

## PROJECT RELATED EXPERIENCE - AIR QUALITY MODELLING

2016

### **Kineticor 1-15, Compressor Station** Saskatchewan, Canada

Air dispersion modelling for NOx and SO2 using AERMOD, AERflare.

### **Husky Ram River Gas Plant** Alberta, Canada

Approval renewal air dispersion modelling for NOx and SO2 continuous, upset and emergency flaring. Using AERflare, ABflare, CALPUFF/CALMET.

### **Wisconsin Rapids** Wisconsin, USA

Review of meteorology and creation of AERMOD ready met dataset for hazard/risk screening. In association with Alp & Associates.

2015

### **Major Hazards Study** Canada

Review of meteorology and creation of AERMOD ready met datasets for 6-locations across Canada for hazard/risk screening: Quebec, Ontario, Manitoba, Saskatchewan, Alberta, BC.. In association with Alp & Associates.

### **Flare Assessment, RockEast** Saskatchewan, Canada

Flaring assessment using AERflare.

### **Alder Flats Phase II Gas Plant, Bellatrix** Alberta, Canada

NOx air dispersion for expansion project at Alder Flats. In association with Keywest Projects.

### **Provost Flare Assessment, RockEast** Saskatchewan, Canada

Flaring assessment using AERflare.

### **Boundary Lake, Flare Assessment, Venturion** Alberta, Canada

Flaring assessment using AERflare.

### **Gas Plant 5-16 Flare Assessment, Venturion** Alberta, Canada

Flaring assessment using AERflare.

2014

### **Husky, Moose Mountain** Alberta, Canada

Non-routine air quality dispersion modelling for advanced blowdown scenarios for planned and unplanned blowdowns. Dispersion modelling using ABflare and CALMET/CALPUFF.

### **Suncor, Flare Upgrade** Alberta, Canada

Air quality dispersion modelling using SLAB, CALPUFF and AERmode to determine potential hazards for workers operating at stack height on a operational flare and also being impacted from emissions from a nearby operational twin flare.

### **Tuxla** Alberta, Canada

Air quality dispersion modelling using SLAB, ZZArisk and AERflare to determine potential of ignition of a vented release being ignited from a nearby flare.

### **Connorsville** Alberta, Canada

Air quality dispersion modelling using AERflare.

### **Swan Hills Treatment Centre, Renewal** Alberta, Canada

Air quality dispersion modelling using CALMET/CALPUFF for PCB, dioxins, furans and criteria pollutants.

### **Update Stack Top Temperature SO<sub>2</sub> Modelling, Kaybob South Plant 3** Alberta, Canada

Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for stack top temperature reduction of the facility incineration. In Association with Sulphur Experts.

### **Sour Gas Well Testing, Shell** Shpirag & Molisht, Albania

Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for well test flaring and incineration.

### **Update, Sour Gas Well Testing, Petromanas** Molisht, Albania

Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for well test flaring and incineration. Calculation of emergency planning distances using ERCBH2S.

### **Rheume Engg.** Alberta, Canada

Air quality modelling using AERflare

### **Geno, Sturgeon Lake, Behr Engg.** Alberta, Canada

Air quality modelling using AERflare

### **Encana, AERflare modelling** Alberta, Canada

Air quality modelling using AERflare

### **Manitok, AERflare modelling** Alberta, Canada

Air quality modelling using AERflare

### **Ferguson SO<sub>2</sub>, DeeThree Exploration** Alberta, Canada

Air quality modelling for the Ferguson 01-21 Sour Oil Battery, DeeThree Exploration Ltd. Air dispersion modelling AERMOD and CALPUFF in complex terrain for three incinerators. In association with Keywest Project Ltd.

### **Alder Flats, NOx, Bellatrix Exploration** Alberta, Canada

Air quality modelling for the Alder Flats 10-09 gas plant, Bellatrix Exploration Ltd. Air dispersion modelling AERMOD in complex terrain compressor station. In association with Keywest Project Ltd..

