★ **Roll Call Number**
20-1551

Agenda Item Number
6

Date October 5, 2020

RATIFYING AND APPROVING SUBMISSION OF THE IOWA CLEAN AIR ATTAINMENT PROGRAM (ICAAP) FUNDING APPLICATION TO THE IOWA DEPARTMENT OF TRANSPORTATION (IOWA DOT) FOR THE TRAFFIC SIGNAL SYSTEM TIMING UPDATE – PHASE 4

BE IT RESOLVED, BY THE CITY COUNCIL OF THE CITY OF DES MOINES, IOWA: That the actions of the City Engineer in submitting an application to the Iowa Department of Transportation for Iowa Clean Air Attainment (ICAAP) Program funds are hereby ratified and approved for the following project:

Traffic Signal System Timings Update - Phase 4

BE IT FURTHER RESOLVED upon project completion, the City will be responsible for adequately maintaining and operating the project for public use during the project's useful life and will commit the necessary local matching funds to implement the project.

(Council Letter Number 20-440 attached)

Moved by Gatto to adopt.

FORM APPROVED: s/Kathleen Vanderpool
Kathleen Vanderpool
Deputy City Attorney

Funding Source: ICAAP in the amount of $220,000 are requested for this project. $55,000 (remaining amount pending funding award) 2020-2021 CIP, Page Street Improvements – 54, Traffic System Operation Improvements, C038EG99 TR097.

COUNCIL ACTION	YEAS	NAYS	PASS	ABSENT
COWNIE	✓			
BOESEN	✓			
GATTO	✓			
GRAY	✓			
MANDELBAUM	✓			
VOSS	✓			
WESTERGAARD	✓			
TOTAL	7			

MOTION CARRIED APPROVED

J. W. Franklin Cownie
Mayor

CERTIFICATE

I, P. Kay Cmelik, City Clerk of said City hereby certify that at a meeting of the City Council of said City of Des Moines, held on the above date, among other proceedings the above was adopted.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the day and year first above written.

P. Kay Cmelik
City Clerk

Application for FY2022
Clean Air Attainment Program Funds
Iowa Department of Transportation

Traffic Signal System Timing Update – Phase 4

City of Des Moines
Traffic and Transportation Division

October 1, 2020

CITY OF DES MOINES
ENGINEERING DEPARTMENT

Form 230017 (05-20)

IOWADOT

PROJECT APPLICATION
IOWA CLEAN AIR ATTAINMENT PROGRAM (ICAAP)

General Information:

Applicant Agency: City of Des Moines (Public Agency (required)) E-mail: cdbogenreif@dmgov.org

Contact Person (*Name and Title*): Corey Bogenreif, PE, Principal Traffic Engineer

Complete Mailing Address: 400 Robert D Ray Drive (Street Address and/or Box Number)

Des Moines (City) | IA (State) | 50309 (ZIP Code) | 515-208-4014 (Daytime Phone)

If more than one agency or organization is involved in this project, please state the name, contact person, mailing address, and telephone number of the second agency. *(Attach an additional page if more than two agencies are involved.)*

Co-Applicant Agency: N/A (Public Agency, Non-Profit Organization[1], For-Profit Organization[1], or Individual[1]) E-mail:

Contact Person (*Name and Title*):

Complete Mailing Address: (Street Address and/or Box Number)

City | State | ZIP Code | Daytime Phone

Project Information:

Project Title[2]: Traffic Signal System Timing Update - Phase 4

Project Description (including length, if applicable):

Review and update signal timing and phasing plans of the traffic signal system in Des Moines. This project is the fourth phase of a multi-phase project to update the signal operations through the entire city. SYNCHRO traffic models will be used to help optimize signal cycle lengths, basic signal timings, split timings, offsets, and time of day periods for coordination plans.

*Project priority (1 = highest priority): 1 (a sponsor submitting multiple applications in this funding cycle must assign a numerical rank or priority to each application.)[3]

*Assign the proposed project to one or more of the following categories (check one or more):

- ☐ Transportation-Related Project in the State Implementation Plan (SIP)
- ☐ Transportation Control Measure (TCM)
- ☑ Traffic Flow Improvement (Intersection, Signalization, Other)
- ☐ Planning and Project Development
- ☐ Travel Demand Management (TDM)
- ☐ Transit-Related Improvement
- ☐ Shared-Ride
- ☐ Bicycle or ☐ Pedestrian Facility or Program (select one)
- ☐ Intermodal Freight
- ☐ Passenger
- ☐ Alternative Fuels
- ☐ Vehicle Inspection and Maintenance Program
- ☐ Outreach Activity (Education, Advertising, or Technical Assistance)

*Is the project consistent with the State Implementation Plan for air quality for non-attainment areas? ● Yes ☐ No ☐ Not Applicable

*Is the project consistent with the MPO's local congestion management plan? ● Yes ☐ No ☐ Not Applicable

*Is the project consistent with the ● MPO ☐ RPA ☐ Statewide Long-Range Transportation Plan? ● Yes ☐ No ☐ Not Applicable

Notes: [1]Requires public agency as co-sponsor of application.
[2]The term "project" means any ICAAP infrastructure or program proposal.
[3]The Iowa Department of Transportation will use the priority ratings to reflect the sponsor.

