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Executive Summary

The cities of Pittsburg, Brentwood, Oakley, and Antioch, along with East Contra Costa Transit Authority (ECCTA), Contra Costa Transportation Authority (CCTA), and Contra Costa County, have collaborated to conduct a feasibility study for potential deployment of a Dynamic Personal Micro Transit (DPMT) network in Eastern Contra Costa County (East County). The purpose of this Feasibility Study (Study) is to analyze whether constructing and operating a DPMT system in the East County region is feasible and beneficial. The Study investigates the DPMT’s core system, including how it operates, the potential benefits, potential ridership demand, costs of implementation, and identification of risk mitigation strategies, potential business models, and funding strategies. The main purpose of the Study is to inform decision-making entities whether the DPMT proposed by Glydways could be successfully integrated over time, to complement traditional bus and rail transit, and support the region’s greater transportation strategies.

DPMT system, to be built by Glydways, consists of a fleet of driverless electric vehicles operating on-demand in elevated or at-grade paved pathways. The operating space can be created from repurposed roads, abandoned railroad, capped canals, or newly built elevated pathways. Glydways vehicle is a lightweight bidirectional electric vehicle with full functionality steering, sensing and control in each direction. Users can request a ride through an app on their phone or using kiosks at boarding zones for a non-stop ride from their origin to destination. The system is expected to have the capacity to serve up to 10,000 persons/hour in each direction.

A conceptual route alignment (Figure ES1) was developed with feedback received from key stakeholder in East County. The proposed alignment connects existing and planned residential, medical, institutional, business, and industrial developments/centers with multimodal transit stations in East County as a continuous route. The alignment shown as a dashed line represents routes for future consideration. The proposed route has not been finalized and is subject to change as the availability of rights of way and the connections needs further study.
Table ES1 lists the characteristics, estimated costs, and estimated 2030 (projected opening year) annual ridership. Capital costs include infrastructure (guideway, garage/central control, and vehicle costs) and development costs. Annual Operations and Maintenance (O&M) costs include operating expenses and replacement costs of vehicles and infrastructure. O&M costs also include labor costs and service licensing fees.

Table ES1: DPMT Characteristics, Estimated Costs and Ridership

<table>
<thead>
<tr>
<th>DPMT Segment</th>
<th>Segment Length</th>
<th>Total Capital Cost (in millions)</th>
<th>Total Annual O&amp;M Cost (in millions)</th>
<th>Estimated 2030 Annual Ridership (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburg</td>
<td>9.6 miles</td>
<td>$196</td>
<td>$12</td>
<td>2.9</td>
</tr>
<tr>
<td>Antioch</td>
<td>6.3 miles</td>
<td>$121</td>
<td>$7</td>
<td>2.1</td>
</tr>
<tr>
<td>Oakley and Brentwood</td>
<td>12.8 miles</td>
<td>$134</td>
<td>$10</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28.7 miles</strong></td>
<td><strong>$451</strong></td>
<td><strong>$29</strong></td>
<td><strong>7.0</strong></td>
</tr>
</tbody>
</table>

For the purpose of this Study, Glydways technology was evaluated using various criteria with respect to technology readiness, scalability, costs, and return on investment. Financing and delivery of the project is an additional evaluation criterion that is discussed separately in “Feasibility of DPMT Deployment Business Case” section. The summary of the evaluation in comparison to other transit modes is shown in Table ES2.
### Table ES2: Evaluation Criteria Matrix - Summary

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Bus Transit</th>
<th>Rail Transit</th>
<th>Private Car</th>
<th>Glydways DPMT</th>
</tr>
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<tbody>
<tr>
<td>Technology Level</td>
<td>✅</td>
<td>✪</td>
<td>✫</td>
<td>✖</td>
</tr>
<tr>
<td>On-demand 24/7</td>
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<td>✖</td>
<td>☑</td>
<td>✪</td>
</tr>
<tr>
<td>Total Trip Time</td>
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<td>✖</td>
<td>✫</td>
<td>✪</td>
</tr>
<tr>
<td>Non-Stop Travel</td>
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<td>✖</td>
<td>☑</td>
<td>✪</td>
</tr>
<tr>
<td>Scalability</td>
<td>+</td>
<td>✖</td>
<td>☑</td>
<td>✪</td>
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<tr>
<td>Safety</td>
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<td>+</td>
<td>✖</td>
<td>✪</td>
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<tr>
<td>ADA Compliant</td>
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<td>☑</td>
<td>+</td>
</tr>
<tr>
<td>Infrastructure Capital Costs</td>
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<td>☑</td>
<td>✪</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
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<td>+</td>
<td>☑</td>
<td>✪</td>
</tr>
<tr>
<td>Ridership Demand</td>
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<td>✫</td>
<td>☑</td>
<td>✪</td>
</tr>
<tr>
<td>Operating Costs</td>
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<td>+</td>
<td>✖</td>
<td>+</td>
</tr>
<tr>
<td>Potential Savings in Accident Costs</td>
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</tr>
<tr>
<td>Barriers in Implementation</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Risk Management</td>
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<td>+</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbols</th>
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<th>No/Bad</th>
<th>Acceptable</th>
<th>Varies</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging</td>
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<td>✖</td>
<td>+</td>
<td>?</td>
<td>☑</td>
</tr>
<tr>
<td>Funding</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Environmental</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

Potential Public Private Partnership (P3) models with Design-Build-Finance-Operate-Maintain (DBFOM) options to deliver the DPMT system were explored and are recommended for deployment in East County as discussed in “Feasibility of DPMT Deployment Business Case” section. The DBFOM financial model can accelerate deployment of the DPMT, while limiting risk, and ensuring financial sustainability.
This feasibility study concludes that deployment of the DPMT is feasible in East County with the potential following benefits:

- Supports economic development and creates jobs
- Congestion relief by converting vehicle trips to transit trips
- Increased transportation access for underserved communities
- Cost effective and scalable solution
- Environmentally sustainable solution
- Speedy deployment delivered through public/private partnership

Procurement and deployment of a DPMT in East County requires consensus of project stakeholders and decision makers while the success is driven by the adoption by the users. The project requires detailed engineering, environmental clearance, approvals, secured funding, right of way acquisition, construction management, and commitment for safe and secured operations and maintenance. As next steps, execution of a Pre-Development Agreement (PDA) is recommended to initiate a negotiating period during which project stakeholders can discuss and finalize the implementation agreements that are necessary for the comprehensive implementation of the Glydways system; provided by the private sector in a DBFOM environment.
Introduction

This section includes the purpose of the study and an overview of the current demographic, regulatory, and policy context surrounding the existing transportation system in East County.

PURPOSE OF THE STUDY

East County (Figure 1), an area that includes Antioch, Brentwood, Discovery Bay, Oakley, Pittsburg, unincorporated areas of Bay Point and unincorporated areas of Contra Costa County, is an expanding area of economic growth. 79% of area residents drive to work on SR-4 which is a vital regional and interregional commute and trade corridor; and one of the most congested in the Bay Area. Economic expansion is essential for this region and alternative mobility options that supports a transportation mode shift away from single occupant vehicles are needed to keep and promote this area’s vitality and to connect it to the rest of the County and the Bay Area. The cities of Pittsburg, Brentwood, Oakley, Antioch, along with Contra Costa County, have collaborated to conduct a feasibility study for potential deployment of DPMT to enhance transit accessibility and connectivity in East County.

The purpose of this Study is to analyze whether constructing and operating the DPMT system in the East County region is feasible and beneficial. The Study investigates the core system of the DPMT, including how it operates, the potential benefits, potential ridership demand, costs of implementation, and identification of risk mitigation strategies, potential business models, and funding strategies. The main purpose of the Study is to inform decision-making entities whether the DPMT system could be successfully integrated over time, to complement traditional bus and rail transit, support the region’s greater transportation strategies, and encourage economic growth and vitality.

The East County Integrated Transit Study (ECITS) initiated by CCTA is evaluating the need for transit services in East County. The findings of this feasibility study will inform the ECITS study regarding DPMT as a viable mobility option that could provide necessary transportation service in East County.

Figure 1: East County Map
GOALS + OBJECTIVES

The goals and objectives for this study were drafted in collaboration with the project stakeholders.

