

“A year from now you will wish you had started today”

- *Karen Lamb*

5.0 IMPLEMENTATION

This plan has highlighted many of the existing challenges with the overall traffic management systems in the City of Lincoln. While there are indeed challenges, there are obvious opportunities. Many of these needed upgrades and process improvements can provide great benefit and service to the community at large – not just within one small project area, but the entire city. Often times it is a struggle to prioritize needed arterial roadway projects, or intersection improvements, or small segments of rehab because those projects do touch such a small geographic area. It may seem quite easy in comparison to prioritize system upgrades that will impact each and every commuter city wide.

Multiple research studies, continuous web data compilations, and sources of “big data”, all reveal that in Quality of Life surveys, Quality of Life rankings, or “Best Places to Live” listings – all have one thing in common. Traffic. Several similar variables are typically listed:

- Traffic commute index
- Average travel commute
- Traffic volumes
- Traffic delays
- Travel times for commercial vehicles

Texas Transportation Institute (TTI) estimates that American commuters within cities collectively lost 5.5 billion hours stuck in traffic annually, meaning the average commuter lost nearly a week to sitting in traffic. TTI’s calculations further suggest that traffic congestion caused American commuters to purchase an extra 2.9 billion gallons of fuel, costing them more than \$120 billion in added fuel costs, and wasted time.

And it’s not just the delays, safety is important too. From a local perspective, based on the most recent citywide crash study, the annual societal cost of crashes in the City of Lincoln was staggering. Over 7,000 crashes, resulting in costs over \$279,000,000. One year. By making upgrades to the system, improving traffic flow, and enhancing safety by a mere 10%, saves nearly \$30M to the citizens of Lincoln.

Finally, based upon the quite conservative, quite easy to achieve benefit/cost ratios associated with signal optimization improvements, the system can achieve a positive benefit over \$22M.

A bulleted list of the priority recommendations are included on the following page. A comparison and opinion of probable costs for these items are also included.

The following recommended implementation of improvements is summarized below:

ATMS Hardware and Software

- Procure and integrate a modern ATMS software to operate, monitor, manage, and maintain traffic signals and ITS field devices.
- Replace all existing traffic signal controllers with advanced traffic controller (ATC) protocol that are NTCIP compliant with appropriate local controller software in the field.
- Upgrade necessary traffic signal cabinets to TS2, Type I minimum standard that allows for compatibility with future detection needs and IP communications infrastructure.
- Implement operational hardware and software in the PWOC for management of the system.

Vehicle Detection and Signal Phasing

- Upgrade vehicle detection at existing faulty locations citywide with a mix of non-intrusive detectors (cameras and/or microwave radar) and preformed loops under pavement as needed.
- Continue annual replacement and conversion of mainline corridor detection to cameras for stop bar detection, and enable viewing of intersection approaches with the camera management software.



Signal Optimization Program

- Implement cyclical signal optimization program enabling primary arterials to be retimed every 3-5 years.
- Evaluate and install updated signal phasing hardware (Flashing Yellow Arrow) at all required protected/permitted left-turn locations.
- Develop City of Lincoln standard traffic signal optimization guidelines for internal and consultant staff use on signal timing projects.
- Continue deploying emergency vehicle preemption (EVP) systems per the available funding in place with various public safety agencies.
- Coordinate with StarTran to facilitate evaluation of transit signal priority (TSP), bus rapid transit (BRT), or other transit projects as needed.

Intelligent Transportation System (ITS) Devices

- Deploy closed-circuit television (CCTV) cameras with pan-tilt-zoom (PTZ) capabilities across the city at the intersections of arterial roadways, as well as other locations to monitor traffic performance and incidents.

- Deploy arterial DMS and trailblazer signs on primary routes for incident management, special events, congestion management, and travel time information.
- Deploy additional system sensors (microwave radar and Bluetooth/Wi-Fi) as needed for automated travel time collection and performance measurement.

Communications System

- Continue construction of the redundant, self-healing gigabit Ethernet fiber optic network.
- Implement wireless communications to signals not located on arterial roadways.
- Establish internet protocol (IP) based communications on the network to all devices.

