

**THE DISTRICT OF COLUMBIA'S SPENDING PLAN
FOR VOLKSWAGEN SETTLEMENT FUNDS
(BENEFICIARY MITIGATION PLAN)**

July 6, 2018

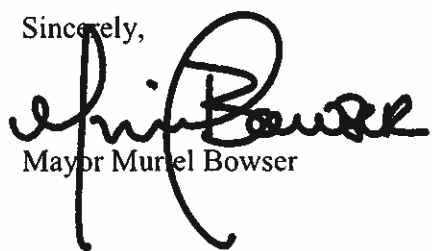


Letter from Mayor Muriel Bowser

Clean air is at the core of what makes a city livable. This plan puts Washington, DC on a path to reduce a broad swath of air pollutants—from oxides of nitrogen to greenhouse gases --that are harmful to people’s health and the health of our planet.

All District residents deserve to know the air they’re breathing is clean. This plan advances environmental justice by placing special emphasis on communities in Washington, DC that have been disproportionately impacted by air pollution. By enabling a majority of the funds to be used for electric vehicle projects, this plan also supports my pledge to make Washington, DC carbon-neutral and climate resilient by 2050.

Sincerely,




Mayor Muriel Bowser

Letter from Department of Energy and Environment Director Tommy Wells

As a beneficiary of the Volkswagen Mitigation Trust, the District of Columbia submits this Beneficiary Mitigation Plan to the trustee, Wilmington Trust, N.A, for the Environmental Mitigation Trust for State Beneficiaries. Developed with extensive community input, this plan lays out the District’s intended uses of the allotted settlement funds. This plan is grounded in science and economics to ensure our settlement dollars will make the biggest impact in promoting health and reducing air pollution citywide and in especially hard-hit communities.

Sincerely,



Tommy Wells

1. Introduction

Washington, DC (District, or DC) will receive \$8.125 million as a result of the civil enforcement case, *Volkswagen “Clean Diesel” Marketing, Sales, Practices, and Products Liability Litigation*. The settlement stems from Volkswagen’s (VW) use of a defeat device in its diesel vehicles, which allowed the vehicles to emit much higher levels of oxides of nitrogen (NOx) than allowed by the U.S. Environmental Protection Agency (EPA). The settlement funds are primarily intended to reduce NOx emissions from diesel vehicles.

To use the VW settlement funds, the District must develop a beneficiary mitigation plan that describes how the District intends to use its allotted funds to offset the air quality impacts, primarily NOx pollution, that occurred due to the defeat devices on VW vehicles. The funds can only be utilized on eligible mitigation actions as defined in the VW settlement, specifically Appendix D-2.¹ Examples of eligible uses of the funds include replacement of older model heavy duty diesel vehicles; replacement of the engines of older model heavy duty diesel vehicles; installation of electric vehicle infrastructure; and installation of idle reduction technologies. The following are examples of *ineligible* uses of the VW funds: replacement of gasoline powered vehicles; installation of compressed natural gas fueling infrastructure; and expansion of an existing vehicle fleet.

Mayor Bowser selected the District’s Department of Energy and Environment (DOEE) to serve as the lead agency to coordinate the use of the District’s VW settlement funds. This document constitutes the District’s Spending Plan for Volkswagen Settlement Funds (“Spending Plan” or “Beneficiary Mitigation Plan”).

2. Air Pollution Emissions in Washington, DC

The principal air pollutants of concern in the District are NOx, fine particles (PM2.5), ozone, greenhouse gases (GHG), and air toxics. Although the VW settlement is primarily focused on reducing NOx emissions, the District has also decided to consider reduction of PM2.5, GHGs, and air toxics in developing this spending plan. Air pollutants contribute to various health ailments and threats to the environment, described in more detail below.²

Air pollutants in Washington, DC originate from a variety of sources. The total inventory of emissions of an air pollutant is typically subdivided into four types of sources: area, off-road, on-road, and point. Area sources include small, disperse sources such as small boilers and emergency generators. Off-road sources use both gasoline and diesel and include construction

¹ Appendix D-2 of the VW settlement gives details of eligible mitigation actions and can be found at: <https://www.epa.gov/sites/production/files/2017-10/documents/statebeneficiaries.pdf>.

² All data in this section other than the GHG data is sourced from EPA’s National Emissions Inventory database. GHG data is sourced from DOEE’s forthcoming Greenhouse Gas Inventory.

and lawn/garden equipment, portable generators, locomotives and marine engines. On-road sources use both gasoline and diesel, and include any highway vehicles. Stationary industrial sources, also known as point sources, are larger sources that emit pollution from a single location, such as industrial facilities and power plants.

Past research has shown higher levels of some air pollutants near heavily traveled roads and highways, leading to increased levels of lung and heart diseases, particularly in children and adolescents. Tailpipe standards have become more stringent and the levels of air pollutants from vehicles are decreasing. The near-road monitor in the District shows levels of nitrogen dioxide, PM2.5, and carbon monoxide only slightly above the levels at other District monitors (air toxics are not measured at the near-road site).

NO_x: One component of NO_x is nitrogen dioxide (NO₂). Breathing air with high levels of NO₂ can irritate airways. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing, and difficulty breathing). Longer exposures to high levels of NO₂ may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. NO_x emissions also lead to higher ozone levels. Breathing ozone can trigger chest pain, coughing, throat irritation, and airway inflammation. It can also harm lung tissue and reduce lung function. Ozone can worsen bronchitis, emphysema, and asthma.

The total amount of NO_x emitted in Washington, DC in 2014, the most recent year for which comprehensive data is available, was 8,606 tons. On-road and off-road vehicles together were the largest source of NO_x emissions, emitting 6,518 tons or 76 percent of total NO_x emissions in 2014.

NO_x emissions from diesel vehicles totaled 3,909 tons, which accounted for 60 percent of the NO_x emissions from all vehicles. Gasoline vehicles accounted for the remaining 2,609 tons of vehicle NO_x emissions in 2014. Figure 1 represents the distribution of NO_x emissions between different types of **diesel** vehicles in 2014.

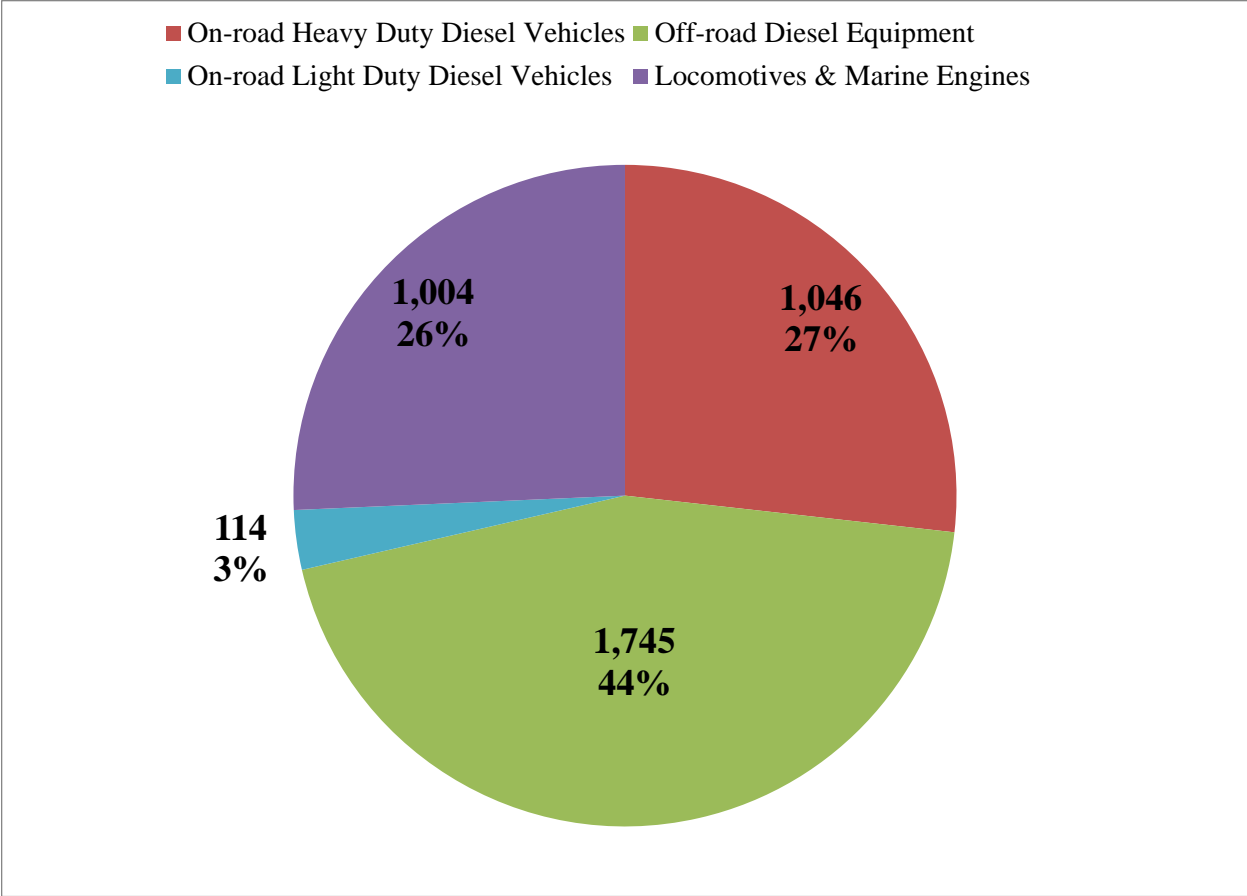


Figure 1: 2014 NOx Emissions from Diesel Vehicles in Washington, DC in tons (Total: 3,909 tons/year)

PM2.5: Particulate matter is solid and liquid particles suspended in air, such as dust, soot, pollen, and smoke; it results from human activity but also occurs naturally. Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and NOx, which are pollutants emitted from power plants, industrial processes, and on-road and off-road vehicles. Diesel exhaust is mostly composed of particulate matter.

