

## **Near-Road Air Quality and Mitigation in Schools near the Mountain View Corridor Presentation to the Granite School District Board on February 3, 2015**

Presenters: Cameron Cova, Air Working Group Member  
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The Utah Department of Transportation (UDOT) is constructing the Mountain View Corridor (MVC), a planned freeway from Interstate 80 in Salt Lake County to State Route 73 in Lehi. During the environmental review for the MVC, members of the public were concerned about future air quality at schools along the new roadway. In response to those comments, UDOT formed the MVC Air Working Group (AWG).

AWG objectives are:

- To monitor the air quality effects of the new roadway and
- To address potential impacts resulting from the construction of the roadway near five schools in the Granite School District.

The AWG was allocated \$4.1 million (from UDOT) for monitoring and for mitigation at the five schools.

The AWG and its contractors have completed their initial work:

- Background (pre-construction) air monitoring has confirmed typical urban concentrations of air pollutants.
- It is expected that concentrations of toxic air pollutants from vehicular traffic, namely Diesel Particulate Matter (DPM), will increase when the MVC is completed.
- Results from other studies at schools near busy freeways demonstrate that DPM concentrations of diesel particulate matter can be significantly reduced in classrooms by a program of improved ventilation systems and improved filtration.
- A mitigation strategy at the five schools is being recommended; this strategy will be summarized for the Board.
- The mitigation strategy includes immediate changes to ventilation systems and ongoing increases in operating costs at the five schools. The AWG's allocated funding is being proposed to cover the capital costs and the increase in operating costs for 30 years. Net Present Value of those costs is about \$1.8 million. A mitigation strategy and costs for portable classrooms is currently being worked on.

The AWG is working with Superintendent Bates and Granite School District (GSD) staff on the recommendation details. The AWG hopes to continue working with GSD staff to implement the recommendations, in order to better protect GSD students from the effects of increased air pollution from the MVC.

# Near-Road Air Quality and Mitigation in Schools Near the Mountain View Corridor (MVC)

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Presented to the Granite School District  
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Sonoma Technology, Inc.  
*Environmental Science and Innovative Solutions*

# Overview of Today's Presentation

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- Background: Why is near-road pollution of concern?
- Background on the Mountain View Corridor (MVC) Air Working Group (AWG).
- Summary of pre-construction outdoor air quality at Hunter High School.
- Current filtration systems' capability to remove diesel particulate matter (DPM).
- Mitigation recommendations for schools.

# Project Motivation: Near-Road Pollution and Health Effects

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- Pollutant concentrations are higher near busy roadways.
- Rob McConnell (USC, Children's Health Study) recently reframed the air pollution problem in general by saying [paraphrasing] **“We’ve been looking at the wrong pollutant mixture; it’s not regional air pollution, but near-road pollution, that is the key to understanding the effect of pollution on public health.”**