TRANSPORTATION CONTEXT

East County is an expanding area with extensive economic growth. The three East County communities that have seen growth rates higher than average in Contra Costa County are Brentwood, Antioch, and Pittsburg. Among these three cities, Brentwood is the fastest-growing community transitioning from a primarily agriculture-based community to a more commercialized and thriving suburb within the greater San Francisco Bay Area. The lower cost of housing compared to other Bay Area communities and continued expansion of jobs along the Interstate 580 and 680 corridors, including in the Livermore Tri-Valley and Concord/Walnut Creek areas are contributing factors to growth.

Transportation through and within East County consists of a network of facilities across multiple travel modes (roadways, rail transit, and bus transit), functions, and capacities. Many agencies oversee the planning, development, operation, and funding of these facilities.

The California Department of Transportation (Caltrans) manages the state transportation network. Contra Costa Transportation Authority (CCTA) administers the county’s transportation sales tax program and is the designated Congestion Management Agency (CMA) for Contra Costa County. At the local level, the Contra Costa County Departments of Public Works and Conservation and Development are responsible for overseeing the planning, design, construction, and maintenance of transportation facilities, including roadway, bicycle, pedestrian, and transit facilities, in unincorporated areas.

Incorporated cities of Antioch, Oakley, Pittsburg, and Brentwood in East County are responsible for overseeing the planning, design, construction, and maintenance of transportation facilities, including roadway, bicycle, pedestrian, and transit facilities, in their respective jurisdictions. ECCTA, a Joint Powers Agency (JPA) consisting of cities of Antioch, Brentwood, Oakley, Pittsburg, and the Contra Costa County, operates fixed-route transit and paratransit service under the name “Tri Delta Transit” and micro transit service under the name “Tri My Ride”. The light rail branch line of the Bay Area Rapid Transit (BART) system eBART - East Contra Costa County BART extension - starts at the Pittsburg/Bay Point station and extends to the Antioch station. San Joaquins is a passenger train service operated by AMTRAK in the San Joaquin Valley. The San Joaquins route passes through East County and connects Stockton, in the Central Valley, with Oakland in the San Francisco Bay Area. AMTRAK stations in East County include Antioch station and proposed Oakley station.
Regional highway access to East County is primarily provided by State Route 4 (SR 4), which extends east-west through the county. The SR 4 corridor connects East County to other East Bay cities to the west and Discovery Bay and Stockton and the central valley cities to the east. Regional public transit is provided by BART’s Antioch to San Francisco Line that serves East County with Pittsburg/Bay Point, Pittsburg Center and Antioch stations. “The eBART Next Segment Study” includes alternatives to extend the rail system within the median of SR 4 to a new terminus station in Brentwood. Tri Delta Transit provides fixed-route and on-demand service from East County to the BART system and regional job centers to accommodate the commuter workforce population. Figure 2 illustrates transportation services available and planned in East County.

Figure 2: Transportation Services in East County

Based on 2019 census data, 'Driving Alone' is the dominant commute mode used by 71% of residents of East County. Carpooling is used by 16% of residents and approximately 6% use public transit to get to work. A small percentage of residents, approximately 2%, use bicycling, walking, or other means to commute. Approximately 5% of the people reported that they work from home. Figure 3 and Figure 4 show high minority (more than 65%) and high poverty (30% or higher) census tracts in East County, respectively.

Figure 3: High Minority Census Tract – East County

Figure 4: High Poverty Census Tract – East County
TECHNOLOGY FEASIBILITY

The transportation system in East County has been significantly impacted by the COVID-19 pandemic. Day-to-day social and travel behavior has drastically changed within the region, as has been the case throughout the San Francisco Bay Area and the state. Transit ridership has dropped significantly, and commute times are currently more comparable to pre-COVID-19 levels on SR 4 due to increased use of single occupant vehicles. Even before COVID-19, fixed-route bus transit ridership had been declining as travel time reliability and overall long commute times remained the biggest challenges for transit. As cities and transit providers plan for re-opening post COVID-19, they need to factor in budget constraints, congestion, adoption of new regulations such as California’s plan to eliminate gasoline powered vehicles in 15 years, and also prepare for new technology and growth.

New transportation technologies and services are emerging and evolving. On-demand services such as Lyft, Uber, and other transportation network companies operate in East County to meet customers’ demand. Technology growth in recent years has brought automation capabilities to all aspects of our transportation system. While the automation of vehicles and services is relatively mature in the rail transit industry, bus transit and personal vehicles still lag in automation. Connected and Automated Vehicle (CAV) technology is slowly progressing through pilot programs, partnerships, private sector involvement, and research activities in bus transit automation.

Technologies like DPMT come with innovative strategies that can bring much needed on-demand transit service to East County where important factors like ride time, wait time and ride quality can be greatly improved. With much of the community in high minority and high poverty areas in East County, the passenger’s willingness to board the system, or not to board the system, will greatly depend on the fare structure of the system as well. Various factors along with the issues and risks are assessed in this feasibility study to determine the viability of DPMT in East County.
Technology

Hybrid transportation systems similar to the DPMT have been proven in the past as Personal Rapid Transit (PRT), Group Rapid Transit (GRT), and Automated Transit Network (ATN) systems, first introduced in 1975 in Morgantown, West Virginia. The concepts have had varying success gaining acceptance despite clear advantages in capital/operating costs, flexible operating capability, personalized safety, convenience, and scalability. However, recent transportation technology advances, dynamic block control, Artificial Intelligence (AI) and cloud computing, which is implemented in DPMT, makes it a viable micro transit option in the era of redefining mobility. This section reviews the DPMT technology, how it operates, technical requirements, and its potential benefits.

CONCEPT

Glydways is a phased, ATN based transportation solution that can bring micro transit connectivity to East County. The features of the proposed Glydways system fits within the characteristics of ATN that is sometimes referred to as PRT. ATN characteristics are:

- Direct origin-to-destination service with no need to transfer or stop at intermediate stations.
- Small vehicles available for the exclusive use of an individual or small group traveling together by choice.
- Service available on demand by the user rather than on fixed schedules.
- Fully automated vehicles which can be available 24 hours a day, 7 days a week.
- Vehicles operating on a guideway that is reserved for their exclusive use.
- Small (narrow and light) guideways that are elevated, at ground level or underground as required to meet the needs of rights of way and cross traffic while delivering non-stop seamless travel.
- Vehicles able to use all guideways and stations on a fully connected network without any restrictions.

GLYDWAYS SYSTEM

Glydways system consists of a fleet of electric vehicles operating on-demand in a dedicated paved pathway. The operating space is created from repurposed roads or built anew in a dedicated structure. The vehicles are autonomous and independent yet
orchestrated by local and central control as a “system of systems” to provide potential capacities of up to 10,000 persons/hour in each direction. The Glydways system consists of three elements; the vehicles, infrastructure, and Continuous Flow System Control.

**Figure 5: Glydways Vehicle**

Glydways vehicles, shown in Figure 5, use standard parts and technology currently available and built in the U.S. The Glydways vehicle is a lightweight electric vehicle designed for reliable, efficient, and comfortable urban mobility. The Glydways vehicles are bidirectional electric vehicles equipped with full functionality steering, sensing, and control in each direction. The deployed system in East County will typically operate at an average speed of 31 miles per hour (mph) for safety and battery efficiency even though Glydways vehicles can travel at speeds up to 62 mph. Glydways vehicles can accommodate up to four (4) people, a wheelchair and a companion, or a bicycle and (3) passengers.

**Infrastructure**

The proposed Glydways system consists of elevated, at-grade or underground guideways for main vehicle fleet throughput, with all boarding zones at ground level.

**Guideways:** The guideway, as shown in Figure 6, can be a one-way or a two-way track that can be implemented above, at, or below grade and is exclusively grade/barrier separated. Where the guideways are at-grade, fencing, walls, or other appropriate barriers will maintain right of way integrity. The size, spans, and methods of construction are like pedestrian and bicycle bridges with similar design and approval requirements. Because Glydways vehicles can reverse directions along the line at every boarding zone, there are no turnarounds required in this system which reduces system footprint.

**Figure 6: Glydways Overhead Guideway**
**Boarding Zones:** Glydways passengers can access the system via boarding zones. Each boarding zone, as shown in Figure 7, consists of a simple concrete platform, the array of boarding spots, and canopy structures that serve as cover for the boarding zone space. The canopy structure also provides opportunities to incorporate lighting, wayfinding, and system signage.