Project Costs *(an itemized breakdown must be included on an attached sheet)*:

Total Cost: $275,000.00

Iowa Clean Air Attainment Program Fund Request: $220,000.00

Applicant Match $55,000.00

Projects with a private for-profit co-applicant require a minimum 50 percent applicant match; all other projects require a minimum 20 percent applicant match.

	List All Applicant Match Sources	Amount	Assured or Anticipated (Date Anticipated)
1.	City of Des Moines	$55,000.00	December 31, 2022
2.			
3.			

Are any state funds involved in this project? ☐ Yes ● No

If Yes, please explain the source and conditions:

Are any other federal funds involved in this project? ☐ Yes ● No

If Yes, please explain the source and conditions:

Estimated Project Development Schedule:

Design:	Start Date:	July 01, 2021	Completion Date:	December 31, 2022
Land Acquisition:	Start Date:		Completion Date:	
Construction:	Start Date:		Completion Date:	

Has any part of this project been started? ☐ Yes ● No

If Yes, please explain:

How do you plan to measure the success of this project?

Travel time studies will be performed before and after the timing change implementation to determine reduction in travel times / associated emissions.

Required Documentation and Narrative Information

The following documents and narratives must be submitted with this application. In the upper right corner of each document or narrative write the corresponding letter shown below.

☒ A. A NARRATIVE assessing existing congestions/air quality conditions, outlining the concept of the proposed project, and providing adequate project justification. How will this project reduce congestion, reduce travel or single occupant vehicle usage, and/or improve air quality? Which transportation-related pollutant(s) are being addressed: carbon monoxide, ozone, or particulate matter (PM)?

☒ B. A DETAILED MAP identifying the location of the project and clearly differentiating the subject project from any past or future project phases.

☒ C. An ITEMIZED BREAKDOWN of the total project costs. This documentation does not need to be a detailed, line-item type of estimate. However, it must accomplish two objectives: First, it must show the method by which the cost estimate was prepared; and second, it must enable a reviewer to determine if the cost estimate is reasonable. The manner in which these objectives are achieved may vary widely depending on the type, scope, and complexity of the project. Absent a fully itemized list of costs, some general guidelines for possible methods of estimating each type of project cost are provided on Attachment A.

☒ D. A TIME SCHEDULE for the total project development.

☒ E. An OFFICIAL CERTIFICATION from the applicant's governing body (authority) that it shall:
(1) commit the necessary local matching funding for project implementation and
(2) upon project completion, be responsible for adequately maintaining and operating the project for public use during the project's useful life.

☒ F. An ADOPTED FORMAL RESOLUTION from the appropriate MPO or RPA declaring the sponsor's proposed project or program conforms to the MPO's or RPA's regional transportation planning process. (For MPOs, the project or program must be identified in the fiscally constrained transportation plan and, if applicable, the congestion management plan in TMAs.)

☒ G. CALCULATIONS for vehicle emission reductions and total project cost-effectiveness for the targeted pollutants. Project applicant must show through a quantitative analysis how many kilograms of pollutant will be reduced (CO, VOC, NOx, and, if applicable, PM). Project sponsor must calculate the cost-effectiveness of the project by: Dividing the total annualized project cost by the number of kilograms per year of pollutant reduced ($ per kg). Applicant must also show all assumptions and source of data used to calculate the estimates. The applicant must use the most current vehicle emission factors developed by the Iowa DNR and consistent with the U.S. EPA's MOBILE 6.2 air quality model. These emission factors are periodically updated and may be obtained from the Iowa DOT's ICAAP website at: https://iowadot.gov/systems_planning/Grant-Programs/Iowa-Clean-Air-Attainment-Program-ICAAP.

☒ H. Completed MINORITY IMPACT STATEMENT attached to application.

The award of ICAAP funds; any subsequent funding or letting of contracts for design, construction, reconstruction, improvement, or maintenance; and the furnishing of materials for this project shall not involve direct or indirect interest of any state, county, or city official, elective or appointive. All of the above are prohibited by Iowa Code 314.2, 362.5, or 331.342. Any award of funding or any letting of a contract in violation of the foregoing provisions shall invalidate the award of ICAAP funding and authorize a complete recovery of any funds previously disbursed.

Certification

To the best of my knowledge and belief, all information included in this application is true and accurate, including the commitment of all physical and financial resources. This application has been duly authorized by the participating local authority. I understand the attached **official endorsement(s)** binds the participating local governments to assume responsibility for adequate maintenance of any new or improved facilities.

If ICAAP funding assistance is approved for the project described in this application, I understand that an executed contract between the applicant and the Iowa DOT is required before such funding assistance can be authorized for use in implementing the project.

