



Summary Report

Omaha Streetcar Advanced Conceptual Engineering

March 7, 2018

Introduction

The purpose of this Summary Report is to provide a summary of pertinent information for decision makers of the Technical Memorandums prepared for the Omaha Streetcar Advanced Conceptual Engineering phase. The primary purpose of the ACE phase was to revise the project definition for the Omaha Streetcar project from the planning alternative identified in the Central Omaha Transit Alternatives Analysis.

Advanced Conceptual Engineering

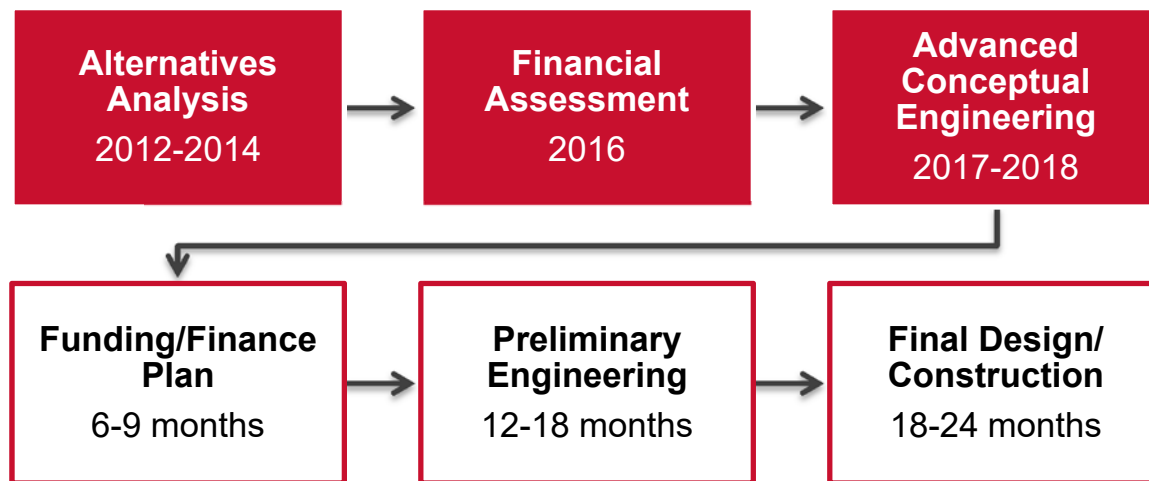
The Advanced Conceptual Engineering (ACE) phase started in 2017. This effort included the following:

- ACE plans that show revised alignment, termini, and station locations, and identify a vehicle maintenance facility location
- Revised capital cost estimate that correlates to ACE level of design
- Traffic evaluation
- Governance recommendations

Background

The current version of the Omaha Streetcar project originated from the Central Omaha Transit Alternatives Analysis (AA) that was prepared between 2012 and 2014. A Financial Assessment was prepared for the Omaha Streetcar project in 2016. **Figure 1** shows the timeline associated with the Omaha Streetcar effort to date and potential next steps, which are discussed at the conclusion of this Summary Report.

Figure 1: Timeline



Project Purpose

The general purpose as outlined in the Central Omaha Transit Alternatives Analysis (AA) study is to improve transportation connections for residents, employees, and visitors to employment centers, educational facilities, various services, and areas of interest while serving as a driver for employment growth and economic development. The following studies all concluded that an enhanced transit system was necessary for Downtown and Midtown to reach their full potential:

- Destination Midtown (2005)
- Downtown Omaha Master Plan (2009)
- Omaha Transportation Element (2012)

The area evaluated is the highest employment corridor in Omaha but it lacks high-frequency transit service. The area also exhibits an imbalance in parking availability and capacity which has resulted in significant consumption of land in the corridor for parking which limits office, residential, and commercial development and thus prevents Downtown and Midtown from reaching their full potential and tax base. The AA study outlined the need for bus rapid transit to serve longer transit trips in a more efficient manner along the Dodge Street corridor from 10th Street to Westroads, and the need for a Downtown/Midtown high-frequency transit connector system. The streetcar was identified to address not only the transportation needs, but also a catalyst for higher density growth.

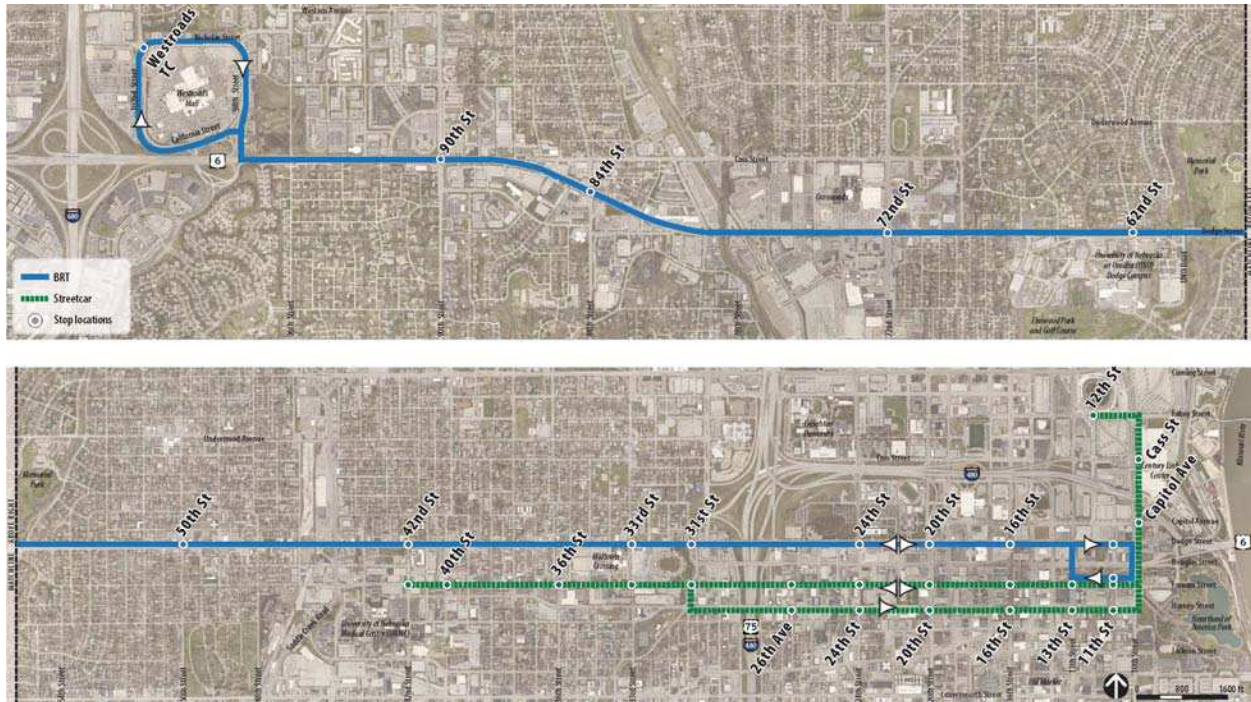
Reasons why cities build streetcar systems:

- Improve mobility and support economic development
- Link people to jobs, education, commerce, healthcare, and improve circulation for special events
- Provide frequent service that is easy to understand by residents and visitors alike
- Support a park-once strategy and reduce the need to own a car, thereby freeing up land allocated to surface parking for higher and better uses
- Shift development patterns to maximize the tax base
- Bring people and their destinations closer together
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Central Omaha Transit Alternatives Analysis

The Central Omaha Transit Alternatives Analysis (AA) study was led by Metro in partnership with the City of Omaha and the Metropolitan Area Planning Agency (MAPA). The study developed and evaluated transit alternatives to connect activity centers and neighborhoods in Central Omaha while improving the regional transit network. The study included extensive public engagement, stakeholder involvement, and one-on-one meetings.

The Locally Preferred Alternative (LPA) included both a Bus Rapid Transit (BRT) and Streetcar project. The BRT line was approximately 8 miles between Downtown, Midtown, University of Nebraska Medical Center (UNMC), University of Nebraska Omaha, and the Crossroads and Westroads areas. As identified in the AA study, the Streetcar was approximately 3 miles between North Downtown, Downtown, Midtown, and UNMC. The LPA was approved as part of the MAPA Long Range Transportation Plan. **Figure 2** shows the LPA from the AA study.

Figure 2: Locally Preferred Alternative

Financial Assessment

In 2016, at the request of the City of Omaha, Metro and MAPA, HDR completed a Financial Assessment that provided information related to funding options for a Modern Streetcar. HDR gathered extensive information from similar projects throughout the country and localized information to identify and assess 17 funding sources ranging from federal, state, and local funds to corridor-specific revenue capture demonstrating the project is financially feasible. Three combinations were given to illustrate potential funding scenarios, and each emphasized funding from local business contributions and corridor-specific value capture scenarios. Value capture is a type of public financing that recovers a percentage of the value that public infrastructure (streetcar) generates for private property. The next stage of the project will require a convening of corridor businesses and property owners, representatives of charitable organizations as well as the City of Omaha to determine the best financial package for the project.

Route and Alignment

The Omaha Streetcar route as identified in the ACE phase is approximately 3 route miles (5.5 track miles) with 13 stations that extends between 42nd Street / Farnam Street and 10th Street / Cass Street. The streetcar serves Downtown and North Downtown, Midtown, the Blackstone District, and the University of Nebraska Medical Center (UNMC). The streetcar route uses Farnam Street between 42nd Street and Turner Boulevard, the Farnam/Harney Street couplet between Turner Boulevard and 10th Street and a bi-directional single track on 10th Street. A map of the Omaha Streetcar route is shown in **Figure 3**. The ACE plan set is included as **Appendix A**.

Figure 3: Omaha Streetcar Route Map



The streetcar route originally identified in the AA study was refined in the ACE phase. The ACE phase included two workshops with Metro, the City of Omaha, and MAPA. Major decisions related to alignment, termini, and stations were determined at these workshops and through coordination with individual utility providers. Input on lane configurations, on-street parking, access control, and other design elements was provided.

The Omaha Streetcar project alignment was divided into segments to assist with refining the project definition. This allowed the project team to isolate issues by common area and compare alignment and station options within each segment. The streetcar segments and vehicle maintenance facility locations evaluated as part of the ACE phase are shown in **Figure 4**.

Stations

Conceptual streetcar station layouts were developed as part of the ACE phase. This includes the approximate dimensions for side and center station platforms. Common station elements include canopies for weather protection and seating. The infrastructure and passenger amenities for the stations have not been determined and the cost estimate only includes a basic station configuration without lighting, wayfinding, security, or other elements.

The placement of the stations and platforms must consider the needs of the transit passenger as well as other users of the roadways, including pedestrians, bicyclists, and general purpose vehicles. The location of the stations and track are interdependent and are designed and tested against each other during the next phase of design.

Figures 5 and 6 show the typical plan view, elevation, and cross-section for Omaha Streetcar center platform and side platform stations, as identified in the ACE plan set.

Figure 4: Omaha Streetcar Segments and Vehicle Maintenance Facility Locations Evaluated