**Figure 7: Glydways Boarding Zone**

**Garages:** The Glydways Maintenance and Storage Facilities (MSFs) are very small and can be accommodated inside existing buildings, parking structures or built new. Inside the MSF, the vehicles are stored on simple lightweight steel deck structures. The MSFs will be spread over multiple locations across the system to both minimize footprint as well as reduce rider wait time. As the Glydways system is expanded, additional garages will be built to accommodate the increase in fleet requirements. Charging and vehicle maintenance will occur in these facilities.
Continuous Flow System Control

Glydways’ system relies on a Fleet Management System (FMS), Track Management System (TMS), and Boarding Zone Management System (BMS) to maintain the continuous flow of vehicles. Figure 8 shows how the three systems work together.

**FMS:** The volume of vehicles in a Glydways system is modulated by the FMS by way of garages, which dispatch vehicles into or out of the system throughout the day, matching vehicle supply to both live and historically predicted passenger demand. The FMS’s roles include: (i) Coordinate reservations; (ii) fleet supply to demand balancing; (iii) system-wide recommendations to account for emergency requirements; and (iv) act as a central observation point for the control team to react to events. The FMS intentionally does not provide direct control override for individual vehicles. The master control shutoff is located in the system Control Center and can quickly slow each vehicle to a stop in any emergency.

**TMS:** The TMS maintains a continuous flow of vehicles on a section of track called a trunkline. Under normal operating conditions, the velocity of a vehicle on a trunkline is 31 mph but even at maximum system capacity never falls below a minimum speed (e.g., 15.5 mph).

**BMS:** Vehicles enter and exit a trunkline to pick up passengers at boarding zones in a process called coordinated embarkation. This process is managed by the BMS.

*Figure 8: Continuous Flow System*
CONCEPT OF OPERATION

This section explains how the Glydways System will be operated in various typical operational scenarios.

Operational Scenario 1: On-demand point-to-point service

Glydways’ basic operating model is on-demand, point-to-point service. Passengers can request a ride through a smartphone app or a kiosk at the boarding zone. The request will be processed, and the passenger will be directed to a boarding bay, where identity-based boarding can take place.

Unlike traditional transit modes, Glydways passengers are treated to a personal vehicle with enough room to accommodate travel companions and luggage. The vehicle begins the journey at the indication of the passenger by the way of the “Go” button. Once the journey begins, the vehicle maneuvers from the boarding spot toward the service ramp leading to a continuous flow trunk lane on the main guideway. At the end of the journey, the vehicle maneuvers into a destination boarding with a flush, stable transition from vehicle floor to the boarding platform, which will allow the passenger to disembark easily when the doors open. Glydways’ average wait time and boarding process is illustrated in Figure 9.

Figure 9: Glydways Boarding Process
Operational Scenario 2: Changing Destination Mid-Route

To maintain system efficiency, Glydways vehicles do not offer changes to the journey mid-route if a ride is booked on a kiosk. If the user needs to change destinations, then they can request a stop by pressing the “Stop” button (system chooses the closest possible stop), exit the vehicle, and request a new ride from that station. If the user is using a phone app, the user can change the destination mid-route. If there is no direction change involved, the vehicle continues to the changed destination. If a direction change is involved, the vehicle will be routed to the nearest boarding zone to accommodate the direction change.

Operational Scenario 3: Technical Problem in the Vehicle

Glydways vehicles are fully autonomous within the Glydways infrastructure and do not need any other system to safely arrive at their destination. Vehicles are equipped with proactive automatic (and continuous) self-checks and assessments to identify problems before they occur and manage them if they occur. Vehicles with any issues pull over into an auxiliary lane, and travel at reduced speed, either to a garage, or if with a passenger, to the nearest boarding zone. Vehicles that cannot travel further pull over into an auxiliary lane and stop, ultimately retrieved by a utility vehicle that can tow the vehicle at low speed to a garage or boarding zone. All vehicles are equipped with communications ability for two-way audio and one-way video. This service gives Glydways central control a way to help direct the outcome of any event. This is of utmost importance as the ideal course of action to an event may not be to exit the vehicle. If a vehicle escape is necessary, the door can be defeated through a top mounted release latch. The door can then be easily pushed back. If the vehicle is turned on its side, then the window gasketing can be removed and the window pushed out similar to a conventional bus window.

SYSTEM REQUIREMENTS

Infrastructure Requirements

- The elevated, side-by-side configuration can range from 24’ wide to 36’ wide (the width of two to three car lanes) where
two ramps descend to the boarding zones or rise up to access a T-Junction.

► The elevated, vertically stacked configuration requires a min. of 17’ wide profile which can range from 13’ – 17’.

**Vehicle Performance Requirements**

► **Acceleration** | 3.43 m/s²
► **Boarding Zone Arrival/Load Time** | 50 seconds average
► **Speed** | 31 mph (Average Speed)

**System Maintenance Requirements**

► **Guideways** | **Industry standard** Periodic structural inspections and track monitoring system and repair. Resurface the running surface every 15 years.
► **Vehicles** | Calibration, inspection, cleaning every time a vehicle enters the garage. Rigorous maintenance of battery and doors. Battery replaced after 250,000 miles. Tires replaced every 60,000 miles.
► **Garages** | Building maintenance like a regular office. Vehicle charging is facilitated through commercially available direct DC charging.
► **Central Control** | Periodic replacement of equipment like an IT server center.
► **Software** | Upgrades, maintenance, and protection by skilled technicians.

**CONCEPTUAL LAYOUT**

Conceptual route alignment was developed with the feedback received from stakeholder jurisdictions in East County. The feedback was collected through a series of meetings with individual cities and through a series of stakeholder workshops.

![Figure 10: DPMT Proposed Alignment](image-url)
Figure 10 shows the proposed route alignment through the cities of Pittsburg, Antioch, Oakley, and Brentwood. The alignment shown in dashed line in the figure represents routes for future considerations.

Figure 11 shows the transportation services in East County with an overlay of the proposed DPMT alignment which connects all the mass transit stations in the service area and complements the existing transit options. Table 1 lists the characteristics of the conceptual layout. Quantities in the Table 1 do not include information for the future route considerations.

The proposed alignment connects existing and planned residential, medical, institutional, business, and industrial developments/centers with multimodal transit stations in East County as a continuous route. The proposed route uses existing public right of way of roadway network, unused railway tracks, exiting water facility right of way, and through planned development areas. Note that the routing and station locations shown are not intended to be final and is subject to change as the engagement with individual jurisdictions, transit agencies, and other project stakeholders continues throughout the development of the project. DPMT has the capability to be scaled up or down to meet demand and locations. It would be possible to start with a simple demonstration system and to scale up from there in phases. It is also possible to add more connections to new neighborhoods and activity centers as they are developed. As new routes and boarding zones are added, the new boarding zones will be accessible from the existing system with no transfers necessary.

Table 1: DPMT Conceptual Layout Characteristics

<table>
<thead>
<tr>
<th>Feature</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>At-grade Segment (miles)</td>
<td>11.4 miles</td>
</tr>
<tr>
<td>Elevated Segment (miles)</td>
<td>17.3 miles</td>
</tr>
<tr>
<td>Total Length (miles)</td>
<td>28.7 miles</td>
</tr>
<tr>
<td>Boarding Zones</td>
<td>56</td>
</tr>
<tr>
<td>Average Speed of Glydways Vehicle (mph)</td>
<td>31 mph</td>
</tr>
</tbody>
</table>

Figure 11: Transportation Services in East County with DPMT Route Overlay
POTENTIAL BENEFITS

Economic Development | Real estate and land values in areas served by boarding zones connecting the DPMT network are expected to rise. Easier access and connections to regional transit services are expected to attract businesses to East County which in turn will increase the need for additional housing development. With the potential of many trips to and from the DPMT boarding zones, ease of transit access is expected to shift users from cars to transit. This would potentially reduce the need for increased parking supply and expand local road capacity reducing road gridlock, travel times and environmental impacts.

In addition, DPMT fits within the vision and goals of the Northern Waterfront Economic Development Initiative (NWEDI), an effort by the County and East County cities to revitalize the north waterfront area of Contra Costa, create jobs, and invest in the local communities and human capital. DPMT would provide alternate commute mode with enhanced connectivity to northern waterfront area which would further enhance NWEDI’s competitiveness of regional economy. Support investment in transportation projects is identified as one of the objectives in NWEDI to achieve the goal to enhance regional competitiveness.

