Identification and Evaluation of Potential Control Measures for the Treasure Valley

Idaho Department of Environmental Quality

Boise Regional Office

April 2006

COMPARISON OF STATE EMISSION REDUCTION PROGRAMS

The emission control strategies contained in table one are meant to provide examples of the types of measures that have been undertaken around the county to reduce a variety of air pollutants. This list is not meant to be a comprehensive listing of all possible control measures, nor are pollution control devices normally found on permitted industrial and commercial sources included. A qualitative idea of the magnitude of emission reductions expected, the complexity of the example (both regulatory and technical), and the cost-effectiveness (expressed on a dollars/ton basis) is provided to help evaluate the listed measures. These qualifiers in many cases are based on actual numbers based on practice in the states, and in other cases may be more of an opinion where numbers are hard to calculate (such as education programs).

The f following nomenclature and assumptions are used in the table:

NOx	Nitrogen Oxides	VOC	Volatile Organic Compounds
CO	Carbon Monoxide	O3	Ozone
PM	Particulate Matter		

Reduction

Low	- less than 100 tons per year of 1% of airshed total
Medium	- less than 1,000 tons per year (but greater than 100) or 5% of airshed
High	- greater than 1,000 tons per year

Regulatory Complexity

Low	- no regulatory barriers
Medium	- needs new regulations, but no existing regulations prohibiting action
High	- needs change to existing law to allow activity

Technical Complexity

Low	- requires no technological improvements or applications
Medium	- requires the application of technology, but nothing new or unusual
High	- requires the application of new or untested technologies

Cost

Low	- less than $1,000 per ton or no cost
Medium	- less than $10,000 per ton (but greater than $1,000)
High	- greater than $10,000 per ton

Program	State	Pollutant(s)	Reduction	Regulatory Complexity	Technical Complexity	Cost
Vehicle Emission Reduction Measures						
Commute Trip Reduction Law	AZ	NOx, VOC, CO, PM	high	high	low	medium
Accelerated Vehicle Retirement/Buyback and Scrappage ($500 buyback)	DE, CO, IL	NOx, VOC, CO	low	medium	low	medium
Big Dig diesel construction equipment retrofit project	CT	CO, VOC, PM	low	low	medium	high
Discourage idling by school buses – voluntary program	ID, MN	NOx, VOC	low	low	low	low
Replace existing fleet vehicles with cleaner-fuel vehicles	CA	NOx, VOC, CO, PM	medium	high	medium	high
Electric airport ground support equipment replacement	GA	NOx, VOC	low	low	low	medium
Truck-stop electrification	GA	NOx, VOC, CO	low	low	medium	medium
Traffic signal synchronization	Many states	NOx, VOC	low	low	medium	medium
Lower speed limits on rural interstates (75 to 55)	TN	NOx	medium	high	high	low
Smoking vehicle ordinance	GA	NOx, VOC, CO	low	high	high	high
Inspection & maintenance program	Many states	NOx, VOC	high	high	high	high
School bus retrofit program	ID	VOC, CO, NOx, PM	low	low	low	medium
Diesel Truck retrofit project	IN	VOC, PM	low	low	medium	medium
Area-wide rideshare incentives	TN	NOx	low	medium	low	high
Advanced Truckstop Electrification	UT	CO, VOC	low	low	medium	high
Adoption of the California Low Emitting Vehicle/Clean Fuels (LEV/CF) standards	Many states	VOC, NOx	high	high	high	medium
Public Transit Measures						
Light Rail Vehicles	MD, UT	NOx	low	high	high	high
Park-n-Ride Facility	MD	NOx	low	medium	low	high
Voluntary employer-based trip reduction	CA	VOC, CO, NOx,	medium	low	low	medium

