permit, Reasonable Potentials (RP) determinations were used to derive these mixing zones. Very limited data was available for the 1999 mixing zone determinations.

Due to the increased ratio of produced water to hydrocarbons extracted from the Cook Inlet oil fields, a natural occurrence as fields age, a higher discharge volume and increased loading of pollutants have resulted for some facilities. However, some facilities have ceased operation, so their pollutant load is reduced and/or eliminated.

Table 2a. Mixing Zone Sizes for Produced Water Discharge 015 (Except Trading Bay)

		CHEVRON						XTO ENERGY		CONOCO PHILLIPS		CHEVRON					
Receptor/ Parameter	**Exposure Type**	**GTPF**		**Anna**		**Bruce**		**EFTF**		**Tyonek A**		**Baker**		**Dillon**		**GPP**	
AQUATIC LIFE		**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**
Hydrocarbons (TAH/TAqH)	Chronic	2685	20	2725	4	1840	11	1794	8	36	1	3016	6.6	2121	6.6	1863	22
Metals	Chronic	21	1	255	3	218	28	121	1	60	1	216	1	13	<1	14	1
	Acute	19	1	233	3	201	26	142	1	36	1	202	1	11	<1	12	1
Ammonia	Chronic	53	1	98	2	61	8	21	1	4	1	197	1	--	--	35	1
	Acute	7	1	14	1	10	3	<1	1	3	1	28	1	--	--	5	1
WET	Chronic	780	5	267	3	715	4	1742	8	73	<1	248	1	210	1	533	5
HUMAN HEALTH																	
Metals	Chronic	35	1	31	1	44	1	172	1	N/A	N/A	93	1	10	1	23	1
Organics	Chronic	3	1	1	1	4	1	N/A	N/A	N/A	N/A	<1	1	--	--	2	1

Table 2b. Mixing Zone Sizes for Trading Bay Produced Water Discharge 015

Note: Trading Bay without a diffuser was modeled with present day flows, not the 5-year projected flow.

		CHEVRON			
Receptor/ Parameter	**Exposure Type**	**TBPF – without diffuser**		**TBPF – with diffuser**	
AQUATIC LIFE		**Length (m)**	**Width (m)**	**Length (m)**	**Width (m)**
Hydrocarbons (TAH/TAqH)	Chronic	3644	231	2418	360
Metals	Chronic	679	89	9	80
	Acute	83	4	<1	80
Ammonia	Chronic	294	31	1	80
	Acute	39	3	<1	80
WET	Chronic	988	119	31	80
HUMAN HEALTH					
Metals	Chronic	884	104	16	80
Organics	Chronic	6	1	<1	80

Table 2c. Dilution Factors for Produced Water Discharges

	Exposure Type	CHEVRON							XTO ENERGY	CONOCO PHILLIPS
		GPTF	Anna	Bruce	Baker	Dillon	GPP	Trading Bay	EFTF	Tyonek A
AQUATIC LIFE										
Hydrocarbons (TAH/TAqH)	Chronic	7756	12509	9170	15668	3386	7756	1970	2556	175.6
Metals	Chronic	35.9	665.6	550.7	168	26	35.9	183.3	55.1	276.7
	Acute	32.2	599.1	496	151	24	32.2	20.3	64.6	178.7
Ammonia	Chronic	90	234	108	144	1	90	72	11	11.8
	Acute	13.2	34.3	15.8	21	1	13.2	10.6	1.6	1.7
WET	Chronic	1638	701	2625	210	358	1638	346	1476	327
HUMAN HEALTH										
Metals	HH	60.4	72.9	70.6	70	22	60.4	249.5	77.9	1
Organics	HH	5.6	3.2	7.5	2.5	1	5.6	2.2	1	1

ATTACHMENT 2. ANTIDEGRADATION ANALYSIS UNDER 18 AAC 70.015 CERTIFICATE OF REASONABLE ASSURANCE FOR NPDES PERMIT AKG31-5000 COOK INLET OIL AND GAS

The Antidegradation Policy of the Alaska Water Quality Standards (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This attachment analyzes the department's decisions in this certification with respect to the Antidegradation Policy.

