



United States  
Environmental Protection  
Agency

Region 10  
1200 Sixth Avenue  
Seattle WA 98101

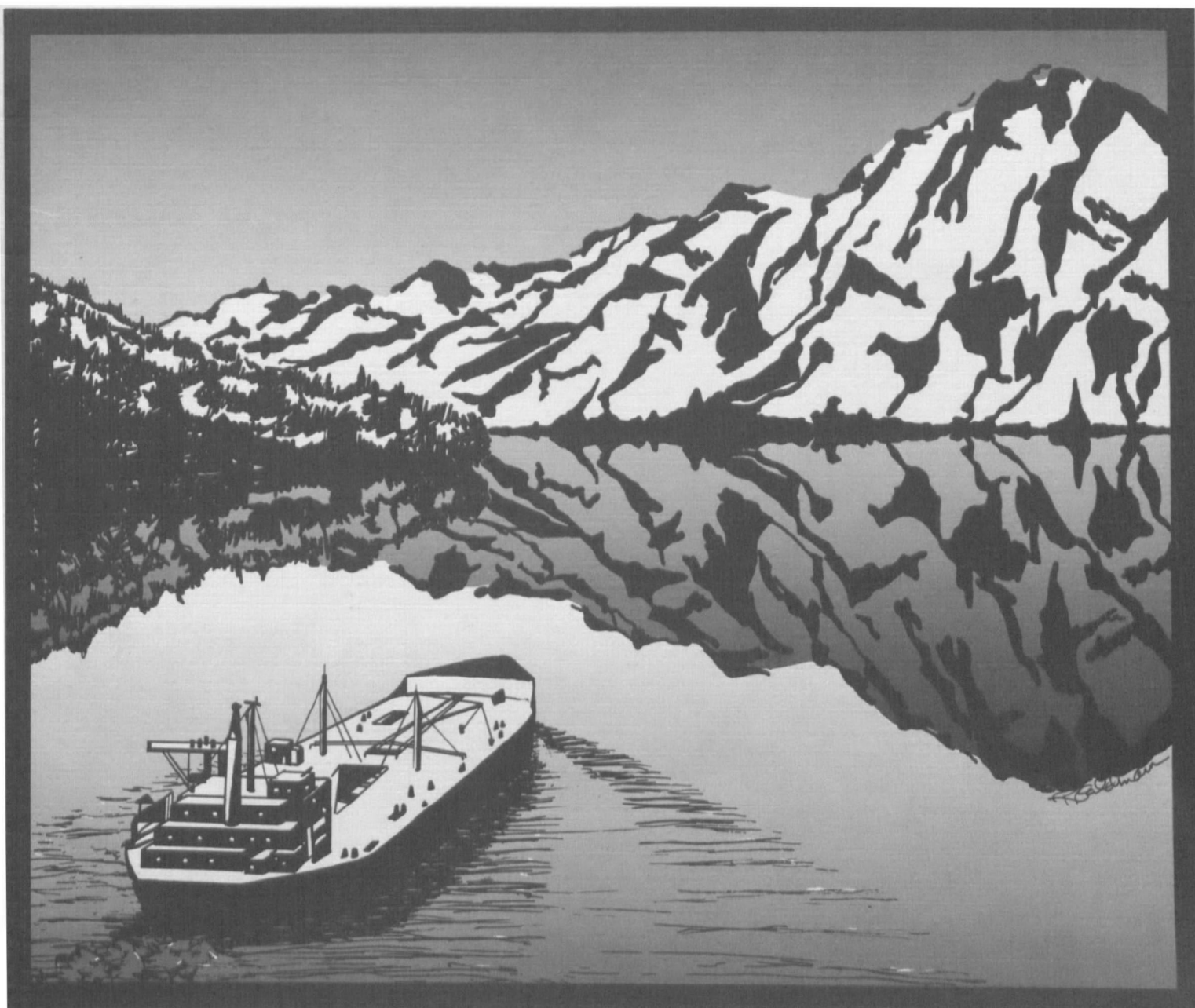
EPA-10-AK-Valdez-NPDES-79  
December 1979  
EPA 910/9-79-064

Draft

# Environmental Impact Statement

Attachment  
A

## Alaska Petrochemical Company Refining and Petrochemical Facility Valdez, Alaska



DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Alaska Petrochemical Company  
Refinery and Petrochemical Facility  
Valdez, Alaska

ATTACHMENT A

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

NOV 1 1979



REPLY TO  
ATTN OF: M/S 443

To: All Interested Government Agencies, Public Officials, Public Groups and Citizens

Pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969 and implementing Federal Regulations, I am forwarding for your review and comment this Draft Environmental Impact Statement (EIS) for the Alaska Petrochemical Company's (ALPETCO) proposed Refinery and Petrochemical Facility in Valdez, Alaska. ALPETCO has applied for a National Pollutant Discharge Elimination System (NPDES) Permit to discharge pollutant to navigable waters pursuant to the provisions of the Clean Water Act (Public Law 95-217). The proposed facility has been determined to be a New Source under Section 306 of the Clean Water Act and hence is subject to the provisions of the National Environmental Policy Act (83 Stat. 852) under Section 511(c) (1) of the Clean Water Act. Pursuant to 40 CFR Part 124.31(d), the draft New Source NPDES permit has been released for concurrent public review with this EIS. Please see the attached Notice for details.