Passenger Experience | For commuters in East County who desire reliable public transportation with direct connections to their destination, DPMT can provide on-demand transit options with shorter connection times. Users of the DPMT system can avoid delays associated with traffic signals, crowded transit vehicles, and long dwell times at intermediate stops. The ability of the DPMT system to provide service with approximately one minute wait times is not achievable with any other transit service or ridesharing services that are currently available for East County users. Additionally, with DPMT, youth, the elderly and disabled who are unable to drive, and those who do not own a vehicle, will have more transit options. Users will have the potential to save considerable time traveling within East County and the ability to connect with other regional transit services for travel to other parts of the Bay Area and beyond.

Environmental Benefits | As federal, state, and local agencies are moving towards cutting greenhouse gas emissions and moving towards a carbon-free economy, ATN can significantly contribute to reducing fuel consumption. Use of energy-efficient electric vehicles reduces emissions that contribute to climate change and impact air quality, improves public health, and reduces ecological damage. The modal shift from private cars to DPMT contribute to additional air quality and congestion relief benefits.

The use of DPMT technology provides users the ability to plan efficient routes to transport people from point to point and make trips only when there is passenger demand. By reducing the trips without any passengers DPMT has the potential to reduce the total Vehicle Miles Traveled (VMT) and make each mile traveled more efficient.

Roadway Congestion | East County residents experience significant congestion on local roads and the SR 4 freeway, especially during AM and PM peak weekday hours. Introduction of ATN like DPMT brings the potential to carry a significant number of people during peak hours thereby increasing the overall transportation capacity. Increased capacity reduces the burden of excess demand on congested road networks.
**Safety Benefits** | The system operates on a dedicated guideway and does not mix with other roadway users (vehicles, trucks, bicycles, and pedestrians) on city streets, decreasing the chances for vehicular or pedestrian conflicts.

**Cost Benefits** | The cost benefit potential of DPMT is multi-fold. Cost savings can be realized in construction with narrower and smaller infrastructure needs when compared to transit modes of similar capacity, lower operating costs resulting from automation, fuel cost reductions, and cost savings associated with increased safety.
Technology Evaluation

DPMT can be defined as a truly disruptive innovation, with the ability to change how East County residents’ commute. The system involves permanent infrastructure that would become part of East County’s transportation network. This section identifies various criteria to determine the feasibility of DPMT by assessing technology and implementation. Project delivery methods and financing options are discussed in the next section.

TECHNOLOGY READINESS

Transportation options such as BART, buses and automobiles are mature industries. Technology Readiness Levels (TRL) is a federal measurement system used to assess the maturity of a particular technology. Each technology is evaluated against the parameters for each technology level and is then assigned a TRL rating based on the project’s progress. For the transportation industry there are nine technology readiness levels. TRL 1 is the lowest and TRL 9 is the highest. Currently, all aspects of the Glydways system have achieved TRL 3 while significant portions of both the hardware (vehicle, autonomy stack) and the software (vehicle and zone agents) have achieved TRL 4. TRL of specific components are included in Table 2. TRL 4 represents that the components are valid in a laboratory environment. The technology readiness of Glydways is considered emerging as the prototype needs to be demonstrated and proven in an operational environment to reach TRL 9. Technology with TRL 7 will provide a minimum viable product.

Glydways is in the process of building an outdoor full-scale Proof of Concept (PoC) at the GoMentum station. The DPMT prototype system is a half-mile long segment with all the components of a Glydways system: trunk, elevated and grade sections, garage, two boarding zones, form factor accurate vehicles and associated TMS, BMS, and FMS. Phase 1 will be completed by summer 2021.

EVALUATION CRITERIA

- Technology readiness
- Passenger convenience
- Scalability
- ADA compliant
- Environmental sustainability
- Ridership
- Costs
- Risks
Table 2: Glydways Technology Readiness

<table>
<thead>
<tr>
<th>System</th>
<th>Sub System</th>
<th>TRL</th>
<th>Demonstrated Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>All</td>
<td>3</td>
<td>Structural components have been designed using industry accepted practices.</td>
</tr>
<tr>
<td>Vehicle</td>
<td>Powertrain</td>
<td>3</td>
<td>Concept based on off-the-shelf hardware with known performance.</td>
</tr>
<tr>
<td></td>
<td>Top Hat</td>
<td>4</td>
<td>Concept form factor validated with full-scale prototype model.</td>
</tr>
<tr>
<td></td>
<td>Autonomy</td>
<td>4</td>
<td>Both software and hardware stack concept validated using 1/5 scaled vehicles.</td>
</tr>
<tr>
<td>Software</td>
<td>Vehicle</td>
<td>4</td>
<td>Both tracking and autonomy modules have been demonstrated using 1/5 scaled vehicles.</td>
</tr>
<tr>
<td></td>
<td>Track &amp; Boarding Zone</td>
<td>4</td>
<td>Track and Boarding Zone modules have been demonstrated using 1/10 scale systems.</td>
</tr>
<tr>
<td></td>
<td>System-Level</td>
<td>3</td>
<td>Overall system functionality modeled, and performance validated using simulation.</td>
</tr>
</tbody>
</table>

PASSENGER CONVENIENCE

Most public transit service in East County operates on a fixed route and fixed schedule. Tri Delta Transit operates Tri MyRide, an on-demand micro transit service, with limited weekday hours. Wait time for transit depends on the transit schedule, stop delays, and delays associated with traffic and unforeseen conditions. These delays add to the total trip time. Rail transit has fewer stops than bus transit but there is rarely a non-stop trip when using any of these transit options. Traveling in a personal vehicle usually quicker than transit as transit riders typically experience unnecessary delays associated with wait time and stop frequency. However, traffic congestion, while experienced by both cars and transit, is especially stressful on vehicle drivers as the time spent in traffic requires mental focus that can be used for relaxing or other purposes while commuting on public transit or traveling via another shared mode of transportation.

DPMT can provide a 24/7 on-demand service depending on the ridership demand and economics of the solution. Vehicles are expected to be available in less than a minute from when a user requests it. The minimum time from when a vehicle arrives at a boarding zone to when it leaves is roughly 30 seconds,
with the average time expected to be around 50 seconds, comfortably enabling a boarding zone throughput of 70 events per hour per spot. Glydways operates on a dedicated right of way and can control vehicles and the infrastructure environment. This aids in an increased level of service reliability. Passengers will have the ability to use a phone app or a boarding zone kiosk to request a ride. Transit fare cards like Clipper card are redeemable at the boarding zone kiosk or through the Glydways phone app. These on-demand vehicles and seamless ticketing services will provide a convenient and personalized routing experience for the users.

**SCALABILITY**

Glydways control envelope is disaggregated into vehicle, localized control, and overall fleet balancing. Each control component has been designed to be a discrete element without relying on the larger system to function safely. Because of this, a Glydways system can be built incrementally, boarding zone by boarding zone and commissioned by guideway extension individually, if needed, with unprecedented levels of customization. Similar to other network services, as the network expands, infrastructure is built to support it. These are separated into three aspects: Garage, Boarding Zones and Central Control. Flexibility and incremental expansion is a hallmark of a Glydways system. Ultimately, future expandability is constrained by existing peak trunkline capacity, ~10,000 ppl/hr for a single lane. Trunkline capacity can always be increased by adding parallel/stacked lanes.

**SAFETY**

Bus transit and automobiles deal with crossing traffic that can increase the potential for accidents. The dedicated DPMT offers right of way with no crossing traffic, reducing potential conflicts.

Regulatory compliance, codes, and safety certifications are well defined for transit systems and cars. As no system such as Glydways has been certified in California, new standards will be established for the operation and construction of the system by the California Public Utilities Commission (CPUC). For vehicles, Glydways uses design and operations standards set forth in ANSI/ASCE/T&DI 21-13 as a guideline, which establishes the minimum requirements necessary to achieve an acceptable level of safety and performance for an automated people mover (APM) system.

Glydways will certify the system under the CPUC through the process of submission of a Safety Certification Plan (SCP) for the system deployed. The purpose of the SCP is to document the procedures, responsibilities, and processes for the certification and safe ongoing operation of the Glydways system. It provides a context for verifying that the appropriate safety and security-related activities are documented and performed in support of each Certificate of Conformance (CoC) issued. The SCP will document the design, manufacture, and commissioning of the Glydways system and ensure compliance with the SCP. The certification process will consist of five steps:

1. Create a list of certifiable factors
2. Define the conformance checklists and items to be tracked
3. Verify compliance with the requirements
4. Audit the compliance with requirements
5. Document the review and approval process
AMERICAN WITH DISABILITIES (ADA) REQUIREMENTS

Transit systems must comply with ADA requirements. BART stations require ADA ramps, fixed-route buses require lifts and service must be augmented with ADA paratransit accessible buses. The Glydways system has been designed and reviewed for conformance to ADA standards for public vehicles and facilities (boarding zones) listed below. In summary, Glydways system provides all the ADA features expected in public transit systems.