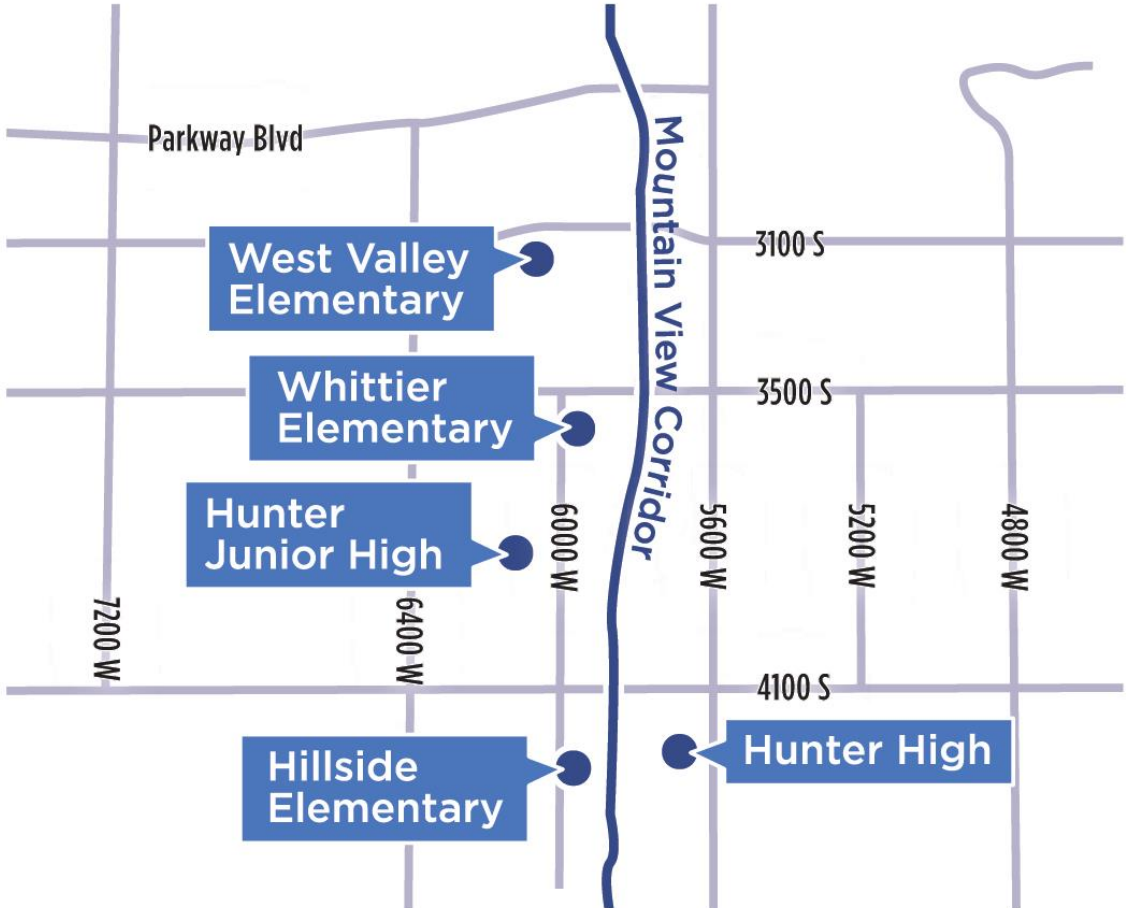


# Background on the MVC and Near-Road Air Quality

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- Plans developed for transportation alternatives for a new roadway and transit-way in west Salt Lake County and northwest Utah County (2003-2007)
- Concern that children would be adversely affected by air pollution from a new major roadway (MVC) near their schools
- Concerned groups included
  - Utahns for Better Transportation
  - Utah Moms for Clean Air
  - Physicians for a Healthy Environment
  - Sierra Club

# The 5 Schools of Concern and the Future Route of the Mountain View Corridor



# The MVC Air Working Group (AWG)

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- In Final EIS, UDOT adopted mitigation measures to address near-road air quality impacts
- In the Record of Decision (2008), UDOT and UTA established the AWG and provided \$4.1M for monitoring air quality and for mitigation (installing air filters and ongoing maintenance) at 5 schools
- AWG makeup
  - Four members appointed by citizen advisory groups
  - Four members from UDOT, UTA, Utah Division of Air Quality, local government (West Valley City)
  - Include expertise in air quality modeling and medicine

# AWG: Working Together Since 2009

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- Familiar with transportation and air quality issues
- Educated itself on near-road air quality issues
- Hired a consultant team to perform air quality monitoring and to design mitigation approaches for the 5 schools

The rest of this presentation is a summary of the air quality monitoring results and of the AWG recommendations for mitigation in the schools



# Summary of Background (Pre-Construction) Air Quality and Classroom Measurements

- Diesel particulate matter (DPM) is the greatest contributor to cancer risk from air toxics now. Contribution will be larger with MVC.
- We measured black carbon (BC) as a surrogate for DPM.
- Current HVAC systems remove 73% of  $PM_{2.5}$  but only 7-34% of black carbon.
- 90-95% of ambient black carbon was removed in Las Vegas near-road schools with improved HVAC systems and improved filters.

