

Clean Air Research Fund

Status Report - 2005

Clean Air Research Fund Steering Committee

March 2006

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1 INTRODUCTION

Since the inception of the BC Clean Air Research Fund (CARF) at the end of 1995, the fund has been utilized for two programs, BC Scrap-It and Clean Air Research. From the outset half of the fund has been used to start the BC Scrap-It pilot program for retirement of old high-polluting motor vehicles. Since 1997 contributions have been made from the fund to a number of research projects on air quality in the Lower Fraser Valley and other areas of the province. The "*Clean Air Research Fund Status Report - 1997-1999*", July 2000, and subsequent annual reports provided summaries of the activities supported by the fund from the beginning to the end of the year 2004. This report summarizes the projects funded from CARF in the year 2005. It also provides brief descriptions and the status of the BC Scrap-It program and various research proposals considered for funding during this period.

All Clean Air Research Fund Status Reports are currently being made available at the following web site of the B. C. Ministry of Environment (MOE):
<http://www.env.gov.bc.ca/air/airquality/carf/index.html>

The 2005 year-end status of the completed and on-going research projects, and proposals approved-in-principle and under consideration for funding, as well as new proposals received are provided below. Also, included are the numbers of project discontinued and proposal withdrawn.

- (i) a total of 33 projects were completed since 1997,
- (ii) 6 projects were in-progress at the end of 2005,
- (iii) 2 proposals, new and revised, remained as approved-in-principle,
- (iv) 4 proposals received in 2005 were being considered for funding, and
- (v) 2 proposals were discontinued and another was withdrawn.

The key aspects of these projects and proposals, as well as an update of the Scrap-It Program are provided below.

2. CLEAN AIR RESEARCH FUND HISTORY

In December 1995, the Canadian Petroleum Products Institute (CPPI) and BC MOE, signed an agreement on CPPI funding for two specific programs. While the BC Scrap-It Program is an old, high-polluting motor vehicle scrapping program, the Clean Air Research Program is for research projects on air quality issues in the Province with a particular focus on transportation and fuels. Under the agreement, CPPI is committed to contribute up to a maximum of \$500,000 per year for a total of \$2.5 million over the 5-year period (1996-2001), and the total annual amount is to be split between the two programs. The agreement was amended in December 1997 to include the Greater Vancouver Regional District (GVRD) as another party to the agreement. The CPPI funding members are Chevron Canada, Husky Oil, Imperial Oil, Petro-Canada and Shell Canada. Unless otherwise agreed by the Parties, \$250,000 per year will be dedicated to support clean air research on air quality issues during the 1997-2001 period. The Clean Air Research Fund is being managed by a Steering Committee consisting of one representative from each of CPPI, MOE's Water, Air and Climate Change Branch (WACC) and GVRD.

As the original CARF was due to expire at the end of 2001, the Parties agreed in March 2001, to continue the Agreement until "... *the full commitment of \$2.5 million has been expended or committed.*" Hence the Fund is still used for air quality research projects and the BC Scrap-It Program beyond the year 2001.

The CARF Steering Committee usually meets 3 or 4 times a year. Environment Canada and the Fraser Valley Regional District representatives attend the meetings as observers.

3. CLEAN AIR RESEARCH FUND PROGRAM ACHIEVEMENTS IN 2005

As in previous years, the CAR Fund was used to support both the BC Scrap-It Program and a number of research projects in 2005. The achievements of these financial contributions are described in the following sections.

3.1 BC SCRAP-IT PROGRAM

The BC Scrap-It Program was launched as a pilot project for retirement of old high-emitting vehicles in 1996 by WLAP in the Lower Mainland and Victoria. The program partners included the CPPI, BC Hydro, Vancouver and Victoria Regional Transit Commissions and BC Automotive Dealers Association (BCADA). WLAP, GVRD, and AirCare provided additional in-kind support to the program. The pilot program was operated from April 1996 to November 1998, and 955 vehicles of 1983 or older high-polluting vehicles were scrapped.

Based on the experience of the pilot program, in November 1998 the Scrap-It program was expanded to the owners of 1987 or older vehicles. Since 1999 the program has been funded by the CPPI, Translink, Insurance Corporation of B. C. and the BCADA. WLAP, GVRD, and AirCare (now Pacific Vehicle Testing Technologies) have continued their support for the program. Environment Canada is supporting the program with a contribution of \$60,000 for the fiscal year 2005-2006. Another car scarp page program not affiliated with Scrap-It Program is also operating in Kelowna, B. C. with funding from Environment Canada.

Presently, the Scrap-It Program Steering Committee is investigating the creation of a charitable society to manage the program; draft bylaws have been approved, and it is anticipated that the move to a society model will occur in the near future.

The CPPI contributions to the Scrap-It program are illustrated in Figure 1. A total of \$200,000 was paid towards the program in the year 2005, which brought the total CPPI contributions to the Scrap-It since 1996 to \$1,188,550.

The choice of incentives for the vehicle owners participating in the program has also been widened in subsequent years. The incentives presently offered to vehicle owners include: (i) varying amounts of cash toward the purchase of a new natural gas vehicle, a new vehicle, used 1994 or later model year vehicle, (ii) bicycle, (iii) money towards vanpooling or carpooling, and (iv) a choice of transit or West Coast Express pass.