Background on receiving waters and current discharges

NPDES permit AKG-31-5000 covers discharges from facilities for exploration, development and production activities. These oil and gas related activities began more than 50 years ago. From the 1960s to the end of 2001, approximately 1,030 million barrels of oil and 978 million barrels of water were produced largely from upper Cook Inlet. *(Source: Draft Environmental Assessment for this permit prepared for EPA by Tetra Tech, Inc, March 2006).* Upper Cook Inlet northward of the southern extent of Kalgin Island is considered inland waters and under state jurisdiction. EPA has promulgated effluent guideline limitations (EGLs) for Upper Cook Inlet with an exemption that allows disposal of drilling fluids and produced water directly to surface waters (40CFR Part 435, Part D, Coastal Subcategory). Not all produced water is discharge to the Inlet; some is discharged back into the oil and gas formation for enhanced oil recovery via Class II Underground Injection Control (UIC) wells regulated by the Alaska Oil and Gas Conservation Commission (AOGCC).

Under Alaska Water Quality Standards (AKWQS), the marine waters of Cook Inlet are protected for all uses. The AKWQS list site-specific metals and turbidity limits for the area near the Point Woronzof municipal treatment plant. These site-specific criteria (SSC) recognized dissolved metals loading from natural sources as well as the natural condition of high turbidity in Cook Inlet. EPA requires that the more conservative total recoverable metals form be use in NPDES permits. Since adopting the above SSC in Cook Inlet, the AKWQS have been changed to adopt the dissolved form, the rationale being that dissolved metals are the bio-available form of metals.

Industrial and domestic wastewater discharges are permitted by EPA and DEC throughout the upper Cook Inlet region, ranging from the Point Woronzof primary treatment plant serving Anchorage, oil refining, a fertilizer production plant, seafood processing, and other minor industrial and sanitary discharges. Cook Inlet is unique in Alaska and noted for large tides, strong currents, extensive mudflats, high turbidity and seasonal input of fresh water from snowmelt and runoff. Some of Alaska's most urbanized watersheds channel their waters into Cook Inlet.

The Department has no evidence to suggest that the activities, existing or proposed, subject to this Certification will cause exceedances of water quality standards in the areas of coverage. This is a general permit with a wide area of coverage with little site-specific receiving water monitoring data. Some provisions in the reissued NPDES permit will increase information on receiving waters for large and new dischargers, so more information will be available for the next NPDES permit reissuance.

Analysis:

The following antidegradation analysis will focus on these parameters based on the theoretical possibility for water quality degradation:

1. *18 AAC 70.015(a) (2)(A). Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.*

Oil and gas is Alaska's largest industry. The oil and gas industry generates approximately 33,500 jobs and a $1.4 billion payroll annually in the state. Alaska has two commercially active oil and gas regions: Cook Inlet in South Central Alaska, and Alaska's North Slope. The Prudhoe Bay Unit (PBU) on the Alaska Arctic coast is the largest operating oil field in the United States, having produced 12.8 billion barrels of oil since production began in the late 1970s.

Oil and gas production from Cook Inlet is processed and refined for domestic and international markets. Natural gas is distributed for residential and commercial use in the upper Kenai Peninsula, Anchorage and the Mat-Su Valley. Several smaller, independent oil companies have shown increased interest in Cook Inlet oil and gas exploration and production since the mid 1990s, leading to renewed drilling and production following years of decline. (Sources: McDowell Group. (January 2001 *Economic Impact of the Oil and Gas industry on Alaska* and the Alaska State Chamber of Commerce website).