# Outline of Mitigation Discussion

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- Objective: to design HVAC system modifications to remove outdoor black carbon particles from classroom air
- Summary of steps to reduce particle concentrations indoors in schools
- Examples of cost analysis results
- Summary of pre-construction study results
- Summary of mitigation recommendations

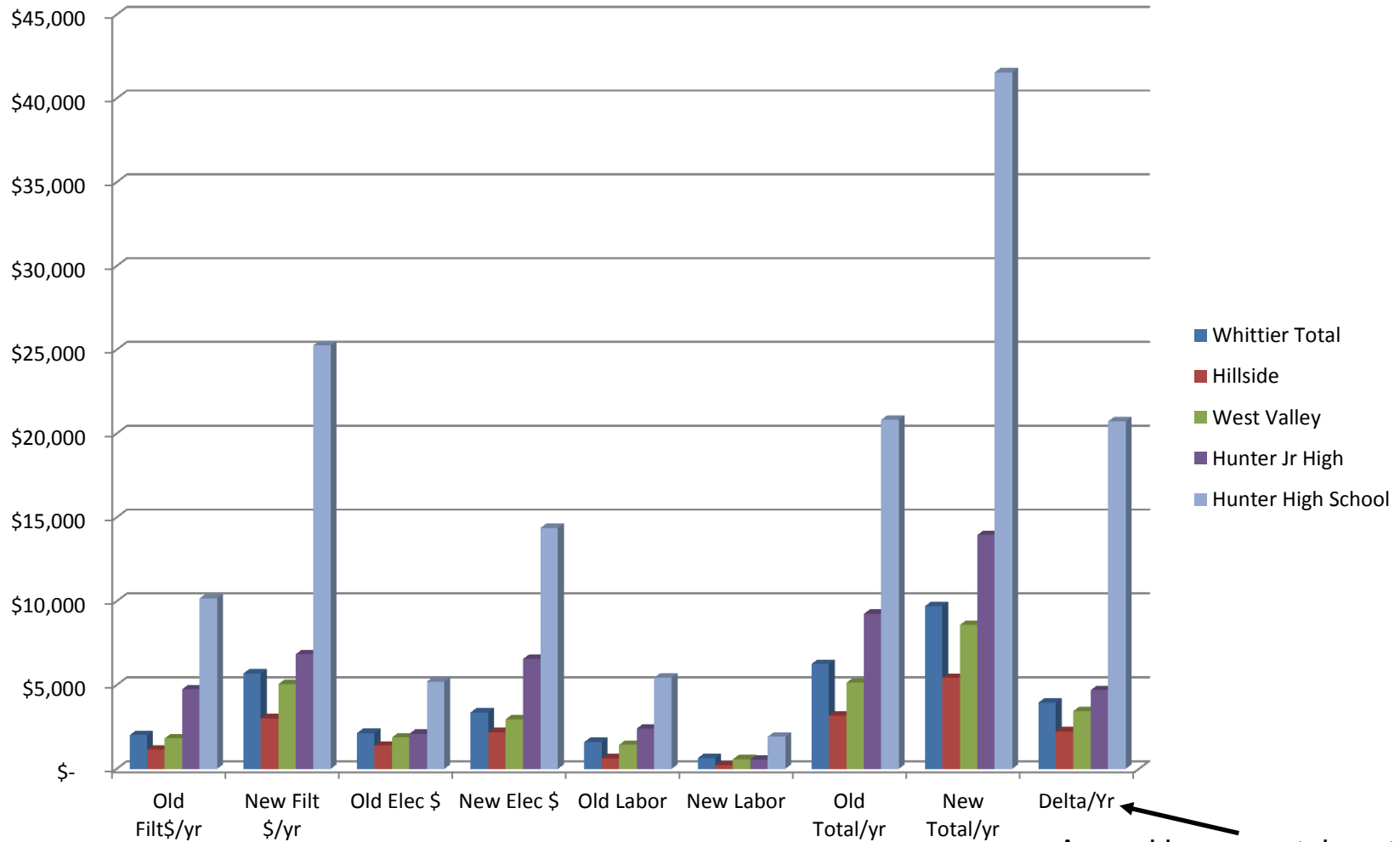
# Overall Steps in Mitigation Analysis

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- Evaluate existing system design
- Evaluate available filters and their performance specifications
- Perform engineering and cost analysis of potential equipment to be upgraded
- Evaluate sensitivity of costs to assumptions