Nearly 2,471 vehicles were scrapped between November 26, 1998 and December 31, 2004. In the year 2005 a total of 1,100 vehicles were approved for scrapping and 808 vehicles were scrapped. The vehicle owners opted for a total of 704 incentives: 357 transit passes, 8 West Coast Express passes, and cash for 304 new and used less-polluting vehicles, 34 bicycles, and 1 vanpool.

The major benefits accrued from the Scrap-It program have been a cost-effective reduction in vehicular emissions and an increased public awareness about alternatives to the use of old high-polluting vehicles. The estimated reductions in emissions of hydrocarbons (HC), nitrogen oxides (NO_x), carbon monoxide (CO) and carbon dioxide (CO₂) from recycling of vehicles for which incentives were granted during the pilot and expanded phases of the program are provided in Table 1. These estimates are based on the methodology developed in the August 1997 study, "Evaluation of the Scrap-It Pilot Program", one of the projects funded from CAR Fund.

Figure 1. Clean Air Research Fund Status

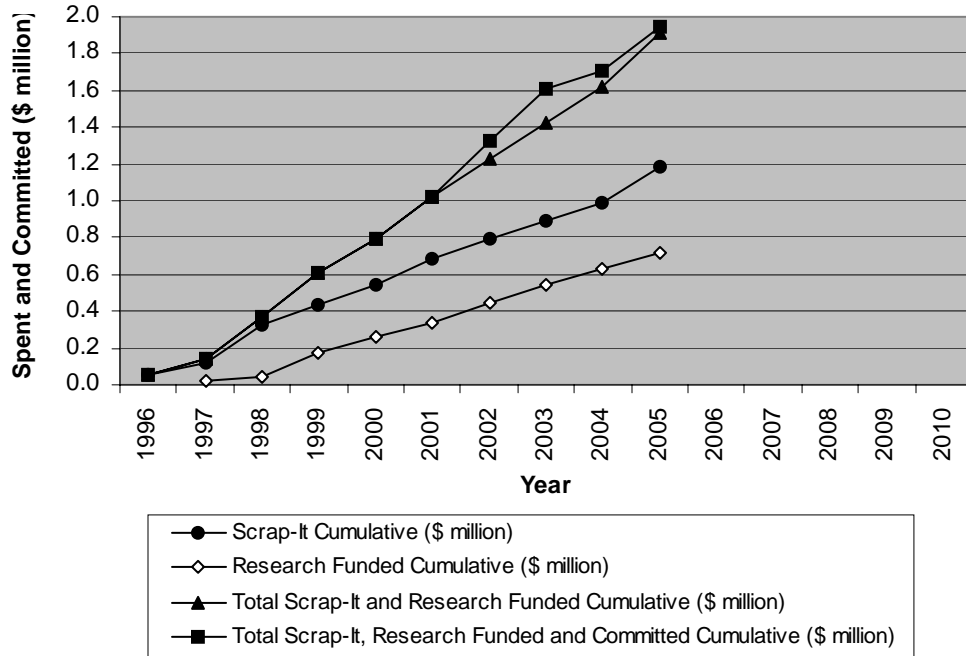


TABLE 1: ESTIMATED EMISSION REDUCTION BENEFITS OF THE SCRAP-IT PROGRAM

Program Phase	Reduction in Contaminant and Greenhouse Gas Emission, tonnes			
	HC	NO _x	CO	CO ₂
Pilot	164	43	1,173	7,691
November '96 - December '02	276	75	2,231	14,418
January '02 - December '04	135	36	972	7,190
January '05 - December '05	134	37	926	6,653

Note: Assuming 13,010 km/yr distance driven for 3 years, the remaining life of the scrapped vehicle.
 Source: CAR Fund Status Report – Year 2001, January 2003, January 2004, and Scrap-It Program Administration Office, February, 2005.

On the basis of the pilot program evaluation, the Scrap-It program has been found to be cost-effective, about \$2, 177 per tonne of 'emission' reduced. The 'emission' in this context refers to the contaminants with smog-forming potential, and calculated as (HC + NO_x + CO/7). The cost-effectiveness of greenhouse gas reduction was estimated to be \$130/t of CO₂, indicating that the program is not currently cost-effective when considered only in terms of these gases.

3.2 CLEAN AIR RESEARCH FUND CONTRIBUTIONS

The historical trend of the CAR Fund contributions made and committed to date towards all research projects which are complete and in-progress till the end of 2005 is shown graphically in Figure 1.

In the year 2005, about \$88,775 was paid from the CAR Fund towards the completed and on-going projects. This amounted to nearly \$747,540 contributions from the CAR Fund to various projects and the fees paid to the CAR Fund coordinator during 1997-2005. In 2004 an amount of \$12,500 was also contributed towards Bob Caton Memorial Scholarship Fund. The funding committed, but remains to be paid, towards the remaining on-going projects by the end of 2005 amounts to about \$37,558. The estimated total value of all projects co-funded from the CAR Fund is approximately \$11.86 million. The major projects towards which partial CAR funding have been made include:

- (i) Ethanol BC (Total - \$7.4 million and CAR funding - \$100,000),
- (ii) Pacific 2001 (Total - \$1.4 million and CAR funding for 2 projects - \$62,584), and
- (iii) Canadian Synthetic Diesel Fuel Testing (Total - \$1.25 million and CAR funding - \$60,000).