► Overview of Requirements
  o Rider information
  o Barrier-free movement
  o Seamless boarding transition
  o Service animals

► Architectural Requirements: As a fixed-route transportation system operating along a prescribed route, Glydways will provide:
  o Announcements at stops
  o Vehicle destination information
  o Lifts and ramps
  o Lighting and Tactile Surfaces
  o Turning room, hand-rails, and pull cords

► Unique Glydways Accessibility Features
  o Level, stable roll-in boarding
  o Fencing and tactile floor strips

ENVIRONMENTAL SUSTAINABILITY

Transit is generally considered more environment friendly than cars. However, the efficiency per passenger goes down if transit is running with few or no passengers. Glydways is designed to meet the environmental sustainability challenge of the next century. The low-profile nature of the infrastructure allows for faster and cheaper deployment without sacrificing capacity and system resiliency. There are ample opportunities within the Glydways clean-technology system to incorporate additional sustainability measures to save on costs, energy, and space. The disaggregated model translates to direct implications on the impact and carbon footprint of the system.

► Streamlined Infrastructure | Glydways can maintain a low visual and audible cross section through its low speed, and four-foot-wide vehicles. The width of the guideway at 24’ to 30’ feet for a two-way segment is narrower than a trackway of a typical light rail transit. This leaves more room for community essentials such as natural habitat and public space.

► Limiting Emissions | Carbon impact is in direct proportion to the energy required to move a single person. Carbon mitigations can be manifested through reduced VMT by automobile.

► Carbon Efficiency | Based on Glydways calculations, Glydways generates less carbon per mile than Urban rail, Bus Rapid Transit, and electric/gas/hybrid cars.

► Technological Flexibility | A Glydways system can leverage renewable resources through its use of electric vehicles, off-peak charging, and integrated solar options.
RIDERSHIP DEMAND

Before COVID-19, the average annual ridership of Tri Delta Transit was approximately 2.7 million and the average annual ridership of BART in East County was 2.2 million which represents the transit mode share in East County. In comparison, the annual traffic on SR 4 alone was 52 million vehicles/year, which represents the bulk of car mode share in East County. As part of the feasibility study, AMG conducted analysis to estimate potential ridership demand of DPMT.

The route alignment and boarding zones of proposed DPMT was overlaid on a census map (Figure 12) to determine population within 0.25-mile walking distance of boarding zones. Populations further than 0.25 miles from a boarding zone were not considered in the ridership demand forecasting as they may require another mode of transportation to reach the boarding zone. The census data included mode share split of workers’ commuting trips. The Longitudinal Employer-Household Dynamics (LEHD) for the year 2018 within the census data was looked at to determine the number of workers who work in the selected area and live outside, the number of workers who live in the selected area and work outside, and the number of workers who work and live in the selected area. This data was used as a base to determine the number of potential work trips and home-based work trips that DPMT can capture.

Figure 12: Proposed Glydways Boarding Zones within 0.25-mile buffer

The transit passenger profile based on MTC’s 2019 Tri Delta Transit On-Board Survey indicates that nearly 60% of Tri Delta Transit trips are home/work related and 40% include social, recreational, shopping, school/college based, medical and other trips. The 2019 average daily ridership of Tri Delta Transit fixed routes indicate that weekend ridership is approximately 30% of weekday ridership. The census data and the current transit passenger profile were used to estimate the total number of annual
person trips for the analysis year 2021. Annual growth in number of workers, mode splits, and ridership patterns were considered to be fixed from 2018 to 2021. Although there were changes in commuting patterns due to COVID-19, these changes were considered temporary and the base conditions for the analysis were pre COVID-19 conditions.

It is assumed that the DPMT system will be in operation for 30 years starting in the year 2030. Ridership growth projections are based on 0.5% annual growth from 2021 to 2060 plus trip growth from planned projects (developments expected in the study area, which was determined based on the discussions with project stakeholders) from 2030 to 2060 with full development by the year 2060. Figure 13 shows the future planned development locations considered in the growth projections. Linear growth was assumed between 2021 to the end of 2060 to determine the opening year 2030 estimated annual person trips. The potential additional growth in the area resulting from the introduction of innovative transportation solutions like DPMT was not considered.

**Figure 14: Future Planned Developments in East County – with DPMT overlay**

The current mode choices available for commuters in East County are public transit, car (drive alone and carpool), bike, walk and ride-hailing options. Introduction of the proposed system will add DPMT to the available mode choices for commuting in the area. The shift from current modes to the DPMT mode was estimated using the logit model (Rongfang Liu, 1997) to determine mode share shift based on the travel costs and travel time. These factors are comprised of the in-vehicle travel time, out-of-vehicle walking, waiting times, and the anticipated travel costs.

1. **Mode Shift from Public Transit** | The proposed alignment of the DPMT system is designed to connect the existing multimodal stations and high activity centers that could use additional public transit services and future developments. Though in practice, DPMT will serve some of the trips included in current public transit mode share, these trips are considered complementary to the existing public transit and were not included in the estimated ridership for DPMT.

2. **Mode Shift from Walk and Bike** | Commuters walk or bike to workplaces, schools, and other activities when it is practical based on trip distance, weather, and route safety. Some
commuters choose these modes of transportation for health and environmental benefits. It is assumed that this will continue after the addition of DPMT as another choice for commute and these trips were not included in the estimated ridership for DPMT.

3. **Mode Shift from Ride-hailing Options** | In practice, there might be a shift from ride-hailing options to DPMT with increased convenience and safety when factored with a comparable or better fare structure. However, the percent of commuters currently using this mode as their primary commute choice is low and is not included in the DPMT estimated ridership.

4. **Mode Shift from Car** | Mode shift from car to DPMT was calculated using logit model using travel costs, waiting time, and travel time. The actual in-vehicle travel time and zero wait time was considered for car trips that drive alone. Waiting time was added to the carpool trips to account for the time waiting for the ride to arrive. Travel speeds of 31 mph, one minute wait time and five-minute walk time were used for the DPMT system consistent with the simulations performed by Glydways and other ATN studies. Usually, the perceived monetary costs are less than the actual costs for automobile trips as costs of ownership, insurance and automobile maintenance are often not considered by riders. There might be parking, and toll costs involved at the destination for trips using cars. There will be a fare structure to use the DPMT system and some of these trips might include parking fees at the origin. With all of these perceived monetary costs considered and with the fare structure of the DPMT system unknown, the monetary costs to use both modes is considered to be the same.

Based on the methodology and assumption mentioned above, the estimated 2030 annual DPMT trips capturing commuters within 0.25-mile distance of the boarding zones are around 13 million. Using conservative numbers for non-work trips (20% of work trips) and better travel speeds for cars because of reductions in car traffic due to DPMT ridership, the estimated 2030 annual Glydways DMPT estimated trips are around 8.8 million. The estimated trips were further reduced by 20% to estimate the low end of the ridership capture potential. **Table 3** includes the low-end ridership demand estimates for the year 2030.

**Table 3: Estimated DPMT Ridership -2030**

<table>
<thead>
<tr>
<th>DPMT Segment</th>
<th>Total Segment Length</th>
<th>Estimated Annual Ridership</th>
<th>Estimated Average Daily Ridership - Weekday</th>
<th>Estimated Average Daily Ridership - Weekend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburg</td>
<td>9.6 miles</td>
<td>2,956,352</td>
<td>10,796</td>
<td>1,848</td>
</tr>
<tr>
<td>Antioch</td>
<td>6.3 miles</td>
<td>2,069,235</td>
<td>7,609</td>
<td>1,173</td>
</tr>
<tr>
<td>Oakley and Brentwood</td>
<td>12.8 miles</td>
<td>2,051,713</td>
<td>7,577</td>
<td>1,088</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28.7 miles</strong></td>
<td><strong>7,077,300</strong></td>
<td><strong>33,559</strong></td>
<td><strong>5,196</strong></td>
</tr>
</tbody>
</table>

The ridership estimates for the DPMT are projected trips shifting from current car share to transit share with the addition of DPMT to the transit modes. This kind of shift from private car use is feasible with the provision of convenient, efficient, affordable, and appealing alternatives like DPMT that commuters will choose to take especially on East County roads where congestion is continuously increasing. In
addition to the multi-modal network connectivity that DPMT is geared to achieve, introducing rewards and incentives, public relations campaigns, and smart ticketing will make DPMT more attractive. Promoting and implementing transit-oriented development along the DPMT alignment will achieve a longer-term and larger-scale modal shift.