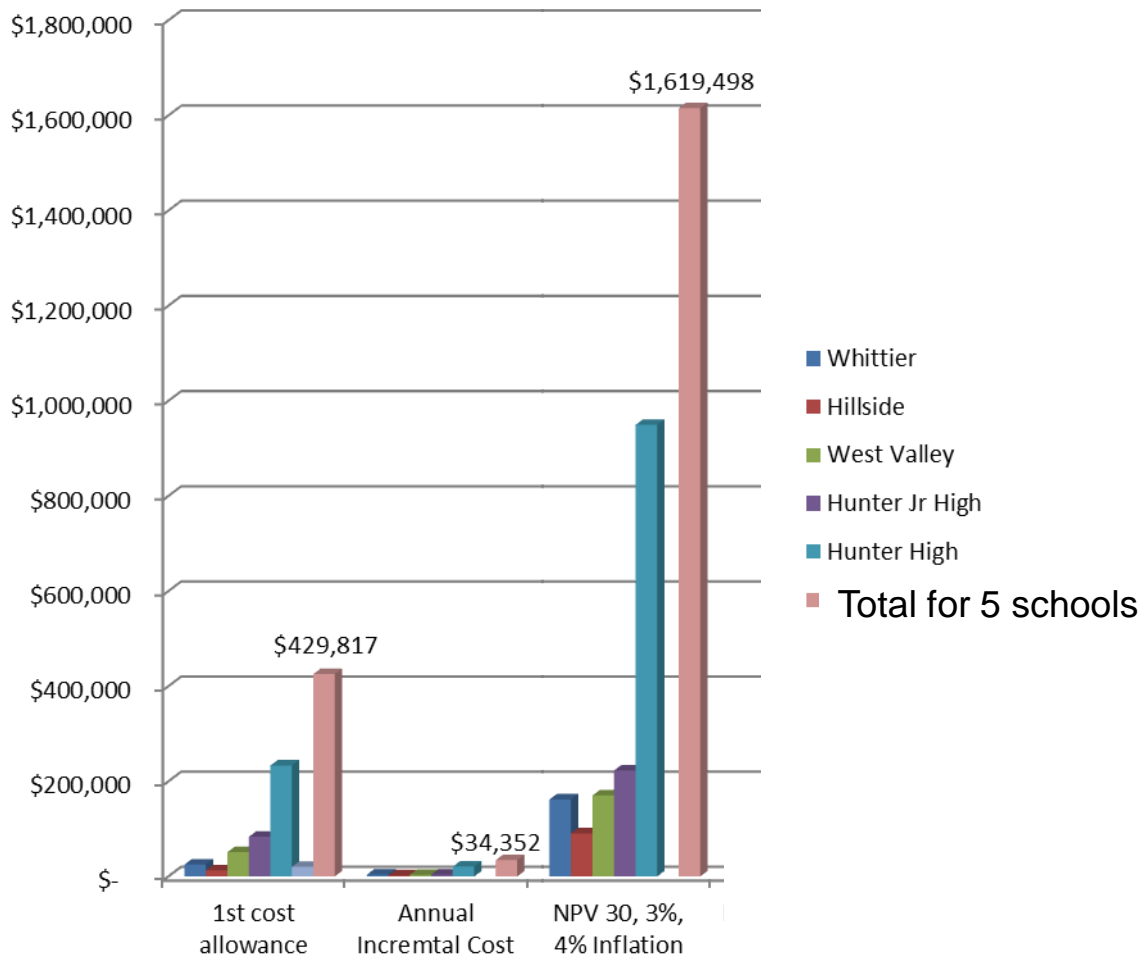
Note: We received engineering and cost support from existing HVAC contractors at the schools.

# Example of Cost Analysis Results: Estimated HVAC Operating Cost by School



Annual incremental cost  
Total for 5 schools \$34,352

# Estimated Net Present Value (NPV) for the Five Schools



# Pre-Construction Study Results and Mitigation Recommendations (1 of 2)

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- Near-road pollution affects health
- Diesel particulate matter (DPM) is a major contributor to air toxic cancer risk
- Exposure to DPM is highest during morning rush hour
- Current HVAC systems remove up to 34% of DPM
- Improved filtration systems can remove 90-95% of DPM
- Improved filtration systems for portables being designed
- HVAC system operations are critical for sufficient ventilation in classrooms

# Pre-Construction Study Results and Mitigation Recommendations (2 of 2)

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- Mitigation design process included
  - Evaluating systems and filter performance
  - Engaging GSD staff and HVAC contractors
  - Performing engineering and cost analyses
- Estimated first cost plus incremental operating costs over 30 years at 3% interest, 4% inflation
- Total first costs of \$430k, annual incremental cost of \$35k; NPV of \$1,620,000
- With 10% contingency of \$162,000; total of \$1,782,000 for mitigation.
- Mitigation design & costing for portables in process.