The smaller the particle, the more dangerous for human health, as particles can travel deep into the respiratory system and bloodstream. Repeated inhalation of these particles can lead to serious lung and heart health problems. These small particles are referred to as PM2.5.

In 2014, emissions of PM2.5 from all sources in Washington, DC totaled 1,219 tons. Of that, 383 tons were from all types of on-road and off-road vehicles. Diesel vehicles (on-road and off-road) accounted for 226 tons of PM2.5 emissions, with gasoline and other alternatively fueled vehicles accounting for the remaining 157 tons.

GHGs: Gases that trap heat in the atmosphere are called greenhouse gases (GHGs) and include carbon dioxide, methane, nitrous oxide (N2O), and fluorinated gases. GHGs contribute to

climate change, which is predicted to cause extreme heat waves, rising sea levels, changes in precipitation resulting in flooding and droughts, intense hurricanes, and degraded air quality, all of which can directly and indirectly affect the physical, social, and psychological health of humans. The District is doing its best to reduce the impact of climate change in keeping with Mayor Bowser's pledge to reduce greenhouse gas emissions by 100 percent by 2050. Note that N₂O is also one of the compounds that make up NO_x.

The latest GHG emission inventory from 2015 estimated a total of 8,844,152 tons of GHG emissions in the District. Diesel vehicle (on-road and off-road) emissions accounted for 126,085 tons or 1.4 percent of the total of GHG emissions in the District.

Air Toxics: Air toxics, also known as toxic air pollutants or hazardous air pollutants (HAPs), are those pollutants that cause or may cause cancer and other serious health effects, such as reproductive effects or birth defects. The Clean Air Act identifies 187 HAPs that EPA and states are required to control to protect public health. Although Washington, DC does not have high levels of air toxics, they are emitted from diesel engines. In 2014, diesel vehicles accounted for 117 tons out of the total 815 tons (14 percent) of HAPs emissions in the District.

3. Impacted Communities in the District

The VW settlement requires each beneficiary, including the District, to describe how our proposed projects will benefit areas of the city that bear a disproportionate share of the air pollution burden. To identify the areas of the city that are the most vulnerable and impacted by air pollution, we have looked at the following indicators: asthma rates in the District, mortality rates from cancer and heart disease, and underrepresented neighborhoods as defined by income levels.

Asthma Rates in Washington, DC: The current citywide rate of asthma among adults is 11.5%.³ Asthma rates in Washington, DC reflect national trends,⁴ with African-American adults, adults with lower incomes, and adults who did not finish high school disproportionately impacted. African-American adults in Washington, DC had twice the rate of asthma (15.4%) than Caucasian adults (7.6%). Asthma was also more prevalent among District adults with

³ Government of the District of Columbia Department of Health (DOH), *Behavioral Risk Factor Surveillance System (BRFSS) Annual Health Report, 2014*, District of Columbia: DOH, 39, <https://doh.dc.gov/node/1190347> (accessed November 20, 2017).

⁴ U.S. Department of Health and Human Services (HHS), Centers for Disease Control and Prevention (CDC). *Asthma Facts—CDC's National Asthma Control Program Grantees*. Atlanta, GA: HHS, CDC, 2013, https://www.cdc.gov/asthma/pdfs/asthma_facts_program_grantees.pdf (accessed November 20, 2017).

annual incomes below \$15,000 (25.7%) and among those with less than a high school education (20.9%).⁵

Geographic disparities in asthma prevalence are also evident in Washington, DC. Current asthma rates among District adults are highest in Ward 8 (17.6%) and Ward 7 (16.9%), followed by Ward 5 (14%) (see Figure 2).

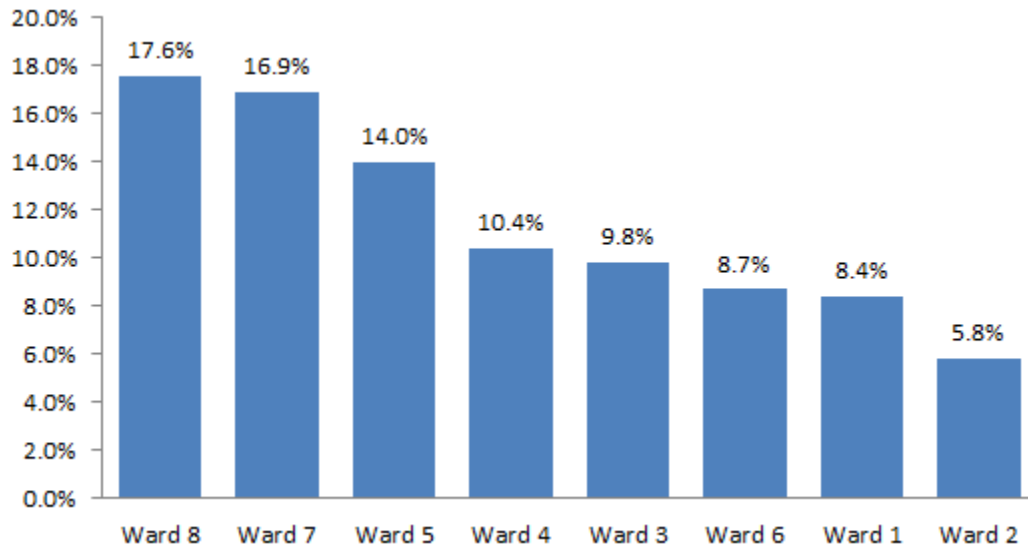


Figure 2: Current Asthma Rates Among District Adults, Ranked by Ward, BRFSS, 2014⁶

Current asthma rates are higher among children in Washington, DC than among children nationwide. An estimated 15.5% of District children 0–17 years of age currently have asthma, compared with 8.8% of children in the same age range nationwide.⁷ Similarly, while 22.8% of high school students nationwide have ever been told by a doctor or nurse that they had asthma; District students in middle and high school have a lifetime prevalence of asthma of 25.9% and 30.8%, respectively.⁸

A higher burden of asthma is also borne by youth of color in Washington, DC. African-American students in the District’s middle and high schools have much higher lifetime asthma

⁵ Government of the District of Columbia Department of Health, *Behavioral Risk Factor Surveillance System (BRFSS) Annual Health Report, 2014*, 39.

⁶ Ibid.

⁷ National Survey of Children's Health. NSCH 2011/12. Data query from the Child and Adolescent Health Measurement Initiative, Data Resource Center for Child and Adolescent Health website. Retrieved November 20, 2017 from <http://www.childhealthdata.org/browse/survey/results?q=2400&r=1&r2=10>.

⁸ Sowole-West, Omotunde and Scholl, Kelley (2016) *2015 District of Columbia Youth Risk Behavior Survey Surveillance Report*. Office of the State Superintendent of Education: Washington, DC, 56 and 68, <https://osse.dc.gov/sites/default/files/dc/sites/osse/publication/attachments/2015%20YRBS%20Report.pdf>

(Accessed November 20, 2017).

rates (at 28.8% and 32.6%, respectively) than their Caucasian counterparts (at 14.0% and 19.0%, respectively).⁹ Lifetime asthma rates are also higher among middle and high school students classified as Hispanic, Other, or Multiple Races, ranging from 21.3% to 35.6%.¹⁰

Figure 3 represents the asthma-related emergency room visits for residents of all ages, by Ward.¹¹ According to the DC Hospital Association, the highest rates of asthma-related emergency room visits are in Ward 8, 7, and 5.