The United States Environmental Protection Agency (EPA) will announce the availability of this document in the Federal Register on Friday, December 7, 1979, initiating a 59-day review and comment period. It is requested that comments on the draft EIS be submitted by 1 February 1980. Comments on the draft EIS should be submitted to Ms. Deborah Kirk, Environmental Evaluation Branch, Mail Stop 443, at the above address. Substantive comments on the draft EIS will be considered in the preparation of the final EIS.

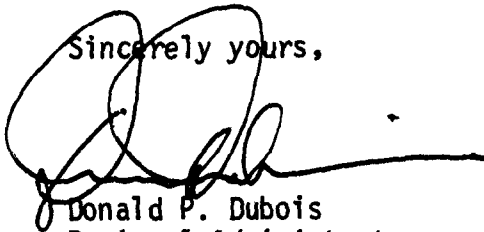
Please note that this draft EIS consists of a Text, Attachments and multiple technical appendices. All technical appendices were not distributed to all agencies and persons. If you need additional copies of the draft EIS or any of its technical appendices, please contact Deborah Kirk at the listed address or telephone (206) 442-4011 or (FTS) 399-4011. All volumes are available for review at the locations noted on the attached Notice.

Public hearings on the draft EIS and the draft New Source NPDES permit will be held in Anchorage, Valdez and Juneau on January 29,30 and 31, 1980, respectively. Please see the attached Notice for details.

It should be noted that if changes to the proposed project and draft EIS are minor, the final EIS will consist primarily of: 1) a summary, 2) pages with modifications, addition and/or deletions as necessitated by the coordination and review process; and 3) a new coordination section containing comment letters received on the draft EIS with EPA's responses to those comments. Therefore, the draft EIS should be retained since it, along with the final EIS, will provide a full analysis of the environmental issues. The final EIS will be sent only to the agencies and interested parties who request a copy or make substantive comments on the draft.

If you need additional information, please contact Ms. Deborah Kirk at (206) 442-4011 or (FTS) 399-4011.

Sincerely yours,

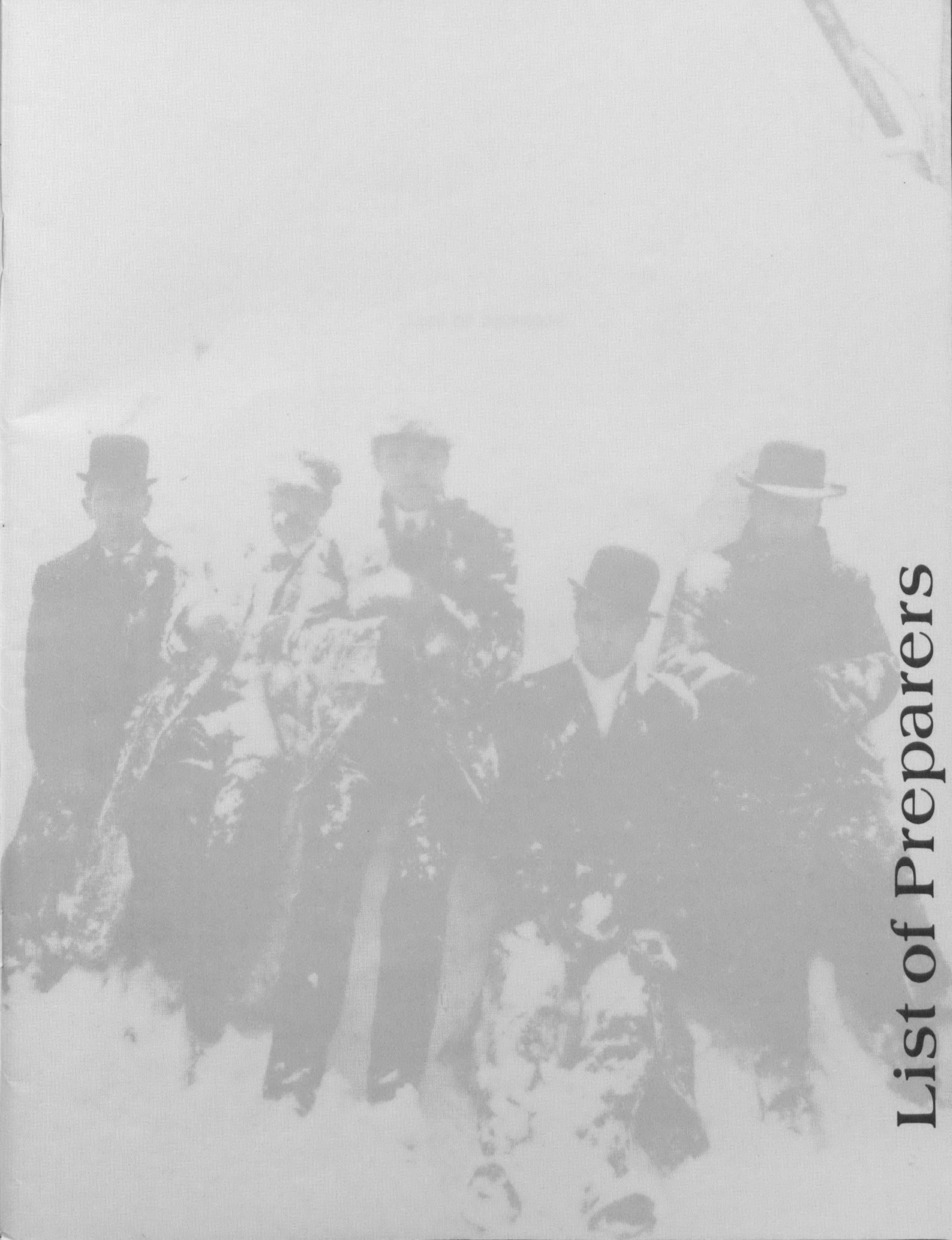
A handwritten signature in black ink, appearing to read 'Donald P. Dubois', with a long horizontal flourish extending to the right.