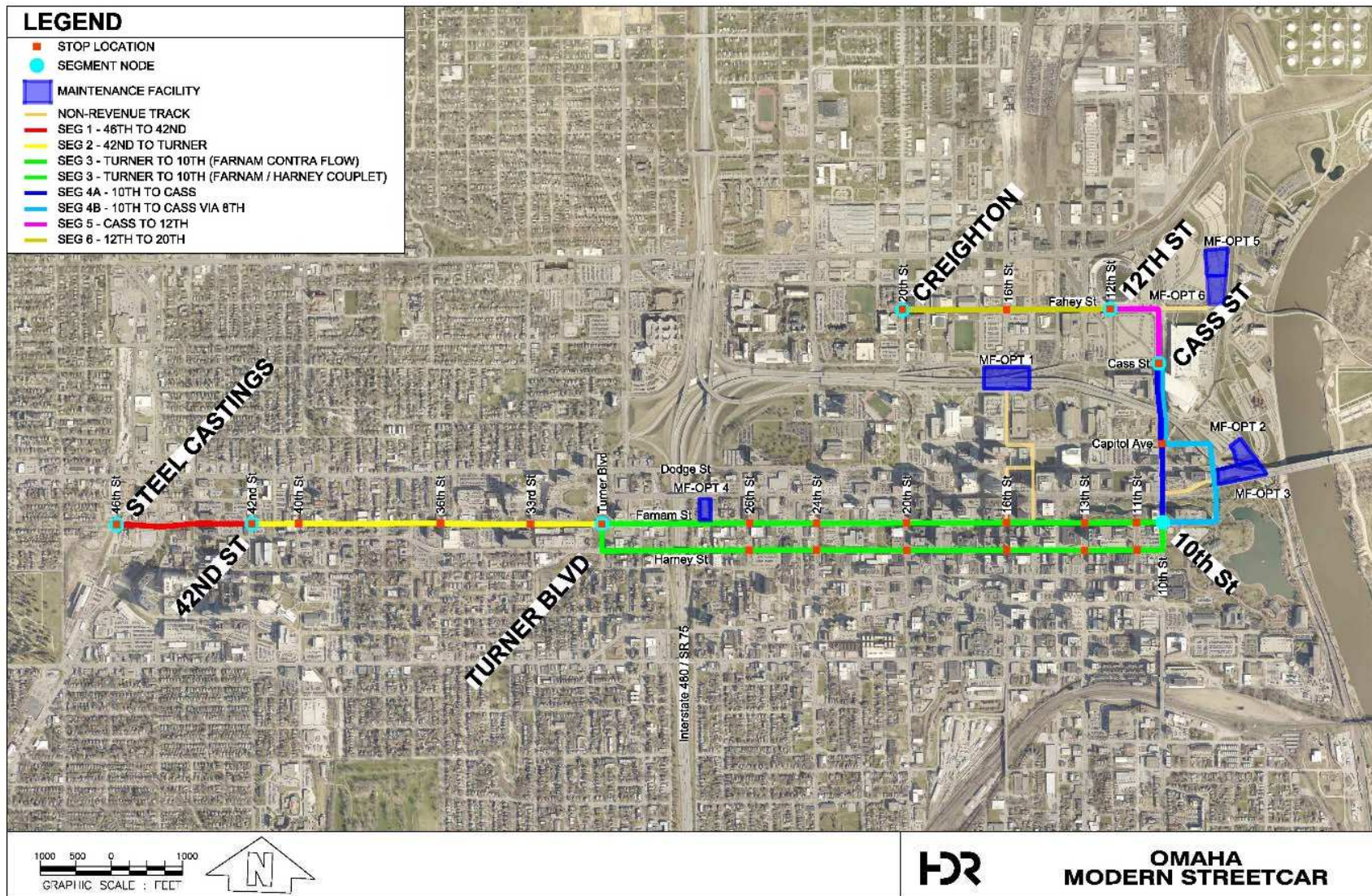


Figure 5: Center Platform Station

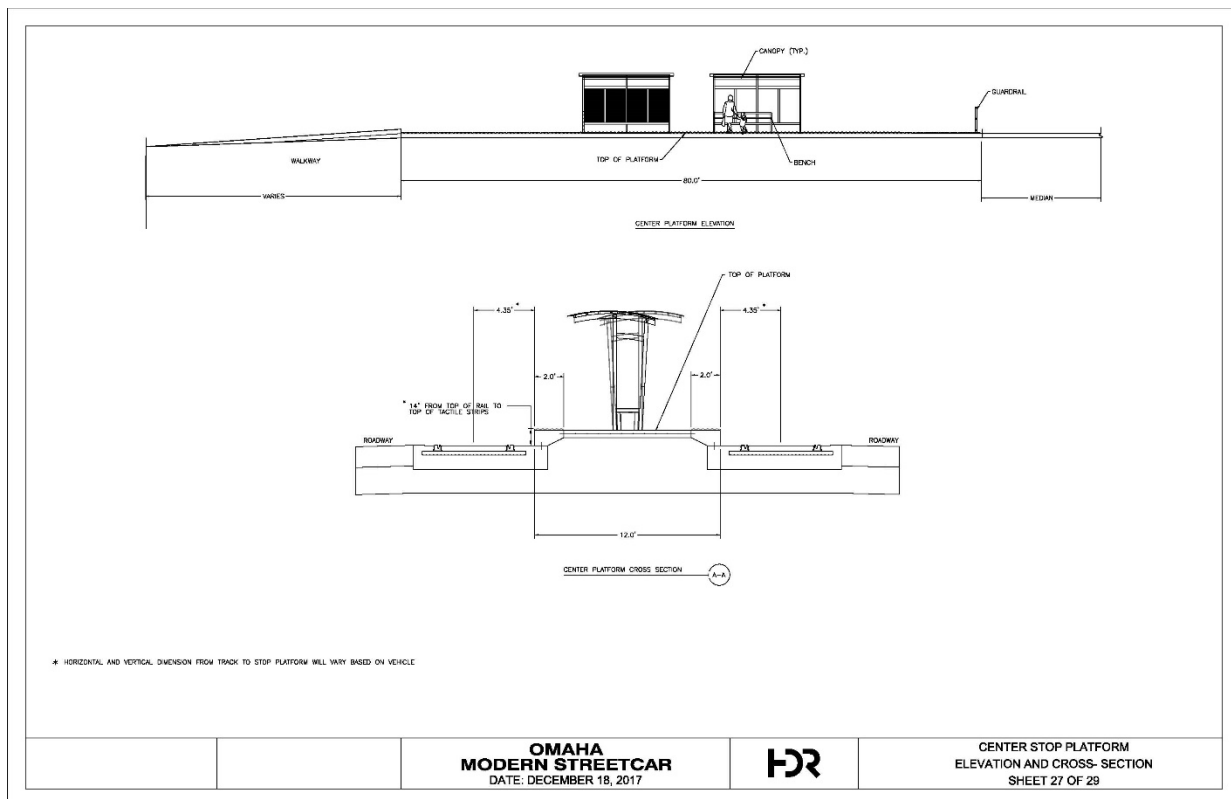