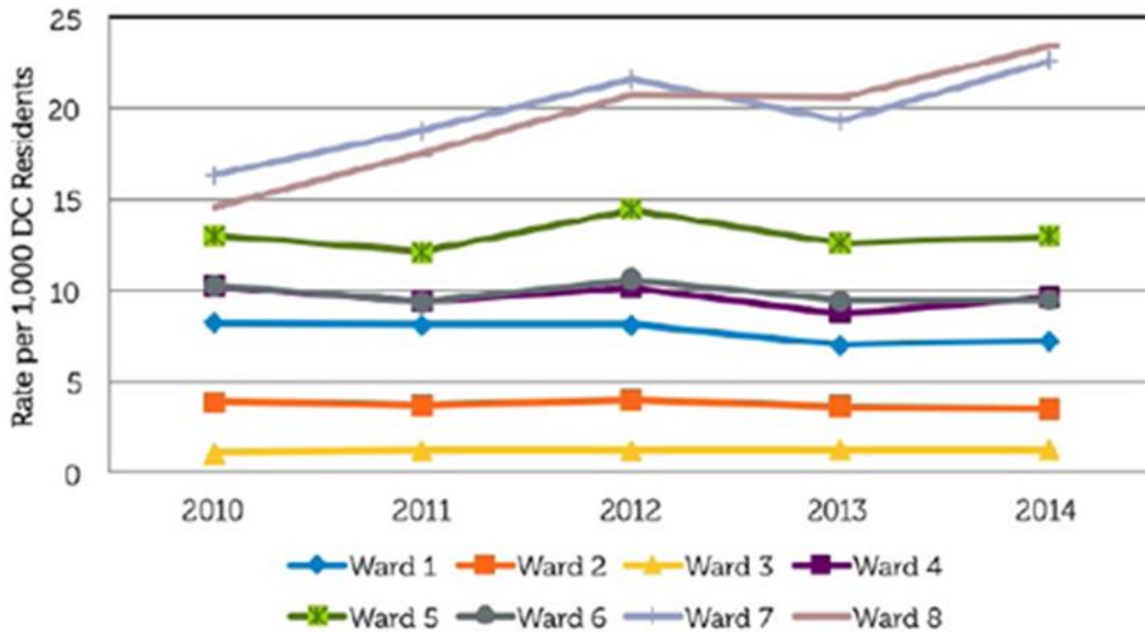


Figure 3: Emergency Room Visit Rate for Asthma by Ward, 2010-2014

Mortality Rates from Cancer and Heart Disease: There is evidence that exposure to NO₂ from vehicle emissions is associated with lung cancer.¹² Scientific studies have linked particle pollution exposure to various health impacts, including premature death in people with heart or

⁹ Ibid.

¹⁰ Ibid.

¹¹ District of Columbia Community Health Needs Assessment, June 2016, By Chaya Merrill, DrPH; Linda Cottrell, MPH; and, Kimberle Searcy, MPH, http://www.dchealthmatters.org/content/sites/washingtondc/2016_DC_CHNA_062416_FINAL.pdf (Accessed on November 20, 2017).

¹² Lung Cancer and Exposure to Nitrogen Dioxide and Traffic: A Systematic Review and Meta-Analysis, November 2015, By Ghassan Hamra, Francine Laden, Aaron Cohen, Ole Raaschou-Nielsen, Michael Brauer, and Dana Loomis, <https://ehp.niehs.nih.gov/1408882/> (Accessed April 23, 2018).

lung disease.¹³ See map in Appendix 3 for roadways with high traffic volumes in Washington, DC.

In Washington, DC, there are geographic disparities in the mortality rates from cancer and heart disease. Current mortality rates from cancer and heart disease among District residents are highest in Ward 8 and Ward 7, followed by Ward 5 (see Table 1).

Table 1: Mortality Rate per Ward¹⁴

| Ward | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cancer | 171.9 | 88.7 | 115.1 | 160.4 | 220.1 | 185.9 | 233.1 | 323.8 |
| Heart Disease | 204.3 | 127.6 | 98.5 | 188.2 | 267.5 | 224.1 | 309.4 | 370 |

Note: The mortality rate is stated as the age adjusted rate per 100,000. A higher number indicates a higher mortality rate.

Underrepresented Neighborhoods: According to 2016 Census estimates, the overall racial/ethnic makeup of Washington, DC residents is 47.7% African-American, 36.4% Caucasian, 10.9% Hispanic/Latino, and 4.1% Asian.¹⁵ The District’s Office of Planning reports that 25.9% of the District’s African-American residents, or nearly 80,000 individuals, were living in poverty in 2014.¹⁶ Roughly 47% of the District’s African-American population lives east of the Anacostia River, specifically in Wards 7 and 8, where the median income is less than half of the District’s \$75,000 median income.¹⁷

Geographically, the highest poverty rates in the city are in Wards 7 and 8, where more than 90% of the residents in both wards are African-American. The percentage of families living below the poverty level in Wards 7 (25%) and 8 (29%) is significantly higher than the citywide average of

¹³ Health and Environmental Effects of Particulate Matter, US Environmental Protection Agency, <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm> (Accessed April 23, 2018).

¹⁴ District of Columbia Behavioral Risk Factor Surveillance System, 2014, By Department of Health https://dchealth.dc.gov/sites/default/files/dc/sites/doh/publication/attachments/BRFSS_Annual_Report_2014.pdf (Accessed on April 19, 2018).

¹⁵ U.S. Bureau of the Census. QuickFacts: District of Columbia, U.S. Government Printing Office, Washington, DC, July 1, 2006, <https://www.census.gov/quickfacts/DC>, <https://www.washingtonian.com/2016/09/21/the-dc-area-has-the-highest-median-income-in-the-us-again/>; https://www.washingtonpost.com/local/dc-losing-black-residents-west-of-the-anacostia-census-data-show/2016/09/30/b74279e8-8725-11e6-92c2-14b64f3d453f_story.html?utm_term=.fafeef883a7c (Accessed on November 20, 2017).

¹⁶ https://planning.dc.gov/sites/default/files/dc/sites/op/page_content/attachments/Poverty%20in%20DC%202014_1.pdf (Accessed on November 20, 2017).

¹⁷ DC Fiscal Policy Institute. DC’s Black Residents Increasingly Live East of the Anacostia River, September 28, 2016, By Claire Zippel, <https://www.dcfpi.org/all/dcs-black-residents-increasingly-live-east-of-the-anacostia-river/> (Accessed on January 3, 2018).

18.5%, and about 15 times higher than in Ward 3 (2%).¹⁸ Rates of childhood poverty are also higher than average in these communities, at 40% in Ward 7 and 50% in Ward 8 (Table 2).¹⁹

Table 2: District Children < 5 Years, by Population, Race/Ethnicity, and Poverty, by Ward

| Ward | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Total Population | 4,723 | 2,174 | 4,241 | 5,565 | 5,743 | 4,804 | 5,204 | 7,870 |
| % Hispanic/Latino | 39% | 17% | 16% | 31% | 19% | 11% | 5% | 3% |
| % African-American | 28% | 4% | 4% | 46% | 63% | 29% | 94% | 91% |
| Child Poverty ²⁰ | 24% | 6% | 3% | 16% | 21% | 17% | 40% | 50% |

Priority Neighborhoods for VW Funds: Based on the review of asthma rates, mortality rates from cancer and heart disease, and income levels in Washington, DC, DOEE determined that Wards 7, 8, and 5 demonstrate the highest need. Accordingly, DOEE is prioritizing projects in Ward 7, Ward 8, and Ward 5 within the VW Spending Plan. Ward 7 and Ward 8 will receive a higher level of priority in the VW Spending Plan than Ward 5 due to exhibiting a higher level of need. Due to the types of projects that are eligible for VW funds and due to the mobile nature of vehicles, DOEE elected not to prioritize particular communities (Census tracts) within Wards.

4. Public Engagement

In June 2017, DOEE issued a Request for Information (RFI) to solicit public input on the potential uses of the District’s VW settlement funds. DOEE received 16 responses to the RFI. Summaries of the responses are posted on the District’s VW settlement webpage, <https://doee.dc.gov/node/1257131>.

DOEE also invited the public to complete a short survey on how the District should spend the VW settlement funds. DOEE received feedback from 170 residents across all eight Wards. Figures 4 and 5 illustrate the survey responses. A fuller summary of the survey responses is posted on the District’s VW settlement webpage, <https://doee.dc.gov/node/1257131>.

¹⁸District of Columbia Community Health Needs Assessment, June 2016, By Chaya Merrill, DrPH; Linda Cottrell, MPH; and, Kimberle Searcy, MPH, http://www.dchealthmatters.org/content/sites/washingtondc/2016_DC_CHNA_062416_FINAL.pdf (Accessed on November 20, 2017).

¹⁹ https://planning.dc.gov/sites/default/files/dc/sites/op/page_content/attachments/Key%20Indicators%202011-2015_0.pdf.

²⁰ Percent of children under 18 years living below 100 percent of the federal poverty level. Source: The Annie E. Casey Foundation, KIDS COUNT Data Center, <http://datacenter.kidscount.org>. Accessed April 17, 2017. From U.S. Census Bureau, 2010 Decennial Census, 2011-2014 ACS 5-Year Estimates.