# MVC Air Quality and Mitigation: Potential Next Steps

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- Presentation and discussions between AWG and GSD (today and beyond).
- Construction on MVC to begin in spring 2016 south of 4100 S.
- Implementation of mitigation plan in schools (once approved).
- Air quality monitoring to determine student exposure (after MVC is connected to I-80 or SR-201).
- Classroom and outdoor monitoring to demonstrate improved filter effectiveness.

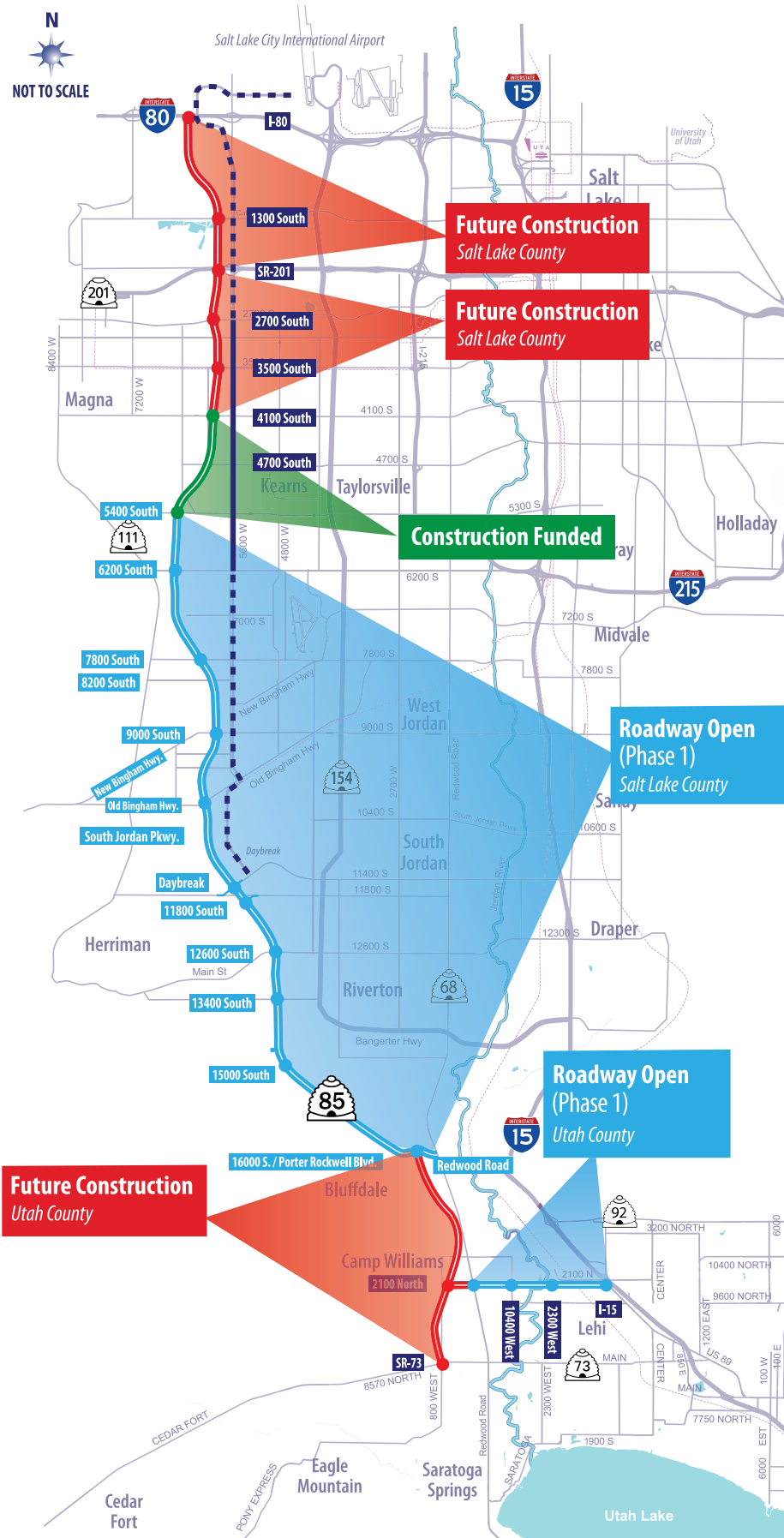


# Mitigation Recommendations (other than improved filtration)

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- Place portable classrooms as far away from MVC as possible.
- Avoid outdoor activities during morning rush hour.
- Minimize outdoor activities during periods with strong inversions.
- Provide training for teachers with difficult classrooms (windows that open; doors that open to the outside, rather than to an interior hallway).
- Control HVAC systems to minimize filling classrooms with morning rush-hour pollutants.
- Eliminate or minimize emissions from indoor sources (cleaning materials, markers, etc.).