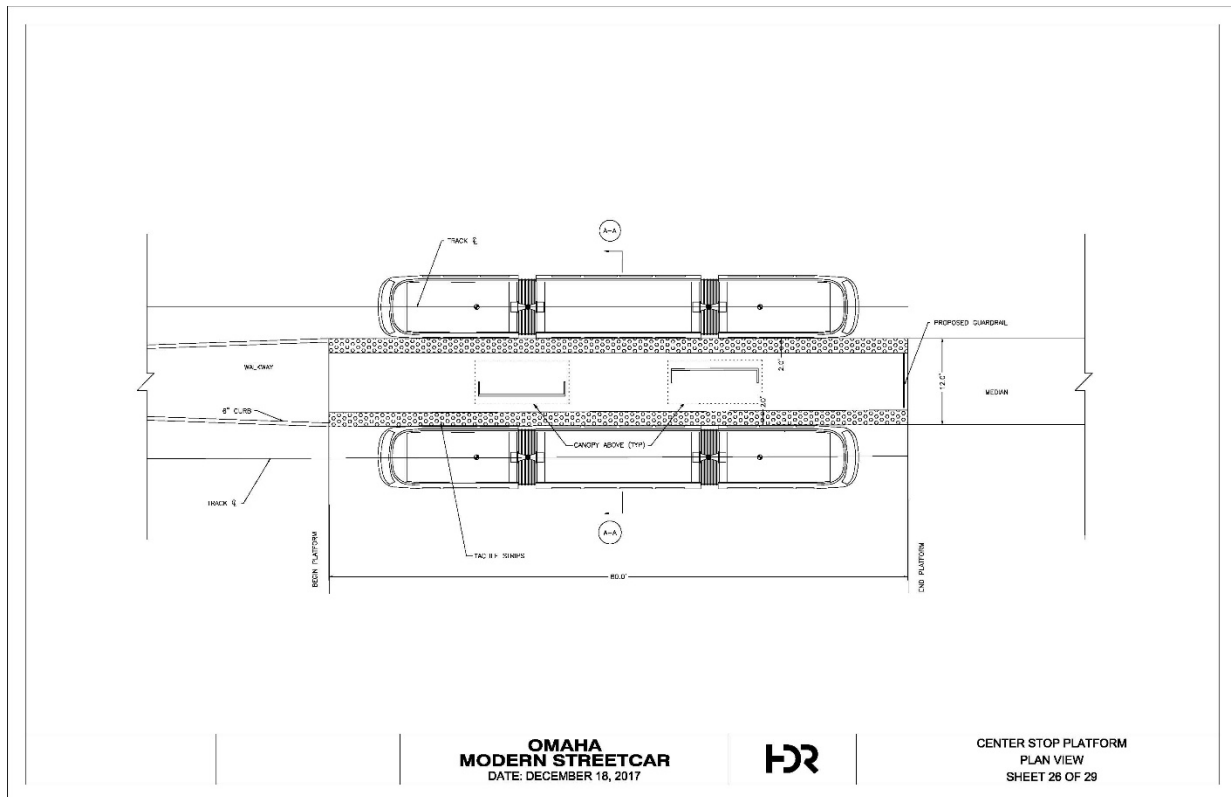
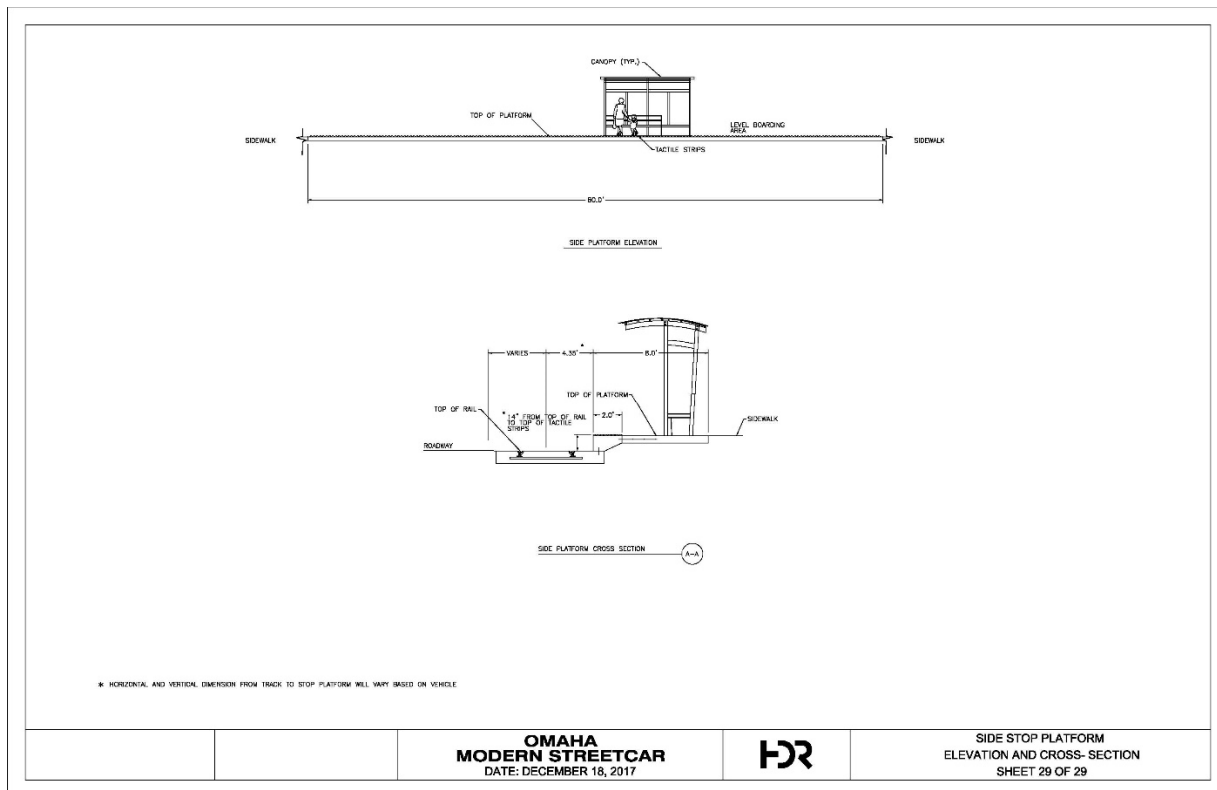
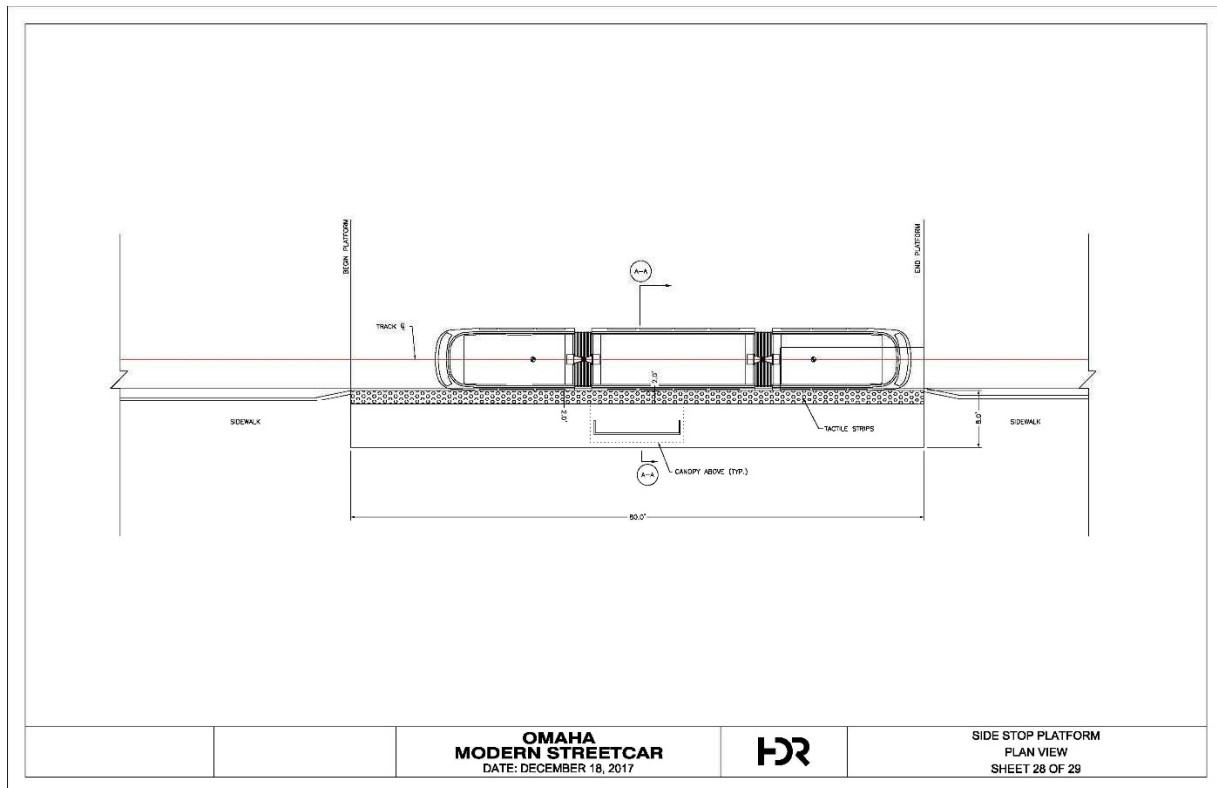