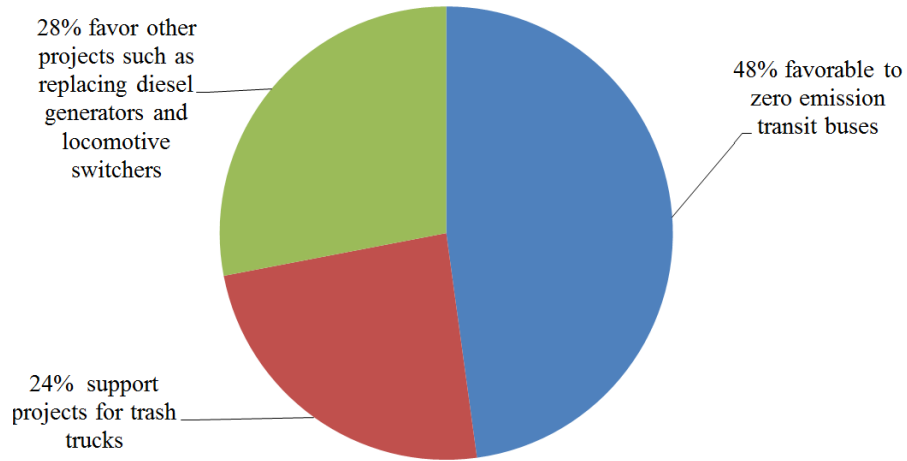


Figure 4: VW Proposed Projects Survey Results

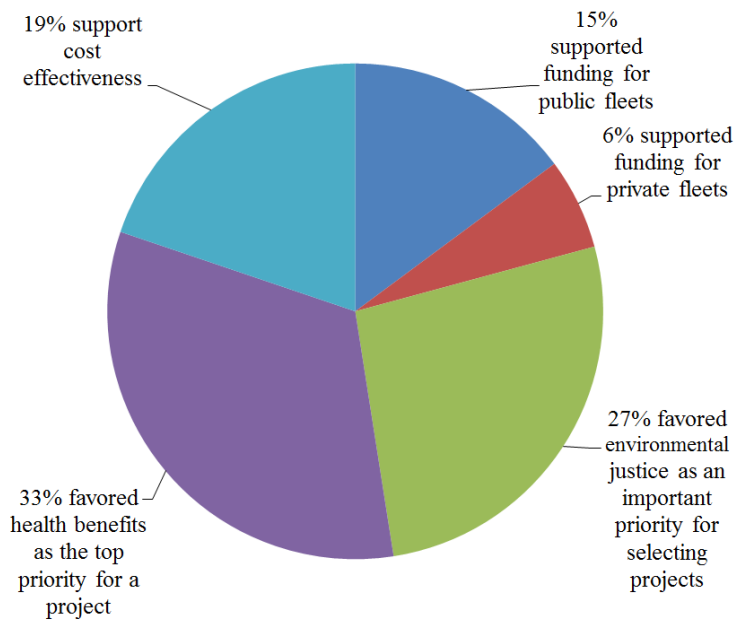


Figure 5: VW Project Selection Criteria in the Survey Results

On July 13, 2017, DOEE held a Public Information Open House in Ward 8 on the VW settlement funds. Approximately 25 members of the public participated and talked with DOEE staff about the settlement.

DOEE staff also met with interested entities and individual stakeholders upon request, and held discussions with other District Government agencies to gather their input.

While DOEE received comments on a wide variety of topics, several themes emerged:

- **Public transportation, specifically zero-emission buses.** The survey allowed respondents to rank their top three favorite project ideas, with 48 percent favoring transit buses (WMATA and Circulator). Additionally, 717 residents signed a Sierra Club petition requesting the Mayor to convert the Circulator bus fleet from diesel to electric through the use of VW settlement funds.
- **Trash trucks.** 24 percent of survey respondents favored lower-emitting trash trucks.
- **Reduce related pollutants (which include greenhouse gases, PM2.5, and air toxics) in addition to reducing NOx.** The survey allowed respondents to rank their top three factors to consider in project selection, with 33 percent of survey voters favoring health benefits.
- **Prioritize vulnerable communities/environmental justice.** 27 percent of survey respondents and 2 RFI commenters supported this goal.
- **Cost-effectiveness is an important but not deciding factor.** 19 percent of survey respondents and 5 RFI commenters supported this goal.

On January 26, 2018, DOEE solicited input on a Draft Spending Plan from all interested parties. The public comment period closed on March 12, 2018. DOEE received 16 written comments from trade associations, vehicle and equipment manufacturers, businesses, consultants, members of the public, a District government agency, and an environmental organization. Summaries of the responses are posted on the District's VW settlement webpage, <https://doee.dc.gov/page/volkswagen-settlement>.

On February 21, 2018, DOEE held a Public Information Open House in Ward 7 on the VW settlement funds. Approximately 5 members of the public participated and talked with DOEE staff about the settlement. Open House participants also had the opportunity to provide written comments on the Draft Spending Plan.

Some of the suggestions DOEE received during the public engagement process, while excellent, did not fit the legal parameters of eligible projects for funding through the VW settlement. The VW settlement funds are primarily geared towards equipment-based solutions related to repowering or replacing of older diesel vehicles.

During the implementation of the District's Spending Plan, DOEE will use its VW settlement webpage (<https://doee.dc.gov/page/volkswagen-settlement>) to house and publish District of Columbia-specific documents related to the VW settlement. This webpage will be used to publish all documents, information, and updates related to the VW Settlement, including documents to be submitted in support of each funding request and information on expenditures from the settlement.

5. Goals of the Beneficiary Mitigation Plan

The District selected and will implement mitigation actions that will achieve the following overarching goals:

- **Health:** Positively impact the health of Washington, DC residents by reducing emissions from diesel engines, such as NOx and PM2.5 emissions that contribute to lung and heart problems; GHG emissions that will increase temperature, flooding, and disease; and air toxics that contribute to cancer and birth defects.
- **Environmental Justice (EJ):** To ensure that all communities receive the same degree of protection from environmental and health hazards, prioritize VW funds to address air pollution in wards with the most vulnerable and impacted populations, including underrepresented communities, communities with high cancer and heart disease mortality rates, and neighborhoods with high asthma rates.
- **Zero-Emissions and Alternative Fuels:** Prioritize funds to drive the greatest possible reduction in emissions by catalyzing the adoption of zero-emission and alternative fuel vehicles.

6. Methodology for Project Selection

In evaluating potential projects to implement, we asked the following questions:

- i. Is it an eligible project per the VW settlement?²¹
- ii. How much will it reduce NOx emissions?
- iii. What other pollutants will be reduced and by how much?
- iv. What is the cost-effectiveness of the project? (dollars per ton of pollutant reduction)
- v. Can external funds be used to add to the VW settlement funds for the project?
- vi. Will the project provide a direct health benefit to vulnerable and impacted populations? For example, will the replacement vehicles be physically routed in areas of the city that have historically borne a disproportionate high share of air pollution?
- vii. Will the overall mix of projects cost-effectively contribute to NOx emission reductions while also helping to catalyze the adoption of zero emission and alternative fuel vehicles in Washington, DC?

7. Spending Plan

The District plans to spend the \$8.125 million of VW settlement funds in three project areas: locomotive switcher engine replacement; incentives for replacement of diesel transit buses and trash trucks; and rebates for tailpipe pollution reduction retrofits. DOEE will also use a portion of the VW funds for project administration. Each project is described in detail in this section. Table 3 provides a breakdown of the funds allocated for each project.

²¹ <https://www.vwcourtsettlement.com/wp-content/uploads/documents/DOJ/Approved%20Appendix%20D-2.pdf>

DOEE plans to leverage the VW funds as a match to the Diesel Emissions Reduction Act (DERA) grant. The DERA option provides additional funding for certain VW mitigation actions through a yearly grant provided by EPA to invest in cleaner vehicular technology and ultimately reduce emissions from diesel vehicles. In addition to the base amount of the DERA grant funds obtained, EPA will provide additional bonus funding equal to 50 percent of the base grant amount. For example, the District is expected to receive a DERA grant for \$411,000 (base amount \$274,000 plus \$137,000 bonus), which will be available for use during Fiscal Year (FY) 2019. As the DERA grant is not funded consistently on a year-by-year basis, DERA grant funds are not included in Table 3 beyond FY 2019. As noted in Table 3, the DERA grant will supplement VW funds for two specific eligible actions in the District’s Spending Plan- 1) Locomotive Switcher Engine Replacements and 2) Rebates for Tailpipe Pollution Reduction Retrofits.

Table 3 shows the timeframe in which DOEE plans to spend the funds. The timeframe for spending is subject to change based on the demand for each project; if demand for a project is low, DOEE may reallocate remaining funds to other projects in the Spending Plan. Table 3 does not include investment income (interest accrued) from the VW funds; to the extent that interest is accrued, DOEE may allocate the accrued interest towards any of the projects in the Spending Plan or to project administration as needed.

Also, as new zero-emission and alternative fuel vehicles become available, DOEE will evaluate and consider them for inclusion in the Spending Plan. To the extent that DOEE amends components of the Spending Plan projects in the future, updated project descriptions will be made available on the DOEE VW settlement webpage, <https://doee.dc.gov/page/volkswagen-settlement>.