The total value of all other projects is estimated to be about \$1.81 million, and the contributions, already made and committed, from the CARF to these projects amount to \$0.77 million or 42%.

3.3 CLEAN AIR RESEARCH PROGRAM ACHIEVEMENT

Proposals submitted to the Steering Committee for CAR funding are required to meet the following eligibility criteria:

- (1) research projects should be on air quality issues relevant in B. C. and in particular on issues related to transportation and fuels;
- (2) in general, funds will not be available solely for capital equipment purchases, on-going programs or staff salaries and benefits;
- (3) generally the funding will be limited to a maximum of one-third of the total project cost, with an annual maximum of \$50,000 or 20% of the fund for any single project;
- (4) payments will be made either in installments according to approved project deliverables or in full upon project completion and acceptance of the final report.

Typically no projects will be funded in advance, and all three Steering Committee members must approve a project. Preference will be given to projects of immediate priority and to those co-funded by other partners.

From the inception of the CAR Fund in 1997 to the end of December 2005, altogether 70 research proposals were received. Of these 40 projects were approved for funding and other proposals were denied funding for not meeting the funding eligibility criteria. Several of the approved proposals were withdrawn, discontinued, and deferred. Of the 33 completed projects to date – (i) 8 were done by the end of 1999, (ii) 6 were finished in 2000, (iii) 1 was completed in 2001, (iv) 4 were completed in 2002, (v) 8 were completed by the end of December 2004, and (vi) 6 were completed in 2005.

The categories of projects completed until the end of 2005 are listed in Table 2. The status of the projects completed, discontinued and in progress, as well as the new and revised proposals under consideration and withdrawn is discussed in Section 4.

TABLE 2: TYPES OF PROJECTS COMPLETED IN 2005

(Completed projects during 1997-2004 in parenthesis)

Project Proponent	Project Type				
	Basic Research	Applied Research (Study & Assessment)	Planning	Pilot Demonstration Program	Other
University					
- Academic	1 (4)	(1)		1	
- Student	1	1	(3)		
Business and Industry		1 (5)		2	
Government agencies		3 (13)	3 (3)		(1*)
Non-governmental Organizations					

* Training session on a new model (MOBILE 6) for estimation of on-road motor vehicle emission factors.

It should be noted that although six projects were completed in 2005, the total number of completed projects categorized in the Table was higher because some completed projects were jointly sponsored or undertaken by more than one proponent.

4 STATUS OF CAR FUNDED PROJECTS AND PROPOSALS AT THE END OF 2005

At the end of 2005 the status of projects and proposals stand as:

- 6 projects were completed in 2005, 5 of which were approved in previous years and 1 was approved in 2005;
- 9 new and revised proposals for funding were received in 2005 and 4 proposals were approved for partial funding. However, 2 of the approved projects do not require any immediate funding but may need at a later date. Of the two other projects approved for funding, one was completed during the year and the other project was in-progress at the year end.
- By the year-end 2005, 2 revised proposals were approved-in-principle and 2 new ones remained under consideration for funding. Another proposal received in 2005 was subsequently withdrawn.

4.1 PROJECTS COMPLETED IN 2005

Six projects which were completed in the year 2005 are summarized in Table 3 along with findings.

4.2 PROJECTS IN-PROGRESS AT THE END OF 2005

The projects still in-progress at the end of 2005 are summarized in Table 4. Brief descriptions of these projects are provided below.