Donald P. Dubois  
Regional Administrator

Attachment

ATTACHMENT A  
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# List of Preparers

## LIST OF PREPARERS

## LIST OF PREPARERS

This Environmental Impact Statement has been prepared by CCC/HOK-DOWL performing as a third-party consultant to EPA. CCC/HOK-DOWL is an association of two Anchorage, Alaska, consulting firms, Dickinson-Oswald-Walch-Lee Engineers and Crittenden, Cassetta, Cannon/Hellmuth, Obata, Kassabaum Architects and Planners. Under the management of CCC/HOK-DOWL, a multidisciplinary team of specialists was assembled to perform the work. Following is a list of the firms and the persons of primary responsibility engaged in preparation of the EIS. Brief biographical sketches of those persons follow the list.

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Adams is a research engineer at the Massachusetts Institute of Technology. His specialty is mathematical modeling of oceanographic effects. He has published numerous reports and supervised many projects since 1970 regarding outfall diffuser designs, fluid mechanics and hydrodynamic modeling.

Glenn H. Bacon - Archaeologist

Bacon has more than 10 years of archaeology experience covering all regions of Alaska. He is a former Acting Alaska State Archaeologist and former lecturer and research associate in archaeology with the University of Alaska. He is lead archaeologist in the Fairbanks firm, Alaskarctic.

Terry L. Barber - Geologist

Barber has been active in drilling supervision and test hole logging throughout Alaska. He also has been involved in a wide variety of soil and rock related subsurface investigations, and in materials quality control.

David R. Bingham - Civil Engineer (hydrodynamics)

Bingham has been involved in the development and application of mathematical models for nearly three years, and has worked on a wide range of projects using one- and two-dimensional finite element hydrodynamic and water quality models.

Douglas L. Burton - Vice President, Engineering Services

Burton directs The Pace Company's process design and environmental management services consulting groups. He coordinates a wide range of studies including refining licensing and technology evaluations for a broad range of refining processes; refinery process designs; environmental assessment studies for grassroots Gulf Coast petrochemical complexes; and permitting projects for new refineries, expansions, and petrochemical complexes.

David A. Cole, Jr. - Civil Engineer (seismology)

Cole has been involved in seismology and earthquake related geotechnical studies throughout Alaska and southern California, and recently presented a paper, "Regional Seismic Risk in Alaska," at the Alaska Professional Design Council Earthquake Symposium (1979).

Joseph Colonell, Ph.D. - Professor of Ocean Engineering

Colonell is the principal investigator for the Institute of Marine Science Program of Environmental Studies, University of Alaska, Fairbanks. Projects with which he has been involved include the Continuing Environmental Studies of Port Valdez, an extensive program of monitoring physical oceanographic conditions to detect effects of the Alyeska marine terminal ballast water treatment plant discharge. Colonell is a registered civil engineer in Alaska and three other states.

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Crittenden is the senior officer of the Alaska Professional Corporation Crittenden, Cassetta, Cannon/Hellmuth, Obata, Kassabaum (CCC/HOK), Architects and Planners, and he has 30 years of consulting experience in Alaska.

Lewis E. Dickinson

Dickinson is the senior partner in the Alaska partnership of Dickinson, Oswald, Walch, Lee (DOWL), and he has 25 years of engineering consulting experience throughout Alaska.

Charles B. Fahl, Ph.D - Meteorologist

Fahl is manager of the Dames and Moore Anchorage Weather Forecast Center. He has 15 years of experience performing and directing air quality, climatological and meteorological studies throughout Alaska including many modeling analyses and impact analyses.

Roberta E. Goldman - EIS Resource Assistant, Graphic Artist

Goldman designed and conducted a cultural anthropological study in Oaxaca, Mexico. She was graphics editor of the Albany Student Press, University at Albany, and was involved in promotional design at St. Martin's Press, New York.

Donald R.F. Harleman, Sc.D - Ford Professor of Engineering (hydraulics, applied mathematics)

Harleman specializes in hydraulics, and has served as consultant to a wide range of state, federal and private agencies throughout the United States and parts of Canada and Europe. He is the author of numerous publications, and is a member of seven scientific and professional societies.

Gordon S. Harrison - Economist

Harrison is a former associate professor at the University of Alaska, Fairbanks, Institute of Social, Economic and Government Research. He has conducted policy planning analyses for Alaska state and local governments, and has contributed to several major reports to the BLM describing patterns of petroleum exploration and development in the Gulf of Alaska for the Outer Continental Shelf drilling program.

Alma D. Hartman - Word Processor

Hartman's background is in the biological and environmental sciences. She has experience with many types of word processing machines.