Representing the City of Des Moines
(Name of Applicant's Governing Authority)

Signature — Date: September 29, 2020

Corey Bogenreif, Principal Traffic Engineer — Date: September 29, 2020

Typed Name and Title
(Governing Authority Official)

IOWADOT
Form 105101 (3-18)

Minority Impact Statement

Pursuant to 2008 Iowa Acts, HF 2393, Iowa Code 8.11, all grant applications submitted to the State of Iowa that are due beginning Jan. 1, 2009, shall include a Minority Impact Statement. This is the state's mechanism for requiring grant applications to consider the potential impact of the grant project's proposed programs or policies on minority groups.

Please choose the statement(s) that pertains to this grant application. Complete all the information requested for the chosen statement(s). Submit additional pages as necessary.

☐ The proposed grant project programs or policies could have a disproportionate or unique **positive** impact on minority persons.

Describe the positive impact expected from this project.

Indicate which groups are impacted.

☐ Women ☐ Persons with a disability ☐ Blacks ☐ Latinos ☐ Asians

☐ Pacific Islanders ☐ American Indians ☐ Alaskan Native Americans ☐ Other_____

☐ The proposed grant project programs or policies could have a disproportionate or unique **negative** impact on minority persons.

Describe the negative impact expected from this project.

Present the rationale for the existence of the proposed program or policy.

Provide evidence of consultation with representatives of the minority groups impacted.

Indicate which groups are impacted.

☐ Women ☐ Persons with a disability ☐ Blacks ☐ Latinos ☐ Asians
☐ Pacific Islanders ☐ American Indians ☐ Alaskan Native Americans ☐ Other _____

☑ The proposed grant project programs or policies are **not expected to have** a disproportionate or unique impact on minority persons.

Present the rationale for determining no impact.

The improved operations of the traffic signal systems would have an equal effect on all vehicle operators, regardless of status.

I hereby certify that the information on this form is complete and accurate, to the best of my knowledge.

Name Corey Bogenreif

Title Principal Traffic Engineer

Definitions

"Minority Persons," as defined in Iowa Code 8.11, means individuals who are women, persons with a disability, Blacks, Latinos, Asians or Pacific Islanders, American Indians, and Alaskan Native Americans.

"Disability," as defined in Iowa Code 15.102, subsection 7, paragraph "b," subparagraph (1):
b. As used in this subsection:

(1) *"Disability"* means, with respect to an individual, a physical or mental impairment that substantially limits one or more of the major life activities of the individual, a record of physical or mental impairment that substantially limits one or more of the major life activities of the individual, or being regarded as an individual with a physical or mental impairment that substantially limits one or more of the major life activities of the individual.

"Disability" does not include any of the following:
(a) Homosexuality or bisexuality.
(b) Transvestism, transsexualism, pedophilia, exhibitionism, voyeurism, gender identity disorders not resulting from physical impairments or other sexual behavior disorders.
(c) Compulsive gambling, kleptomania, or pyromania.
(d) Psychoactive substance abuse disorders resulting from current illegal use of drugs.

"State Agency," as defined in Iowa Code 8.11, means a department, board, bureau, commission, or other agency or authority of the State of Iowa.

REQUEST FOR IOWA'S CLEAN AIR ATTAINMENT PROGRAM (ICAAP)

ATTACHMENT A

Itemized breakdown of total project costs guidelines.

Construction costs
These may be based on historical averages for entire projects of similar size and scope. Examples include:

- Typical cost per mile of trail (e.g., $200,000 per mile for moderate terrain and limited number of structures).
- Typical cost per square foot of bridge deck.
- Typical cost per square foot of fiber optic traffic signal interconnect cable (i.e., $178,000 per mile).
- Typical cost per traffic signal upgrade (i.e., $163,000 per lump sum signal bid item).

Design/Inspection costs
These may be estimated based on the following typical percentages of construction costs, such as:

- 8 to 10 percent for preliminary up through final design and letting activities.
- 12 to 15 percent for construction inspection activities.

Right of way acquisition costs
These may be estimated based on:

- Impact and description of impact.
- Typical cost per square foot for permanent right of way.
- Typical cost per square foot for temporary easements.

Utility and railroad costs
These may be estimated based on:

- Impact and description of impact.
- Typical cost per linear foot of relocated or reconstructed facility (i.e., track, pipe, electrical lines).
- Typical cost per installation (i.e., railroad switches, utility poles, transformers, control boxes).

Indirect costs
If indirect costs are involved (e.g., wages):

- Estimated hours.
- Estimated hourly rate, salary.
- Estimated fringe, direct.
- Other direct cost estimate.
- Other indirect cost estimate.