Traveler and Public Information

- Install kiosks or other traffic-related information displays at City Hall or other high-activity areas to display important traffic/travel condition information for daily and event traffic.
- Explore software that integrates a future parking management and information system with the proposed central traffic signal management system software.
- Evaluate methods to quickly disseminate emergency traffic information via the City's website, social media, and other apps.

Pedestrian & Bicycle Safety

- Continue the evaluation of pedestrian signals at key crossing locations – implement rectangular rapid flashing beacons (RRFB).
- Implement necessary system detection for bicycle facilities (cycle tracks, bike lanes) to monitor efficiency and operations.
- Develop additional public information regarding ped/bike safety programs and planned facilities.

Traffic Signal Rehabilitation

- Program annual replacements of aging traffic signal infrastructure based on structure lifespan and on-going inspection results, and remove unwarranted signals.
- Look to implement roundabout intersection control at existing traffic signal locations as relevant for traffic and environmental conditions.
- Continue non-destructive testing of structures and signal pole inspection program.

Traffic System Management

- Program additional staff to provide one PWOC operator to monitor the traffic signal system and related devices from 6 am to 9 am and 3 pm to 6 pm, Monday through Friday, at a minimum.
- Program additional traffic engineering and technician staff to adequately manage the system.

- Continue to dedicate staff for evaluation of existing timing settings to ensure that they adhere to the latest Manual on Uniform Traffic Control Devices (MUTCD) and industry best practices.
- Optimize traffic signal coordination plans, at a minimum, every 3 to 5 years based on traffic volume and pattern fluctuations.
- Determine the feasibility and/or benefits of installing an adaptive or responsive system on corridors with closely-spaced signals and fluctuating, unpredictable traffic volumes.
- Develop, implement, monitor, and revise timing plans as necessary to accommodate special event traffic around major traffic-generating facilities.
- Staff adequately to respond to public inquiries with technical expertise in a timely fashion.

Maintenance

- Program additional staff positions to properly maintain the communications network and additional ITS devices deployed in the field.
- Continue to perform general traffic signal maintenance using internal maintenance staff, including fiber optic cable repairs.
- Continue to develop and implement a comprehensive and regular preventative maintenance program.
- Provide training for maintenance and operations staff to adequately maintain the traffic signal system.

By implementing the above recommendations, and continuing to proactively plan, fund, operate, and maintain a growing traffic management system, we will provide the citizens of Lincoln with a vastly improved travel experience. Many of the pieces are coming together. With additional support, the safe and efficient movement of all modes of traffic will result in sustainability of the transportation network and improved quality of life.

A six year CIP projection was used to summarize the proposed costs. It is included on the following page. These items include an approximate \$34M expenditure over 6 years, including a \$23M estimate on the signal rehabilitation program which is the single largest cost. The entire remainder of the program, impacting city wide operations and safety, over a 6 year period could be delivered for the construction cost of approximately one mile of urban arterial.