Jan H. Hauge - Acoustical Engineer

As manager for environmental noise studies for Towne, Richards and Chaudiere, Hauge has prepared acoustical EIS and design studies for industrial transportation and community development projects for the past six years.

Miles O. Hayes, Ph.D - Professor, University of South Carolina (geology, marine science)

Hayes has extensive experience as an instructor, research scientist, consultant and lecturer in the fields of geology and marine science. His responsibilities at the University of South Carolina include supervision of theses and dissertations, and directing the Coastal Research Division of the Department of Geology.

James E. Hemming - Arctic Biologist

Hemming is responsible for planning, developing and staffing biological programs for Dames and Moore in Anchorage. Recent projects include a biological evaluation of a major Bering Sea fishery, a survey of fish streams along the proposed route of the trans-Alaska natural gas pipeline, and an Outer Continental Shelf biological impact analysis of petroleum development in the Beaufort and Bering Seas.

Jorden Jacobsen - Geological Engineer (geophysics)

Jacobsen has performed seismic refraction studies and other geophysical analyses in Alaska for DOWL Engineers and Atlantic Richfield Company.

Peter E. Kelly - Manager, Process Design Services

Kelly has developed expertise in design, optimization, cost estimation and computer modeling techniques for petrochemical and refining facilities.

Robert W. Kranich, Jr. - Civil Engineer (groundwater hydrology)

Kranich was primary design consultant for several water systems for public utility companies. He has been responsible for the design and contract administration of numerous groundwater development and other hydrologic projects throughout Alaska.

Harry R. Lee - Civil Engineer (soils mechanics)

Lee has been involved for more than 20 years in a wide variety of geotechnical studies throughout Alaska, ranging from site evaluations to foundation designs. He was a founder of Alaska Testlab, a materials testing laboratory, and he is a principal engineer with DOWL. Lee has lectured at the University of Alaska and has participated in numerous American Society of Civil Engineers technical symposiums.

Richard K. Morehouse - Environmental Planner

Morehouse directed the Alaska Capital Planning Commission's environmental assessment program and was principal planner for the city development plan. He also performed the socioeconomic impact assessment for the Outer Continental Shelf drilling program.

William E. Palmer - Draftsman

Palmer has seven years experience drafting for a civil engineering firm.

John E. Paulson - Civil Engineer (EIS Project Manager)

Paulson has 14 years of experience in industrial and civil engineering, and has assumed project management responsibilities for project planning, environmental and site evaluations and general civil design and construction projects.

F. Paul Pizzi - Project Manager, Environmental Management Services

Pizzi manages projects for The Pace Company covering a wide spectrum, including site selection, permit consultation, wastewater treatment technology evaluation and facilities design, and hazardous waste disposal. Recent experience includes coordination of the Environmental Impact Assessment for a world-scale EDC/VCM/PVC complex; and coordination of all engineering, maintenance, and process activities on initial start-ups of several operating units for a major refinery expansion.

Steven M. Reiner - Planner

Reiner conducted baseline inventories of 14 Alaska coastal communities for the Outer Continental Shelf Socioeconomic Impact Assessment. He also has broad experience in public services planning, including transportation and public facilities planning and programming for new towns, as well as numerous industrial, residential and commercial developments on the West Coast.

Toraman Sahin - Civil Engineer (terrestrial hydrology)

Sahin's recent activities include participating as assistant engineer in a design and feasibility study of the construction of ice islands as off-shore exploratory drilling platforms in the Prudhoe Bay area; and in the design of an ice bridge across the Susitna River for Anchorage Natural Gas exploration activities.

Richard F. Smullen - Senior Consultant, Environmental Management Services

Smullen has been responsible for numerous water and wastewater treatment and control studies, and currently is involved in permit consultation and site planning projects for refining, chemical, and petrochemical facilities.

Vicky N. Sterling - EIS Writer/Editor

Sterling served for three years as technical writer and editor of publications for Alyeska Pipeline Service Company during construction of the trans-Alaska pipeline, and for one year as technical writer and coordinator for Alyeska's Initial Valuation Report to the Federal Energy Regulatory Commission. She also is a former reporter and editor of the Anchorage Daily Times.

Kenneth E. Stroh - EIS Project Coordinator

Stroh has conducted a wide range of geotechnical studies throughout Alaska, and was involved in standardization of Bush school design. Formerly borough traffic engineer (Anchorage), Stroh was responsible for economic and transportation studies as well as project design and construction.

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John Treptow - Attorney at Law

Treptow is a partner in the Anchorage law firm of Atkinson, Conway, Young, Bell and Gagnon, Inc.