TRAFFIC SIGNAL SYSTEM TIMING UPDATE – PHASE 4

Project Concept:

This project will be the fourth phase of a multi-phase effort to review and update the signal timing and phasing of the traffic signal systems in Des Moines. Refer to the attached map for a map of the Phase 4 area. The goal of the project is to increase efficiency of the traffic signal systems resulting in decreased travel times, reductions in traffic congestion, and ultimately the reduction of vehicle emissions. The project will also consider signal timing and phasing for pedestrian and bicycle traffic in support of the City's efforts to provide a more walkable and bikeable transportation network. The first three phases of this project were partially funded with ICAAP funding. Phase 1 has been completed, Phase 2 is currently under way and Phase 3 is currently in the consultant selection process.

Existing Conditions:

The City of Des Moines has experienced moderate to significant growth throughout various parts of the City over the past several years resulting in increased traffic along the signalized corridors. Although the City continues to complete traffic signalization upgrade projects, the signal timing plans and associated coordination plans are developed based on past practices rather than with current traffic volume and pattern data due to limited funding and resources within the City.

Phase 4 of the project includes 74 signalized intersections and 9 pedestrian signals that generally include the following major corridors in Des Moines:

- Martin Luther King Jr. Parkway – Ingersoll Avenue to Euclid Avenue
- 19th Street – Cottage Grove Avenue to Clark Street
- Keosauqua Way – 12th Street to 19th Street
- 6th Avenue – Interstate 235 to Euclid Avenue
- 2nd Avenue – Interstate 235 to Interstate 80/35
- E 14th Street – E University to Interstate 80/35
- University Avenue – Martin Luther King Jr. Parkway to 2nd Avenue
- Euclid Avenue – Martin Luther King Jr. Parkway to E 14th Street

The majority of the traffic signals in Des Moines are already interconnected and include communication to a central software system. The central software system will be used to help implement the new traffic signal timing and coordination plans as developed through this project.

Proposed Improvements:

The proposed project will provide a comprehensive review and update of the basic timing and coordination plans both along the major corridors mentioned above as well as any stand-alone signalized intersections within the system. It is anticipated that SYNCHRO traffic signal timing models will be developed for the system to model the current traffic volumes and patterns to aid in the optimization of cycle lengths, basic timing plans, split times, offsets, and time of day for the coordination plans to run. Other elements reviewed and updated will be pedestrian crossing times and coordination plans that accommodate pedestrians and bicyclists as well as the vehicular traffic.

The traffic data collection and traffic modeling is anticipated to be completed by outside consulting staff and implementation into the field is anticipated to be completed by the consultant with assistance from City Staff. There are no additional physical improvements being proposed with this project.

Performance improvements will be measured by the collection of travel-time data before and after implementation. The Emission Reduction Calculations in this funding application were determined using average travel speed for the major corridors listed above during peak and off-peak times of a typical weekday. The project would include a detailed collection of travel profiles before and after to determine trouble spots throughout the corridors and to show the improvements made.

Air Quality Benefits:

The following calculations represent the specific emissions reductions expected as a result of the improved traffic operations and reduced intersection delay throughout the corridors mentioned above.

Traffic counts taken by the Iowa DOT in 2016 were used as the base volumes. The percent of daily traffic that occurs during the AM and PM peak hours is approximately 20 percent of the Average Daily Traffic; this percentage was used in the calculations for daily emissions.

Existing average speed data was estimated for the study corridors in the study area based on previous speed studies on the study corridors and similar corridors in Des Moines. Based on data collected by the Institute of Transportation Engineers, comprehensive signal retiming programs have documented benefits of 7-13% reduction in overall travel time, 15-37% reduction in delay and a 6-9% fuel savings[1]. The calculations for this application assumed a 10% reduction in travel time.

Emission factors in grams/hour for Carbon Dioxide (CO), Hydrocarbons/Volatile Organic Compounds (VOC), and Nitrogen Oxide (NOx) were developed using emission factors provided by the Iowa DOT. The air quality model outputs for operating speeds on city arterials were used for the calculations.

Based on the project cost of $275,000, the estimated benefits from this project are as follows (see Exhibit "G" for further information):

Pollutant	Reduction	Cost of Reduction
CO	2,083 kg/year	$26.40 per kg per year
VOC	4,647 kg/year	$11.83 per kg per year
NOx	1,225 kg/year	$44.90 per kg per year

[1] *Institute of Transportation Engineers (https://www.ite.org/technical-resources/topics/transportation-system-management-and-operations/)*