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<b>2013</b>	
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<b>Sour Gas Flaring, Omers, Alberta</b>	<b>Alberta, Canada</b>
Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for well test flaring and AERMOD. Also using AERflare in development.	
<b>Stack Top Temperature SO<sub>2</sub> Modelling, Kaybob South Plant 3 Alberta, Canada</b>	<b>Alberta, Canada</b>
Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for stack top temperature reduction of the facility incineration. In Association with Sulphur Experts.	
<b>Sour Gas Well Testing, Petromanas Molisht, Albania</b>	<b>Albania</b>
Air quality dispersion modelling in complex terrain using the CALMET/CALPUFF dispersion models for well test flaring and incineration. Calculation of emergency planning distances using ERCBH2S.	
<b>Odours, AER Alberta, Canada</b>	<b>Alberta, Canada</b>
Air quality modelling for odours associated with oil and gas operations in the Peace River region of Alberta. Dispersion modelling using CALMET/CALPUFF and investigation of possible sources of odours from regular emissions from tanks, flaring and heaters associated with well pad battery and tanks. Expert testimony at a hearing.	
<b>Shell-Carmon Creek Alberta, Canada</b>	<b>Alberta, Canada</b>
Air quality modelling for the Shell Carmon Creek. EIA is a re-evaluation of the 2009 Shell Carmon Creek project using CALPUFF/CALMET. In association with Worley Parsons.	
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<b>2012</b>	
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<b>ERCBflare Update Alberta, Canada</b>	<b>Alberta, Canada</b>
Furthering the development of ERCBflare and as an update to the screening capability (as opposed to ABflare) flare source and dispersion model. Co-authored a flare source model for short-term steady and transient flares, taking into account energy balance, flare efficiency, flare assist. User interface, spreadsheet modules, interface for AERMOD using AERSCREEN methodology. Terrain processing following AERmap and land use processing following AERSURFACE, allowing for screening and site-specific refined meteorology processing using AERMET. User guide. In association with ERCB.	
<b>Incinerators, Petromanas Albania</b>	<b>Albania</b>
Air dispersion modelling at two locations in the foothills like terrain of Albania. SO <sub>2</sub> modelling for well test incineration of waste gases at unknown rates and concentrations.	
<b>Update to Incinerators, Petromanas Albania</b>	<b>Albania</b>
Air dispersion modelling at two locations in the foothills like terrain of Albania. SO <sub>2</sub> modelling for well test incineration of waste gases at unknown rates and concentrations.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 03-05, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare, CALPUFF and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 03-05b, Dispersion modelling and report for Barrick Energy. Screening of 30 well test flares for scoping. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 6-21, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 15-6, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 2-31, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 9-31, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 13-3, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 7-6, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Well Test Flaring, Barrick Energy Alberta, Canada</b>	<b>Alberta, Canada</b>
Well 12-5, Dispersion modelling and report for Barrick Energy. Modelling using ERCBflare and AERMOD.	
<b>Aitken Creek, Rheame Engineering NE, BC, Canada</b>	<b>NE, BC, Canada</b>
Facility flaring and incinerator dispersion modelling. Modelling using AERMOD. In association with Sirius Consulting Inc.	
<b>Baseline Update, Shell Canada Alberta, Canada</b>	<b>Alberta, Canada</b>
Peace River Complex baseline SO <sub>2</sub> dispersion modelling update. Modelling using CALPUFF.	
<b>Moose Pad1, Husky Alberta, Canada</b>	<b>Alberta, Canada</b>
Update of NO <sub>x</sub> modelling for Husky Moose Mtn. Pad1 facility in complex terrain. Modelling using CALMET/CALPUFF.	
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<b>2011</b>	
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<b>ABflare Alberta, Canada</b>	<b>Alberta, Canada</b>
Development of ABflare flare source and dispersion model. Co-authored a flare source model for short-term steady and transient flares, taking into	

account energy balance, flare efficiency, flare assist. User interface, stand-alone fortran modules, extension to CALPUFF, and user guide. In association with ERCB, PSAQM Inc. and Exponent Inc.

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**RAKgas, Sulphur Experts** **United Arab Emirates**

Air dispersion modelling for incineration of SO<sub>2</sub> and stack top temperature reduction options on the coast of the UAE in complex terrain. Modelling using CALMET/CALPUFF. In association with Sulphur Experts.

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**Oldman Gas Plant, Peyto** **Alberta, Canada**

Air dispersion modelling for NO<sub>x</sub> in complex terrain. Modelling using CALMET/CALPUFF.

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**Ammonia Destructor, Syncrude** **Alberta, Canada**

Syncrude is adding of new process equipment for the destruction of ammonia and emissions of SO<sub>2</sub>. Various iterations of stack heights, locations and 3D modelling for on-site worker safety at cat-walk elevations. Accounting for local and regional emissions. Modelling using CALMET/CALPUFF.

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**Tank Odours, Suncor** **Alberta, Canada**

Suncor is investigating possible upset emission scenarios of vapours from tanks from the south tank farm and accounting for the new vapour recovery unit. Odour modelling using CALMET/CALPUFF.

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**Moose Pad1, Husky** **Alberta, Canada**

Husky is preparing emergency flare management plans for Moose Pad1 facility. Blowdown modelling of high SO<sub>2</sub> emissions in complex terrain. Modelling using CALMET/CALPUFF.

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**Flare Model, CNRL** **Alberta, Canada**

SO<sub>2</sub> modelling using CALMET/CALPUFF.

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**Harmattan, Taylor Engineering** **Alberta, Canada**

Update on NO<sub>x</sub> emissions modelling for the Harmattan gas plant for the addition of new equipment. Modelling using AERMOD.

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**Edson Oil & Gas Battery, Crocotta Energy** **Alberta, Canada**

Crocotta is adding equipment at the Edson Oil & Gas battery, requiring modelling for NO<sub>x</sub> in complex terrain. Modelling using CALMET/CALPUFF.

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**BurntTimber, Shell** **Alberta, Canada**

Stack top temperature reduction assessment and air dispersion modelling of SO<sub>2</sub> from acid gas incineration. Modelling using CALMET/CALPUFF. In association with Sulphur Experts.

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**GoldCreek, Progress Energy** **Alberta, Canada**

Emergency Planning Zone calculations using ERCBH2S.

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**2010**

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**Rainbow Lake, Husky** **Alberta, Canada**

Air dispersion modelling for updated facility design for NO<sub>x</sub> and SO<sub>2</sub>. In association with PSAQM Inc.

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**South Monias Gas Plant, Shell** **Alberta, Canada**

Air dispersion modelling for dense gas CO<sub>2</sub> venting. In association with Sirius Consulting Inc.