Program	State	Pollutant(s)	Reduction	Regulatory Complexity	Technical Complexity	Cost
Smoke Management Measures						
Educate homeowners in proper operation and maintenance of woodstoves	CA	PM	low	low	low	low
Solid Fuel Burning Device, Conversion and Removal Incentives	CA	PM	low	low	medium	medium
Voluntary Episodic Curtailment (open burning / woodstoves)	CA	PM	medium	low	low	low
Open and prescribed burning ban	GA	PM, NOx	high	high	low	low
Stationary Source Control Measures						
Industrial natural gas combustion RACT to 25tpy	GA	NOx	medium	high	high	medium
Stage I vapor recovery	TN	VOC	high	medium	high	medium
BACT/MACT for VOC sources over 10tpy	CA	VOC	high	high	high	high
Alert Programs						
Tulsa Ozone Alert!	OK	NOx, VOC	medium	low	low	low
Treasure Valley Air Quality Alert	ID	NOx, VOC, CO, PM	medium	low	low	low
Miscellaneous Measures						
Electric lawn and garden equipment replacement	GA	VOC	low	low	medium	medium
Voluntary Agricultural Diesel Engine Retrofit	ID	PM, VOC, CO	low	low	medium	medium
Railroad Corridor Trail	UT	CO, VOC	low	high	high	medium
Philadelphia Bicycle Network	PA	NOx	low	high	low	high
Lawnmower rebate	TN	NOx	low	low	low	high
Emissions Trading Program	Many states	NOx, VOC, CO, PM	high	high	high	medium
Municipal Dust Control Ordinances	Man states	PM	medium	high	high	medium
Tree Planting at Urban Parking Lots	CA	VOC	low	medium	high	medium
Urban Tree Planting program	IL, NJ	O3, PM	medium	medium	high	medium

Table 1

CONTROL MEASURE RANKING

The following table ranks the control measures presented in the previous table by cost and complexity, with the lowest cost and least complex program ranked first (i.e. the "lowest" score). The scoring was done by assigning a number to the qualifiers in table 1, then (1 for low, 3 for high), then totaling the numbers. This table can be used to focus on those projects and programs that offer low-cost and easily implemented control measures, or conversely to identify those projects that involve large costs or highly complex regulatory or technical issues. In-depth examinations of selected control measures follow the ranking table to assist in the program evaluations.

Program	Cost	Regulatory Complexity	Technical Complexity	Total
Educate homeowners in proper operation and maintenance of woodstoves	1	1	1	3
Discourage idling by school buses – voluntary program	1	1	1	3
Voluntary Woodstove Episodic Curtailment	1	1	1	3
Tulsa Ozone Alert!	1	1	1	3
Treasure Valley Air Quality Alert	1	1	1	3
School bus retrofit program	2	1	1	4
Voluntary Stage I vapor recovery	2	1	1	4
Diesel Truck retrofit project	2	1	1	4
Open burning ban during yellow and red alerts	1	2	1	4
Solid Fuel Burning Device, Conversion and Removal Incentives	2	1	1	4
Open and prescribed burning ban	1	2	1	4
Accelerated Vehicle Retirement/Buyback and Scrappage	2	1	1	4
Electric lawn and garden equipment replacement	2	1	1	4
Voluntary employer-based trip reduction	2	1	1	4
Lawnmower rebate	3	1	1	5
Voluntary Agricultural Diesel Engine Retrofit	2	1	2	5
Tree Planting at Urban Parking Lots	2	2	1	5

Program	Cost	Regulatory Complexity	Technical Complexity	Total
Municipal Dust Control Ordinances	2	3	`1	5
Electric airport ground support equipment replacement	2	1	2	5
Lower speed limits on rural interstates (75 to 55)	1	3	1	5
Traffic signal synchronization	2	1	2	5
Mandatory Stage I vapor recovery	2	3	1	6
Commute Trip Reduction Law	2	3	1	6
Diesel construction equipment retrofit	3	1	2	6
Replace existing fleet vehicles with cleaner-fuel vehicles	3	1	2	6
Railroad Corridor Trail	2	3	1	6
Park-n-Ride Facility	3	2	1	6
Area-wide rideshare incentives	3	2	1	6
Smoking vehicle ordinance	2	3	1	6
Truck-stop electrification	2	1	3	6
Industrial natural gas combustion RACT to 25tpy	2	3	2	7
Open and prescribed burning ban	3	3	1	7
Light Rail Vehicles	3	2	2	7
Bicycle Network	3	3	1	7
Emissions Trading Program	2	3	2	7
Inspection & maintenance program	3	3	3	9
Adoption of the California Low Emitting Vehicle/Clean Fuels (LEV/CF) standards	3	3	3	9
BACT/MACT for VOC sources over 10tpy	3	3	3	9