TABLE 3 – CLEAN AIR RESEARCH FUND - PROJECTS COMPLETED IN 2005

Project				Comments
Title	Proponent/Sponsor	Duration	Total Cost and CAR Funding	
Ethanol BC - Process Development Program	The University of B. C.	1 st Quarter 2000 – 1 st Quarter 2005	Total - \$7.4 million over 5 years. CARF - \$100,000 over 5 years.	The primary goals of the project were to promote development and demonstration of technologies for production of ethanol, electricity and other products from softwood residues. Some success with the selection of yeast for conversion of glucose sugar to ethanol has been achieved, and the work on the ethanol Process Development Unit (PDU) at UBC is continuing. Other woodwaste utilization projects, such as gasification of woodwaste for small power generation, lumber kiln drying and pellet production, have also been developed and are at various stages of commercialization.
Testing of Continuous Water Injection System on one of the two Main Engines onboard the MV Queen of New Westminster	BC Ferry Services Inc.	4 th Quarter 2003 – 1 st Quarter 2005	Total - \$55,500. CARF - \$18,500.	The ferry ship's No. 2 main engine cylinders were used to install the continuous water injection (CWI) system after some modifications. The engine was operated for a total of 4,826 hours. The results showed that with water injection NO _x emissions were reduced by 22-24%, and fuel consumption was improved by 1.5-1.9%. There was no excessive engine cylinder wear and both scavenging air and exhaust gas temperatures were reduced with water injection. Overall, it is estimated that the payback period of a CWI system for the Queen of New Westminster's all four main engines would be about 15 months.
ISOPART Model Application to the Lower Fraser Valley	Dr. S. Pryor, Indiana University	3 rd Quarter 2004 – 3 rd Quarter 2005	Total - \$84,809. CARF - \$22,000.	The primary objectives of the project were to run a modified ISOPART model using output from meteorological model simulations for receptors at three locations within the Lower Fraser Valley, and to determine the roles of nitric acid-ammonia vs nitric acid-sea spray, as well as the impact of anthropogenic marine sulphur emissions on the atmospheric particle concentrations. The meteorological, air quality, emissions and other data were obtained from the Pacific 2001 intensive monitoring study. The study findings indicate that: (i) the model simulations are generally in agreement with the observations, except for primary species near sources, (ii) the partitioning of total particle NO ₃ ⁻ between sea spray and NH ₄ NO ₃ was highly sensitive to the amount of sea spray present; (iii) the contribution of sea spray to the total PM was strongly dependent on the emission strength and wind speed and hence showed spatial variability; (iv) reactions on/in sea spray influenced the entire PM ensemble and gas-phase concentrations; (v) anthropogenic sulphur emissions in marine areas played a minor role in determining particle concentrations in the cases studied; (vi) substantial free ammonia was available at the receptor locations and the ammonia emission scenario simulations indicated that increased ammonia emissions were associated with enhanced NH ₄ NO ₃ concentrations; and the modelling of visibility was found to be more challenging than that of PM ensemble.

TABLE 3 (CONTINUED) – CLEAN AIR RESEARCH FUND - PROJECTS COMPLETED IN 2005

Project				Comments
Title	Proponent/Sponsor	Duration	Total Cost and CARF Funding	
Emissions Reduction Options Study for Heavy-Duty Vehicles/Fleet in the Lower Fraser Valley	Levelton Consultants Ltd. and Others	2 nd Quarter 2003 – 4 th Quarter 2005	Total - \$149,000. CARF - \$49,500.	The study was undertaken to assess reduction options for heavy-duty diesel vehicle emissions in the Lower Fraser Valley airshed. Various options, ranging from engine and emission control technology, diesel fuel quality, alternative and renewable fuels, were assessed and their effectiveness evaluated. The report contains a Disclaimer from the CPPI, prepared by an epidemiologist retained by the CPPI. The CPPI Disclaimer is concerned with the analytical and cost-effectiveness methodologies used by the study consultants to estimate the potential health effects of air quality improvements.
Reduction of Nonroad Diesel Emissions in the Lower Fraser Valley and the Rest of B. C..	Genesis Engineering Inc.	1 st Quarter 2004 – 4 th Quarter 2005	Total - \$40,000. CARF - \$13,300.	The project was initiated to identify cost-effective methods for reducing smog-forming emissions from nonroad diesel engine emissions in the Lower Fraser Valley and the rest of the Province of B. C.. Nonroad heavy-duty diesel fuel engines, railway locomotives and small passenger ferries were investigated. Eleven potential emission reduction options, including engine technology and cleaner and alternative fuels, were investigated. The study indicates that there are options available to reduce emissions from nonroad diesel fuel combustion sources, and recommended that additional studies could be undertaken to refine the “broad brush” methodology used in this investigation to identify economic instruments and regulatory methods for implementing some of these options. The report was issued with a Disclaimer from the CPPI, prepared by an epidemiologist retained by the CPPI. The Disclaimer is concerned with the methodology used to evaluate cost-effectiveness of health impacts due to potential improvement in the air quality.
AirCare Program Review - Phase 2	Sierra Research Inc.	1 st Quarter 2005 – 4 th Quarter 2005	Total - \$160,000. CARF - \$50,000.	The Phase 2 of the AirCare Program Review was initiated to develop the design details of a new program scope, economic feasibility, delivery models, transitional approaches, vehicle test fees, customer acceptability, and other technical aspects. The study recommended a new program with several design changes to the current AirCare program, while retaining the other existing features, to provide cost-effective benefits to the motorists as well as to reduce air pollutant emissions in the Lower Fraser Valley.