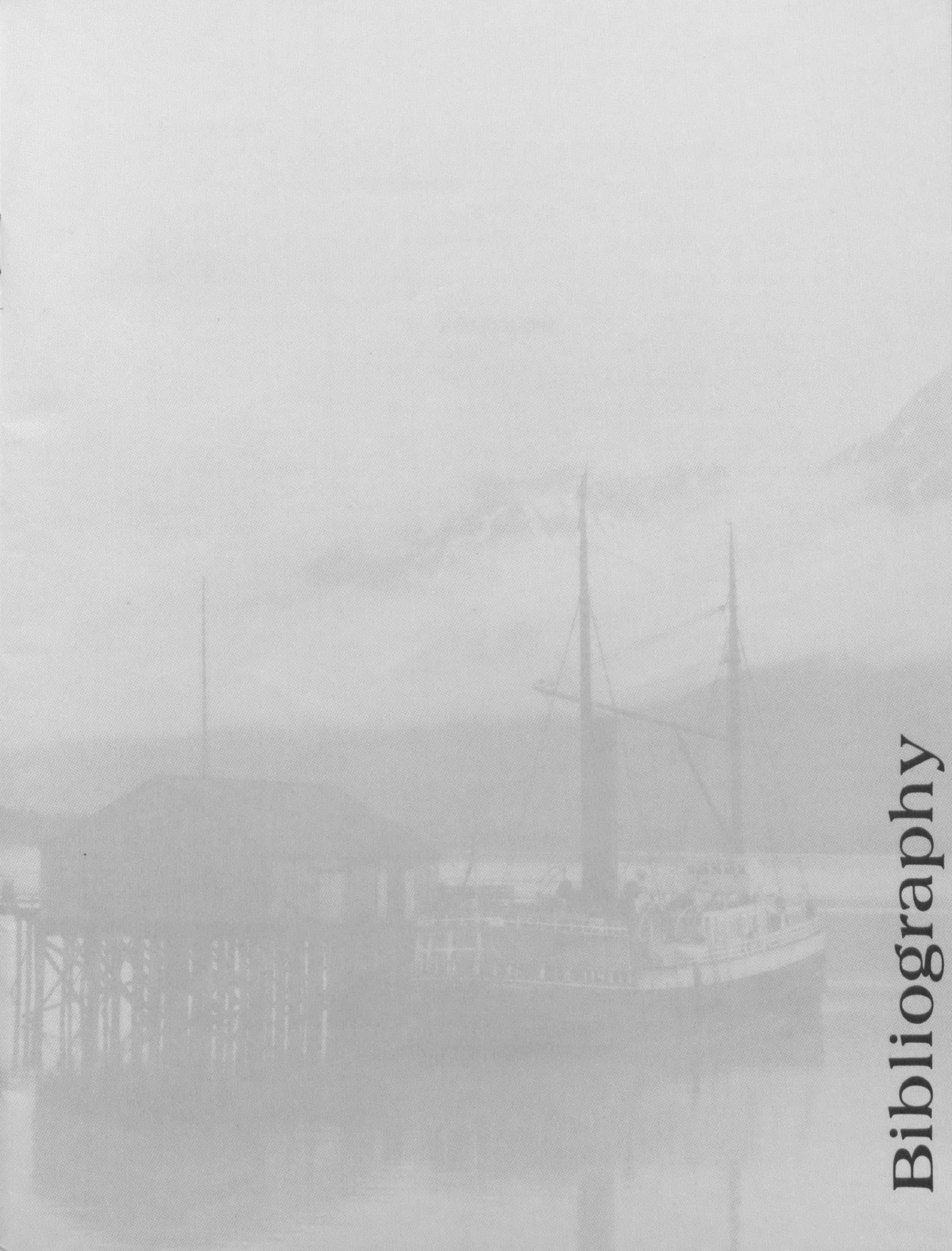
Jekabs P. Vittands - Vice President, Metcalf and Eddy, Inc.

Vittands specializes in wastewater management, and has been responsible for numerous studies involving water quality planning, storm water management and the application of stream and estuary water quality and storm water models.

Priscilla Post Wohl - EIS Assistant Coordinator

Wohl's educational background is in the earth sciences. She is a former natural resource specialist for the Bureau of Land Management, Alaska OCS Office, where she assisted in preparation of several Environmental Impact Statements. She also was a staff geologist for Dames and Moore, where she was involved with data collection, evaluation and report preparation on various multidisciplinary projects for government and private industry.





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## LIST OF ABBREVIATIONS



## LIST OF ABBREVIATIONS

ADEC - Alaska Department of Environmental Conservation

ADNR - Alaska Department of Natural Resources

ADOTPF - Alaska Department of Transportation and Public Facilities

ADT - average daily traffic

ANS - Alaska North Slope

API - American Petroleum Institute

BACT - best available control technology

bpd - barrels per day

bpsd - barrels per stream day

BTU - British thermal units

CEQ - Council on Environmental Quality

cmd - cubic meters per day

cm/s - centimeters per second

COE - Corps of Engineers

CPI - corrugated plate interceptor

CVEA - Copper Valley Electric Association

DAF - dissolved air flotation

dB - decibels

DEIS - Draft Environmental Impact Statement

DO - dissolved oxygen

dwt - dead weight tons

EIS - Environmental Impact Statement

FCC - Fluid catalytic cracking or fluid catalytic cracker

FIA - Federal Insurance Administration

HUD - U.S. Department of Housing and Urban Development

LPG - liquefied petroleum gas

mbd - thousand barrels per day

mgd - million gallons per day

MLLW - mean low low water

MMBD - million barrels per day

MMBTU - million British thermal units

M/S - meters per second

NAAQS - National Ambient Air Quality Standards

NEPA - National Environmental Policy Act - 40CFR Parts 1500-1508

NESHAPS - National Emission Standards of Hazardous Air Pollutants

NMHC - nonmethane hydrocarbons

NPDES - National Pollution Discharge Elimination System

NSPS - New Source Performance Standards

PAD V - Petroleum Administration for Defense District

ppmv - parts per million by volume

PSD - prevention of significant deterioration; Part C of Clean Air Act as amended in 1977