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**NuVista 2** **Alberta, Canada**

Revised facility design air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**BDR Innes** **Saskatchewan, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**Excelsior** **Alberta, Canada**

SIR responses from application. In association with PSAQM inc.

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**Crocotta** **Alberta, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**Sinclair** **Alberta, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**Obed** **Alberta, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**Ranata** **Alberta, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**NuVista** **Alberta, Canada**

Air dispersion modelling for revised facility design including NO<sub>x</sub> and flaring of SO<sub>2</sub>. In association with PSAQM inc.

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**McMullen** **Alberta, Canada**

Air dispersion modelling for revised facility design.

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**Eaglesham** **Alberta, Canada**

Air dispersion modelling of SO<sub>2</sub> from acid gas incineration. In association with PSAQM inc.

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**Donnelly** **Alberta, Canada**

Air dispersion modelling of SO<sub>2</sub> from acid gas incineration. In association with PSAQM inc.

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**Kakut** **Alberta, Canada**

Air dispersion modelling of SO<sub>2</sub> from an incinerator. In association with PSAQM inc.

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**CanSup** **Alberta, Canada**

Air dispersion modelling of SO<sub>2</sub> from an incinerator. In association with PSAQM inc.

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<b>2009</b>	
<b>South Saskatchewan River Basin-Land Use Planning</b>	<b>Alberta, Canada</b>
Air dispersion modelling and expert advice support for land use planning. In association with Alces Group.	
<b>Suncor VRU</b>	<b>Alberta, Canada</b>
Air dispersion for Suncor VRU capacity increase. Dispersion modelling of emergency vent containing H <sub>2</sub> S emissions. In association with Worley Parsons.	
<b>Suncor Ponds</b>	<b>Alberta, Canada</b>
Updated air dispersion modelling of odour emissions from ponds. Flaring emission using hourly emissions and hourly source characteristics using CALPUFF. In association with Clearstone Engineering.	
<b>Husky McMullen Thermal Conduction</b>	<b>Alberta, Canada</b>
Air quality modelling for a proposed pilot facility. In association with Matrix Environmental Solutions.	
<b>Chemical Fire/Risk</b>	<b>Kansas, USA</b>
Air dispersion modelling for support of risk calculations. In association with PSAQM Inc.	
<b>Suncor Energy, Bighorn</b>	<b>Alberta, Canada</b>
Well completion air dispersion modelling in complex terrain. In association with PSAQM Inc.	
<b>Atco Gas, Harmattan Gas Plant</b>	<b>Alberta, Canada</b>
Update to NO <sub>x</sub> and SO <sub>2</sub> modelling with the addition of and removal of: COGEN, engines and heaters. In association with PSAQM Inc.	
<b>Apache Energy</b>	<b>Alberta, Canada</b>
Well test flaring modelling in complex terrain with well test flaring monitoring plan. In association with PSAQM Inc.	
<b>Laurus Energy</b>	<b>Alberta, Canada</b>
Air quality modelling for a proposed pilot facility. In association with Matrix Environmental Solutions.	
<b>Shell-Carmon Creek</b>	<b>Alberta, Canada</b>
Air quality modelling for the Shell Carmon Creek. EIA is a re-evaluation of the 2008 Shell Carmon Creek project using CALPUFF. In association with Matrix Environmental Solutions.	
<b>Husky, Hastings Coulee</b>	<b>Alberta, Canada</b>
Air quality modelling for a facility renewal application including NO <sub>x</sub> and SO <sub>2</sub> concentrations. . In association with PSAQM Inc.	
<b>Husky, Thompson Lake</b>	<b>Alberta, Canada</b>
Air quality modelling for a facility renewal application including NO <sub>x</sub> and SO <sub>2</sub> concentrations. . In association with PSAQM Inc.	
<b>Talisman, Narraway</b>	<b>Alberta, Canada</b>
Air quality modelling in complex terrain for SO <sub>2</sub> concentrations related to a flare test for a new well. . In association with PSAQM Inc.	
<b>Excelsior</b>	<b>Alberta, Canada</b>
Air quality modelling the Fort McMurray oil sands using new extraction technologies. In association with Matrix Environmental Solutions.	
<b>Swan Hills, Synergia</b>	<b>Alberta, Canada</b>
Air quality modelling for update of facility emissions of SO <sub>2</sub> and vented H <sub>2</sub> S. In association with PSAQM Inc.	
<b>Suncor</b>	<b>Alberta, Canada</b>
Air quality modelling for incomplete combustion of waste gases to flare systems. Modelling H <sub>2</sub> S and SO <sub>2</sub> concentrations using hourly variable inefficiency in response to meteorology. In association with Clearstone Engineering.	
<b>Minnow</b>	<b>Alberta, Canada</b>
Air dispersion modelling and monitoring plans for well test flaring at two independent locations. In association with PSAQM Inc.	
<b>Kakut, BDR Engineering</b>	<b>Alberta, Canada</b>
Air Quality modelling for updated facility of NO <sub>x</sub> and SO <sub>2</sub> . In association with PSAQM Inc.	
<b>Swan Hills, Synergia</b>	<b>Alberta, Canada</b>
Air quality modelling for update of facility emissions of SO <sub>2</sub> and vented H <sub>2</sub> S. In association with PSAQM Inc.	
<b>Syncrude</b>	<b>Alberta, Canada</b>
Air quality modelling in relation to additional boiler emissions and modelling near-field NO <sub>x</sub> and CO. In association with Clearstone Engineering.	
<b>Syncrude</b>	<b>Alberta, Canada</b>
Air quality modelling in relation to stack diversion resulting from equipment failure. In association with Clearstone Engineering.	
<b>2008</b>	
<b>Shell-Carmon Creek</b>	<b>Alberta, Canada</b>
A re-evaluation of the 2006 Shell Carmon Creek project using a completely re-designed facility. The air quality modelling used the CALPUFF modelling system. In association with DMLeahey and Matrix Environmental Solutions.	
<b>JACOS-Update</b>	<b>Alberta, Canada</b>
Update on the proposed expansion of the JACOS SAGD operations. Air quality modelling was performed using the AERMOD model.	
<b>McMullen,Husky</b>	<b>Alberta, Canada</b>
Air quality modelling for a proposed SAGD pilot facility. This air quality modelling report was prepared for the proposed Husky Energy Inc. McMullen Thermal Pilot Plant. The McMullen facility is located in	