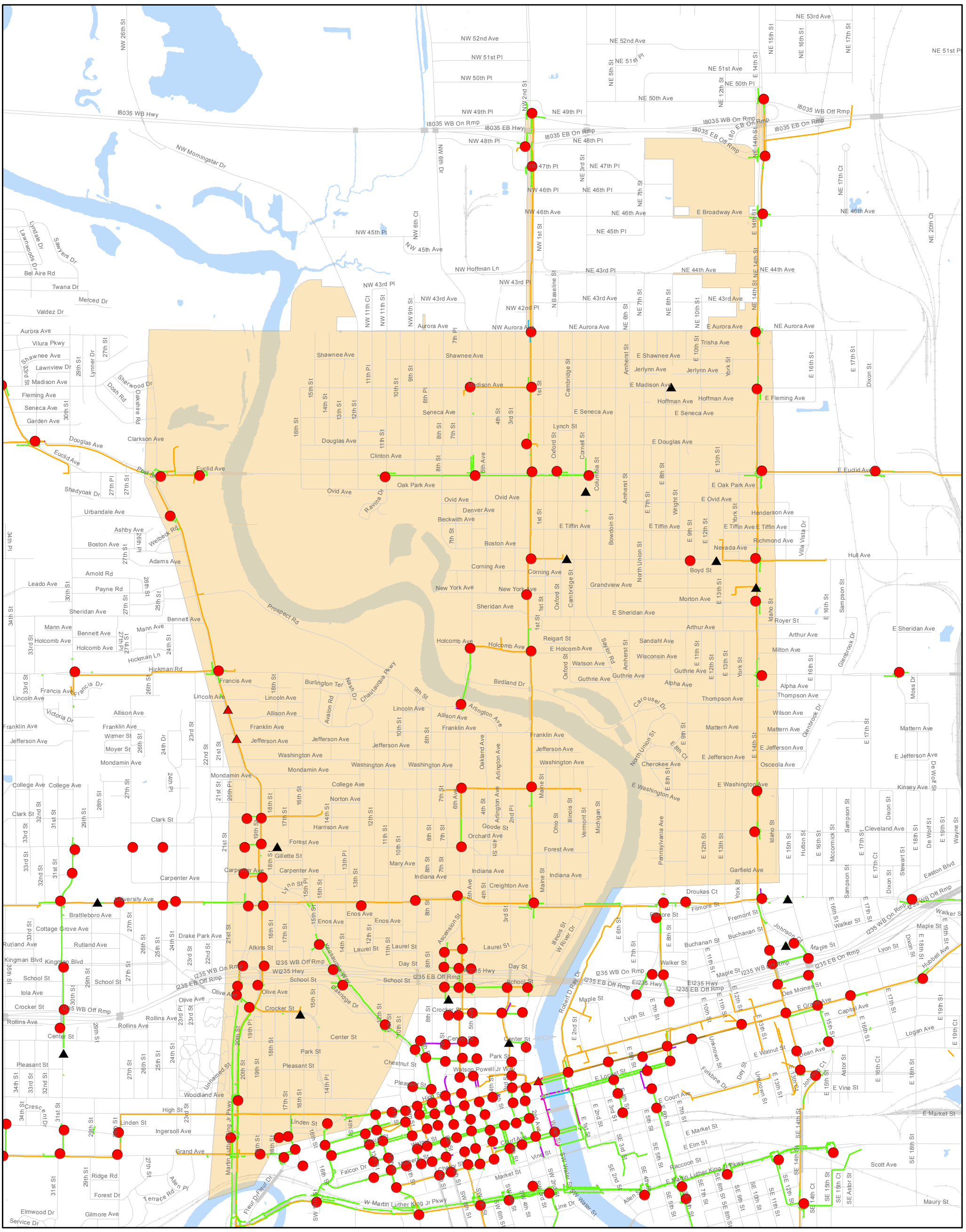
Des Moines Traffic Signal Timing Update Program Zone 4 Map

EXHIBIT B

Date Revised: August 25, 2015

0 0.25 0.5 Miles

N



Legend

Zone 4 Timing

Legend

Traffic Intersection Control Type

- Hawk Flasher (System Control)
- Intersection (Isolated)
- Intersection (System Control)
- Mid-Block (Isolated)
- Mid-Block (System Control)

SIGNAL CONDUITS

Owner

- City of Des Moines
- City of Des Moines Parks
- ICN
- MidAm
- Other
- Polk County
- Qwest
- Urbandale

CITY OF DES MOINES
ENGINEERING DEPARTMENT

Prepared by the City of Des Moines Engineering Department - Traffic & Transportation Division.

Des Moines Traffic Signal Timing Update Program Group Map

EXHIBIT B

Date Revised: July 19, 2017

0 0.5 1 Miles

N

Legend

- Phase 1 Timing
- Phase 2 Timing
- Phase 3 Timing
- Phase 4 Timing
- Phase 5 Timing

Legend

Traffic Intersection Control Type

- Hawk Flasher (System Control)
- Intersection (Isolated)
- Intersection (System Control)
- Mid-Block (Isolated)
- Mid-Block (System Control)

CITY OF DES MOINES
ENGINEERING DEPARTMENT

Prepared by the City of Des Moines Engineering Department - Traffic & Transportation Division.