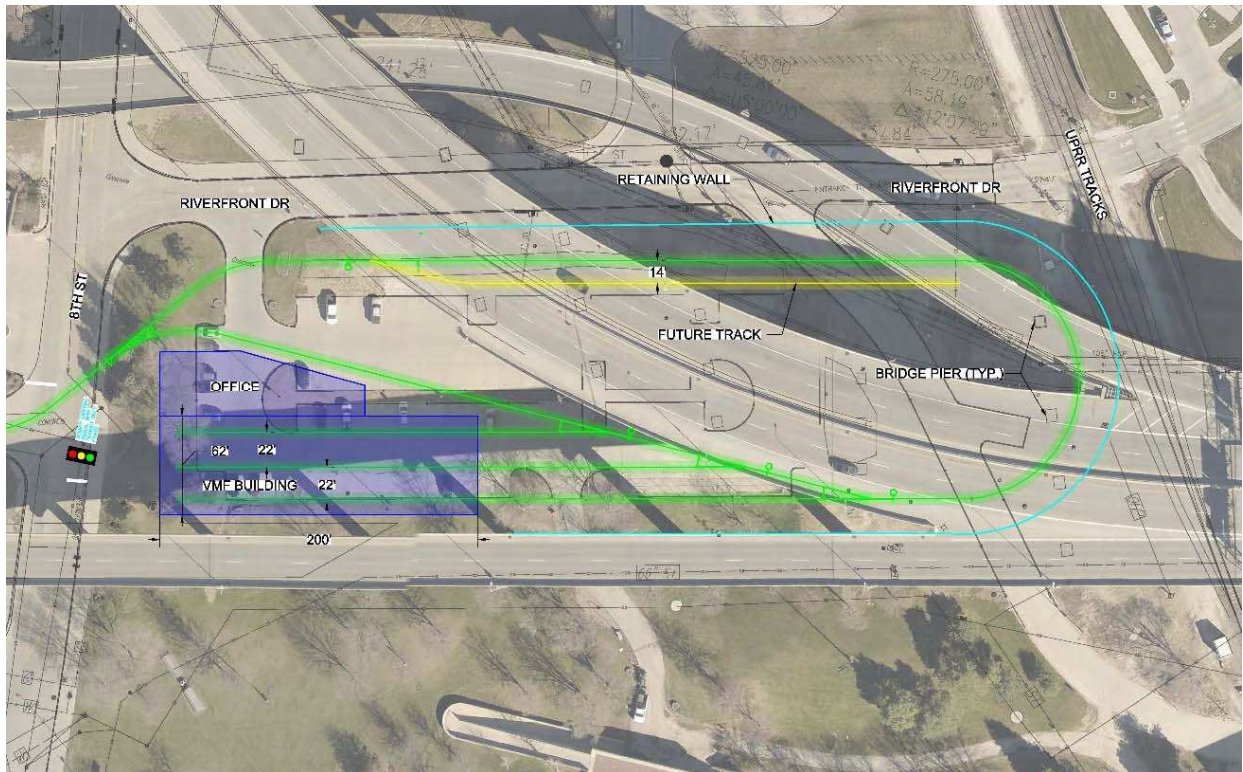
Figure 6: Side Platform Station



Vehicle Maintenance Facility

The preferred Vehicle Maintenance Facility (VMF) location is at the southeast corner of 8th Street and Riverfront Drive. The site was selected due to its proximity to the streetcar alignment, overall size, and existing ownership. **Figure 7** shows the site layout for the VMF as identified in the ACE plan set.