psia - pounds per square inch absolute

psig - pounds per square inch gauge

RBC - rotating biological contactor

scf - standard cubic feet

STD - salinity - temperature - depth profiles

THC - total hydrocarbons

T/D - tons per day

TSP - total suspended particulates

TSS - total suspended solids

WSO - Weather Service Office

ZID - zone of initial dilution



# Glossary of Terms

LOWER FALLS AND CANYON, SOLICAN RIVER  
P.5 HUNT, MT6

## GLOSSARY OF TERMS

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- Acid Gas - any stream made up chiefly of carbon dioxide and/or hydrogen sulfide.
- Aerobic - living, active, or occurring only in the presence of oxygen.
- Aggradation - a modification of the earth's surface in the direction of uniformity of grade by deposition.
- Alevin - a newly hatched salmon which is still attached to the yolk sac.
- Aliphatic - paraffinic compounds.
- Alkylation - a reaction in which isobutane is combined with propylene and butylenes to form a high octane branched paraffin for motor fuel.
- Amine - an alkanol amine such as monoethanol amine used to remove acid gas ( $H_2S$  and  $CO_2$ ) from gaseous or liquid hydrocarbon streams.
- Angle of Internal Friction - angle between the abscissa and the tangent of the curve representing the relationship of shearing resistance to normal stress acting within a soil.
- Anode Grade Coke - coke that is of high enough quality as measured by low concentration of sulfur and metals to be used as anodes in the aluminum industry.
- Aquifer - a water bearing stratum of permeable rock, sand or gravel.
- Aromatics - compounds which contain six-membered rings with each carbon atom of the ring bound by two single bonds and one double bond.
- Assemblages - a group of organisms of several species that are typically found in the same habitat.
- Atmospheric Gas Oil - a portion of the crude oil boiling in the range of 650°F to 850°F.
- Attainment Area - an area within which national ambient air quality standards are being met.
- Benthos - the bottom of a body of water.

Benzene -  $C_6H_6$ , a six carbon membered ring compound with one hydrogen on each carbon. Benzene is the basic building block of all aromatic compounds.

Bivalve - a shell composed of two corresponding movable pieces.

BOD - biochemical oxygen demand - the oxygen used in meeting the metabolic needs of aerobic microorganisms in water which is rich in organic matter.

Bryozoans - aquatic marine invertebrate animals that reproduce by budding.

$CaF_2$  - Calcium Fluoride.

Calcining - a process where the volatile content of coke is reduced by the application of heat.

Cat Gasoline - the  $C_5$  430°F boiling material produced from a fluid catalytic cracker.

Caustic Wash - a procedure where a hydrocarbon stream is contacted with caustic for removal of mercaptans.

CBM Pit - sump where any acidity is neutralized.

Chaetognaths - a planktonic predator.

Chromates - a salt or ester of chromic acid ( $H_2CrO_4$ ).

COD - chemical oxygen demand - the chemicals used in meeting the metabolic needs of aerobic microorganisms.

Cohesionless Soil - a soil that when unconfined has little or no strength when air dried and that has little or no cohesion when submerged.

Cohesive Soil - a soil that when unconfined has considerable strength when air dried and that has significant cohesion when submerged.

Coke - a solid, granular fuel product consisting mainly of carbon.

Coke Gasification - the conversion of coke in the presence of steam and air into clean gaseous fuel.

Colloidal - a substance in suspension or solution which fails to settle out and diffracts a beam of light.

Conradson Carbon - an analytical testing procedure which measures the relative tendency of a petroleum stream to form coke.

Consolidation - the gradual reduction in volume of a soil mass resulting from an increase in compressive stress.

Copepods - freshwater and marine crustaceans.

Cracking - thermal catalytic cracking of heavy residual hydrocarbons into lighter, cleaner fuel products.

Crustaceans - aquatic anthropods that have chitinous or calcareous exoskeletons - including lobsters, shrimp, crabs and barnacles.

Cycle Oil - a heavy fuel product from the fluid catalytic process that cannot be further cracked without hydrogenation to saturate polyaromatics.

Dabbling Ducks - ducks that feed in shallow water.

Debutanizer - a fractionating tower in which butane and lighter boiling components are taken overhead.

Deisohexanizer - a distillation column which distills isohexane and lighter components overhead.

Deisopentanizer - a distillation column which distills isopentane overhead.

Density, Unit Weight - although, it is recognized that density is defined as mass per unit volume, in the field of soil mechanics the term is frequently used in place of unit weight. Unit Weight - weight per unit volume.

Detritus-Based Primary Consumption - the consumption of dead material.

Diatom - minute planktonic unicellular or colonial algae with silicified skeletons that form diatomite.



Diurnal - having a once daily cycle.

Economic Mineralization - minerals found that have commercial value and found in such quantities they are economically recoverable as ores.

Ecotone - a transition area between two adjacent ecological communities.

Egested - to rid the body of.

Endothermic - a reaction in which a heat input is required to maintain a constant temperature, i.e., heat is required by the reaction.

Ephemeral - transitory - lasting only a short time.

Epibenthos - those animals and plants living on top of the sea bottom.

Estuarine - relating to or formed in a water passage where the tides meet a river current.

Exothermic - a reaction in which heat is liberated during the reaction.