Table 2

DESCRIPTION OF SELECTED CONTROL MEASURES

Replace existing fleet vehicles with cleaner-fuel vehicles

This measure encourages the use of low-emission vehicles that have emissions that are significantly lower than the standards established for vehicles of similar make and model year. Low-emission vehicles typically have cleaner burning engines, fuels and/or exhaust treatment devices. Funding would be provided on an incentive-basis for the incremental cost of cleaner-than-required on-road and off-road engines and equipment.

Incentive funding could be used for:

- Purchase of low- or zero-emission vehicles or engines;
- Engine repowers, retrofits and replacements;
- Exhaust treatments and add-on equipment;
- Clean fuels or additives; or
- Infrastructure to supply alternative fuels.

Emission reductions expected from this measure would be achieved by the incremental lower emissions from replacement of conventional vehicles, engines and fuels with low emission vehicles, engines and fuels. Emission reductions would be limited by available program funds, availability of vehicles and infrastructure, and the ability of projects to compete for the funds. In an existing program currently funded in California, the average cost-effectiveness of these projects was approximately $28,800/ton of emissions reduced.

The cost of this measure is dependent on many factors, such as the incremental cost of low-emission vehicles, engines, fuels and exhaust treatment devices compared to conventional vehicles, engines, fuels and exhaust treatment devices. In the California program referenced above, the Bay Area AQMD has granted between $5 million - $7 million per year for clean air vehicles and infrastructure. The AQMD typically provides approximately $4,000 for natural gas vehicles, and between $1,000 - $5,000 for electric vehicles. For the incremental cost of heavy-duty vehicles the District typically provides between $15,000 - $50,000 per vehicle.

Accelerated vehicle retirement / buyback and scrappage

This control measure would accelerate the retirement of older, high emitting vehicles from the region's roadways by providing incentives to scrap them. The first vehicle scrapping program in the country was implemented in the South Coast Air Basin by UNOCAL in 1990. Other buy back programs implemented since around the country include the Bay Area AQMD, Delaware, Colorado, and Illinois

These programs are typically voluntary programs that provide a financial incentive to owners of eligible vehicles to scrap their vehicles. State air agencies contract with vehicle dismantlers to screen, purchase, and destroy eligible vehicles. The purchase of vehicles to be scrapped adheres to vehicle eligibility requirements, which include the registration status of the vehicle, ability of the vehicle to pass a functional test, and an equipment inspection test. Eligibility requirements are established to provide assurance that a vehicle would remain on the road and continue to produce emissions if it were not scrapped. Marketing of the program by the states and their contractors informs potentially eligible vehicle owners about the program through annual direct mailings, newspaper and radio advertisements, fliers and on-site advertisements at scrapping sites. Incentives typically are in the $500 to $650 range.

The federal 1990 Clean Air Act amendments required the EPA to issue guidance on a control measure that would “encourage the voluntary removal from use and the market place of pre-1980 model year light duty vehicles”. The South Coast Air Quality Management District was the first to implement a vehicle buy-back program with their adoption of Regulation 1610 in 1993. Since its inception in June 1996 through April 2004, the program has purchased and scrapped nearly 20,000 vehicles.

The emission reductions from this type of program depends upon the amount of funding available, the vehicle purchase price, vehicle eligibility requirements, the effectiveness of the marketing program, and the actual buy back rate. Increasing the purchase price, reducing the stringency of the vehicle eligibility requirements, and/or more intensive marketing would increase the rate at which vehicles would be purchased. Scrapping 1,000 vehicles annually can result in VOC reductions of 0.10 tons/day, NOx reductions of 0.05 tons/day, and particulate matter reductions of 0.02 tons/day. The cost effectiveness of this type of program as been estimated at approximately $6,400/ton of VOC, NOx and PM reduced.