Figure 7: Vehicle Maintenance Facility Preferred Site Location



Capital Cost Estimate

The ACE phase includes a conceptual capital cost estimate for the Omaha Streetcar project based on observed pricing of recent streetcar systems. This includes engineering, track, utilities, structures, stops, traction power and communication systems, vehicles, a small allowance for fare collection, rights-of-way, professional services, and contingencies. Capital costs were developed to support the streetcar alignment and are intended to be order of magnitude costs consistent with the level of detail available. The capital cost estimate correlates to the ACE plan set included as **Appendix A**.

Methodology

The capital cost estimate includes items related to vehicles, engineering, and construction of a streetcar in Omaha to establish a base cost. This base cost is structured around engineering experience with similar projects and historical bid prices. The costs were estimated in both the current year (2017) as well as in the year of expenditure (YoE). For the purpose of this study, it was assumed that the streetcar will begin revenue service in 2021; should revenue service begin at a later date, project costs would rise based on the assumed rate of inflation. Corridor length is shown in both route miles (total length of corridor) and track miles (total length of track in the corridor). Additionally, the level of design is still pre-engineering, with many of the items in the cost estimates represented as allowances, which in effect act as a “place-holder” until further analysis and design identify quantifiable items needed to develop a more accurate cost estimate.

***Capital Cost Disclaimer:** The following costs are intended to establish an “order of magnitude” cost, not a detailed estimate. The estimate assumes that only improvements absolutely necessary to construct the streetcar will be built; betterments such as City Code compliance (zoning), streetscape, street lighting, elaborate stations, utilities not directly associated with the project, etc. are not included in the cost. It will be very important as the project advances into the engineering phase to minimize these betterments or provide additional funding to the project to account for additional scope items. In addition, it has not been determined if the Omaha Streetcar project will pursue federal funding. The current cost estimate uses the Federal Transit Administration (FTA) capital cost methodology. It does not include costs for professional services for National Environmental Policy Act (NEPA) documentation, which would be required if the project pursues federal funding. There is the potential to lower inputs in the capital cost estimate if the project were to use local funding only and not pursue federal funding. It is recommended that the capital cost estimate retain the current format for the current ACE phase.*

Capital Cost Development

Estimates of project capital costs were developed in four general steps under this methodology.

1. The costs were based on the concept alignments developed during this study. The corridors were laid out following typical streetcar design guidelines based on past project experience. Project specific design criteria shall be established during the engineering phase based on vehicle selection and City of Omaha design standards.
2. Project cost components, consistent with the level of design, were identified and quantified for each segment.
3. Unit costs were developed for each of the cost components based on industry standards, HDR's past project experience, and input from project stakeholders. These cost components were assembled in a spreadsheet, unit costs were applied, and the quantities were summed into the major FTA standard cost categories.
4. Additional factors such as contingencies, engineering & administration, and year-of-expenditure escalation were applied to develop the total project cost.

Unit Costs

Unit costs were developed from selected historical data, including final engineering estimates, completed projects, standard estimating manuals, and standard estimating practices. A mix of historical data from various national streetcar projects was used in developing the appropriate unit costs and allowances to be applied to the cost estimate. These include streetcar projects that have provided project cost information to the FTA by Standard Cost Category (SCC), such as Kansas City, Atlanta, Cincinnati and Tucson. In most cases, allowances were established based on the engineer's and firm's experience. These allowances serve as "place-holders" until further analysis and design can provide for more accurate and quantifiable units of work.

Escalation Factor

In order to establish accurate project budgets, an escalation factor must be used. The purpose of an escalation factor is to account for an increase in the cost of construction, materials and labor over time. The escalation factor is used to take the current year estimate and project it to a future base year or year of expenditure (YoE), assumed to be 2021 for the purpose of the ACE phase. It should be noted that, based on the current level of design and project development, this is an aggressive goal and would require the project to progress to Preliminary Engineering in 2018.

The factor by which the current year estimate has been escalated to the YoE was 3%. It is a reasonable estimate of the possible inflation that could be expected given the constant fluctuation in the economy and cost of material, fuel and labor. The actual inflation or escalation realized over the next few years could be more or less than the assumed value. Should the streetcar line not be operational by the assumed 2021 date, this 3% escalation factor should be applied for the revised opening date.

Results

A summary of the capital cost estimate is shown in **Table 1**. The streetcar project is broken out by the SCC for estimating purposes which are then summed to develop the total project cost. The ACE capital cost estimate is approximately \$169.8 million in 2021 dollars.

Table 1: Capital Cost Summary

SCC	Item	ACE (2021)
10	Guideway and track elements	\$22,910,000
20	Stations, stops, terminals, intermodal	\$4,190,000
30	Support facilities: Maintenance facility, administration buildings	\$16,180,000
40	Sitework and special conditions	\$36,360,000
50	Systems: Traction power, traffic control, communications	\$23,520,000
CONSTRUCTION SUBTOTAL (10-50)		\$103,160,000
60	Right-of-way, land, existing improvements	\$290,000
70	Vehicles	\$26,460,000
80	Project administration, design, construction management	\$24,500,000
SUBTOTAL (10-80)		\$154,410,000
90	Project reserve (unallocated contingency)	\$15,440,000
SUBTOTAL (10-90)		\$169,850,000
100	Finance charges	
TOTAL (10-100)		\$169,850,000
COST PER TRACK MILE (5.51 miles)		\$30,825,000

Note: Totals may not exactly equal sum of components due to rounding

Capital Cost Comparison

The ACE capital cost estimate is approximately \$30.9 million per track mile, and \$53.1 million per route mile. These costs were compared against other streetcar projects which have been completed since 2013. The comparison is not intended to rank specific projects against each other as being more or less “expensive”, but to help verify that the Omaha Streetcar costs developed in the ACE phase were in line with peer systems.

Cost information used in this comparison was compiled from FTA reported project costs for the Atlanta, Cincinnati, Kansas City, and Tucson streetcar projects as compiled in the *2016 Community Streetcar Coalition Draft Cost Comparison Report*. Both per track mile and per route mile costs are shown as the escalated 2015 values from the draft report, and as escalated 2021 values for comparison with the Omaha Streetcar project capital cost. **Table 2** shows the range of cost per track mile and route mile from the selected streetcar projects.