TABLE 4 - CLEAN AIR RESEARCH FUND - PROJECTS IN - PROGRESS AT THE END OF 2005

Project/Proposal Title	Project Proponent/ CARF Sponsor	Project Schedule and Funding (\$)				Comments
		Project Schedule	Total Cost	CAR Funding	Other Partner Funding	
1 Canadian Synthetic Diesel Fuel Testing Project - Phase 4	Industry-Govt. Partners / CPPI	Start date - 2004, Multi-year program.	\$400,000 - \$500,000 per fiscal year	\$15,000	The remainder in cash and in-kind from various partners.	This project is a continuation of the multi-partner funded project on the testing of emissions from synthetic diesel fuel burning. Phase 4 of the study has been delayed due to malfunction of the PM sampling system, and steps are being taken to resolve the issue and plan for testing of new biodiesel fuels.
2 FIX-IT Program 2nd Pilot Project	Pacific Vehicle Testing Technology (PVTT) / CPPI	Start date - 2004. Presently on-hold (see comments).	\$46,000	\$16,000	PVTT- \$30,000 (in-kind)	The project started in May 2004. It is now on hold due to lack of response from vehicle owners.
3 Data Collection for Non-Certified Emission Repairs	Pacific Vehicle Testing Technology (PVTT) / CPPI	Start date - 2004. Scheduled completion - early 2006.	\$19,000	\$6,000	PVTT - \$6,800 (in-kind), Envirotest Canada - \$6,200 (in-kind)	The project started in November 2004. To date 1,290 responses from vehicle owners have been received, and are being analyzed. The project completion date is now scheduled for early 2006.
4 Dispersion Modelling During Episode Events in Golden, B. C.	University of Northern B. C. / Ministry of Environment	Start date - 2005. Completion schedule (see comments)	\$44,000	\$11,000	MOE - \$22,000 and UNBC - \$11,000.	The literature review, statement of research questions, methodology and anticipated results are being completed. It is proposed to use CALPUFF dispersion model for assessing episodes of high PM levels in Golden during the winter and early spring.
5 Gasoline Regulations Review	Ministry of Environment	(see comments)	(see comments)			The project is undertaken jointly with CPPI to review and amend BC Cleaner Gasoline Regulation. No CAR fund has been requested.
6 Stage 1 Vapour Recovery	Ministry of Environment	(see comments)	(see comments)			The project is undertaken jointly with CPPI and other agencies for review of existing Regulations and CGSB standard. No CAR fund has been requested.

1. *“Canadian Synthetic Diesel Fuel Testing Project – Phase 4”*

Project Lead/Sponsor

CPPI is both the sponsor of this proposal and CAR Fund Steering Committee Contact.

Project Goal and Objectives

The Phase 4 of the project is a continuation of the Phases 1, 2 and 3 of the Canadian Synthetic Diesel Fuel Testing Project. The plans for this phase of the project include: (i) to perform data mining study to assess the fuel quality and emissions data collected during past years, and to collect additional data, if necessary, (ii) to measure nitrous oxide emissions from Caterpillar 3401E engine operating under various levels of exhaust gas recirculation, (iii) and to study the effects of hydrotreater/hydrocracker processing severity on engine emissions.

Project Funding

A total of \$400,000 - \$500,000 has been budgeted for Phase 4 work, and the CAR Fund contribution would be \$15,000. Besides the CARF contribution, the remainder was being provided in cash and in-kind by other project partners (National Research Council, Syncrude, CPPI, Shell, Suncor, Imperial Oil, Environment Canada, Natural Resources Canada and US Dept. of Energy).

Contractor

National Research Council of Canada, Ottawa.

Approval Date

Project was approved by the Steering Committee in the first Quarter of 2004.

Completion Date and Status

The project which started in the 1st Quarter of 2004 and tests on fuels and engine emissions were done subsequently by the National Research Council (NRC), Shell Canada and Oak Ridge National Laboratory (ORNL). Several modifications to the testing systems, such as a light-duty diesel engine equipped with a prototype lean NO_x trap, a major computer upgrading to the Sierra PM sampling system, and a new high-speed data acquisition system for measuring cylinder pressure, were completed and a set of experiments with biodiesel derived from different sources is underway. However, the testing schedule has been delayed due to resolution of the Sierra PM sampling system malfunction. A revised testing program is being drawn up and additional resources are now in place.

2. *“FIX-IT Program 2nd Pilot Project.”*

Project Lead/Sponsor

Pacific Vehicle Testing Technologies (PVTT) is the sponsor/leader of the project, and CPPI is CAR Fund Steering Committee Contact.

Project Goal and Objectives

The goal of the project is to continue development and verification of the model developed during the 1st pilot program. The model will be refined to determine potential effectiveness and administrative process that can be implemented to provide repair cost assistance for vehicles which would otherwise use the cost waiver and conditional pass provisions of the AirCare program.

Project Funding

Total - \$46,000 in cash and in-kind. CAR Fund –\$16,000 approved in May 2004. PVTT is to contribute the remainder (about \$30,000) as in-kind contribution.

Contractor

PVTT (AirCare Program Administration).

Approval Date

A revised proposal incorporating certain requirements of the CARF Steering Committee was approved in May 2004.

Completion Date and Status

The project was started in May 2004 and anticipated to be complete in six months. Ten AirCare-certified repair shops have been selected and solicited for their participation in the project. These shops consist of the seven which had participated in the first pilot program plus three additional shops in N. Vancouver and Abbotsford to improve geographic coverage. The project objectives, guidelines and vehicle eligibility criteria have been discussed with each participating repair shop. The total number of participating repair shops has been limited to ten because it is anticipated that about 20 vehicles will be targeted in the study. Various means of active promotion of the project have been implemented to seek response and participation by vehicle owners. However, because of poor response, the promotion of the project is currently suspended until further notice, and CARF is in agreement with the decision.