Table 3: The District’s Spending Plan for VW Settlement Funds

| Project | VW Settlement Fund Contribution | | | | | | | | DERA Federal Grant Contribution | | Totals (VW+DERA) |
|--|---------------------------------|------------------|------------------|------------------|------------------|------------------|--------------------|--------------|---------------------------------|-----------------|--------------------|
| | FY 2019 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | VW Contribution | % of VW Fund | FY 2019 | FY 2020-FY 2024 | |
| Locomotive Switcher Engine Replacement (VW+DERA) | \$220,000 | \$520,000 | \$520,000 | \$520,000 | \$520,000 | | \$2,300,000 | 28% | \$300,000 | Unknown | \$2,600,000 |
| District Electrification And Low-NOx Program | \$5,031,000 | - | - | - | - | - | \$5,031,000 | 62% | | | \$5,031,000 |
| Rebates for Tailpipe Pollution Reduction Retrofits (VW+DERA) | \$89,000 | | | | | | \$89,000 | 1% | \$111,000 | Unknown | \$200,000 |
| DOEE Administrative Costs | \$155,000 | \$125,000 | \$125,000 | \$100,000 | \$100,000 | \$100,000 | \$705,000 | 9% | \$0 | | \$705,000 |
| Total | \$5,495,000 | \$645,000 | \$645,000 | \$620,000 | \$620,000 | \$100,000 | \$8,125,000 | 100% | \$411,000 | | \$8,536,000 |

Note: FY in this table refers to the District’s fiscal year which runs October 1 to September 30.

Locomotive Switcher Engine Replacement: DOEE plans to allocate 28 percent of the District's VW settlement funds (approximately \$2.3 million) to upgrade and repower five (5) old diesel-powered switcher locomotives at Union Station with new, much cleaner diesel engines (or electric engines if the technology becomes viable) over five years (starting in FY 2019 through FY 2023).

Switcher locomotives are engines that switch railcars or assemble trains in the railyard. The switcher locomotives at Union Station are high polluting sources because they operate every day (more than 8,000 hours per year); operate under high load conditions; are powered by diesel engines; and they are old – some switchers are over 50 years old. The switcher locomotives operate solely in the railyards that run between Ivy City and Union Station in Wards 5 and 6, respectively, which creates a hotspot for NOx and other pollutant emissions in this area. This investment is a very cost-effective way to reduce NOx emissions; this project alone will lead to approximately 1 percent reduction of total NOx emissions in Washington, DC. Under the terms and conditions of the VW settlement, to be eligible for this project the switcher locomotive must currently operate at least 1,000 or more hours per year.

Currently, a railyard in California is field testing battery powered all-electric switcher locomotives. As the technology advances and matures in the coming years, DOEE may reevaluate this project and consider exploring battery powered switchers instead of rebuilding diesel powered switcher locomotives.

This project will be funded jointly by VW funds and the DERA grant for up to 40 percent (approximately \$2.6 million) of the total cost estimated at \$6.5 million for the five switcher locomotives. Amtrak must contribute the remaining 60 percent (approximately \$3.9 million) of the cost for this project. As noted in Table 3, in FY 2019 a contribution of \$300,000 is expected from the DERA grant for this project. DERA grant funds, if available in FY 2020 through FY 2023, will reduce the VW settlement fund's contribution towards the locomotive switcher engine replacements. Whenever the DERA grant becomes available in a future year, the unspent VW funds allocated for this project will be moved to the other projects described below.

The District Electrification And Low-NOx Program (DEAL Program): The DEAL Program, to be managed by DOEE, will provide District government agencies with the means to overcome the high incremental cost of purchasing alternative fuel fleet. DOEE will allocate 62 percent of VW settlement funds (approximately \$5.03 million) to the DEAL Program starting in FY 2019. Any DEAL Program funds remaining available at the end of FY 2019 will be carried over to subsequent years until all funds are spent. DOEE may increase the funding amount allocated for the DEAL Program in future years if funds allocated to other projects become available. Conversely, DOEE may reduce the funding amount allocated for the DEAL program if there is insufficient demand and move those VW funds to other projects.

At this time, the DEAL Program covers the following technologies: electric transit buses and infrastructure, electric refuse trucks and infrastructure, and CNG refuse trucks. The funds will cover approximately 80 percent of the incremental cost of purchasing electric vehicle technologies, and 55 percent of the incremental cost of purchasing CNG technologies, when compared with the cost of purchasing a new diesel vehicle.²² Although the DEAL Program will not cover 100 percent of the incremental cost, savings made through fuel and maintenance will help cover the remaining costs and provide overall long term savings during the life of the new vehicle. As new zero emission and alternative fuel vehicles become available, DOEE will evaluate and consider them for inclusion in the Spending Plan.

The DEAL Program is modeled on successful vehicle voucher and rebate programs implemented in other jurisdictions,²³ which capped incentives at 80 percent of the incremental cost or up to a designated amount, usually no greater than \$150,000. These programs have demonstrated that covering a portion of the incremental cost of the new vehicle provides the vehicle owner with a significant financial savings over the lifetime of the vehicle. The DEAL Program approach is supported by the District's climate and energy action plan, Clean Energy DC, which states that zero emission buses have a significant role to play in reducing transit GHG emissions. Clean Energy DC recommends that the District pursue funding options to subsidize the purchase of electric transit vehicles and electric charging infrastructure.²⁴

Service Conditions and Vehicle Funding for the DEAL Program

District government agencies interested in participating in the DEAL Program will be responsible for meeting the following service conditions:

²² Please refer to Table A6 in the Appendix for cost comparison between electric, CNG, and new diesel refuse truck and transit bus replacements.

²³ including California, Oregon, New York, Maryland, and Chicago

²⁴ DOEE forthcoming publication of final Clean Energy DC Plan; draft available at: <https://doee.dc.gov/publication/cleanenergydc> .

Electric Transit buses:

| Service Conditions | Funding Amount per Vehicle |
|--|-----------------------------------|
| Requirements: <ul style="list-style-type: none"> • In order to be eligible for funds, agencies must prove that the vehicle and infrastructure will serve Wards 5, 7, and/or 8 for at least 60 percent of the service time or 60 percent of stops over a 6 year period. • The vehicle will have signage displaying the health benefits of the vehicle. • Agencies receiving funds must provide at least 6 asthma outreach/educational events over a 6 year period, irrespective of the number of vehicles purchased. | \$155,000 |
| Bonus: If the vehicle and infrastructure serves Wards 7 and/or 8 for at least 60 percent of the service time or 60 percent of stops over a 6 year period, the vehicle will be eligible for additional funding. | \$270,000 |
| Total available if all service conditions are met: | \$425,000 |

Electric and CNG refuse trucks:

| Service Conditions | Funding Amount per Vehicle for Electric Refuse Trucks | Funding Amount per Vehicle for CNG Refuse Trucks |
|---|--|---|
| Requirements: <ul style="list-style-type: none"> • The vehicle and infrastructure purchased with these funds must be used for routes in Wards 7 and 8, for a period of at least 6 years. The vehicle can also be used for routes outside Wards 7 and 8. • The vehicle will have signage displaying the health benefits of the vehicle. • Agencies receiving funds must provide at least 6 asthma outreach/educational events over a 6 year period, irrespective of the number of vehicles purchased. | \$240,000 | \$50,000 |
| Total available if all service conditions are met: | \$240,000 | \$50,000 |

DEAL Program Framework

District government agencies will be allowed to plan for their fleet replacement in future years by “reserving” a portion of the allotment on a “first come, first served” basis. However, the amount reserved must be used within two years or the funds will be reallocated to the next request in line.

DOEE has the ability to advance DEAL project funds to District government agencies that are within the District government’s financial system; District government agencies that are outside the District government’s financial system will receive a reimbursement after purchase has been completed. DOEE will establish agreements with each agency that will delineate the timing and the process for the funds transfer and reporting requirements. As a condition of receiving DEAL Program funds, the vehicle to be replaced must have been used for at least 1,000 hours annually and agencies will be required to supply proof for the scrapped vehicle they are replacing.

Rebates for Tailpipe Pollution Reduction Retrofits: DOEE plans to allocate one percent (approximately \$89,000) of the VW settlement to provide rebates to public and private fleet owners to retrofit any eligible diesel vehicle with EPA-verified idling reduction technologies and/or exhaust control retrofit technologies. This project will be funded jointly by VW funds and the DERA grant. In FY 2019, the DERA grant will provide \$111,000 in supplemental contribution that will result in a total of \$200,000 available funding for this project.

To be eligible for a rebate, vehicles must operate exclusively within Washington, DC. Funds will be available to qualified vehicles on a first-come first-served basis. Cost share will be required by the project participants. The two types of rebates available—for idling reduction technologies and for exhaust control retrofit technologies—are described below.

Idling Reduction Technologies

Idling reduction technologies (IRT) are devices that allow engine operators to reduce long-duration idling of the main propulsion engine by using an alternative technology. IRT devices are inexpensive, ranging from approximately \$1,500 to \$8,000, and are widely available in the market. Eligible idle reduction technologies are included in EPA’s approved list²⁵. Only on-road vehicles with model years 1995 to 2009 will be eligible for IRT rebates²⁶; off-road vehicles are not eligible. DOEE will provide rebates that will cover 25 percent of the cost of idle reduction technology. The VW settlement (DERA option) requires fleet owners to cover 75 percent of the cost.

²⁵ <https://www.epa.gov/verified-diesel-tech/smartway-verified-list-idling-reduction-technologies-irts-trucks-and-school>.

²⁶ Vehicles with model years 2006-2009 will not be eligible for Auxiliary Power Unit installation.