**PHASED CONSTRUCTION APPROACH**



- Current Intersection/Future Interchange
- Future Intersection/Future Interchange
- Construction Funded from 5400 S. to 4100 S.
- Initial Transit Project
- - - Future Transit Projects

**PHASE 1**

UDOT constructed two lanes in each direction, and the on-and-off ramps of the future freeway from 16000 South to 5400 South. Trail and bike lanes run adjacent to the entire corridor. Future construction will extend the roadway from 5400 South to S.R. 201.

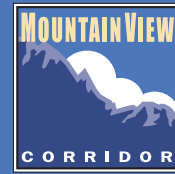


**PHASE 2**

UDOT will convert the existing signalized intersections to freeway interchanges.

**PHASE 3**

UDOT will add additional lanes in each direction.



**MVC AIR QUALITY WORKING GROUP UPDATE**  
DRAFT NOVEMBER 2014

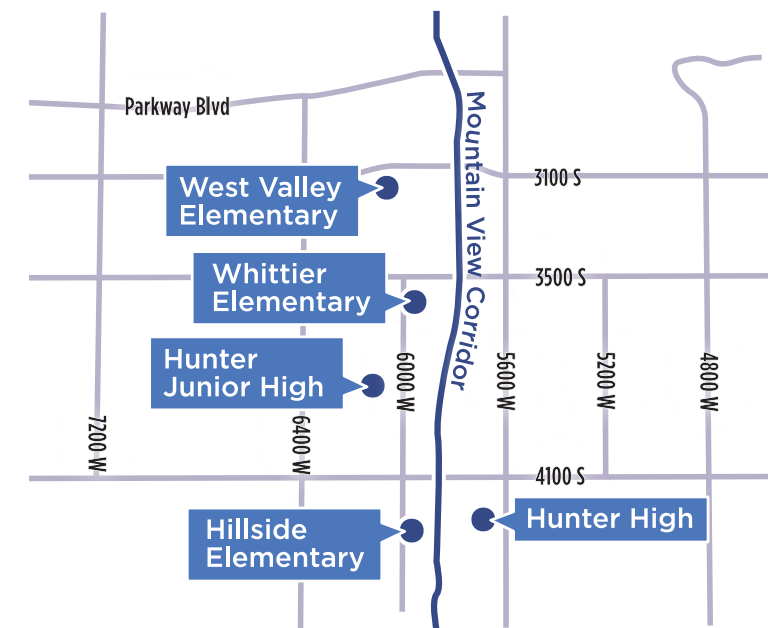


The Utah Department of Transportation (UDOT) is constructing the Mountain View Corridor (MVC), a planned freeway from Interstate 80 in Salt Lake County to State Route 73 in Lehi.

During the MVC Draft Environmental Impact Statement (EIS) public comment period, UDOT received comments from residents with concerns about the air quality near public schools surrounding the corridor. In an effort to be responsive to the comments, the Record of Decision (ROD) described the creation of the MVC Air Working Group (AWG) to monitor the air quality effects of the new roadway and to address potential impacts resulting from the construction of the roadway near five schools in the Granite School District (GSD).

The decision to incorporate the comments as mitigation commitments does not represent a determination by the Federal Highway Administration (FHWA) or UDOT that the MVC project or any other road will cause measurable adverse health effects on population near roads.

The first step of the group was to measure the background pollutant levels and monitor Mobile Source Air Toxics (MSATs), and other relevant pollutants for future comparison, plus evaluate existing ventilation systems in the schools and recommend a mitigation strategy. \$1 million for monitoring and \$3.1 million for mitigation was allocated.