PROJECT COST ESTIMATE
Traffic Signal Timing Update - Phase 4
September 28, 2020

TASK	Senior Engineer	Project Engineer	Eng Tech
Traffic Counts		20	250
Intersection Function Review	20	120	
Data Collection (Existing Signal Timings / Phasing)	8	40	40
Traffic Modeling	20	100	300
Field Observations / Model Calibration			175
Travel Time Studies	16	80	80
TOTAL HOURS	64	360	845
RATE	$200	$175	$125
TOTAL COST	**$12,800**	**$63,000**	**$105,625**

EXPENSES

Traffic Video Processing (Counts)	$88,800
Mileage / Printing	$5,000
TOTAL PROJECT COST	**$275,000**
ICAAP Request (80%)	$220,000.00
City Match (20%)	$55,000.00

TIME SCHEDULE

Approval of Agreement	October 2021
Data Collection	October 2021 – December 2021
Traffic Modeling	January 2022 – May 2022
Implementation	May 2022 – August 2022
Post Travel Time Runs	August 2022 – September 2022
Reporting	September 2022 – December 2022

EXHIBIT E

★ **Roll Call Number** 20-1551

Agenda Item Number 6

Date October 5, 2020

RATIFYING AND APPROVING SUBMISSION OF THE IOWA CLEAN AIR ATTAINMENT PROGRAM (ICAAP) FUNDING APPLICATION TO THE IOWA DEPARTMENT OF TRANSPORTATION (IOWA DOT) FOR THE TRAFFIC SIGNAL SYSTEM TIMING UPDATE – PHASE 4

BE IT RESOLVED, BY THE CITY COUNCIL OF THE CITY OF DES MOINES, IOWA: That the actions of the City Engineer in submitting an application to the Iowa Department of Transportation for Iowa Clean Air Attainment (ICAAP) Program funds are hereby ratified and approved for the following project:

Traffic Signal System Timings Update - Phase 4

BE IT FURTHER RESOLVED upon project completion, the City will be responsible for adequately maintaining and operating the project for public use during the project's useful life and will commit the necessary local matching funds to implement the project.

(Council Letter Number 20-440 attached)

Moved by Gatto to adopt.

FORM APPROVED: s/Kathleen Vanderpool
Kathleen Vanderpool
Deputy City Attorney

Funding Source: ICAAP in the amount of $220,000 are requested for this project. $55,000 (remaining amount pending funding award) 2020-2021 CIP, Page Street Improvements – 54, Traffic System Operation Improvements, C038EG99 TR097.

COUNCIL ACTION	YEAS	NAYS	PASS	ABSENT
COWNIE	✓			
BOESEN	✓			
GATTO	✓			
GRAY	✓			
MANDELBAUM	✓			
VOSS	✓			
WESTERGAARD	✓			
TOTAL	7			

MOTION CARRIED APPROVED

J. W. Franklin Cownie
Mayor

CERTIFICATE

I, P. Kay Cmelik, City Clerk of said City hereby certify that at a meeting of the City Council of said City of Des Moines, held on the above date, among other proceedings the above was adopted.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the day and year first above written.

P. Kay Cmelik
City Clerk

EXHIBIT F

RESOLUTION FY 2021- 11

WHEREAS, the Des Moines Area Metropolitan Planning Organization is established under Chapter 28E of the Code of Iowa;

WHEREAS, the Des Moines Area Metropolitan Planning Organization is the designated metropolitan planning organization for the Des Moines metropolitan area;

WHEREAS, the Des Moines Area Metropolitan Planning Organization has reviewed the submitted Iowa Clean Air Attornment Program application and found the project to be in conformance with the MPO's regional transportation planning process, the Congestion Management Process and is included in the MPO's Long-Range Transportation Plan:

NOW, THEREFORE, BE IT RESOLVED by the Des Moines Area Metropolitan Planning Organization that:

The Des Moines Area Metropolitan Planning Organization approves the Iowa Clean Air Attainment Program Application (ICAAP) project submitted by the City of Des Moines regarding Traffic Signal Timing Updates- Phase 4.

Done this 17th day of September 2020.

Joe Gatto - Chair
Des Moines Area Metropolitan Planning Organization Chair

DES MOINES AREA MPO METROPOLITAN PLANNING ORGANIZATION

Traffic Signal System Timing Update - Phase 4			
	Annual Reductions (kg/year)		
Corridor	*CO*	*VOC(HC)*	*NOx*
Martin Luther King Jr Parkway / 19th Street	781	1,074	342
Keosauqua Way	1,813	518	259
6th Avenue	194	430	129
2nd Avenue	(263)	841	53
E 14th Street	(1,819)	931	85
University Avenue	1,377	854	358
Euclid Avenue	(1,531)	784	71
TOTAL REDUCTIONS	2,083	4,647	1,225
Reduction Costs:			
Project Cost			$275,000
Project Life			5 years
Annual Project Cost			$55,000
Annual Cost per kg of pollutant reduction	$26.40	$11.83	$44.90