Voluntary employer-based trip reduction

Support and encourage voluntary efforts by Treasure Valley employers to promote the use of commute alternatives by their employees. Empirical results show that employer trip reduction programs can decrease vehicle trips to a typical worksite by as much as 5-10 percent.

There is a strong need for trip reduction programs in the Treasure Valley. Without continued trip reduction programs, increased traffic volumes in general could increase motor vehicle emissions, and congestion in particular increases auto emissions due to stop and go traffic and lower average speeds. Employment growth in the Treasure Valley has been especially robust in suburban areas, which due to land use patterns and limited transit infrastructure, tend to have the highest drive alone rates. In the near term, carpool and vanpool programs are especially suited for many suburban locations. Commute trips, which comprise 25% of daily trips, are still logical targets for employer-

based trip reduction efforts due to: a) their key role in contributing to peak period traffic congestion and ozone formation, b) the long average distance of commute trips compared to other trip types, c) the repetitive nature of commute trips that occur on the same route and schedule each day, d) the pool of potential candidates for ridesharing at larger work sites, and e) the ability of employers to influence employee commute mode choice by means of the facilities, services, and incentives that they provide.

Support efforts for this type of program typically include:

- Provide core support for employer programs, based on an assessment of employer needs and the level of employer interest. Potential support includes assistance in developing or enhancing employer programs, referrals, employer networks, and programs to recognize outstanding employer programs.
- Support legislation to maintain and expand incentives for employer programs, such as tax deductions and/or tax credits for employer efforts to promote ridesharing, transit, and other commute alternatives.
- Implement employer elements of the *Treasure The Valley's Air* program.
- Provide information and assistance to employers in organizing transportation fairs and other marketing events.
- Work with employers to implement regional promotions such as Rideshare Week, Bike to Work Day, etc.
- Implement sub-regional or local programs to promote employer-based trip reduction in those cities and counties that choose to allocate local resources to such efforts.
- Work with cities, counties and other public agencies who are also employers to develop commute alternatives, including telecommuting, compressed work week schedules, guaranteed ride home programs, etc.
- Seek legislation to create incentives for stronger voluntary programs for all employers or to require certain minimum elements of a basic commute alternatives program for public employers.

The costs of this control measure include the public sector costs to provide services to promote voluntary employer efforts as well as the costs to employers that choose to implement such programs. Employer costs depend upon the number of employers that implement voluntary programs and the specific services and incentives that they offer to their employees. Data from studies of mandatory trip reduction programs indicate that employer costs typically ranged from $25 to $100 per employee per year. It is expected that employer costs for voluntary programs are lower, perhaps a maximum of $40-$50 per employee per year on average. Employer costs are offset to some extent by indirect gains such as increased productivity of employees due to less stressful commutes and improved recruitment and employee retention.

Stage 1 Vapor Recovery at Retail Gas Stations

Stage 1 vapor recovery is a system designed to recover the fumes which escape when fuel is delivered to storage tanks at retail gasoline stations. The vapors are captured by a second hose as the fumes in the underground tank are displaced by the fuel being delivered, and are routed back to the delivery truck where they condense back into a liquid state. Based on the most current emissions inventory for gasoline fuel delivery in Ada and County Counties, 1,108 tons per year of volatile organic compounds (VOC's) are emitted due to fuel delivery at retail gasoline stations. This represents almost 3% of all VOC emissions in the Treasure Valley, and about the same amount as emitted by all the stationary point sources combined (i.e. industry). If Stage 1 vapor recovery was to be installed at all these stations, VOC emissions would be reduced by 1,079 tons per year (a 97% reduction). This probably represents the greatest single source category for VOC reduction present in the Treasure Valley at this time, and would pay great benefits in reduced ozone and PM2.5 precursor compounds.

Stage 1 vapor recovery systems at gasoline service stations consist of a fitting where hoses from the tanker truck are connected to allow for gasoline to be dispensed to the underground tank and vapors to be collected from the tank and returned to the truck (figure 1). In many cases this is a single coaxial fitting (figure 2). A submerged fill tube is also typically installed. The control efficiency of these systems is estimated to be 97% or better.