Flash Point - temperature at which a source of ignition can cause a hydrocarbon to ignite.

Flash Zone - the feed entrance area of a crude vacuum or distillation unit where the initial separation of distillates from residue occurs.

Fluid Coking - the thermal cracking of crude oil resid into light, clean fuel products plus coke.

Fractionator - a column where components having different boiling points are separated by application or control of heat.

Fuel Oil - fuel product that is environmentally acceptable as a fuel.

Fugitive Emissions - those emissions which are not confined to a specific vent or stack.

Gas Oil - that portion of the crude oil boiling between 650°F and 1000°F.

Glacial Load - material scoured and transported by glaciers.

Glacial Moraines - accumulation of earth and stones carried by a glacier.

Greywacke - an impure sandstone consisting of quartz and feldspar fragments and small fragments of rock.

Heat Exchange - the heating or cooling of a stream by another stream using a heat transfer surface.

Heavier/Lighter - relative terms which refer to boiling ranges.

Heaviest Crude Cut - (in this context, vacuum resid) The specific gravity of crude fractions increases with increasing boiling point. For this reason, vacuum resid, which is the highest boiling fraction, has the highest specific gravity, giving rise to the term "heaviest cut".

Herbivory Consumption - consumption of living plant material.

Hydrogenation - the addition of hydrogen onto unsaturated molecules. Production of paraffins from olefins or naphthenes from aromatics are examples.

Hydrophytic - plants growing in or under water or in water logged soil.

Hz - Hertz, a unit of frequency equal to 1 cycle per second.

Intertidal - part of the littoral zone above low-tide mark.

Invertebrate - an animal lacking a spinal column.

Isohexane - a paraffinic compound with six carbon atoms arranged in a branched fashion.

Isopentane - a paraffinic compound with five carbon atoms arranged in a branched fashion.

KOH Mix Tank - vessel where KOH (potassium hydroxide) is dissolved in water.

LCO Saturation - conversion of polycyclic

aromatics in light cycle oil to monocyclic aromatics.

LC<sub>50</sub> - the median lethal concentration of a toxicant - the concentration that is lethal to 50% of the organisms tested under specified conditions in a specified time.

Leached - to dissolve out by the action of a percolating liquid.

Light Ends - mixture of light gases e.g., methane, ethane, propane.

Light Olefins - in this context, propylene and butylene.

Liquefaction - (spontaneous liquefaction) - the sudden large decrease of shearing resistance of a cohesionless soil. It is caused by a collapse of the structure by a shock or other type of strain and is associated with a sudden but temporary increase in the fluid pore pressure. It involves a temporary transformation of the material into a fluid mass.

Liquid Limit of a Soil - the water content, expressed as a percentage of the weight of the over-dried soil, at the boundary between the liquid and plastic states. The water content at this boundary is arbitrarily defined as the water content at which two halves of a soil cake will flow together for a distance of 1/2 inch (12.7 mm) along the bottom of a groove separating the two halves, when the cup is dropped 25 times for a distance of 1 cm, (0.3937 inches) at the rate of two drops/sec.

Littoral Zone - the shore area between high and low water marks.

LPG - Liquid Petroleum Gas, a mixture of C<sub>3</sub> and C<sub>4</sub> hydrocarbons that is under sufficient pressure to keep the components in the liquid phase at ambient temperatures.

MCRSVAL - a first-order refined model used to predict air emission concentrations.

Megathrust Fault - a large fault that is inclined at a low angle to the horizontal. Movement along this fault is such that the top section of the fault overrides the lower section.

Mercaptans - sulfur compounds of the type R-S-H where R represents an alkyl group.

Merox Sweetening - a process utilizing caustic where mercaptans are converted to disulfides.

Metamorphosed - rock that has undergone mineralogical and structural adjustment due to physical or chemical conditions differing from those under which the rock originated.

Naphtha - a hydrocarbon stream boiling in the range of 130°F to 400°F.

Naphthene Dehydrogenation - the conversion of naphthenes to aromatics which results in the production of hydrogen.

Naphthenes - hydrogen saturated ring compounds. Cyclohexane is the basic naphthene.

Nekton - highly mobile animals living on or above the bottom.

Nematode Worms - elongated, cylindrical worms.

Net Hydrogen Make - the hydrogen produced from a reformer.

Noncohesive Soil - soil which does not stick tightly together.

Olefins - organic compounds with at least one double bond.

Orogeny - mountain-building by folding and thrusting.

Overhead - that portion of the feed to a distillation column which is produced as a top product.

Paraffin Cyclization - the formation of a carbon ring structure from a straight chain paraffin.

Paraffinic Naphtha - a naphtha which contains only small concentrations of naphthenes and aromatics.

Paraffins - organic compounds with no double bonds.

Pelagic - living in or occurring in the open sea.

Petrochemical - a chemical isolated or derived from petroleum.

pH - the effective hydrogen ion concentration in gram equivalents per liter, used in expressing both acidity and alkalinity.

Phenols- various acidic compounds analogous to  $C_6H_5OH$  and regarded as hydroxyl derivatives of aromatic hydrocarbons.

Phyllites - fine-grained metamorphic rocks identified by the lustrous, silky sheen that characterizes light reflected from the chlorite and muscovite micas of which they are composed.

Phytoplankton - microscopic plants that drift with the current.