Martin Luther King Jr. Parkway/19th Street (Ingersoll Avenue to Euclid Avenue)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	2.94			
Average Daily Traffic (vpd)*	22,775			
Vehicle Miles Travelled (Length x ADT)	66,858			
% VMT in peak hours (20%)	13,372			
Non-Peak Hour VMT (80%)	53,487			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	24			
Existing speed (Non-Peak Hour)	31			
Emission Factor Peak Hour (EF g/mi)		13.00	1.85	1.82
Emission Factor Non-Peak Hour (EF g/mi)		12.53	1.69	1.74
Peak Hour Emissions = Peak VMT x EF (g)		173,832	24,738	24,336
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		670,189	90,393	93,067
Daily Emissions = Peak + Non-Peak (g/day)		844,021	115,130	117,403
****After Project****				
New speed (Peak Hour)	26			
New speed (Non-Peak Hour)	33			
Emission Factor Peak Hour (EF g/mi)		12.80	1.79	1.79
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.65	1.73
Peak Hour Emissions = Peak VMT x EF (g)		171,158	23,935	23,935
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		670,724	88,253	92,532
Daily Emissions = Peak + Non-Peak (g/day)		841,881	112,188	116,467
Emission Reductions				
Daily Emission Reduction (g/day)		2,139	2,942	936
Annual Reduction = daily x 365 day (kg/year)		781	1,074	342

*ADT is an average of the 2016 Iowa DOT Traffic Counts along the corridor.
Martin Luther King Jr Parkway and 19th Street from Cottage Grove Avenue to Washington Avenue are one-way pairs. The ADT along this portion of the corridor is the total ADT for both directions.

Keosauqua Way (12th Street to 19th Street)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	1.07			
Average Daily Traffic (vpd)	20,800			
Vehicle Miles Travelled (Length x ADT)	22,179			
% VMT in peak hours (20%)	4,436			
Non-Peak Hour VMT (80%)	17,743			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	24			
Existing speed (Non-Peak Hour)	26			
Emission Factor Peak Hour (EF g/mi)		13.00	1.85	1.82
Emission Factor Non-Peak Hour (EF g/mi)		12.80	1.79	1.79
Peak Hour Emissions = Peak VMT x EF (g)		57,665	8,206	8,073
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		227,111	31,760	31,760
Daily Emissions = Peak + Non-Peak (g/day)		284,776	39,966	39,833
****After Project****				
New speed (Peak Hour)	27			
New speed (Non-Peak Hour)	29			
Emission Factor Peak Hour (EF g/mi)		12.72	1.77	1.78
Emission Factor Non-Peak Hour (EF g/mi)		12.59	1.73	1.76
Peak Hour Emissions = Peak VMT x EF (g)		56,423	7,851	7,896
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		223,385	30,695	31,228
Daily Emissions = Peak + Non-Peak (g/day)		279,808	38,547	39,123
Emission Reductions				
Daily Emission Reduction (g/day)		4,968	1,419	710
Annual Reduction = daily x 365 day (kg/year)		1,813	518	259

*ADT is an average of the 2016 Iowa DOT Traffic Counts along the corridor.

6th Avenue (Interstate 235 to Euclud Avenue)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	2.22			
Average Daily Traffic (vpd)	13,300			
Vehicle Miles Travelled (Length x ADT)	29,472			
% VMT in peak hours (20%)	5,894			
Non-Peak Hour VMT (80%)	23,577			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	27			
Existing speed (Non-Peak Hour)	31			
Emission Factor Peak Hour (EF g/mi)		12.72	1.77	1.78
Emission Factor Non-Peak Hour (EF g/mi)		12.53	1.69	1.74
Peak Hour Emissions = Peak VMT x EF (g)		74,976	10,433	10,492
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		295,423	39,846	41,024
Daily Emissions = Peak + Non-Peak (g/day)		370,399	50,279	51,516
****After Project****				
New speed (Peak Hour)	29			
New speed (Non-Peak Hour)	33			
Emission Factor Peak Hour (EF g/mi)		12.59	1.73	1.76
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.65	1.73
Peak Hour Emissions = Peak VMT x EF (g)		74,209	10,197	10,374
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		295,659	38,903	40,789
Daily Emissions = Peak + Non-Peak (g/day)		369,868	49,100	51,163
Emission Reductions				
Daily Emission Reduction (g/day)		530	1,179	354
Annual Reduction = daily x 365 day (kg/year)		194	430	129

*ADT is an average of the 2016 Iowa DOT Traffic Counts along the corridor.

2nd Avenue (Interstate 235 to Interstate 80/35)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	3.79			
Average Daily Traffic (vpd)	19,000			
Vehicle Miles Travelled (Length x ADT)	71,970			
% VMT in peak hours (20%)	14,394			
Non-Peak Hour VMT (80%)	57,576			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	31			
Existing speed (Non-Peak Hour)	33			
Emission Factor Peak Hour (EF g/mi)		12.53	1.69	1.74
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.65	1.73
Peak Hour Emissions = Peak VMT x EF (g)		180,356	24,326	25,045
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		722,000	95,000	99,606
Daily Emissions = Peak + Non-Peak (g/day)		902,356	119,326	124,652
****After Project****				
New speed (Peak Hour)	33			
New speed (Non-Peak Hour)	35			
Emission Factor Peak Hour (EF g/mi)		12.54	1.65	1.73
Emission Factor Non-Peak Hour (EF g/mi)		12.55	1.62	1.73
Peak Hour Emissions = Peak VMT x EF (g)		180,500	23,750	24,902
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		722,576	93,273	99,606
Daily Emissions = Peak + Non-Peak (g/day)		903,076	117,023	124,508
Emission Reductions				
Daily Emission Reduction (g/day)		(720)	2,303	144
Annual Reduction = daily x 365 day (kg/year)		(263)	841	53