A cost/benefit analysis of a stage 1 vapor recovery installation project has been determined for the Treasure Valley. The following assumptions were used in doing the analysis:

- 410 active underground gasoline storage tanks at retail gasoline stations in Ada and Canyon County.
- Cost of Stage 1 installation $1,500 per tank. Average of actual average cost on similar installation program in Utah ($1,000/tank), and estimate from local supplier to install equipment ($2,000/tank).
- Emissions reductions from the project will total 16,185 tons over the life of the project (1,079 tpy x 15 yr).

Retrofitting all 410 current underground storage tanks with Stage 1 vapor recovery at a per tank average cost of $1,500 will total $615,000. This will reduce VOC emission by 1,709 tons per year, for a 15 year project life total reduction of 16,185 tons of VOC. At a $615,000 funding cost, the estimated cost benefit for this project equals $39/ton of VOC reduced, or $0.043/kg VOC reduced.

School bus retrofit program (*Idaho Clean Air Zone)*

This control measure is designed to reduce motor vehicle travel and mobile source emissions related to the transportation of youths and students for school and other activities. The primary way this is accomplished is by converting school buses to clean fuels or installing particulate matter retrofit devices.

Retrofitting school buses with diesel oxidation catalysts (DOC) typically costs around $2000/ DOC per bus. Based on Idaho survey there are approximately 2,400 school buses in Idaho, so a complete retrofit of every bus in Idaho would cost on the order of $5,000,000. The cost effectiveness of these types of projects is based on a 15 year design life, with an estimated cost per kilogram of $2.40 and $58.69 for CO and PM respectively.

Public education control measures (*Treasure The Valley's Air, Tulsa Ozone Alert!*)

The purpose of these control measures is to educate the public about air quality, and encourage residents, employers and local governments to make choices that have a positive effect on air quality, particularly regarding transportation and consumer activities. Special emphasis is placed on the need to curtail polluting activities on the relatively infrequent days when meteorological conditions could lead to poor air quality and possible exceedences of federal and state air quality standards. In the Treasure Valley the public education air quality program is called *Treasure The Valley's Air*.

Educating the public about the health effects of air pollution, the sources of air pollution, and ways to reduce air pollutant emissions is a critical component of efforts to improve air quality. Increased awareness can lead to changes in personal behavior. The Air District administers a wide variety of public education campaigns. DEQ encourages voluntary actions that reduce air pollution throughout the year, but particular emphasis is focused on days when pollution levels are expected to be highest.

Since motor vehicles are a leading source of ozone and PM2.5 forming emissions in the Treasure Valley, efforts to reduce vehicle travel, particularly on Air Quality Alert days, can help in avoiding exceedences of federal and state standards. DEQ also encourages the public to reduce other types of polluting activities including use of paints, solvents and consumer products, use of gasoline-powered lawn and garden equipment, and woodburning. DEQ attempts to inform the public of actions they can take through public announcements in the media, through employers and local governments, and through various promotional activities. Because the *Treasure The Valley's Air* program is voluntary in nature, its effectiveness depends on the cooperation of the general public.

On Yellow and Red Air Quality Alert days, DEQ issues advisories and asks Treasure Valley residents to curtail or postpone activities that pollute. This includes eliminating discretionary driving and substituting driving trips with biking, walking, telecommuting,

taking public transit or carpooling instead. The strategy also includes linking motor vehicle trips together ("trip-linking") to avoid excessive engine cold start emissions. To inform the public of these days, DEQ sends e-mail notices, contacts television news bureaus, publishes announcements in newspapers and makes public service announcements on the radio. The Idaho Department of Transportation posts messages on their variable message signs on valley highways letting motorists know of alert conditions. Residents are also asked to avoid activities that generate pollution such as use gasoline-powered lawn and maintenance equipment. DEQ also has an active Public Service Announcement program that places 30-second air quality spots on local television with targeted messages at intervals throughout the year.