northern Alberta, approximately 50 km northeast of Grande Prairie. The heavy oil battery is being proposed to test the potential of the reservoir and production methods. The oil plant has a licenced capacity of 160 m<sup>3</sup>/d of bitumen and will have sulphur emissions of 0.218 t/d. Modelling was performed using the CALPUFF modelling system for three proposed site locations. In association with Matrix Environmental Solutions.

## **Kakut, Galleon Energy Inc. Alberta, Canada**

This air quality modelling report was prepared for the proposed Galleon Energy Inc. Kakut Gas Plant with information supplied by BDR Engineering Ltd. The Kakut facility is located in northern Alberta, approximately 50 km northeast of Grande Prairie, along the eastern edge of the Saddle Hills. The oil battery is being expanded to process sour gas. The gas plant has a licenced inlet gas capacity of 480 103m<sup>3</sup>/d with a sulphur inlet of 0.65 t/d. Nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) emissions from facility were modelled in the study area surrounding the facility using the USEPA-CALPUFF model.

## **Big Horn, Talisman Alberta, Canada**

Air quality modelling in complex terrain for a flare emissions during a well clean up. Modelling was performed using CALPUFF model. In association with PSAQM.

## **Ram River, Husky Alberta, Canada**

Air quality modelling for a facility change of emissions including NO<sub>x</sub> and benzene emissions. Air quality modelling was performed using the AERMOD model in complex terrain. In association with PSAQM.

## **Ram River, Husky Alberta, Canada**

Meteorological review and assessment of on-site monitoring tower and sodar data. In association with PSAQM Inc.

## **PetroCanada, Wilson Ck Alberta, Canada**

Air quality modelling for continuous, upset and emergency flaring at PetroCanada Wilson Ck. Facility. In association with PSAQM Inc.

## **Innes, Saskatchewan Alberta, Canada**

Air quality modelling for battery at Innes, Saskatchewan. In association with PSAQM Inc.

## **PetroCanada, Peppers Alberta, Canada**

Air quality modelling using the ISCST model at the PetroCanada, Peppers facility. SO<sub>2</sub> flaring. In association with PSAQM Inc.

**2007**

## **Sawn Lake, Andora Alberta, Canada**

Andora Energy Corporation is proposing to construct the Sawn Lake SAGD Demonstration Project approximately 115 km northeast of Peace River. The demonstration Project will be located at 15-21-091-12 W5M or 7-30-091-12 W5M. The Project has a low pressure (LP) flare to dispose of sour produced gas and burns sweet fuel gas to produce steam in two once-through steam generators. In association with PSAQM.

## **ConocoPhillips Alberta, Canada**

Air quality modelling in support of legal claims regarding emissions from a sour oil pipeline leak near a farm house and cattle. In association with PSAQM.

## **JACOS, Renewal Alberta, Canada**

Air quality modelling in support of the JACOS renewal application and expansion. Air quality modelling was performed using the pre-approved ISCST model. In association with PSAQM.

## **Moose Mountain, Husky Alberta, Canada**

Air quality modelling in the complex terrain of the Rocky Mountain eastern slopes at three mountain top oil/gas pads. 3D wind fields were modelled using CALMET with 2003,2004 and 2005 RUCii data. Modelling included short-term upset flaring in connection with various duration pipeline blowdown scenarios. Modelling also considered flaring for various well cleanup emission scenarios. In association with PSAQM.

## **Prince George, PBEC Alberta, Canada**

Air quality modelling for the relocation of the Pacific BioEnergy Corporation (PBEC) wood pellet manufacturing facility in Prince George, British Columbia. Modelling focused on stack particulate emissions. Modelling used the UNBC CALMET configuration and the CALPUFF model. In association with SEACOR.

## **RAM Update, Husky Alberta, Canada**

Air quality modelling updates for the RAM renewal application to AENV. Modelling of SO<sub>2</sub> and NO<sub>x</sub> using the AERMOD model included equipment changes. In association with PSAQM.

## **Vero-Sakwatamau, Talisman Energy Alberta, Canada**

Air quality modelling for compressor engine and heater NO<sub>x</sub> emissions using the ISCST model. In association with PSAQM.

## **Orion Update, Shell Alberta, Canada**

Air modelling update to Orion EOR EIA for as built equipment and emissions. Modelling included both SO<sub>2</sub> and NO<sub>x</sub> emissions using the CALPUFF model.