3. *“Data Collection for Non-certified Emission Repairs.”*

Project Lead/Sponsor

Pacific Vehicle Testing Technologies (PVTT) is the sponsor/leader of the project and submitted the proposal in October 2004. CPPI is the CAR Fund Steering Committee Contact.

Project Goal and Objectives

More than half of vehicles failing the AirCare emission inspection are performed by non-certified repair shops. No data on the types of repair done and costs are available. The goal of the project is to collect repair information from a sample of these vehicles by offering a small incentive (\$2) to vehicle owners. The information will then be analyzed to determine the cost-effectiveness of non-certified emission-related repairs.

Project Funding

Total - \$19,000 in cash and in-kind. CAR Fund –\$6,000 approved in May 2004. PVTT and Envirotec Canada are to contribute \$6,800 and \$6,200 as in-kind contribution respectively.

Contractor

PVTT (AirCare Program Administration).

Approval Date

The proposal was approved by the CARF Steering Committee for funding of \$6,000 in the 4th Quarter 2004, although an incentive of \$2 was considered to be too small.

Completion Date and Status

The project was started in December 2004. The first run of 6,000 flyers was distributed to vehicle owners in early January 2005. As of the end of the 4th Quarter 2005, over 1,500 responses about the repair invoices were received. The responses are being reviewed for data analysis. It is anticipated that no additional data collection would be necessary. The project is now scheduled for completion in early 2006.

4. *"Dispersion Modelling During Episode Events in Golden, B. C."*

Project Lead/Sponsor

Dr. Peter Jackson of the Faculty of Natural Resources and Environmental Studies, University of Northern B. C. is the project leader and Tyler Abel, a graduate student is the other member of the project team. The proposal was submitted in February 2005. The MOE is the project sponsor and CAR Fund Steering Committee Contact.

Project Goal and Objectives

The objectives of the project are to investigate the dispersion of air pollutants from the source to receptor in the Golden airshed, to characterize the boundary layer properties which influence the mixing and movement of air pollutants, and to assess the relative contributions of various sources to the observed and modelled ambient air pollutant levels. Recently collected meteorological and particulate measurements data under the Source Apportionment Study in Golden, as well as the emission inventory, will be used in this study. The research will be the basis of the thesis for an M. Sc. Degree in Environmental Studies at the University of Northern B. C..

Project Funding

The project budget is estimated to be \$44,000 of which \$11,000 is approved from the CAR Fund. The remaining fund will be available from MOE and UNBC.

Contractor

Not applicable.

Approval Date

After considering the proposal and the request for \$22,000, a funding of \$11,000 was approved by the Steering Committee in May 2005.

Completion Date and Status

The project started in May 2005 after all fundings were approved. Since then the graduate student has undertaken to prepare a detailed thesis proposal consisting of a literature review, statement of research questions, methodology and anticipated results for review by the thesis supervisory committee. It is proposed to use CALPUFF dispersion model for high PM episodes in Golden during the winter and early spring. The data from the existing three monitoring stations in Golden for meteorological and pollutant are to be used. In addition, a Doppler sodar monitoring system was set up in the area during the 4th Quarter 2005 to gather additional meteorological data. The project is scheduled for completion in 2 years.

5 *"Gasoline Regulations Review"*

In January 2005 BC MOE proposed an independent review of the new federal and existing BC gasoline Regulations for determining future options for retaining or repealing the Province with respect to the BC Regulations. On June 30, 2005 the CPPI provided the MOE with comments for consideration on the existing BC Cleaner Gasoline Regulation.

This project is being carried out by the stakeholders, and no CAR funding has been requested at present.

6 *“Stage 1 Vapour Recovery”*

In view of the proposed amendments to the existing Canadian General Standards Board (CGSB) Standard for vapour control systems in gasoline distribution networks, the CPPI has submitted a proposal to MOE and GVRD for undertaking a review of the B. C. Regulations and GVRD Bylaw on the same subject. This project is being carried out by the stakeholders, and no CAR funding has been requested for the time being.

4.3 PROPOSALS APPROVED-IN-PRINCIPLE AND UNDER CONSIDERATION AT THE END OF 2005

The proposals approved-in-principle and new proposals under consideration are listed below and summarized in Table 5.

Proposals Approved-in-Principle

1 *“Updating the Lower Fraser Valley Source-Receptor Air Quality Model.”*

RWDI West Inc. had first submitted the proposal in March 2003 for CAR funding, and it was approved-in-principle. Because of the project leader's sudden death, the Committee requested RWDI West Inc. about its interest in pursuing the project under a new leader and project team, as well as to resubmit it for consideration. The revised proposal for updating an existing air quality model was submitted in June 2004, and after further revisions it was submitted in December 2004. The current proposal is for a 2-Phase project with 2 optional tasks. The total budget varies from \$39,410 to \$64,780 (plus GST), depending on the Phases and optional tasks. CAR funding of \$18,500 for the Phases 1 (LFV) & 2 (Victoria and Okanagan) has been approved with other funding provided by the GVRD and MoE. No CAR funding for the Optional Task of health aspects is approved.