**COSTS**

**Capital Costs**

Capital costs of the proposed DPMT alignment were based on the planning level unit costs provided by Glydways for at-grade and elevated segments for a two-way track. Projected planning level costs for the DPMT are shown in Table 4. Right of way costs are not included in the capital costs.

**Table 4: Planning Level DPMT Capital Costs**

<table>
<thead>
<tr>
<th>DPMT Segment</th>
<th>At-Grade Segment Length</th>
<th>Elevated Segment Length</th>
<th>Guideway/Central Control Cost (in millions)</th>
<th>Vehicle/Batteries Cost (in millions)</th>
<th>Development Costs (in millions)</th>
<th>Total Capital Cost (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburg</td>
<td>2.01 miles</td>
<td>7.6 miles</td>
<td>$163.4</td>
<td>$6.4</td>
<td>$17.6</td>
<td>$195.7</td>
</tr>
<tr>
<td>Antioch</td>
<td>1.7 miles</td>
<td>4.6 miles</td>
<td>$101.6</td>
<td>$3.3</td>
<td>$12.0</td>
<td>$121.2</td>
</tr>
<tr>
<td>Oakley and Brentwood</td>
<td>7.7 miles</td>
<td>5.1 miles</td>
<td>$109.3</td>
<td>$5.3</td>
<td>$12.0</td>
<td>$134.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11.41 miles</strong></td>
<td><strong>17.3 miles</strong></td>
<td><strong>$374.3</strong></td>
<td><strong>$15.0</strong></td>
<td><strong>$41.6</strong></td>
<td><strong>$450.9</strong></td>
</tr>
</tbody>
</table>

**eBART** | The eBART extension in East County between Pittsburg/Bay Point Station and Antioch is 10 miles long and uses a different type of train called a Diesel Multiple Unit (DMU). The project cost was $525 million and is considered 60% less expensive than conventional BART. The project was possible with approximately $1 billion invested in the eBART corridor to widen SR 4. The 2014 eBART Next Segment Study included costs for a possible extension from the Antioch Station to a new station at six alternate locations along SR 4. The estimated construction cost of a 6.9-mile extension of eBART from Antioch Station to Balfour Road in Brentwood in 2012 dollars was $355 million. With a 4% escalation rate it is approximately $482.8 million in 2021 dollars. These capital costs include the cost of the trackwork and train control systems, the cost of the stations and parking, the cost of supporting facilities for train storage and maintenance and the cost of the additional vehicles to operate the extended service.

A similar Glydways alignment from Antioch BART Station to Brentwood is estimated to cost around $89.5 million in 2021 dollars. Order of magnitude costs is presented in Table 5 for comparison.

**Table 5: Order of Magnitude Costs ($Millions-2021) eBART vs DPMT**

<table>
<thead>
<tr>
<th>Commute Mode / Cost Item</th>
<th>Highway Modifications (millions)</th>
<th>Trackwork/Guideway (millions)</th>
<th>Station Facilities and Maintenance/Control Facilities (millions)</th>
<th>Vehicles (millions)</th>
<th>Total (millions)</th>
</tr>
</thead>
</table>

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Tri Delta Transit | On other hand, the annual capital budget of Tri Delta Transit in the Fiscal year 2014-2015 is $13.6 million. The proposed DPMT system will require an annual budget of around $19.3 million after fare box revenues.

In comparison, the estimated O&M costs of DPMT are considerably less than eBART and higher than Tri Delta Transit.

Operations and Maintenance Costs

Typical assumptions used in the O&M cost estimates of the DPMT are:

► Vehicles:
  o Vehicle lifecycle replacement: 500,000 miles
  o Battery lifecycle replacement: 250,000 miles
  o Maintenance Labor/parts: $0.024/passenger mile
  o Cleaning/Inspection Labor: $0.13/passenger mile
  o Standard Clean: 1.0 min / vehicle x 3 times a day
  o Deep Clean: 5 min / vehicle every 30 rides
  o Tire replacement: $0.003/passenger mile – 60,000 miles
  o Energy: $0.19 kWh wholesale

► Infrastructure:
  o Structural Maintenance Labor ($8/ft/year)
  o TMS system Labor/parts ($58.32/ft)
  o Emergency Services Labor (24-hour redundant service, 3 shifts 8 hours each): ($25.6/ft)
  o Energy ($4/ft $0.19kwh wholesale)
  o Landscape Maintenance

► Control Center:
  o Maintenance: IT replacement - 5% of IT system per year
  o Personnel Labor
  o Energy: $1.56/sqft. - $0.19kwh wholesale
  o Administrative Costs
  o Other Direct Costs

The estimated planning level O&M costs based on these assumptions are presented in Table 6.

<table>
<thead>
<tr>
<th></th>
<th>eBART*</th>
<th>DPMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking (millions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$143</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>$118</td>
<td>$67.5 (@ $9.93/mile)</td>
</tr>
<tr>
<td></td>
<td>$87</td>
<td>$2.3</td>
</tr>
<tr>
<td></td>
<td>$26</td>
<td>$12.5</td>
</tr>
<tr>
<td></td>
<td>$109</td>
<td>$7.2</td>
</tr>
<tr>
<td></td>
<td>$483</td>
<td>$89.5</td>
</tr>
</tbody>
</table>

Table 6: Planning Level DPMT O&M Costs

<table>
<thead>
<tr>
<th>DPMT Segment</th>
<th>Total Segment Length</th>
<th>Total Annual O&amp;M Cost (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburg</td>
<td>9.6 miles</td>
<td>$12.0</td>
</tr>
<tr>
<td>Antioch</td>
<td>6.3 miles</td>
<td>$7.0</td>
</tr>
<tr>
<td>Oakley and Brentwood</td>
<td>12.8 miles</td>
<td>$10.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28.7 miles</strong></td>
<td><strong>$29.0</strong></td>
</tr>
</tbody>
</table>

eBART | The cost of operating and maintaining the eBART system includes costs of administration, service delivery, and maintenance of vehicles and facilities. The operating and maintenance costs of the eBART extension from Antioch Station to Balfour is estimated as $8.1 million in 2013 dollars\(^1\). With 4% escalation cost it is $10.7 in 2021 dollars. Similar DPMT alignment from Antioch BART Station to Brentwood is estimated to cost around $3.5 million in 2021 dollars.

Tri Delta Transit | The actual operating expenses of Tri Delta Transit are provided for relative comparison of O&M costs. In the year 2019, operating cost/passenger is $9.80; operating cost/revenue hour is $117.91, and operating cost/revenue mile is $9.24 for fixed route transit. Tri Delta Transit total maintenance costs are approximately 20% of the operating costs. In comparison, the estimated operations and maintenance cost of DPMT is around $3.80 per passenger using the estimated planning level O&M costs and 2030 ridership demand.

In summary, the estimated O&M costs of DPMT is less than eBART and Tri Delta Transit.

COST BENEFIT + RETURN ON INVESTMENT

Fare Policies

The transit provider in East County, Tri Delta Transit, offers a fare structure for single rides on both local and express buses, transfer from BART, day passes, monthly passes, regional trips, and discounted fares for seniors and persons with disabilities. The fare for single local route with no transfer is $2.00. Tri Delta Transit is a partner in the Clipper card fare payment system and accepts fare payment by cash and Clipper card.

As part of Plan Bay Area, the Metropolitan Transportation Commission (MTC) projected that an integrated fare structure consisting of “a flat local fare with free transfers across operators and a distance or zone-based fare for regional trips” would be revenue-neutral over the long term due to “incentivized growth in transit trips.” MTC began efforts in early 2020 on a comprehensive study to identify steps to integrate fare structure and policies of the Bay Area’s transit agencies. The study, which is scheduled to be completed in summer 2021, will help design fare policies that make transit across the Bay Area easier to use and incentivize ridership.