Placer Mining - that form of mining in which the alluvium or glacial deposits are washed for gold or other valuable minerals. When water under pressure is employed to break down the gravel, the term hydraulic placer mining is generally employed.

Plastic Limit -  $W_p$ ,  $PL$ ,  $P_w$ , (D) - (a) the water content corresponding to an arbitrary limit between the plastic and semi-solid states of consistency of a soil. (b) water content at which a soil will just begin to crumble when rolled into a thread approximately 1/8 inch (3.2 mm) in diameter.

Polychaetes - marine annelid worms with paired segmental appendages and free swimming larva.

Polycyclic Aromatic Saturation - conversion of aromatic rings to naphthenes by hydrogenation.

Polymer - a high boiling, high molecular weight, organic compound.

Polymerization - the reaction of gaseous propylene or butylenes to produce a high octane gasoline product.

Primary Production - the amount of energy produced by photosynthetic and chemosynthetic activity of producer organisms.

Purse Seine - a large net with sinkers on one edge and floats on the other that hangs vertically in the water and is used to enclose fish when its ends are pulled together or drawn to shore.

RADM - Random-Walk Atmospheric Dispersion Model - a Lagrangian model used to solve complex atmospheric phenomena.

Raffinate - the paraffinic stream produced from an aromatics extraction unit.

Raptorial - bird of prey or adapted to seize prey.

Reduced Crude - atmospheric distillation column bottoms product.

Reflux - a portion of a product returned to a distillation column to improve separation.

Reformate - bottoms - the heavier boiling reformed gasoline stream from a catalytic reforming plant.

Research Octane Number, Clear - a number indicating the relative performance of a fuel in an internal combustion engine. Clear refers to an absence of lead.

RSH - a mercaptan; in organic chemistry, "R" is a general symbol used to mean any saturated paraffin group (Alkyl). Therefore, RSH could be  $C_3SH$ ,  $C_4SH$  or any other similar grouping.

Saturates Butane - mixture of isobutane and normal butane.

Saturates Gas - gas streams containing only paraffinic hydrocarbons such as gas produced by crude units and catalytic reformers.

Sea Anemone - solitary polyps whose form, bright and varied colors, and cluster of tentacles superficially resemble a flower.

Seismic Refraction - the deflection of the direction of wave propagation when waves pass obliquely through the earth.

Semi-diurnal - occurring twice a day.

Sessile - not free to move about; permanently attached.

Side Stream Fractions - streams produced from the side of a distillation column.

Sieching - seismically induced waves in closed bodies of water.

Soil - a natural aggregate of mineral grains with or without organic constituents, that can be separated by gentle mechanical means such as agitation in water. Sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks and which may or may not include organic matter.

Sour Water - process water that is contaminated with ammonia or hydrogen sulfide.

Stoichiometric - the balance of reactants such that there is no excess of any reactant required to form a particular product.

Straight Run - products produced directly from the crude unit with no other processing.

Subduction Zone - a megathrust fault consisting of two tectonic plates, where the oceanic plate plunges underneath the continental plate.

Subtidal - part of the littoral zone, below low-tide mark.

Surge Drums - vessels used to provide liquid capacity during minor fluctuations in processing conditions.

Suspension Feeders - feed by filtering out suspended matter or organisms.

Tail Gas - light gas produced by fractionation.

Talus - (slopes or rockfalls) - a slope formed by an accumulation of rock debris.

Tectonic Activity - pertaining to large scale geological forces that shape the structure of a region's geology, creating such features as folds, faults, joints and other similar geologic features.

Tectonic Plate - large section of the earth's crust able to move about and interact with other such plates.

Tectonic Plates - the resulting form of the earth's crust following extreme deformation.

Toluene -  $C_6H_5CH_3$ , a benzene ring with a single methyl group ( $CH_3$ ) replacing one hydrogen.

Tsunami - a great sea wave produced by submarine earth movement or volcanic eruption.

Unsaturation or Unsaturated Gas - gas streams containing olefins and diolefins in combination with paraffinic hydrocarbons. Unsaturated gas is produced by cokers and Fluid Catalytic Cracking units.

UOP Continuous Reforming - a reforming process utilizing a circulating catalyst system to provide continuous catalyst regeneration.

Vacuum Gas Oil - A portion of the crude oil boiling in the range of 650°F to 1050°F.

Vacuum Resid - the bottom product of the vacuum tower, all of which typically boils at more than 1000°F.

VALLEY Dispersion Model - an EPA approved and certified Gaussian Dispersion model intended for short-term analysis of air emissions and is not generally suitable to provide reasonable concentrations in the long-term mode and in complex terrain. Concentrations in complex terrain can be greatly overpredicted using this model.

Virgin Fuel Oil - fuel oil as produced by the crude unit with no further processing. Synonymous with "straight run".

Weight Percent - the weight of an individual component contained in a stream divided by the total weight of the stream, expressed in percent.

Williwaw - a sudden violent gust of cold land air common along mountainous coasts of high latitudes.

Xylenes -  $C_6H_4(CH_3)_2$ , any of three isomers containing a benzene ring with  $CH_3$  replacing



hydrogen in two positions. The relative positions of the methyl group to each other around the ring dictate whether the xylene is ortho, meta, or paraxylene.

Zooplankton - microscopic organisms that drift with the current.