Exhaust Control Retrofit Technologies

Exhaust control retrofit technologies are products that may be added to further reduce emissions from certified engine configurations. Examples of exhaust control retrofit technologies are diesel particulate filters, diesel oxidation catalysts, and engine component upgrades. Exhaust control retrofit technologies range in price from \$7,000 to \$25,000 and could result in emission reductions of NO_x and PM_{2.5} up to 70% and 90%, respectively. Both on-road and non-road vehicles are eligible. Funding will be available for most technologies found on EPA's approved list, "Verified Technologies List for Clean Diesel," with the exception of biodiesel.²⁷ DOEE will limit the rebate to 75% of the total cost (up to \$18,750) and fleet owners will cover the remaining 25% for the retrofits.

Project Administration: DOEE plans to allocate 9 percent (approximately \$705,000) of the VW funds for administrative purposes. These funds will cover the costs of program outreach, soliciting and reviewing project applications, writing Memoranda of Understanding with agencies, issuing rebates, verifying project completion, verifying scrappage, discussions with EPA and technical experts, accounting, audits, legal compliance, recordkeeping, reporting and related costs. In FY 2019, DOEE plans to hire one full-time staff member to coordinate the implementation of the Spending Plan. DOEE is also considering outsourcing some of these administrative functions, such as issuing rebates and verifying the destruction of engines, through a competitive procurement process. DOEE will report its actual administrative expenditures associated with implementing each project as part of its regular reports to the VW Settlement Trust.

8. Estimated Emission Benefits

DOEE has estimated the emission reduction benefits that could be achieved from the Locomotive Switcher Engine Replacement project, DEAL Program, and the Tailpipe Pollution Reduction Rebates at the proposed funding levels. The estimates for the DEAL Program were prepared using a hypothetical mix of vehicle categories, model years, fuel types, and charging station capacities. Emission reduction data was modeled using the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool from Argonne National Laboratory and EPA's Diesel Emissions Quantifier. Actual emission benefits will vary depending on the specifics of the projects approved for funding.

Table 4 presents the costs and the total emission benefits, based on conservative estimates, resulting from the projects proposed in this spending plan.

²⁷ <https://www.epa.gov/verified-diesel-tech/verified-technologies-list-clean-diesel> .

Table 4: Potential Costs and Emission Benefits for All Projects²⁸

| Project | NOx Reduction (tons/year) | PM2.5 Reduction (tons/year) | GHG Reduction (tons/year) | Cost (in millions)* |
|--|----------------------------------|------------------------------------|----------------------------------|----------------------------|
| Switcher Engine Replacement | 60-65 | 1-2 | 685-695 | ~\$2.60 |
| DEAL Vehicle Projects | 6-47 | 0.1-2 | 285-4,002 | ~\$5.04 |
| Tailpipe Pollution Reduction Retrofits Project | 1-2 | 0.1-0.5 | 0-160 | ~\$0.20 |
| Total | 67-114 | 1.2-4.5 | 970-4,857 | ~\$7.84 |

* The cost estimates are based on the District’s VW fund contribution and DERA grant.

9. Equipment the District Decided Not To Fund

There are other types of equipment eligible for VW settlement funds, which the District has elected not to fund:

Electric vehicle charging infrastructure for light duty vehicles: The District is not allocating VW settlement funding for supply equipment, such as electric vehicle charging stations, for light duty zero emissions vehicles. The primary beneficiaries of this type of infrastructure would be private owners of electric vehicles. Instead, the District has opted to prioritize vehicle types that provide a direct benefit to a greater number of residents. Separately from the VW effort, the District is involved in ongoing work to leverage private funding to invest in private vehicle charging infrastructure in Washington, DC. Additionally, Electrify America is planning to install ZEV charging stations in the DC metropolitan area in the next 24 months.

Biofuels: Biofuel repowering was not chosen due to the Department of Public Works’ interest in using soybean oil. When evaluating biofuels developed from soybean oil, a life cycle analysis shows the land use for growing the soybean is not sustainable and could be as harmful to the environment as the use of fossil fuels in regards to GHG emissions. The benefits of using the necessary land for food production rather than for fuel production are also a subject of debate.²⁹

²⁸ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool and EPA’s Diesel Emissions Quantifier Tool. This data is calculated based on preliminary assumptions about the types and numbers of vehicles that will participate in these programs.

²⁹ http://www.raeng.org.uk/publications/reports/biofuels_

Another concern revolves around the issue that biodiesel fuel could increase NOx emissions compared to petroleum diesel, possibly as much as 10 to 12 percent.³⁰ There has been development of control technologies that have successfully mitigated the increased NOx emissions but these technologies have resulted in decreased engine efficiency and have shown an increase in other harmful pollutants, such as carbon monoxide and hydrocarbons.³¹

New diesel trucks and buses: DOEE decided not to fund new diesel trucks and buses mainly due to environmental factors. Although new diesel vehicles have greatly reduced their NOx emissions, use of diesel powered vehicles still results in relatively high GHG and air toxics emissions. DOEE also wants to incentivize more zero emission vehicles, and the continued purchase of diesel vehicles would inhibit the incentive to move toward zero emission technology.

CNG buses: It appears that there is not much interest by District agencies to invest in any CNG buses due to the successful deployment of electric buses in other cities and the high cost of CNG fueling infrastructure. Table A8 also shows that CNG buses result in higher GHG emissions compared to electric buses.

School buses: The Office of the State Superintendent of Education (OSSE) is currently replacing older diesel school buses with new gasoline vehicles. Gasoline vehicle replacement is not eligible for funding under the VW Settlement Appendix D-2; therefore, the VW funds could not be utilized for this project.

10. Next Steps

This Spending Plan has been developed in accordance with the terms of the VW settlement. Funding from the VW settlement will be made available to the District 30 days after this Spending Plan is accepted by the VW Trustee. DOEE expects to begin implementing the Spending Plan in early FY 2019. DOEE will use the District's VW settlement webpage (<https://doee.dc.gov/page/volkswagen-settlement>) to announce funds availability and application instructions, along with other District of Columbia-specific documents related to the VW settlement.

³⁰ <https://elibrary.asabe.org/abstract.asp?aid=20475>.

³¹ <http://www.sciencedirect.com/science/article/pii/S0196890413004305>.

APPENDICES

Appendix 1: Description of Locomotive Switcher Engine Replacement

Table A1: Locomotive Switcher Engine Replacement

| | |
|---|---|
| Project Description: | Replace the engines of five older diesel switcher locomotives with new diesel engines that are compliant with EPA’s Tier 4 emission standards, or replacement with battery powered all-electric switchers. The switchers operate between Ivy City in Ward 5 and the Union Station Rail Terminal. |
| Implementing Agency: | Amtrak |
| Timeline for Implementation: | 5 years |
| Project Cost: | Cost per switcher: \$1.3 million Total project cost (for 5 switchers): \$6.5 million |
| Leveraging: Will the project leverage outside funds? | Yes. This project will use DERA grant funds and Amtrak funds, in addition to VW settlement funds. Through the DERA option, Amtrak must contribute 60 percent of the cost of the project over the five year period. |
| Anticipated Benefits: | Per switcher: <ul style="list-style-type: none"> • NOx reduction: 12.9 tons per year • PM2.5 reduction: 0.33 tons per year • GHG reduction: 138.4 tons of CO2 per year • Increased reliability, and reduced maintenance and fuel costs |
| EJ considerations | Switchers operate solely in the railyards that run between Ivy City and Union Station in Wards 5 and 6, respectively. Please refer to Figures A1 and A2 for a map of the railyard where the switchers are located. Comparing Figures A1 and A2 with Figure 3, the railyards are located adjacent to and upwind from the Wards with the highest asthma rates. As the prevailing wind direction flows toward the southeast, the emissions from the railyard flow through Wards 5, 7, and 8. |

Table A2: Cost Benefit Analysis of a Switcher Replacement³²

| Option | Tons of NOx Reduced/yr | Tons of PM2.5 Reduced/yr | Tons of CO2 Reduced/yr | Cost of new switcher | \$/Ton of NOx Reduced | \$/Ton of PM2.5 Reduced | \$/Ton of CO2 Reduced |
|-----------------------------------|------------------------|--------------------------|------------------------|----------------------|-----------------------|-------------------------|-----------------------|
| New Diesel Switcher Engines | 12.9 | 0.33 | 138.4 | \$1,300,000 | \$104,284 | \$3,951,368 | \$9,393 |
| All-Electric Switcher Replacement | 13.9 | 0.343 | 281.3 | \$1,260,000 | \$90,647 | \$3,673,469 | \$4,479 |