## **Harmattan Gas Plant, Taylor Alberta, Canada**

Air quality modelling for the renewal application of the Harmattan gas plant and compressors. Modelling included comparisons of CALPUFF (using MM5 meteorology), AERMOD (using MM5 meteorology and AENV screening data) and ISCST (using MM5 meteorology and AENV screening data). In association with PSAQM.

## **N-SOLV, Hatch Energy Alberta, Canada**

Air quality modelling for the N-Solv approval application to AENV included modelling using the ISCST model using AENV screening meteorology. In association with PSAQM.

## **PC Nordegg, PetroCanada Alberta, Canada**

Air quality modelling using CALMET/CALPUFF using 2002 MM5 data for a temporary flaring permit to EUB. In association with PSAQM.

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**Synergia Polygen** **Alberta, Canada**

Air Quality modelling for a pilot approval application to AENV for an in-situ coal gasification facility. Air quality modelling included CALPUFF/CALMET modelling using 2002 MM5 meteorological data in relatively flat terrain for upset and emergency flaring scenarios. In association with PSAQM.

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**Eglesham, Galleon Energy** **Alberta, Canada**

Air quality modelling for a facility expansion. Modelling included CALPUFF/CALMET modelling using 2002 MM5 meteorological data for emissions of SO<sub>2</sub> and NO<sub>x</sub>. In association with PSAQM.

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**Fugitive Odour, Suncor** **Alberta, Canada**

Air quality modelling of fugitive/odour emissions using CALMET/CALPUFF. Wind fields were created using surface stations in the Fort McMurray oil sands area and available upper air data. Local detailed terrain and landuse were digitized into the model. Modelling calculations included back-calculation for source emissions. In association with PSAQM and Clearstone Engineering.

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**Fugitive Odour, Syncrude** **Alberta, Canada**

Air quality modelling of fugitive/odour emissions using CALMET/CALPUFF. Wind fields were created using surface stations in the Fort McMurray oil sands area and available upper air data. Local detailed terrain and landuse were digitized into the model. Modelling calculations included back-calculation for source emissions. In association with PSAQM and Clearstone Engineering.

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**PC5-20, PetroCanada****PC9-05, PetroCanada****PC9-17, PetroCanada**

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**PC5-11, PetroCanada** **Alberta, Canada**

Complex terrain modelling using CALPUFF and 3D windfields for several well locations located in the Eastern Slopes. 3D windfields created using RUCII (2003, 2004) interpolation. In association with PSAQM.

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**Golden, Focus Energy Trust Resources** **Alberta, Canada**

The air quality modelling supported the review of the flaring at the battery to ensure compliance with Alberta Energy and Utilities Board (EUB) Directive 60. Modelling was conducted using CALPUFF/CALMET using 2002 MM5 meteorology. In association with PSAQM.

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**Benjamin, Husky** **Alberta, Canada**

Air quality modelling the Rocky Mountain eastern slopes complex terrain. Modelling supported the review of the flaring that the Benjamin well site and battery flaring scenario blowdowns. Modelling included various comparisons of multiyear results in complex terrain and sub-hourly emission duration estimates compared to hourly and continuous emissions. In association with PSAQM.

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**NuVista** **Alberta, Canada**

Air quality modelling for expansion and renewal application for NO<sub>x</sub> modelling. Modelling included both AERMOD and CALPUFF modelling using MM5 2002 meteorology. In association with PSAQM.

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**Primewest** **Alberta, Canada**

Air quality modelling using AERMOD of the Primewest compressor station expansion and renewal. Modelling included NO<sub>x</sub> emissions. In association with PSAQM.

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**2006**

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**Olds, BDR** **Alberta, Canada**

In association with PSAQM.

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**AMD Update, Shell** **Alberta, Canada**

Preparation of an air quality monitoring station description report following the AENV-AMD.

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**Sylvan Lake** **Alberta, Canada**

Update. In association with PSAQM.

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**Pouce Coup** **Alberta, Canada**

Update 2. In association with PSAQM.

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**Twining, BDR** **Alberta, Canada**

In association with PSAQM.

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**Pouce Coup** **Alberta, Canada**

Update 1. In association with PSAQM.

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**ConocoPhillips** **Alberta, Canada**

Air quality strategic planning. Support for ConocoPhillips strategic planning for developments in the Fort McMurray oil sands area.

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**Twining Gas Plant, EOG Resources** **Alberta, Canada**

Air quality modelling in complex terrain using the AERMOD model for NO<sub>x</sub> emissions using the PVRM and OLM models for NO<sub>2</sub> conversion. In association with PSAQM.

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**Donnelly, Gas Plant** **Alberta, Canada**

Update. Air Quality modelling of SO<sub>2</sub> and NO<sub>x</sub> for Licence renewal. Modelling included AERMOD, CALPUFF and ISCST3. In association with PSAQM.

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**Savanna Creek, Petro-Canada****PC5-20, PetroCanada****PC5-10, Petro-Canada****PC10-25, Petro-Canada****PC5-33, Petro-Canada****Getty, Petro-Canada****Sullivan, Petro-Canada****West Limestone, Petro-Canada**

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**Trap Creek, Petro-Canada** **Alberta, Canada**

Complex terrain modelling using CALPUFF and 3D windfields for several well locations located in the Eastern Slopes. 3D windfields created using RUCII (2003, 2004) interpolation. In association with PSAQM.