Urban tree planting programs

Urban forests have a positive impact on air quality through deposition of pollutants to the vegetation canopy, sequestration of atmospheric CO2 in woody biomass, and reduction of summertime air temperatures. Air temperature reductions affect air quality by 1) changing chemical reaction rates in the atmosphere that result in ozone formation, 2) decreasing temperature-dependent emissions of hydrocarbons from biogenic and anthropogenic sources, 3) decreasing emissions of pollutants from electric power plants due to reduced air conditioning demands, and 3) changing the depth of the mixing layer.

While the bulk of VOC emissions are from tailpipe exhaust, approximately 15% can be from evaporative emissions that occur during daytime heating of fuel delivery systems of parked vehicles. Evaporative emissions, as well as exhaust emissions during the first few minutes of engine operation (primarily NOx), are sensitive to local microclimate. Many municipalities in California have parking lot shade tree ordinances that require 50% tree canopy over paved areas within 15 years of construction. Although the original impetus for these ordinances was energy conservation and aesthetic amenity, parking lot trees can provide important air quality and stormwater runoff reduction benefits.

Land use planning and development strategies as a control measure

Land use patterns directly affect how we travel between homes, jobs, schools, shops and services, and other destinations. Motor vehicles are a major source of ground-level ozone precursors, fine particulates, toxic air contaminants, carbon monoxide, and other air pollutants. Promoting land use patterns and development projects that facilitate walking, bicycling and transit use to reduce motor vehicle use and emissions is an effective if underutilized control measure.

Encouraging local governments to address the air quality impacts of all local activities by incorporating air quality elements or sections into their general plans should be the goal of land use planning air quality control measures. Local governments can address the land use/transportation/air quality connection through planning and development policies and programs. Cities and counties can integrate air quality-beneficial policies

and programs into general plans and related implementation programs such as subdivision regulations, zoning ordinances, capital improvement programs, parking requirements, and development design guidelines. Localities can produce separate air quality elements, or can incorporate air-quality beneficial policies into the land use, circulation/transportation, and other required elements of the general plan.

MARKET VALUE OF EMISSION TRADING POLLUTION REDUCTION PROGRAMS

For comparison purposes, the following table presents the average, median, high and low costs for NOx, VOC, PM10, CO, and SOx offsets reported by several California Districts in 2002. These offsets were primarily used by stationary sources (i.e. industry) to mitigate emissions from their respective sources, and represent "market values" for the various pollutants at that time.

2002 Prices Paid in Dollars Per Ton for Offsets					
	NOx	**VOC**	**PM10**	**CO**	**SOx**
Average (mean)	$35,261	$9,633	$49,327	$27,802	$14,156
Median	$30,000	$8,630	$20,000	$38,356	$7,450
High	$140,000	$70,000	$136,986	$47,397	$65,753
Low	$990	$485	$3,289	$300	$3,289

Table 3

PEER REVIEW COMMENTS

DEQ – State Office Comments:

- Readjust table headers to appear on each page of the table
- Sort table by cost and/or effectiveness/reduction
- Define the source of the programs identified and the assumptions made by each
    - Use footnotes describing the sources of data or methodology used
- Make each control measure into an active sentence in order to describe the program more clearly

City of Boise Comments:

- Brake down the complexity category in to technical and regulatory categories
- Simplify categorical qualifiers (high, medium, low) for cost, reduction and complexity
    - Could range qualifiers low, low – medium, medium, medium – high, high for more description
- Rename control measures category for “Vehicle Emissions Reduction Measures” to “Vehicle and Fuel Vapor Reduction” to accommodate for the confusion of vapor recovery as a stationary source. The thought is that stationary source is a facility with stacks and a tank is not your first thought when thinking of stationary sources.
- Check into Colorado (Denver?) smoking vehicle program as an example control measure

COMPASS Comments:

- Acknowledge that the benefits of the different transportation related control strategies vary according to the area in which they are applied and the air quality issue(s) being addressed
    - Qualitative rankings & the benefits of transportation related strategies are difficult to measure/ quantify
- VMT (Vehicle Miles Traveled) reductions (other than public transportation)/Land Use/growth Strategies are not included as a control measure category.
    - These need to be acknowledged as viable options to managing emissions/ Air Quality in the valley.
    - VMT is projected to increase as the valley grows, while vehicles will be required to meet more strict emissions standards