2. *“2005 B. C. Marine Vessel Emission Inventory”*

The GVRD submitted the proposal in October 2004 to undertake a 2-Phase work for a 2005 marine vessel emission inventory and forecasts for the Lower Fraser Valley at an estimated cost of about \$120,000. The project is planned to be conducted jointly with Env. Can., Transport Canada, MOE, Western Marine Community, Ports, and other industry sectors. A partial funding from CARF is requested. As the 2000 inventory for the marine vessel emission and emissions forecasts have recently been completed, CPPI has some concern about the new project. However, after receiving clarification about the objectives of the new project, i.e. to enhance the methodology and data collection, CPPI has advised it might be interested in partial funding for a nationally acceptable model/methodology development study for application in other areas of the country. Any CAR funding approval is subject to substantial funding from the marine industry, and the total funding from the latter and CARF should be about one-third of the total project cost.

Proposals Under Consideration

1. *“Scrap-It Program Review”*

In March 2005 BC MOE circulated an initial proposal to the CARF Steering Committee from Rogoza Consulting Group, Inc. to review the existing Scrap-It program and to develop a framework for evaluation of incentives the Program offers. A revised proposal was

TABLE 5 – CLEAN AIR RESEARCH FUND - PROPOSALS APPROVED-IN-PRINCIPLE AND UNDER CONSIDERATION AT THE END OF 2005

Proposal Title	Proposal Proponent / Sponsor	Application Date	Total Cost and CAR Fund Requested	Other Potential Funding Partner	Comments
<i>CAR Funding Approved-in-Principle</i>					
1. Updating the Lower Fraser valley Source-Receptor Air Quality Model	RWDI West Inc. / GVRD	December 2004 (Revised)	\$39,410 - \$64,780 plus GST (see comments). CAR fund requested \$47,670 plus GST.	GVRD, MOE, Env. Can. and BC Lung Assoc.	The proposal is for a two-phase work – Phase 1 (\$39,410) and Phase 2 (\$8,260) with two optional tasks worth \$17,110. CAR funding of \$18,500 has been <i>approved-in-principle</i> subject to not being used for the health outcome part of the proposal.
2. 2005 B. C. Marine Vessels Emission Inventory	GVRD	October 2004	Approx. \$120,000. CAR fund requested part of the total.	GVRD, MOE, Env. Can., Transport Can., Western Marine Community, Ports, and other industry groups.	The proposal is for a 2-Phase work for developing an improved methodology and 2005 emission inventory and forecasts for marine vessels. An initial part of the project is being underway with separate funding. Partial CAR funding has been <i>approved-in-principle</i> subject for to substantial funding from the marine industry and the model / methodology developed should be applicable nationally.
<i>Proposal Under Consideration</i>					
1. Scrap-It Program Review	Rogoza Consulting Group Inc. / MOE	June 2005	Approx. \$11,000. Partial CAR funding requested.	MOE and others.	CPPI has been considering the proposal for partial CAR funding.
2. Air Toxics Emission Inventory Spatial Resolution to Census Tracts and Dissemination Areas	Levelton Consultants Ltd. / GVRD	July 2005	Approx. \$27,000 plus GST. CAR fund requested is one-third of the cost.	GVRD and Env. Can.	CPPI has been considering the proposal for partial CAR funding.
3. An Improved Health Benefit Assessment Model for the GVRD	Levelton Consultants Ltd.	July 2005	Approx. \$36,000. Presently full CAR funding requested.	Health Can., Env. Can. and B. C. Lung Assoc.	The proponent has approached the potential co-funders for partial funding. It is being considered by the CARF Steering Committee.
4. Rempel Bros. Concrete Ltd. – Fuel Additive and Water Injection System	M. A. Turbo / Engine Ltd. / CPPI	November 2005	Approx. \$57,500. CAR fund requested is \$29,700.	Rempel Bros. Concrete Ltd. and the proponent (in-kind)	The proposal is being considered by the CARF Steering Committee.

submitted in June 2005 for a 3-month study at a cost of about \$11,000, and it was subsequently discussed by the Steering Committee. The CPPI is considering the proposal for CAR fund to the amount of one-third of the total cost.

2. *“Air Toxics Emission Inventory Spatial Resolution to Census Tracts and Dissemination Areas”*

This proposal from Levelton Engineering Ltd., submitted in June 2005 and revised in July, 2005, was initially considered as the next phase of the project on, *“Emissions Reduction Options Study for Heavy-Duty Vehicles/Fleet in the Lower Fraser Valley”*. It is now being considered as a separate project by the Steering Committee. The proposal is for a 2-Phase work to spatially resolve the results of the 2000 air toxics emission inventory for all sources in the Lower Fraser Valley according to 449 census tracts in the GVRD, FVRD and Whatcom County. The total budget for the project is about \$27,000 + GST, and the CAR fund requested is one-third of the total, as Environment Canada and GVRD will be contributing the remaining two-thirds. The MOE supports the project, and CPPI is considering it for approval of the CAR fund requested.

4. *“An Improved Health Benefit Assessment Model for the GVRD”* from Levelton Engineering Ltd.