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## 2005

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### **Donnelly, Gas Plant** **Alberta, Canada**

Update. Air Quality modelling of SO<sub>2</sub> and NO<sub>x</sub> for Licence renewal. Modelling included Aermom, CALPUFF and ISCST3. In association with PSAQM.

### **Pigeon Lake Acidification, Fairborne Community** **Alberta, Canada**

'Back of the envelope' scoping and modelling demonstrating magnitude of potential acidification of potential sour well test flaring and impacts on nearby Pigeon Lake.

### **Marten Hills, Gas Compressor, AltaGas** **Alberta, Canada**

Air quality modelling for a facility licence renewal of NO<sub>x</sub> emissions near elevated terrain. In associate with PSAQM.

### **Rainbow Lake, Husky** **Alberta, Canada**

Air quality modelling and assessment of facility emissions and upset flaring near elevated terrain. Development of alternative strategies for upset flaring. In association with PSAQM.

### **Swalwell, Gas Compressor, EOG Resources** **Alberta, Canada**

Air quality modelling and assessment of facility NO<sub>x</sub> emissions. In association with PSAQM.

### **Pouce Coupe, Acclaim Energy** **Alberta, Canada**

Air quality and stack height assessment for NO<sub>x</sub> and SO<sub>2</sub> emissions. In association with PSAQM.

### **Hussar, Gas Compressor, Husky** **Alberta, Canada**

Air quality modelling for NO<sub>x</sub> for license renewal. In association with PSAQM.

### **Peace River, Carmon Creek EIA, Shell** **Alberta, Canada**

Air quality modelling, emission estimation and assessment for the Peace River Complex (Cyclic Steam) facility expansion for the Carmon Creek EIA. In association with DML.

### **Ram River, Application, Husky** **Alberta, Canada**

NO<sub>x</sub> and SO<sub>2</sub> modelling in complex terrain for license renewal of the Husky Ram River Facility. CALPUFF complex terrain modelling was completed using 3D windfield modelling. In association with PSAQM.

### **Incinerator/Flaring, EUB** **Alberta, Canada**

Programming and user-interface development of spreadsheet tools for EUB for assessment of incinerators and flares. Application development for public submissions of applications for incinerators and flaring. In association with PSAQM.

### **Upset Flaring, CAPP** **Alberta, Canada**

3D windfield modelling and CALPUFF complex terrain modelling of upset flaring. Several locations across Alberta. Providing scenario modelling and technical advice for development of upset flaring guidelines for Alberta. In association with PSAQM.

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## 2004 and Before

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### **Panther River II, Suncor** **Alberta, Canada**

Complex terrain dispersion modelling of a well completion flare scenario. CALPUFF was configured and applied in a screening model. Air monitoring design was completed. 3D windfield modelling was also completed. In association with PSAQM.

### **Legal, Hydrogen Chloride** **Alberta, Canada**

Screening level emissions and air quality modelling predictions of a hydrogen chloride spill.

### **Expert Witness, Ammonia Release** **Alberta, Canada**

Screening level emissions and air quality modelling predictions of an ammonia release. Provided expert witness evidence in criminal court regarding short-term exposure modelling for an ammonia release.

### **Incinerator, Questor** **Albania**

Albanian meteorology was processed for a screening level assessment of various incinerator designs in complex terrain using the ISCST3 model.

### **Stuart Lake, Husky** **Alberta, Canada**

Air quality modelling using the Aermom model for a gas plant registration in simple terrain.

### **Panther River, Suncor** **Alberta, Canada**

Complex terrain dispersion modelling of a well completion flare scenario. Aermom was configured and applied in a screening mode. Air monitoring design was completed.

### **Incinerator Optimization, Husky** **Alberta, Canada**

Complex terrain modelling of SO<sub>2</sub> using Aermom, Calpuf, ISCST3, RTDM, Screen3, and Screen2. Meteorological data sets for Aermom were summarized into screening data sets for comparison to the other listed models and for optimization of the incinerator stack temperature in complex terrain.

### **Toxic Gas Modelling, Legal** **Alberta, Canada**

Toxic gas modelling of an ammonia release. Near source modelling using the dense gas SLAB model.

### **SLAB (Dense Gas) Model Modification, EUB** **Alberta, Canada**

Thermodynamic and physical modifications developed by Michael Zelensky were programmed within the USEPA SLAB program. These program modifications will be released as the hazard and evacuation zone planning tool for the Alberta Energy and Utilities Board (EUB) for planning hydrogen sulphide pipelines and wells in Alberta.

### **Tucker Project EIA, Air Quality, Husky** **Alberta, Canada**

Air Quality modelling in simple and intermediate terrain using the CalPUFF model. Acid deposition modelling. Meteorological data review and emissions inventory preparation and estimation. Model verification and preparation of report.

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## **Monitoring Review, Tolko** **Alberta, Canada**

Review of air quality monitoring and preparation of annual air quality and meteorological summary reports.

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## **NOx/Ozone Environmental Review** **TransCanada/Environment Canada** **Alberta, Canada**

Literature review of environmental effects of NOx and ozone in relation to strategies for NOx controls for gas turbines. Review of impacts from Selective Catalytic Reduction (SRC). Review of: ozone monitoring in Alberta; ozone regulations in USEPA/Canada; ozone and NOx photochemistry. Technical writing/editing.