By 1960, Cook Inlet annual oil production stood at 600,000 barrels. Five other Cook Inlet fields began production between 1965 and 1972. Chevron opened a refinery in 1963. The Tesoro refinery began operating in 1969. Cook Inlet production peaked at 83 million barrels per year in 1970 and declined to 7 million barrels per year in 2005. By year-end 2005, the Cook Inlet tallied more than 1.3 billion barrels of cumulative oil production, including about 11 million barrels of natural gas liquids (NGLs). *(Source: Department of Natural Resources, Division of Oil and Gas 2006 Annual Report.)*

Cook Inlet gas production began as a by-product of oil development. The first major gas discovery occurred in the Kenai gas field in 1959. Gas production began the following year and continues today. Several additional large gas discoveries quickly followed. As more oil and gas fields were discovered, nearby markets for the gas were developed in Anchorage and Kenai to supply heat and electricity generation. In 1968, Unocal launched the ammonia-urea plant in Nikiski to take advantage of the abundance of cheap stranded natural gas. This plant was acquired in 2000 by Agrium Inc., of Calgary, Alberta. In 1969, Phillips and Marathon began operating the liquid natural gas (LNG) plant, also located in Nikiski. *(Source: Department of Natural Resources, Division of Oil and Gas 2006 Annual Report.)*

LNG exports to Japan accounted for about a third of total Cook Inlet gas production. Total industrial use of Cook Inlet gas, including LNG exports, fertilizer manufacture, and oil field operations, has remained fairly constant at about 75 percent of total consumption since 1990. Cook Inlet natural gas production has remained relatively stable from 2001 to

2005. In recent years, the steady increase in residential and commercial demand for space heating and electric power generation has been balanced by declines in field operations and reduced fertilizer production. *(Source: Department of Natural Resources, Division of Oil and Gas 2006 Annual Report.)*

There is a public need for the Cook Inlet natural gas in South Central Alaska. Seasonal shutdown of the Agrium fertilizer plant in 2006-2007 occurred so that natural gas could be diverted for home heating and power generation use. As the Cook Inlet field ages, such prioritization of resources is expected.

The EPA effluent guidelines recognize economic considerations (see *Coastal and Offshore Categories of the Oil and Gas Extraction Point Source Category (40 CFR Part 435, Subparts A and D)* and allow discharge of produced water in Upper Cook Inlet. As this is the only national exemption, EPA has recognized the unique setting, the higher costs and the logistical challenges of industrial development and activity in Cook Inlet compared to other U.S. oil and gas producing regions.

The above information demonstrates that the lowering of water quality in Cook Inlet allowed in this certification of the NPDES permit is necessary to accommodate important economic and social development in the area.

2. *18 AAC 70.015(a)(2) (B). Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.*

The modeling and risk-based approach used to develop mixing zones for sanitary wastewater and produced water are consistent with DEC application of water quality criteria. The final permit limits will not violate water quality standards. Mixing zones are specifically authorized in accordance with 18 AAC 70.240. The authorized mixing zones have been sized to ensure that all applicable water quality criteria are met at all points outside of the mixing zone.

Because different computer models were used in the 1999 permit (PLUMES) than that used for this permit (CORMIX), direct comparison of the limits and any resulting reduction of water quality is not possible. For instance, some parameters such as lead did not show reasonable potential to exceed at the Granite Point Production facility in this permit, whereas it was included as a limited parameter in the 1999 permit. Copper limits are lower at all existing facilities in this permit than in the previous permit. Therefore, new modeling and reasonable potential analysis yielded limits that, in some cases, show a reduction in toxicity and in some cases, an increase in toxic potential.