Table 2: Capital Cost Comparison per Track Mile and Route Mile

Project	Per Track Mile (2015) in Millions	Per Track Mile (2021) in Millions	Per Route Mile (2015) in Millions	Per Route Mile (2021) in Millions
Omaha	N/A	\$30.9	N/A	\$53.1
Selected Projects	\$24.6 - \$34.7	\$28.5 - \$41.4	\$28.9 - \$45.1	\$33.6 - \$53.8

Note: Selected Projects escalated to 2021 used a 2.5% inflation rate for the low end of the range and 3.0% for the high end.

Streetcar Extensions

High level cost estimates were also prepared for additional streetcar extension segments that are not part of the ACE plan set. The level of design and available information for these segments was significantly less than the ACE alignment segments, so the cost estimates are largely based on per track mile allowances. These streetcar extension segments include:

- 42nd Street / Farnam Street to Steel Castings
- 10th Street / Cass Street to 12th Street / Fahey Street
- 12th Street / Fahey Street to 20th Street / Fahey Street

In an effort to better reflect the Omaha specific impact and pricing information determined during the ACE phase, the initial per track mile allowances, which were based on available FTA information and pricing information from similar streetcar projects, were updated for this effort. The segment costs are shown in **Table 3**.

Table 3: Capital Cost for Extensions

Segment	Length (Track Mile)	Segment Cost
42 nd St / Farnam St to Steel Castings	0.45	\$13,330,000
10 th St / Cass St to 12 th St / Fahey St	0.27	\$9,380,000
12 th St / Fahey St to 20 th St / Fahey St	0.55	\$22,300,000

Note: High level estimate only

Traffic

HDR completed a traffic evaluation in consultation with the City of Omaha Public Works Department to provide input on the streetcar alignment, intersection configuration and signal operations along the streetcar route. The evaluation also provided estimates for delays and travel times for general traffic and the streetcar along its route. The traffic evaluation was completed using Vissim 9 microsimulation analysis software. Vissim models individual vehicles and their behavior based on vehicle performance and algorithms for specific tasks such as car following and lane changing.

Vissim analysis was completed for year 2021 No-Build and Build alternatives, and for year 2040 of the preferred Build alternative. Year 2021 was selected as the short-term future year because it coincides with the anticipated opening year of the streetcar. The Vissim 2021 No-Build AM and PM models were calibrated to match local driving conditions. Typically, an existing year model is calibrated to match existing field conditions.

Results

The inclusion of the streetcar was generally found to have minimal impacts to general traffic operations. The most notable increase in delay and queuing to general traffic in the Build alternatives was along 10th Street, with several movements showing an increase for both metrics. Queues that increased were generally cleared within one signal cycle, and the overall intersection level of service (LOS) at intersections along 10th Street was mostly the same between the No-Build and Build alternatives.

Special Event Traffic

It should also be noted that the Vissim analysis does not account for conditions with special event traffic. Special event traffic has a noticeable impact to traffic operations in Downtown, particularly along 10th Street from high-attendance events at the CenturyLink Center and TD Ameritrade Park. The reduction in travel lanes on 10th street will likely require a change to special event traffic operations compared to current conditions.

The impact of special events on streetcar operations will most likely be related to the surge of riders that will fill the streetcar vehicles. Since the streetcar will operate along 10th Street in an exclusive bi-directional lane, the streetcar will be able to effectively serve ridership demands from the special events. The streetcar operating plan has not been determined, but would likely include a special event plan whereby additional vehicles are staged for special events.

Future traffic evaluations should be conducted in order to better identify the true impact of special event traffic to general traffic and streetcar operations. This would best be done in collaboration with the streetcar operating plan.

Governance

Baird Holm conducted an assessment of potential governance structures for the Omaha Streetcar project. Based on an initial analysis with Metro, the City of Omaha, and MAPA, it is recommended that the involved public agency partners form a joint interlocal entity ("Interlocal") under the Interlocal Cooperation Act (the "Act") to govern the development, construction, operation, and maintenance of the streetcar.

An Interlocal requires two or more "public agencies" to enter into an agreement (the "Interlocal Agreement") to form and govern the Interlocal. The Act defines a "public agency" as: "any county, city, village, school district, or agency of the state government or of the United States, any drainage district, sanitary and improvement district, or other municipal corporation or political subdivision of this state, and any political subdivision of another state." The Act essentially provides that the Interlocal may do anything the law allows any one of its members to do.

This structure offers the greatest flexibility in organization and governance in the short-term, and in the long-term for ongoing maintenance and future expansion of the project. The public agencies participating in the Interlocal could include Metro, the City of Omaha, MAPA, the Omaha Municipal Land Bank, or a newly-created business improvement district. The Interlocal itself constitutes "a separate public body corporate and politic of this state, exercising public powers and acting on behalf of the public agencies which are parties to such agreement."

It is also recommended that the governing body form a separate, private, non-profit supporting foundation. This foundation, if the Internal Revenue Service certifies it as a tax-exempt entity under section 501(c)(3) of the Internal Revenue Code, could accept private, charitable (tax-deductible) contributions for the benefit of the streetcar project. Alternatively, because the Interlocal may itself be a separate legal entity, the Interlocal could apply to the Internal Revenue Service for tax-exempt status. That would allow the general public to make tax-deductible contributions directly to the entity.

Next Steps

The next step for the Omaha Streetcar project is to prepare a Funding and Finance Plan. This would be followed by Preliminary Engineering (approximately 30% design plans), and then Final Design (100% design plans) and Construction.

Key Considerations

Funding and Finance Plan

A Funding and Finance Plan is needed for the Omaha Streetcar project to proceed. As described earlier, a Financial Assessment was prepared for the project in 2016. This report presented funding/finance scenarios that identify different paths for the implementation and operation of the streetcar project. No decision has been made in terms of a preferred funding and finance approach based on these scenarios.