*Schools near the future Mountain View Corridor.*

## AIR QUALITY MONITORING

The purpose of the air quality monitoring is to characterize air quality prior to any construction in order to provide a baseline for comparison with future monitoring to be done during and after construction.

The project has four major objectives:

- Monitor background air quality focusing on MSATs and particulate matter less than 10 micrometers (PM<sub>10</sub>)
- Monitor wind speed and direction at the five schools
- Design a mitigation approach to reduce MSATs particles indoors
- Recommend future monitoring and mitigation efforts

Evaluation of air quality and its potential health risks were performed using the data collected at Hunter High School from August 2011 to July 2012. Conclusions from the background-monitoring project include:



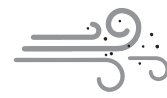
Diesel particulate matter (DPM) is the most critical MSAT to monitor since it is the greatest contributor to cancer risk.



Black carbon concentrations, a component of DPM, are higher during the morning and evening commute.



Measured toxic concentrations are comparable to the measurements at the Bountiful, Utah, Division of Air Quality (DAQ) monitoring station\* and to observed and modeled urban concentrations nationally.



Expected pollutant concentrations may be higher when winds are more parallel to the roadway.



Ultra-fine particle (UFP) data was collected for comparison with future data collected next to MVC. According to the data, UFP concentrations were about one-half of the UFP concentrations next to US Route 95 in Las Vegas.

*\*Already existing DAQ monitoring station*

*\*\*US Route 95 in Las Vegas has a similar air quality monitoring project*



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Meteorological monitor at Hillside elementary school.



Images ©Sonoma Technology, Inc., used with permission.

Air-quality monitor at Hunter High School.

## MITIGATION RECOMMENDATIONS/EFFORTS

The recommended mitigation strategy is to replace current filters in the schools with filters that are more efficient at removing pollutants and perform upgrades needed to handle the improved filters.

### ESTIMATED COST TABLE

School	HVAC System Upgrades	Ongoing Operation and Maintenance (30 yrs)	Total Cost of Upgrades and Ongoing O&M
Whittier	\$26,973	\$136,881	\$163,854
Hillside	\$14,853	\$77,806	\$92,659
West Valley	\$53,020	\$119,350	\$172,370
Hunter Jr. High	\$91,754	\$139,411	\$231,165
Hunter High	\$243,216	\$716,233	\$959,449
<b>Total</b>	<b>\$429,816</b>	<b>\$1,189,681</b>	<b>\$1,619,497</b>

*Note: \$3.1 million was allocated to the AWG for mitigation costs.*

In addition to improved filtration systems in the schools, a number of other recommended mitigation efforts could reduce pollutant concentrations and/or student exposure at schools:

- Install sound walls or vegetated barriers between the schools and MVC
- Eliminate bus idling at schools
- Retrofit existing buses to reduce emissions
- Avoid outdoor activities during morning rush hour
- Minimize outdoor activities during periods with strong inversions
- Install portable classrooms as far away as possible
- Provide training for teachers whose classrooms have characteristics that could defeat the filtration system (windows that open; doors that open to the outside rather than to an interior hallway, etc.)
- Control HVAC systems to minimize filling classrooms with morning rush-hour pollutants
- Eliminate or minimize emissions from indoor sources (cleaning materials, markers, etc.)

Future monitoring near the MVC should determine both outdoor (ambient) and indoor, in-classroom impacts of pollutants from the completed roadway. In addition, some monitoring would be beneficial during construction.

### THE AWG CONSISTS OF MEMBERS OF

**Utah Department of Transportation (UDOT)**  
**Utah Division of Air Quality (DAQ)**  
**Utah Transit Authority (UTA)**  
**University of Utah Department of Pediatrics**  
**West Valley City (WVC)**  
**Granite School District**

**Breathe Utah**  
**Parent Teacher Association (PTA)**  
**Sierra Club**  
**Utah Congress of Parents and teachers**  
**Utahns for Better Transportation**  
**Wasatch Clean Air Coalition**

The AWG contracted with Sonoma Technology, Inc. (STI) and Environmental Health & Engineering (EH&E) to conduct an air quality monitoring study to evaluate background pollution concentrations prior to construction, and to develop future monitoring and mitigation strategies for the impacted schools.

For more details on the report, visit [udot.utah.gov/go/MountainViewAirQuality](http://udot.utah.gov/go/MountainViewAirQuality).