Levelton Consultants Ltd. Submitted a proposal for applying the Health Canada’s Air Quality Benefit Assessment Tool (AQBAT) to the existing air emissions-health benefits model from emissions reduction measures within the GVRD. Several improvements to AQBAT need to be done to for application to GVRD situations. The proponent has requested for CAR fund to provide the total cost of \$36,000 for this six-month project. Other potential partners will be approached for partial funding to reduce the CAR fund contribution.

5. *“Rempel Bros. Concrete Ltd. – Fuel Additive and Water Injection System”*

Rempel Bros. Concrete Ltd. has submitted the proposal for a study to reduce emissions from its concrete trucks by using a combined fuel additive and water injection system designed by M. A. Turbo/Engine Ltd.. It is anticipated that such a measure could reduce emissions of nitrogen oxides, particulates and carbon monoxide from truck engines. The total cash and in-kind cost of the proposed 12-month project is estimated to be \$57,500, and the CAR funding of \$29,700 has been requested.

4.4 PROPOSALS WITHDRAWN AND PROJECT DISCONTINUED IN 2005

Two proposals withdrawn during 2005 and one discontinued project are as follows:

Proposals Withdrawn

(i) *“High Resolution Meteorological Fields over BC for Air Quality Applications”*

The proposal was submitted in June 2004 by Prof. P. L. Jackson, University of Northern BC (UNBC) for the use of mesoscale models to produce and validate a 5-year high resolution dataset of meteorological fields over BC and to render these fields available for air quality modelling applications. The 3-year project for a total cost of \$225,000 (\$75,000/year) was proposed to be funded from several sources, and the CAR fund requested is \$25,000 per year for 3 years. Subsequently the proponent advised the Steering Committee that the project would be deferred for the time being.

(ii) *“Development of an Emission Calculator for Diesel Engine Emissions Reductions”*

The GVRD submitted the proposal in July 2005 from Levelton Engineering Ltd. for development of an emission reduction and cost-effectiveness calculator program, based on the recent work on emissions from on-road heavy-duty diesel vehicles and non-road diesel engine emissions in the Lower Fraser Valley. By the end of 2005 it was withdrawn by GVRD.

Discontinued Project

“Application of Automated Correlation-based Synoptic Map Classification for Establishing a Climatological Link with Air Quality Episodes in Prince George, British Columbia”

Paul F. Willis started the project as a thesis for his M. Sc. Degree in Environmental Studies under supervision of Dr. Peter Jackson of the Faculty of Natural Resources and Environmental Studies, University of Northern B. C.. The project budget was estimated to be \$7,070, and \$4,558.00 was approved from the CAR Fund. The objective of the project was to develop a recurring and representative map pattern of circulation associated with meteorology favourable to air quality in Prince George, including the stages of the development, beginning and decay of any air pollution episode. The thesis completion was being delayed, and the project proponent advised in May 2005 that the UNBC administration had denied any further extension for submission of the thesis. The CARF Steering Committee has advised the proponent that the committed fund would be provided subject to publication of a paper based on his research work in a scientific journal in the near future.

5. FUTURE OUTLOOK OF CAR FUND

Under the Scrap-It program nearly 3,300 old vehicles have been scrapped during the period March 1996 to December 2005, and the CPPI contribution to the program to December 2005 has been about \$1,188,550. The present resources allow scrapping of about 500 vehicles per year. Although the number of scrapped vehicles is relatively low, compared to the total number of vehicles used in the region, the cumulative effect of retirement of high-polluting old vehicles over the years has resulted in cost-effective incremental emission reduction in the Lower Fraser Valley. The participation in the Scrap-It program appears to depend on the types of incentives available to the owners of old vehicles and the level of public awareness. Adequate funding for attractive incentives to vehicle owners' participation is also a key to the success of the Scrap-It program. Presently, The Scrap-It Program Steering Committee is exploring the possibility of creating a charitable society to manage the program.

A similar car scrappage program not affiliated with Scrap-It Program for the Lower Fraser Valley is also operating in Kelowna, B. C. with funding from Environment Canada.

From August 1997 to the end of 2005 nearly \$747,540 from the CAR Fund has been contributed towards a number of research projects. By the end of 2005, a total of about \$37,558 from the CAR Fund remains committed towards projects that are still in-progress. The total value of all projects, jointly funded from the Clean Air Research Fund and various other partners, amounts to about \$12 million.

The projects funded to date consisted of basic and applied research, including pilot demonstration of technology, collection of information for planning purposes, and training

program for agency personnel, industry and consultants. The study proponents ranged from academic and students to industry and government agencies. The type of projects included:

- analysis of air quality, emissions and meteorological data,
- air quality model development,
- enhancement of emission estimation methods,
- computer model development for greenhouse gas emission assessment,
- projects to improve AirCare testing and vehicle repair diagnosis,
- transportation demand management, and
- training of personnel from agencies, industry and consultants.

Research projects undertaken with full or partial CAR funding have resulted in significant scientific advances through improved understanding of key air quality issues, filling of important data gaps, and development of modeling tools to better forecast impacts of emission reduction measures on future air quality. Continued financial support from the CAR Fund for research on air quality issues will lead to improved understanding of the science, and development or enhancement of models and tools for data gathering and analysis. These are necessary prerequisites for formulation of appropriate air quality management strategies and policies.