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E 14th Street (E University Avenue to Interstate 80/35)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	3.41			
Average Daily Traffic (vpd)	17,000			
Vehicle Miles Travelled (Length x ADT)	57,955			
% VMT in peak hours (20%)	11,591			
Non-Peak Hour VMT (80%)	46,364			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	29			
Existing speed (Non-Peak Hour)	33			
Emission Factor Peak Hour (EF g/mi)		12.59	1.73	1.76
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.65	1.73
Peak Hour Emissions = Peak VMT x EF (g)		145,930	20,052	20,400
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		581,400	76,500	80,209
Daily Emissions = Peak + Non-Peak (g/day)		727,330	96,552	100,609
****After Project****				
New speed (Peak Hour)	32			
New speed (Non-Peak Hour)	36			
Emission Factor Peak Hour (EF g/mi)		12.54	1.67	1.74
Emission Factor Non-Peak Hour (EF g/mi)		12.66	1.61	1.73
Peak Hour Emissions = Peak VMT x EF (g)		145,350	19,357	20,168
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		586,964	74,645	80,209
Daily Emissions = Peak + Non-Peak (g/day)		732,314	94,002	100,377
Emission Reductions				
Daily Emission Reduction (g/day)		(4,984)	2,550	232
Annual Reduction = daily x 365 day (kg/year)		(1,819)	931	85

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University Avenue (Martin Luther King Jr Parkway to E 14th Street)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	2.27			
Average Daily Traffic (vpd)	16,600			
Vehicle Miles Travelled (Length x ADT)	37,727			
% VMT in peak hours (20%)	7,545			
Non-Peak Hour VMT (80%)	30,182			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	27			
Existing speed (Non-Peak Hour)	29			
Emission Factor Peak Hour (EF g/mi)		12.83	1.78	1.79
Emission Factor Non-Peak Hour (EF g/mi)		12.59	1.73	1.76
Peak Hour Emissions = Peak VMT x EF (g)		96,808	13,431	13,506
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		379,989	52,215	53,120
Daily Emissions = Peak + Non-Peak (g/day)		476,797	65,645	66,626
****After Project****				
New speed (Peak Hour)	30			
New speed (Non-Peak Hour)	32			
Emission Factor Peak Hour (EF g/mi)		12.53	1.71	1.74
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.67	1.74
Peak Hour Emissions = Peak VMT x EF (g)		94,545	12,903	13,129
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		378,480	50,404	52,516
Daily Emissions = Peak + Non-Peak (g/day)		473,025	63,306	65,645
Emission Reductions				
Daily Emission Reduction (g/day)		3,773	2,339	981
Annual Reduction = daily x 365 day (kg/year)		1,377	854	358

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Euclid Avenue (Martin Luther King Jr. Parkway to E 14th Street)

	FACTORS	*CO*	*VOC(HC)*	*NOx*
Corridor Length (mi)	2.65			
Average Daily Traffic (vpd)	18,400			
Vehicle Miles Travelled (Length x ADT)	48,788			
% VMT in peak hours (20%)	9,758			
Non-Peak Hour VMT (80%)	39,030			
CALCULATIONS				
****Before Project****				
Existing speed (Peak Hour)	29			
Existing speed (Non-Peak Hour)	33			
Emission Factor Peak Hour (EF g/mi)		12.59	1.73	1.76
Emission Factor Non-Peak Hour (EF g/mi)		12.54	1.65	1.73
Peak Hour Emissions = Peak VMT x EF (g)		122,848	16,881	17,173
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		489,440	64,400	67,522
Daily Emissions = Peak + Non-Peak (g/day)		612,288	81,281	84,696
****After Project****				
New speed (Peak Hour)	32			
New speed (Non-Peak Hour)	36			
Emission Factor Peak Hour (EF g/mi)		12.54	1.67	1.74
Emission Factor Non-Peak Hour (EF g/mi)		12.66	1.61	1.73
Peak Hour Emissions = Peak VMT x EF (g)		122,360	16,295	16,978
Non-Peak Hour Emissions = Non-Peak VMT x EF (g)		494,124	62,839	67,522
Daily Emissions = Peak + Non-Peak (g/day)		616,484	79,134	84,501
Emission Reductions				
Daily Emission Reduction (g/day)		(4,196)	2,147	195
Annual Reduction = daily x 365 day (kg/year)		(1,531)	784	71

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