FEDERAL VS. NON-FEDERAL

It has not been determined whether the project will pursue Federal funding. In order to obtain Federal funding, the Omaha Streetcar project would need to apply for funding through the FTA Capital Investment Grant (CIG) program or another discretionary grant program. Based on the current project cost, this would be the Small Starts category, which provides Federal grants to eligible projects less than \$300 million in cost that are seeking less than \$100 million in CIG funds.

There has been considerable discussion among project sponsors about whether the process for Federal funding through the Small Starts programs is worth the potential for associated costs and schedule delay. If the Omaha Streetcar project pursues Federal funding, it will need to follow the additional steps required for Small Starts including the preparation of National Environmental Policy Act (NEPA) documentation and additional ridership forecasting using the FTA STOPS model. The project will need to meet Buy America requirements and will be assigned a Project Management Oversight consultant.

COST OF DELAY

The year 2021 has been identified as the opening year for planning purposes in the ACE phase. The inflation factor by which the current year estimate was escalated to 2021 was 3%. Therefore, any further delay will increase costs by this inflation factor. This escalation factor is just an estimate, and the actual factor may be higher/lower depending on labor costs, cost of materials, and other factors. The cost of delay applies to other funding sources as well, as each year the project is delayed, it misses out on the potential value capture from development projects in the corridor.

Preliminary Engineering

There are several long lead items (operating plan, vehicle procurement, and I-480 bridge replacement) that would need to start immediately in Preliminary Engineering.

OPERATING PLAN

The ACE phase did not include an operating plan or the development of operating costs. General operating assumptions were developed during the AA study and would need to be updated in the next phase along with the travel time and fare policy.

The general assumption is that Omaha Streetcar would provide 10 minute service during the peak, and the peak would be defined as an all-day peak and not just the traditional morning and evening peak hours. The frequency and hours of operation as identified in the AA study are shown in **Table 4**.

Table 4: Operating Plan from AA Study (2014)

Frequency (peak/off-peak/evening)	Hours of Operation (Mon-Fri/Sat/Sun)
10/15/20 minutes	19/18/12 hours

The operating cost as identified in the AA study was developed using Fiscal Year 2011 National Transit Database (NTD) operating and financial data from the three streetcar systems in operation at the time of the AA study: Portland (OR), Seattle (WA), and Tacoma (WA). The NTD data was used to prepare an operating cost estimate in 2013 dollars. The annual operating cost estimate in the AA study was \$6.9 million in 2013 dollars. This estimate was then inflated to \$7.0 million in 2016 dollars and \$7.4 million in streetcar opening year dollars for the Financial Assessment.

Operating Cost Disclaimer: The Omaha Streetcar operating cost was a planning level estimate prepared for the AA study. A new operating cost estimate is needed to correlate to the ACE plan set. Several new streetcar systems have opened since the last operating cost estimate, most notably Kansas City and Tucson. These projects are likely more in line with labor costs that would be seen in Omaha. Also, the streetcar route and alignment has been modified slightly as part of the ACE phase, thereby requiring a revised operating cost estimate.

A travel time assumption was needed for the traffic and ridership analyses as part of the ACE phase. The Vissim 9 microsimulation analysis software used as part of the traffic evaluation determined the streetcar would take between 17.5 to 19 minutes from end to end depending on traffic conditions. This is not the official travel time estimate, as that would be determined by the operating plan.

VEHICLE PROCUREMENT

Vehicles are a long lead item and typically require 36 months minimum for procurement, manufacture, delivery, and testing. If a project uses Federal funding, the vehicle manufacturer must meet Buy America requirements. If the project uses local funding only, there may be more opportunities in terms of vehicle manufacturers.

The ACE cost estimate assumes 5 vehicles, as identified in the AA study. The number of vehicles will need to be reevaluated as part of the operating plan that needs to be completed. There may be a need for an additional vehicle(s) depending on the operating plan, spare ratio preferences, and special event capacity. Adding a vehicle would increase the overall cost estimate.

I-480 BRIDGES

The ACE plan set and cost estimate assumes the Farnam and Harney Street bridges over I-480 will be replaced by the Nebraska Department of Transportation prior to the opening of the Omaha Streetcar project. The cost estimate assumes that the streetcar project will pay for the streetcar infrastructure and shared lane/span associated with each of the bridge structures. In order to be operational by 2021, the planning, programming, and design of the replacement bridge structures would need to begin in 2018. This is a very optimistic schedule and would require a partnership to begin immediately.

Ridership

Additional ridership forecasting is necessary to provide an estimate that better reflects the existing and future travel markets for streetcar. HDR completed a ridership forecasting exercise using a travel modeling software called STOPS (Simplified Trips-on-Project Software). STOPS (version 2.01) is a forecasting software developed by the Federal Transit Administration (FTA). There are limitations of STOPS ridership forecasts in that the trip generation and trip distribution models are based on journey-to-work data captured by the American Community Survey (ACS). The ACS data does not include travel information for special markets, including university students and special events.

Using STOPS, the ridership estimate for Omaha Streetcar is between 820-1,060 boardings per day in 2021. This is substantially lower than peer streetcar systems which typically average 1,000 boardings per day per revenue mile. It is believed this ridership estimate is low because it does not reflect existing travel markets in the corridor. There are additional inputs that would be helpful if further ridership estimates are prepared:

- **Operating Plan:** The ridership forecast will need to be updated with the future operating plan including travel time and fare policy. It is also important to include any potential modifications to the Metro background bus network.
- **Updated On-Board Survey:** Metro is in the process of completing a system-wide on-board survey. This survey will replace the 2012 survey used to calibrate the STOPS model. This new survey includes major changes to the Metro bus network that occurred in 2015.
- **Transit Dependent Persons:** The project will need to better determine the number of transit dependent persons, which FTA defines as trips made by persons in households that do not own a car. When a project is being considered for Federal funding, transit dependent on-project person trips are given a higher weight toward the overall score.
- **Special Events:** There are a large number of special events in the streetcar corridor, particularly at CenturyLink Center and TD Ameritrade Park. It should be determined if data from these special events is available and whether it could be included in the streetcar ridership forecast.
- **Other Shuttles:** UNMC currently operates a shuttle between UNMC and Midtown that could be replaced by streetcar. Ridership from this route could be incorporated into the future STOPS model.

Next Steps

The next steps based on the key considerations described above are shown in **Figure 8**.

Figure 8: Next Steps