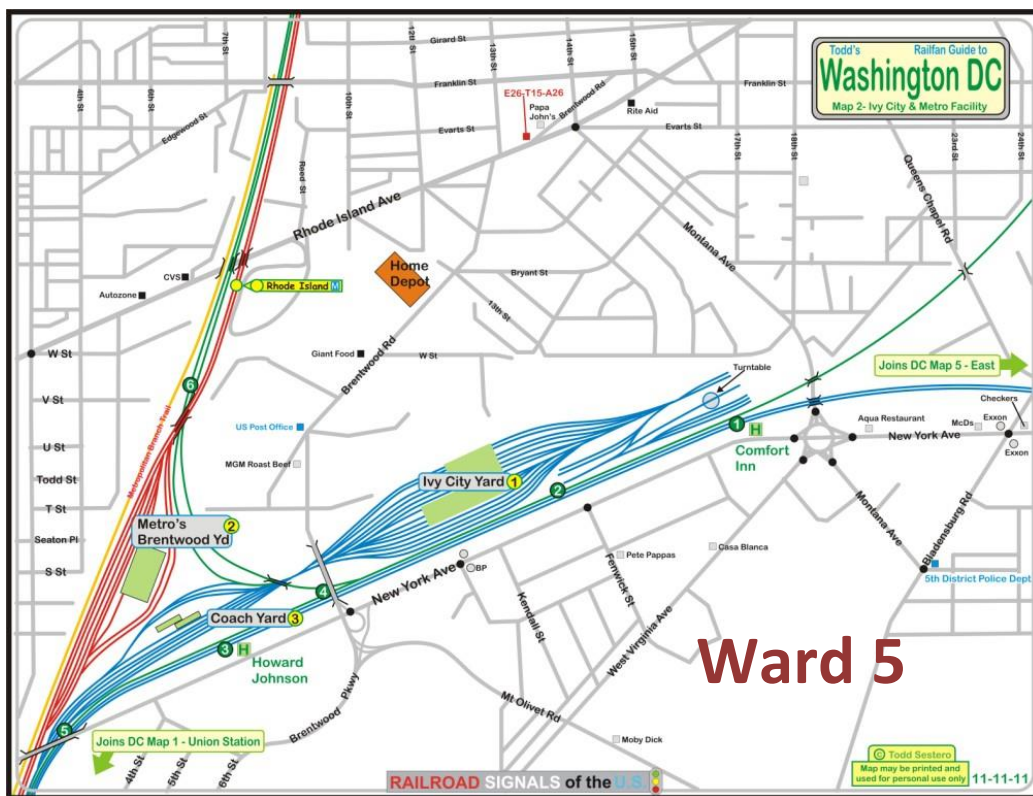


Figure A1: Map of the Ivy City railyard in Ward 5. The railyard is depicted as the blue lines.³³

³² Emission estimates were calculated from EPA's Diesel Emissions Quantifier Tool. Cost estimates are based on an engine replacement cost of \$1,300,000 and do not include maintenance/repair, fuel, infrastructure, etc. The emission reductions are calculated based on the replacement of an older diesel locomotive.

³³ <http://www.railfanguides.us/dc/map2/index.htm>.

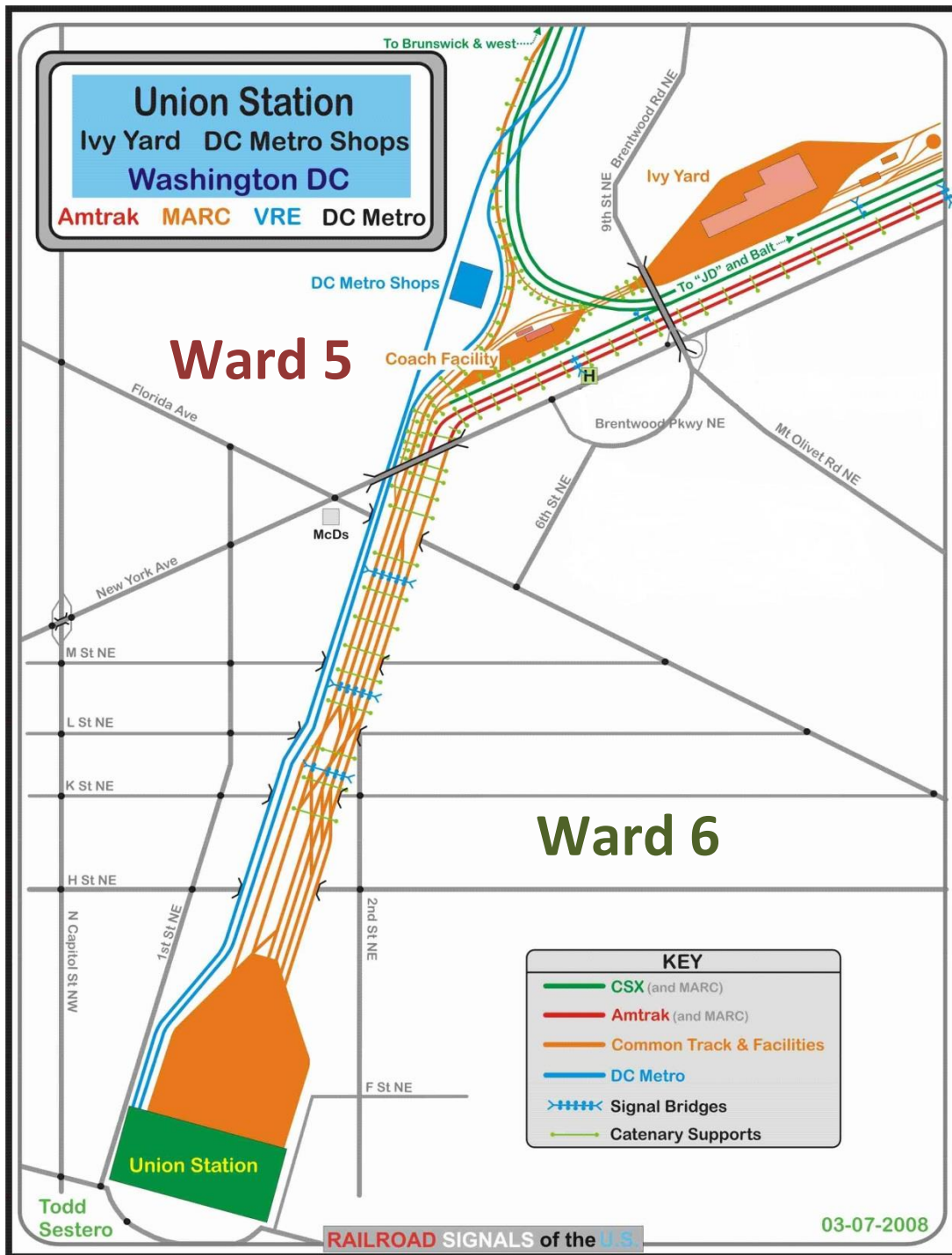


Figure A2: Map of the Union Station Railyard and Its Connection to the Ivy City Railyard (both in orange color).³⁴

³⁴ <http://www.railfanguides.us/dc/map2/index.htm>

Appendix 2: Description of DEAL Program

TableA3: Electric Refuse Truck Replacement

| | |
|---|---|
| Project Description: | The DEAL Program funds enable District government agencies to replace older diesel refuse trucks by covering a portion of the incremental cost for new electric refuse trucks and infrastructure. |
| Implementing Agency: | To be determined. |
| Timeline for Implementation: | Starting in FY 2019, until funds run out. |
| Project Cost: | A new electric refuse truck is estimated to cost \$450,000, and the infrastructure cost for one electric refuse truck is an additional \$50,000 to \$60,000. ³⁵ The DEAL Program will fund up to \$240,000 towards the cost of a new electric refuse truck and infrastructure. This amount (\$240,000) corresponds to 80 percent of the difference between the cost of purchasing a new electric refuse truck (and associated electric infrastructure) and the cost of purchasing a new diesel refuse truck. |
| Leveraging: Will the project leverage outside funds? | Yes. The agency purchasing the vehicle will cover the remaining costs as part of the DEAL Program. |
| Anticipated Benefits: ³⁶ | <ul style="list-style-type: none"> • NOx reduction: 0.470 tons • PM2.5 reduction: 0.021 tons • GHG reduction: 56.2 tons • Noise reduction, and reduced maintenance and fuel costs |
| EJ considerations | The vehicle and infrastructure purchased with these funds must be used for routes in Wards 7 and 8, for a period of at least 6 years. The vehicle can also be used for routes outside Wards 7 and 8. |

³⁵ Source: AFLEET.

³⁶ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool and EPA's Diesel Emissions Quantifier Tool.

TableA4: DEAL Program-- CNG Refuse Truck Replacement

| | |
|---|--|
| Project Description: | The DEAL Program funds enable District government agencies to replace older diesel refuse trucks by covering a portion of the incremental cost for new CNG refuse trucks. |
| Implementing Agency: | To be determined. |
| Timeline for Implementation: | Starting in FY 2019, until funds run out. |
| Project Cost: | A new CNG refuse truck is estimated to cost \$300,000. The DEAL Program will fund up to \$50,000 towards the cost of a new CNG refuse truck. This amount (\$50,000) corresponds to 55 percent of the difference between the cost of purchasing a new CNG refuse truck and the cost of purchasing a new diesel refuse truck. (CNG fueling station infrastructure costs are not eligible for VW settlement funds.) |
| Leveraging: Will the project leverage outside funds? | Yes. The agency purchasing the vehicle will cover the remaining costs as part of the DEAL Program. |
| Anticipated Benefits: ³⁷ | <ul style="list-style-type: none"> • NOx reduction: 0.470 tons • PM2.5 reduction: 0.021 tons • GHG reduction: 39.7 tons • Noise reduction |
| EJ considerations | The vehicle and infrastructure purchased with these funds must be used for routes in Wards 7 and 8, for a period of at least 6 years. The vehicle can also be used for routes outside Wards 7 and 8. |

Table A5. Cost Benefit Analysis of a Refuse Truck Replacement³⁸

| Option | Tons of NOx Reduced/yr | Tons of PM2.5 Reduced/yr | Tons of GHG Reduced/yr | Cost of Vehicle | \$/Ton of NOx Reduced | \$/Ton of PM2.5 Reduced | \$/Ton GHG Reduced |
|---------------|-------------------------------|---------------------------------|-------------------------------|------------------------|------------------------------|--------------------------------|---------------------------|
| Electric | 0.47 | 0.02 | 56.2 | \$450,000 | \$955,414 | \$21,276,596 | \$8,007 |
| CNG | 0.47 | 0.02 | 39.7 | \$300,000 | \$638,978 | \$14,598,540 | \$7,557 |

³⁷ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool.