Because of methods used for reasonable potential analysis (RPA) by EPA and the DEC/Parametrix mixing zone modeling, the whole effluent toxicity (WET) limits for produced water (Discharge 015) are higher than those in the previous permit limits. Some limited parameters contributing to toxic potential are more stringent, but overall toxic potential, measured as WET, has increased according to the RPA. For instance, the Bruce Platform has a maximum daily WET limit of 4312 chronic Toxic Units (TUc) in the reissued permit. In the 1999 permit, the daily maximum WET limit at Bruce was 912 TUc. DEC reviewed WET data for Bruce Platform from the past permit cycle. The permit required annual WET testing. Based on three different test species, the highest recorded

WET result was 625 TUc reported in 2002. The WET limit for Bruce and the other existing facilities covered by the reissued permit is extremely conservative and factors in statistical variance. DEC will be carefully reviewing WET results under this permit and expect that actual WET values will not approach the new limits based on past testing results.

As part of EPA's efforts to further characterize large volume discharges, ambient water and sediment monitoring studies will be done at existing facilities with greater than 100,000 gallons per day discharge of produced water. The Trading Bay facility, with the majority of produced water discharge into Cook Inlet, will be subject to this new study.

With the inclusion of WET testing for the miscellaneous discharges (Discharges 005-014) on this permit, additional information on potential toxicity from these discharges will be obtained this permit cycle.

3. *18 AAC 70.015(a)(2)(C). The resulting water quality will be adequate to fully protect existing uses of the water.*

The permit renewal application does not propose any changes that would likely result in wastewater of lower quality to be discharged than has been discharged into Cook Inlet under the 1999 permit.

As part of the NPDES renewal, EPA contracted out an Ocean Discharge Criteria Evaluation (ODCE) and an Environmental Assessment (EA) to Tetra Tech, Inc. These documents focused on the aquatic life use of the waters of Cook Inlet. Reissuance of the permit with a Finding of No Significant Impact (FONSI) was the outcome of the EA. These evaluations included information on impacts to endangered species and essential fish habitat. To lessen any potential impacts from the permit activities to Cook Inlet, EPA concluded that:

- If permittees comply with all applicable limitations and conditions, the implementation of them would maintain the quality of Cook Inlet and prevent unreasonable degradation of the marine environment.
- No new facilities could discharge produced water.
- New controls on treatment chemicals and toxicity were added.
- More stringent limits for Total Residual Chlorine were established.
- Two new studies are proposed to better understand potential impacts to Cook Inlet waters. Any new facilities must conduct baseline monitoring.
- Ambient monitoring is required for dischargers with a daily discharge volume over 100,000 gallons per day, including sediment and water column samples in the vicinity of the discharges

In addition to the aquatic life use, DEC evaluated the human health criteria and use of growth and propagation of fish and shellfish for human consumption. The impact to shellfish resources at the limited number of existing shore-based facilities will be mitigated with the inclusion a requirement in this certification for warning signs at these locations. The overall use for the entire waterbody for shellfish production and consumption will not be affected. Again, water column and sediment monitoring required in the reissued permit will give additional assurance that all existing Cook Inlet water uses will be protected.

4. *18 AAC 70.015(a) (2) (D). The methods of pollution prevention, control, and treatment found by the department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.*

Because of large volumes of produced water and limited space on platforms for treatment, produced water is either discharged or injected back into the formation as part of enhanced oil recovery. As an oil/gas field ages, the percentage of produced water increases. However, the department notes the following methods of pollution prevention and control are in place:

- Because of closures of some platforms, total load of hydrocarbons from produced water has decreased. This includes the Dillon platform, the only facility that showed reasonable potential for mercury concentrations exceeding state water quality standards.
- New controls on platforms in the permit including chemical and biocide inventories. New monitoring requirements include WET testing for miscellaneous discharges
- A new diffuser at the Trading Bay production facility will reduce the mixing zone impacts from that shore-based facility.
- No new produced water discharges are permitted in state and federal waters under this permit coverage.

5. *18 AAC 70.015(a) (2)(E). All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.*

After review of the applicable statutory and regulatory requirements, including 18 AAC 70 and 18 AAC 72 the Department finds that the discharge from existing point sources meets the highest applicable statutory and regulatory requirements.