\(^1\) eBART Next Segment Study, BART, 2014

[https://www.bart.gov/sites/default/files/docs/eBART%20Next%20Segment%20Final_013015_2.pdf](https://www.bart.gov/sites/default/files/docs/eBART%20Next%20Segment%20Final_013015_2.pdf)
If DPMT system is led by an existing transit operator, such as the ECCTA Joint Powers Authority (JPA), or a new JPA agreement formed by an existing transit operator and Glydways, the fare policies and fare media must fit within the regional integrated fare structure.

DPMT offers two services: single ride, or a shared ride in Glydways vehicle. Average price of $2.20 per single ride is used for calculating return on investment for DPMT.

Fare Box Revenue

With the assumption that the Glydways opening year is 2030 and the system is in operation for 30 years the farebox revenue is calculated with average annual ridership numbers for the year 2045. Using the average price of $2.20 per single ride, Table 7 shows net costs over 30 years. As indicated by the table, farebox revenue is lower than total costs when the average price per single ride is $2.20. The estimated average price per single ride needs to be more than $5.80 to realize return on investment. Using the numbers shown the farebox recovery ratio of DPMT is estimated to be around 58%. This means that the potential portion of DPMT’s operating expenses paid by passenger fares alone is around 58%.

Table 7: DPMT Estimated Farebox Revenue

<table>
<thead>
<tr>
<th>DPMT Segment</th>
<th>Capital Costs (in millions)</th>
<th>O&amp;M costs in 30 years (in millions)</th>
<th>Farebox Revenue in 30 years (in millions)</th>
<th>Net Cost over 30 years (in millions)</th>
<th>Subsidy per ride (in dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburg</td>
<td>$195.7</td>
<td>$360.0</td>
<td>$209.1</td>
<td>$346.6</td>
<td>$3.65</td>
</tr>
<tr>
<td>Antioch</td>
<td>$121.2</td>
<td>$210.0</td>
<td>$146.4</td>
<td>$184.8</td>
<td>$2.78</td>
</tr>
<tr>
<td>Oakley and Brentwood</td>
<td>$134.0</td>
<td>$300.0</td>
<td>$145.1</td>
<td>$288.9</td>
<td>$4.38</td>
</tr>
<tr>
<td>Total/Average</td>
<td>$450.9</td>
<td>$870.0</td>
<td>$500.6</td>
<td>$820.3</td>
<td>$3.60</td>
</tr>
</tbody>
</table>

BART | Pre-pandemic, BART’s farebox recovery ratio was 60% indicating a significant portion of the operating expenses are paid by fares. BART fare for rides between East County stations is similar to Tri Delta Transit’s bus fare, and fare used to estimate farebox revenues for DPMT. The estimated farebox recovery ratio for DPMT is slightly lower than the farebox recovery ratio of BART.

Tri Delta Transit | The farebox recovery ratio of Tri Delta Transit was 25% (pre-COVID). The estimated farebox recovery ratio for DPMT is considerably higher than Tri Delta Transit.

In comparison, farebox recovery ratio of DPMT is projected to be better than fixed route bus transit and slightly less than BART in East County. It is also projected that the Tri Delta Transit’s farebox recovery ratio will improve considerably after implementation of DPMT.
BARRIERS/ISSUES FOR IMPLEMENTATION

Barriers for bus transit and rail transit implementation often include insufficient funding and environmental constraints for construction. On the other hand, there are potential additional barriers/issues that could turn into obstacles that prevent or challenge the implementation of DPMT in East County. These are grouped into two categories for further investigation:

1. Technical Issues
2. Institutional and Societal Issues

Technical Issues

► Technology | As is the case with any new technology, DPMT technology might be perceived to be less mature and risky compared with traditional mass transit modes.

► Complexity of Large Network | The larger the network is, the more complex the trip scheduling and empty vehicle management will be. The complexity increases with the number of stations. The trunk line capacity must be planned and designed with ultimate system configuration and future growth in perspective even though in practice the system might be built in segments and further expanded in future. DPMT is extremely scalable and flexible in incremental implementation.

Institutional and Societal Issues

► Aesthetics | The aesthetic and environmental concerns related to guideway and stations can often be controversial. The planning process should involve public input and trained professionals to incorporate appropriate design elements, amenities, art, and landscaping to mitigate the concerns. Elevated structures of DPMT are much smaller than typical heavy rail transit like BART system.

► Revenues | With the DPMT system designed and built to link and complement existing transit, business models are not well defined for financial planning and revenue sharing. Micro transit systems like DPMT need to be included in the transit options mix when regional entities like MTC are planning a vision for integrated fares for all the Bay Area transit agencies.

► Public Perception and Acceptance | DPMT could be perceived as costly and trip planning not easily understandable. With effective public outreach and a competitive fare structure with similar discounts as the other transit modes for qualified users based on income, age, and disabilities, public acceptance of DPMT can be increased. Provision of wi-fi on Glydways cars can help users with limited or no data connection with their transit route planning.

► Funding | Constrained funding can prevent transportation and transit agencies from investing in DPMT, even if the system has potential for significant operating, economic, environmental, and safety benefits. Federal and State support and public-private partnerships have to be planned to secure funding needed for DPMT implementation.

► Vehicle Procurement | Buy America requires certain a percentage of transit vehicle components be sourced from American manufacturers. FTA policies will need to be assessed for potential regulatory barriers, including those regarding funding eligibility and technology procurement requirements. Glydways vehicles uses standard parts and technology currently available and built in the U.S.
► **Right of Way for Garages** | For the implementation of a demand-based ATN system, DPMT will require places to stage vehicles throughout the service area when compared to the current fixed-route service. The vehicles need to be on stand-by near high demand areas when they are not in use, requiring multiple garages throughout the service area. Local governments and communities need to be engaged to identify and plan locations for DPMT garages.

► **Workforce** | FTA requires transit agencies to protect certain worker rights in exchange for receiving federal funding. These regulations need to be assessed and monitored for funding eligibility as DPMT will operate with minimal workforce. A much larger labor workforce will be required during the guideway construction.

**RISK MANAGEMENT**

In general, the issues for DPMT implementation that are presented in the previous section, are foreseeable and manageable. However, there are many unpredictable risks that cannot be foreseen. These risks are present in any mode of transportation and the risk mitigation strategies in well-established bus and rail transit are also applicable. Specific risks related to DPMT and proposed strategies to mitigate those risks are included in Table 8. The risk mitigation strategies in place for DPMT are acceptable.

**Table 8: Risk Management Summary**

<table>
<thead>
<tr>
<th>ID</th>
<th>Risk Category</th>
<th>Identified Risks</th>
<th>Glydways Mitigation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Software</td>
<td>Coordination between vehicles</td>
<td>- Issues are addressed at software design level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Software testing at the 1/10 scale is proof of concept in a variety of loading and testing scenarios.</td>
</tr>
<tr>
<td>2</td>
<td>Vehicle</td>
<td>Drivetrain failure</td>
<td>Run diagnostics of Glydways vehicle agents on the various critical components and develop appropriate responses as needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Finish a trip if the issue is minor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Emergency stop in lane for more serious issues.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Disaggregated nature of the Glydways system allows it to be conservative in the diagnostics. Doing so minimizes the number of severe responses that impact the overall system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- In severe situations Glydways has a redundant lane for trunk operations.</td>
</tr>
<tr>
<td>3</td>
<td>Tire wear/Wheel lifespan</td>
<td>Daily inspections and pre-failure replacement reduce tire failure during operations. Glydways is exploring solid tires and air suspension to mitigate flat tire situations. Redundant lane to minimize operation disruptions in these situations.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Weather</td>
<td>Service interruption due to weather conditions</td>
<td>Glydways infrastructure is flexible to accommodate design modifications for severe weather conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Replace open railings with solid barriers for high wind events.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Replace open railings with solar or regular roof for rain and snow.</td>
</tr>
</tbody>
</table>
**EVALUATION CRITERIA MATRIX**

The evaluation of Glydways technology in comparison with other transportation modes discussed in the previous sections is summarized in Table 9 and was also presented in the Executive Summary (Table ES2). As seen from the table, DPMT is better than other transportation modes or comparable in all the factors used for evaluation.