³⁸ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool. Cost estimates are based on the purchase price of a new electric or CNG refuse truck and do not include maintenance/repair, fuel, infrastructure, etc. The emission reductions are calculated based on the replacement of an older diesel vehicle.

TableA6: DEAL Program—Electric Transit Bus Replacement

| | |
|---|---|
| Project Description: | The DEAL Program funds enable District government agencies to replace older diesel transit buses by covering a portion of the incremental cost for new electric transit buses and infrastructure. |
| Implementing Agency: | To be determined. |
| Timeline for Implementation: | Starting in FY 2019, until funds run out. |
| Project Cost: | The estimated cost of a new electric transit bus is \$770,000, and the infrastructure cost for one electric transit bus is an additional \$50,000 to \$60,000. ³⁹ The DEAL Program will fund up to \$425,000 of the cost of a new electric transit bus and infrastructure. This amount (\$425,000) corresponds to 80 percent of the difference between the cost of purchasing a new electric transit bus (and associated electric infrastructure) and the cost of purchasing a new diesel transit bus. |
| Leveraging: Will the project leverage outside funds? | Yes. The agency purchasing the vehicle will cover the remaining costs as part of the DEAL Program. |
| Anticipated Benefits: ⁴⁰ | <ul style="list-style-type: none"> • NOx reduction: 0.462 tons • PM2.5 reduction: 0.010 tons • GHG reduction: 24 tons • Noise reduction, and reduced maintenance and fuel costs |
| EJ considerations | <p>As a minimum requirement, agencies must prove that the vehicle and infrastructure will serve Wards 5, 7, and/or 8 for at least 60 percent of the service time or 60 percent of stops over a 6 year period.</p> <p>If the vehicle and infrastructure serves Wards 7 and/or 8 for at least 60 percent of the service time or 60 percent of stops over a 6 year period, the vehicle will be eligible for additional funding.</p> |

³⁹ Source: AFLEET.

⁴⁰ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool.

Table A7: Cost Benefit Analysis of a Transit Bus Replacement⁴¹

| Option | Tons of NOx Reduced/yr | Tons of PM2.5 Reduced/yr | Tons of GHG Reduced/yr | Cost of Vehicle | \$/Ton of NOx Reduced | \$/Ton of PM2.5 Reduced | \$/Ton GHG Reduced |
|----------|------------------------|--------------------------|------------------------|-----------------|-----------------------|-------------------------|--------------------|
| Electric | 0.46 | 0.01 | 24.1 | \$770,000 | \$1,666,667 | \$74,038,462 | \$31,950 |

Table A8: Project Comparisons between Refuse Truck and Transit Bus Replacements⁴²

| Vehicle Type | Vehicle Purchase Cost ⁴³ | NOx Emissions (tons emitted per year) | PM 2.5 Emissions (tons emitted per year) | GHG Emissions (tons emitted per year) | Air Toxics Emissions (tons emitted per year) |
|-------------------------|-------------------------------------|---------------------------------------|--|---------------------------------------|--|
| Electric Refuse Truck | \$450,000 | 0 | 0 | 139 | NONE |
| CNG Refuse Truck | \$300,000 | 0.001 | 0.001 | 156 | MEDIUM |
| New Diesel Refuse Truck | \$210,000 | 0.029 | 0.001 | 196 | HIGH |
| Electric Transit Bus | \$770,000 | 0 | 0 | 64 | NONE |
| CNG Transit Bus | \$360,000 | 0.0013 | 0.001 | 72 | MEDIUM |
| New Diesel Transit Bus | \$300,000 | 0.027 | 0.001 | 88 | HIGH |

⁴¹ This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool. Cost estimates are based on the purchase price of a new electric transit bus and do not include maintenance/repair, fuel, infrastructure, etc. The emission reductions are calculated based on the replacement of an older diesel vehicle.

⁴² This information was calculated from Argonne National Laboratory Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool and EPA's Diesel Emissions Quantifier Tool. This chart illustrates the total pollution emitted from one vehicle per year.

⁴³ The vehicle cost does not include the infrastructure cost of charging or fueling station. Electric charging stations typically cost around \$100,000 and can be covered under the VW funds. CNG fueling infrastructure typically costs around \$1.2 million and is not eligible for funding. Both costs include installation. Source: Alternative Fuels Data Center.

Appendix 3: Traffic Volume Data

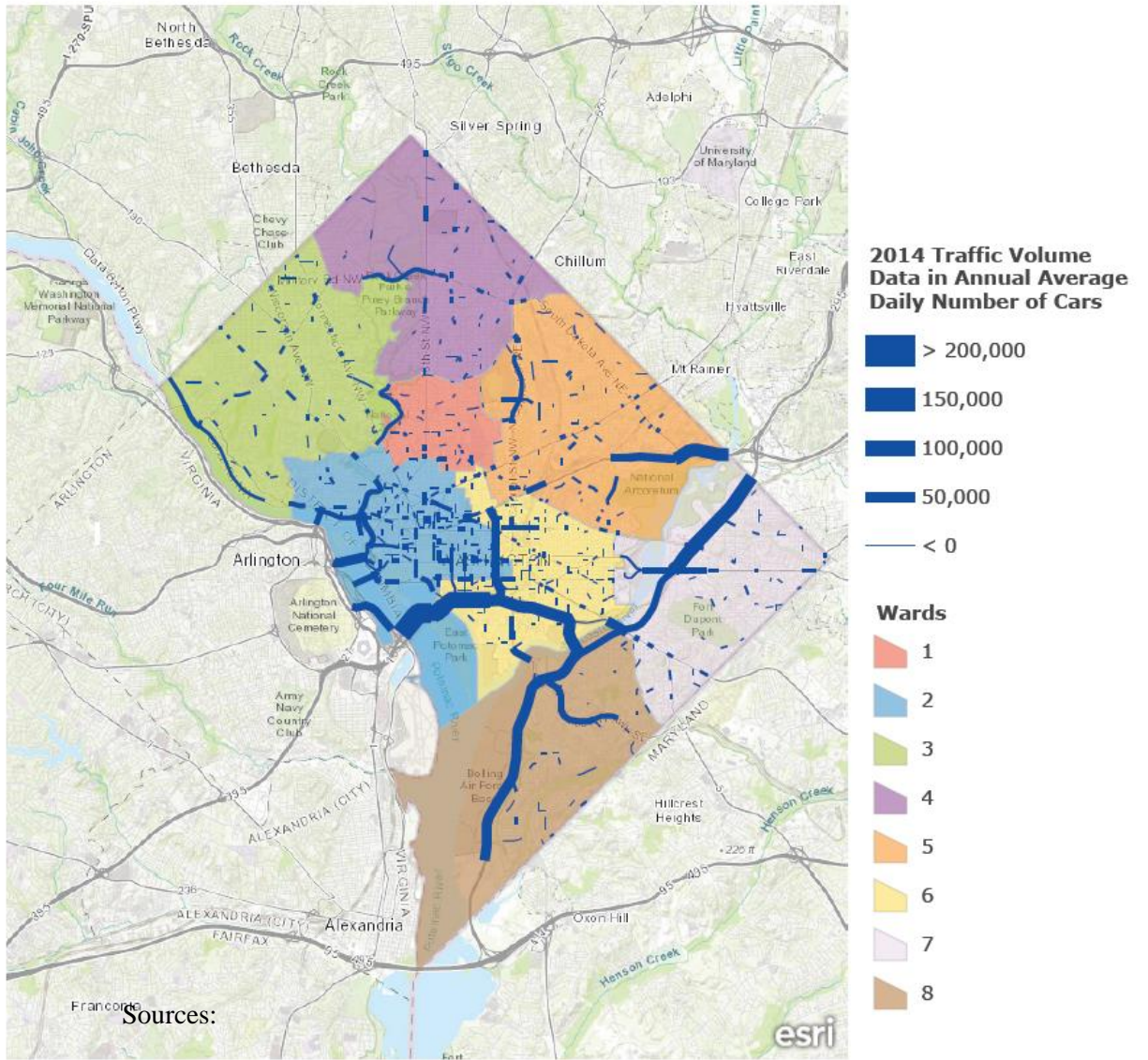


Figure A3: Daily Traffic Volume Data in Washington, DC