City of Lincoln
Traffic Management Modernization Projects
6 Year Budget

ID	Item #	Overall Project & Components	Qty	Unit	Price Per Unit	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A		Advanced Traffic Management System (ATMS)										
	1	Central Signal System Software	1	LS	\$600,000	\$600,000	1 \$600,000	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
	2	Local Controller Upgrades	430	EA	\$3,500	\$1,505,000	430 \$1,505,000	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
	3	Annual Maint./Support	6	EA	\$15,000	\$90,000	1 \$15,000	1 \$15,000	1 \$15,000	1 \$15,000	1 \$15,000	1 \$15,000
						\$2,195,000	\$2,120,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
B		Public Works Operations Center (PWOC)										
	4	Equipment, Cam Mgmt Software, Integration	1	LS	\$160,000	\$160,000	1 \$160,000	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
						\$160,000	\$160,000	\$0	\$0	\$0	\$0	\$0
C		Intersection Detection Improvement										
	5	Vehicle Detection System	110	EA	\$20,000	\$2,200,000	25 \$500,000	25 \$500,000	25 \$500,000	20 \$400,000	10 \$200,000	5 \$100,000
	6	Non-intrusive Detector	40	EA	\$6,000	\$240,000	8 \$48,000	8 \$48,000	8 \$48,000	8 \$48,000	8 \$48,000	0 \$0
						\$2,440,000	\$548,000	\$548,000	\$548,000	\$448,000	\$248,000	\$100,000
D		Intersection Operational & Safety Data										
	7	Signal Optimizaton Corridors	10	EA	\$40,000	\$400,000	5 \$200,000	5 \$200,000	0 \$0	0 \$0	0 \$0	0 \$0
	8	Count Program	6	EA	\$180,000	\$1,080,000	1 \$180,000	1 \$180,000	1 \$180,000	1 \$180,000	1 \$180,000	1 \$180,000
	9	Citywide Crash Evaluation	3	EA	\$95,000	\$285,000	1 \$95,000	0 \$0	1 \$95,000	0 \$0	1 \$95,000	0 \$0
						\$1,765,000	\$475,000	\$380,000	\$275,000	\$180,000	\$275,000	\$180,000
E		Flashing Yellow Left Safety Program										
	10	Heads, wiring, cabinet mods. (200 ints)	200	EA	\$8,000	\$1,600,000	0 \$0	30 \$240,000	30 \$240,000	40 \$320,000	50 \$400,000	50 \$400,000
						\$1,600,000	\$0	\$240,000	\$240,000	\$320,000	\$400,000	\$400,000
F		ITS Modernization										
	11	CCTV Monitoring Cameras	40	EA	\$4,000	\$160,000	10 \$40,000	10 \$40,000	10 \$40,000	5 \$20,000	5 \$20,000	0 \$0
	12	Cabinets	50	EA	\$9,000	\$450,000	5 \$45,000	10 \$90,000	10 \$90,000	10 \$90,000	10 \$90,000	5 \$45,000
	13	Signal Monitors (MMU)	120	EA	\$1,300	\$156,000	20 \$26,000	20 \$26,000	20 \$26,000	20 \$26,000	20 \$26,000	20 \$26,000
	14	Arterial DMS	20	EA	\$50,000	\$1,000,000	0 \$0	4 \$200,000	4 \$200,000	4 \$200,000	4 \$200,000	4 \$200,000
	15	Portable DMS	20	EA	\$14,000	\$280,000	0 \$0	4 \$56,000	4 \$56,000	4 \$56,000	4 \$56,000	4 \$56,000
						\$2,046,000	\$111,000	\$412,000	\$412,000	\$392,000	\$392,000	\$327,000
G		Traffic Signal Communications Upgrades										
	16	Managed Switch	300	EA	\$1,500	\$450,000	0 \$0	100 \$150,000	50 \$75,000	50 \$75,000	50 \$75,000	50 \$75,000
	17	Pull Box, Splicing & Enclosures	200	EA	\$3,000	\$600,000	0 \$0	50 \$150,000	50 \$150,000	50 \$150,000	25 \$75,000	25 \$75,000
						\$1,050,000	\$0	\$300,000	\$225,000	\$225,000	\$150,000	\$150,000
H		Traffic Signal Rehabilitation Program										
	18	Rectangular Rapid Flashing Beacons (RRFB's)	24	EA	\$24,000	\$576,000	4 \$96,000	4 \$96,000	4 \$96,000	4 \$96,000	4 \$96,000	4 \$96,000
	19	Traffic Signal Rebuilds (15 per year)	100	EA	\$225,000	\$22,500,000	15 \$3,375,000	15 \$3,375,000	15 \$3,375,000	15 \$3,375,000	20 \$4,500,000	20 \$4,500,000
						\$23,076,000	\$3,471,000	\$3,471,000	\$3,471,000	\$3,471,000	\$4,596,000	\$4,596,000
						\$34,332,000	\$6,885,000	\$5,366,000	\$5,186,000	\$5,051,000	\$6,076,000	\$5,768,000