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## **Orion EOR Project EIA, Air Quality, BlackRock** **Alberta, Canada**

Air Quality modelling in simple and intermediate terrain using the CalPUFF model. Acid deposition modelling. Meteorological data review and emissions inventory preparation and estimation. Model verification and preparation of report.

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## **Aerosol Assessment, Toxcon** **Alberta, Canada**

An integral component of the investigation on potential health effects from a new house carpet powder, the distribution of fine particles were analyzed. Distribution statistics and graphics were developed and a report was prepared.

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## **Air Quality Modelling Training** **Alberta, Canada**

A delegation of professors from Chinese universities were trained on the Canadian perspective of environmental issues related to the oil and gas development. An overview of meteorology, air quality modelling issues, emissions estimation and practical examples were presented. (1-d course)

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## **Lochend Sour Gas Well Modelling,** **City of Calgary** **Alberta., Canada**

Modelling of combusted and uncombusted H<sub>2</sub>S and SO<sub>2</sub> from the proposed Lochend sour gas well near Calgary. A detailed investigation of dense gas effects using the SLAB model was prepared. A far field model using neutrally buoyant gas was prepared using the ISC model.

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## **Hub Oil Fire Review, Komex** **Alberta, Canada**

A review and report on the meteorology and probable plume path for the first few hours of the Hub Oil Refinery fire in 1998.

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## **Maxhamish Air Quality Permit, Salmo** **Ft. Liard, B.C., Canada**

Air quality modelling in simple and complex terrain for the Maxhamish Gas plant in northern B.C. Emissions, modelling and report were prepared for the B.C. Permit to Operate. (ISC)

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## **Lubicon Lake, Sorrel Environmental** **Alberta, Canada**

As a part of the Lubicon Lake lands claim process, the settlement (village) at Lubicon Lake will be moved. The air quality impacted by sources within 20km was modelled using the ISC model in complex terrain. Emission estimates included plant, battery and fugitives from well-heads.

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## **Air Quality Modelling, Amoco** **Alberta, Canada**

An update to Wolf Lake SAGD operations resulted in a need to update the air quality modelling for Amoco's permit. SO<sub>2</sub> and NO<sub>x</sub> modelling of steam generators, co-generation and field flares. (ISC).

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## **EIA, Suncor Energy** **Alberta, Canada**

Management of the air quality task of the EIA for the Project Millennium oil sands mine and facilities expansion. Meteorological data set preparation and quality assurance based on site data from two meteorological towers. Emissions inventory preparation for the Millennium project and greater oil sands area. Air quality model development (ISCBE configuration and CALPUFF), calibration and use.

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## **Noise Assessment,** **Diavik Diamond Mines** **Northwest Territories, Canada**

A preliminary noise assessment was completed for Diavik Diamond Mines which included three separate noise assessments: aircraft noise assessment based on the aircraft types and frequency of traffic; general mine operation noise levels were estimated based on literature noise spectrum and were modelled using a modified version of NoiseCalc sound program.

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## **Cyanide Spill, EuroGold** **Turkey**

Hazardous gas assessment involving the estimation of cyanide spill emission rates to the atmosphere and heavy gas dispersion assessment for a human health risk and consequence analysis for a proposed gold mine. Estimation of toxic gas concentrations in the direction of a nearby village.

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## **Gazoduc, TransQuebec and Maritime Pipeline** **Quebec, Canada**

Two complex terrain air quality dispersion modelling assessments of compressor stations along the proposed TransQuebec and Maritime pipeline. The USEPA ISC model was applied using five-year meteorological data sets.

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## **Air Quality Monitoring,** **Newport Petroleum** **Saskatchewan, Canada**

Responsible for the design, implementation and environmental management of an air quality monitoring program for a new sour gas plant. Monitoring results from two trailers were analyzed to assess the likely hood of air quality problems reported at residential locations were resulting from the sour gas plant or from oil field operations.

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## **Leak Detection/Emission Estimation** **Union Carbide Canada** **Alberta, Canada**

Estimation of VOC and speciation emissions from the proposed Union Carbide Prentiss polyethylene plant expansion. Greenhouse gas emission inventory was also prepared.

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## **Air Quality Modelling ,** **Weldwood Canada** **Alberta, Canada**

Dispersion modelling using the ISC model in complex terrain for Weldwood Canada, Hinton mill for their license renewal. A review and detailed comparison of monitoring air quality data and meteorological data was completed in preparation for modelling.



## **Landfill Gas Dispersion** **City of Windsor** **Ontario, Canada**

Technical direction and model configuration of the air quality modelling of landfill gases for the City of Windsor proposed elevated landfill.

## **Registration, Canadian 88** **Alberta, Canada**

Nitrogen dioxide (NO<sub>x</sub>) emissions summary was prepared from plant operations information and a screening level air quality model for NO<sub>x</sub> was developed. A registration was prepared for a renewal for a Permit to Operate.

## **Air Quality Modelling,** **Saskatchewan Wheat Pool** **British Columbia, Canada**

Technical direction of the ISC modelling for particulates, NO<sub>x</sub> and SO<sub>2</sub> at the proposed SWP-Cargill grain terminal at Robert's Bank. Preparation of report graphics of the modelling results.

## **Clean Air Act Permit,** **CS Resources Ltd** **Western Saskatchewan, Canada**

Air quality dispersion modelling for the Senlac Thermal Project and preparation of the Clean Air Act operating permit. The Alberta Environment air quality dispersion models were used in the assessment of heavy oil plant emissions from steam generators, flares and other sources of SO<sub>2</sub> and NO<sub>x</sub>.

## **Wolf Lake Heavy Oil EIA** **Northeastern Alberta, Canada**

Air quality dispersion modelling using Alberta Environment and U.S. EPA dispersion models was used in this EIA amendment to determine air quality impacts as a result of the increased emissions for the Wolf Lake and Primrose operations. Plant site steam generators, processing equipment and field flares were included in the assessment of SO<sub>2</sub>, NO<sub>x</sub> and VOC concentrations. Greenhouse gas calculations and ozone precursor concentrations for ozone generation potential were included in the assessment for the EIA and AEUB approval.

## **Air Quality** **Scoping Assessment, EIA** **Buenos Aires, Argentina, SA**

A scoping and issues assessment of the emissions and air quality resulting from port and ship traffic for the Hidrovia project in Buenos Aires. The EIA was a part of international project for approval of dredging of 3400 km of rivers in South America. Potential industrial related emission increases were scoped including dust and diesel emissions.

## **Dust Dispersion** **Exposure Modelling** **Vancouver, British Columbia**

Exposure problem formulation, dust dispersion modelling and expert consulting on the dispersion of dust from a landfill site in the greater Vancouver regional district for a human health risk assessment. U.S. EPA dispersion model techniques were applied and emissions were calculated based on field sampling and emission factor estimates.

## **Air Quality Assessment, Ford** **Buenos Aires, Argentina, SA**

Air quality modelling around the Ford assembly and painting buildings to assess the ground level concentrations of hazardous fumes from rooftop vents.

## **Odour and Noise Assessment** **Alberta, Canada**

As a result of public complaints about odours adjacent to a gas compressor station and well battery, continuous H<sub>2</sub>S and meteorological sampling was conducted. A noise survey was performed on the plant operations. The monitoring results were assessed and recommendations for remediation were supplied.

## **Dust Dispersion Exposure Modelling** **Eastern Ontario, Canada**

Dust dispersion modelling using fundamentals and the U.S. EPA dispersion models (ISC, SCREEN and FDM) for a human health risk assessment of fugitive dust emissions from the hazardous waste pile of an electro-arc furnace flue dust at a steel recycling plant.

## **Complex Terrain** **Dispersion Modelling** **Western British Columbia, Canada**

Complex terrain dispersion modelling in a screening assessment for the design of a regional air quality monitoring plan in the Kitimat valley for Alcan, Methanex and Eurocan. The US EPA- ISC model was used in a screening level assessment of the emissions from three industrial source groups and included air quality estimates of TRS, NO<sub>x</sub>, SO<sub>x</sub>, TSP and fluorides. Recommendations were made as to the siting of the ambient air quality monitoring stations.

## **Long-Term Monitoring** **Western Saskatchewan, Canada**

Long-term air quality management including the assessment of air quality monitoring results, and preparation of regular reports of static and continuous monitoring results to the provincial government.

## **Primrose Commercial Development** **Northeastern Alberta, Canada**

The Primrose Commercial Development is the first expansion phase from the pilot study of the steam injection oil sands recovery project by Amoco. Air dispersion of slightly sour gas from 33 flared annulus gas oil production well stacks was performed using the Alberta Environment SEEC model for SO<sub>2</sub>. NO<sub>2</sub> dispersion calculations were performed for the commercial development steam generators and existing plant operation equipment using the Alberta Environment SEEC model.

## **Air Quality Modelling for Monkman Area** **Gas Development** **Northeastern British Columbia, Canada**

Complex terrain air modelling using Alberta Environment and U.S. EPA air quality models for an environmental impact assessment of the gas development and expansion in the Sukunka and Bullmoose valleys, and Monkman gas field.

## **Progress Gas Expansion** **Northwestern Alberta, Canada**

Air quality modelling and permit preparations for a number of existing and expansion stacks and flares. The Alberta Environment air quality models were used in the analysis.

## **Landfill Gas Dispersion** **Edmonton, Alberta**

Gas contaminant dispersion estimates for the proposed Aurum Landfill site, using a modified ERCB computer model (PLUMES2) and the Wilson/Zelt computer model (SHELTER/EXPOSURE).

**Indoor Air Quality Investigation  
in Drayton Valley** **Edmonton, Alberta**

Time series analysis of data from indoor monitoring equipment recording concentrations of contaminants in residential houses downwind of several pulp mills near Drayton Valley, Alberta. Programming of several analysis packages and graphical generation of analysis results provided insight for meaningful interpretation of the data.

**Occupational Health and Safety &  
Alberta Public Safety Service Grants** **Edmonton, Alberta**

Development and programming of two state of the art dispersion models (SHELTER and EXPOSURE) which run on an IBM PC computer. The models predict concentrations and concentration fluctuation levels downwind of sources and predict indoor/outdoor toxicity and mortality estimates based on the gas lethality. Supervision of an experimental plume dispersion study in a water channel simulation of an atmospheric boundary layer. Co-ordination and preparation of reports and presentations.