**Table 9: Evaluation Criteria Matrix – Summary**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Bus Transit</th>
<th>Rail Transit</th>
<th>Private Car</th>
<th>Glydways DPMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Level</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>1</td>
</tr>
<tr>
<td>On-Demand 24/7</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>Total Trip Time</td>
<td>☒</td>
<td>☒</td>
<td>?</td>
<td>☑</td>
</tr>
<tr>
<td>Non-Stop Travel</td>
<td>☒</td>
<td>☒</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Scalability</td>
<td>☑</td>
<td>☒</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Safety</td>
<td>☑</td>
<td>☑</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>ADA Compliant</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Infrastructure Capital Costs</td>
<td>☑</td>
<td>☒</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>☑</td>
<td>☑</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>Ridership Demand</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>☒</td>
<td>☑</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>Potential Savings in Accident Costs</td>
<td>☑</td>
<td>☑</td>
<td>☒</td>
<td>☑</td>
</tr>
<tr>
<td>Barriers in Implementation</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2 3 4</td>
</tr>
<tr>
<td>Risk Management</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

- ☑ Yes/Good
- ☒ No/Bad
- ☑ Emerging
- ● Varies
- ☑ Additional Technical, institutional and Societal Barriers
- ☒ N/A

Note: The table uses symbols to indicate different levels of performance.
Feasibility of DPMT Deployment Business Case

East County future economy and communities rely on an extensive infrastructure network of highways, commuter rail, transit, waterways, public buildings, energy, and wastewater systems. According to the Bay Area Economic Institute, on the current spending trajectory, California’s infrastructure funding gap will reach $1 trillion by 2050. All indication is that there is a business-as-usual approach to infrastructure delivery, which will fall short of addressing and strengthening the transportation needs in East County. Innovative projects and creative financing strategies are needed to support a vibrant economy, the growing population, and increased demand and congestion on SR 4 - the main commute and freight corridor in the area.

MODEL DEPLOYMENT

<table>
<thead>
<tr>
<th>Delivery Options</th>
<th>Feasible?</th>
<th>Explanation</th>
<th>Potential implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Design- Bid-Build (DBB)</td>
<td>✗</td>
<td>• No private financing component involved</td>
<td>• Cities are required to raise/or apply for financing on their own and to fund construction costs as and when they occur.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Does not meet criteria to pay for performance</td>
<td>• Lack of innovation or efficiency in the design and construction aspects.</td>
</tr>
<tr>
<td>Design-Build (DB)</td>
<td>✗</td>
<td>• No private financing component involved</td>
<td>• Cities are required to raise/or apply for financing on their own and pay as costs are incurred.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Does not meet criteria to pay for performance</td>
<td></td>
</tr>
<tr>
<td>Design-Build-Operate-Maintain (DBOM)</td>
<td>✗</td>
<td>• Same as above.</td>
<td>• Same as above.</td>
</tr>
<tr>
<td>Design-Build-Finance (DB(F))</td>
<td>✓</td>
<td>• Would allow Cities’ public sector to maintain ownership and retain its operations.</td>
<td>• Private sector will be responsible for raising construction financing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cities pay private sector at substantial completion based on inspection against specifications.</td>
<td>• Cities will need to obtain funding at substantial completion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• City will retain its operation and maintenance services.</td>
</tr>
<tr>
<td>Design-Build-Finance-Operate-Maintain</td>
<td>✓</td>
<td>• Similar to DB(F), with the exception that the Cities will pay private sector over time.</td>
<td>• Similar to DB(F), with the exception that the Cities will transfer the operation and maintenance aspects of the facility to the private sector.</td>
</tr>
<tr>
<td>(DBFOM)</td>
<td></td>
<td></td>
<td>• City will need to obtain funding at substantial completion (if substantial completion payment is required).</td>
</tr>
<tr>
<td>Design-Build-Own-Operate (DBO0)</td>
<td>✗</td>
<td>• Similar to DB(F), with the exception that the Cities will pay private sector over time.</td>
<td>• Private sector would assume ownership of the facility.</td>
</tr>
</tbody>
</table>

Figure 15: Design-Build-Finance vs Design-Build-Finance-Operate-Maintain

Figure 15 above illustrates a comparison of the various delivery models with the cities’/county deployment needs applied to each. The project team recommends a DBFOM structured P3 strategy to address the proposed East Contra Costa County DPMT system infrastructure and model deployment needs. Although definitions of P3 vary widely, they most commonly refer to long-term performance-based contracts with public-sector entities in which the private sector shares the responsibility and risk
for the DBFOM elements of a public infrastructure project. While we are monitoring all potential public funding sources with a near-term time horizon, there is substantial potential for P3 private financing to deliver value through transit infrastructure investments and DBFOM demonstrates faster implementation, improved cost, and operational performance without major investment by all four East County cities.

**Design-Build-Finance-Operate-Maintain (DBFOM) Option** | Under this option, the final design, construction, and long-term maintenance responsibilities are all integrated with the private sector partner. However, the private sector partner is not fully paid for construction of the asset following completion of construction but is paid in installments over the length of the operating term (typically 15-30 years). Alternatively, the private-sector partner may be partially paid for construction during construction and/or at substantial completion, through milestone payments, with the remaining unpaid portion being repaid in installments over the term of the agreement. After the asset is constructed, the private sector's scope of work includes operation and maintenance. As noted above, the private sector partner will receive at least a portion of its payment via monthly Availability Payments (AP) throughout the length of the operation and maintenance term. The APs include:

- **A fixed capital repayment component**, which effectively repays the private sector’s long-term debt and equity investors for their financing of the construction works; and

- **An O&M component to compensate the private sector partner for its ongoing operation and maintenance work, and lifecycle replacement costs**. The payment is typically performance-based and is subject to deductions for failing to meet contractually specified performance standards. If deductions are quite severe, they may reduce the capital repayment component as well.

Throughout the term of the project the private sector assumes long-term debt and equity capital risk, which results in enhanced oversight and due diligence from third party private capital investors, both during construction as well as operation. Upon construction completion, the private partner will be responsible for major and minor maintenance (which is secured by the fixed capital payment component), resulting in a more robust and quality asset. Although not a requirement, under this project delivery option, the public sector can maintain ownership of the asset.

**BENEFITS OF P3 ENVIRONMENT**

**Risk transfer** | Risks can be allocated to the party that is best able to manage them. Private financing helps secure risk transfer to the private sector as the payments from the cities/county will be deferred until substantial construction completion and then made over the life of the asset and linked with operational performance. APs from the cities/county will become at risk to the private partner if the construction and/or operational performance does not meet pre-agreed specifications.

**Time and budget certainty** | P3s provide greater certainty for the cities/county to budget its fiscal plan. The fixed price provided by the private partner to the cities/county means the private partner assumes all price uncertainties over the life of the contract. The private partner has a strong incentive to complete the project within committed timelines because they will not start getting any AP payments.
until substantial construction completion. During operation, their AP payments will incur deductions if they do not perform as agreed. The cities’/county’s budget is limited to the full AP.

**Innovation** | The cities’/county’s requirements will be defined in output terms as part of the project development providing opportunity for innovation. For example, shifting long-term operation and maintenance responsibilities to the private sector creates incentive to ensure construction and operations quality and incorporate innovation to minimize long term costs as the private partner is responsible for those costs many years down the road.

**Bring construction forward** | P3 will enable the cities/county to build the project sooner, saving on cost escalation and to defer the cost of upfront infrastructure investment by spreading the cost over the lifetime of the asset, creating more budgetary room for the cities/county simultaneous capital projects.

**Accountability** | P3 will provide the cities/county with single point of accountability for the asset and its performance over the full construction, operation, and maintenance period, as well as the asset condition at the end of the term. Performance standards will be clearly defined, and cities’/county’s payments are linked to the private partner’s ability to deliver against these standards.

**Un-deferred maintenance** | P3s facilitate long-term maintenance of infrastructure by transferring maintenance requirements to the private partner, including the full life cycle of the project, reducing the possibility of maintenance deferrals if the cities/county were responsible for such long-term periodic costs.

**Revenue sharing** | The P3 can be incentivized to innovatively increase ridership through revenue sharing resulting in a lower net AP from the cities.

**PUBLIC FUNDING OPPORTUNITIES**

Identification of potential public funding streams is underway by the project team which include but are not limited to, regional, state, and federal discretionary grant programs to complement potential private financing options.

**PRIVATE FINANCING**

The private sector investment market has nearly unlimited investment capacity for projects that yield attractive risk adjusted returns. Properly developed and structured transportation P3s with APs meet these tests and because the risks are relatively low, the private sector financing costs are commensurately low.

Although private financing often comes with financing rates that are not as low as tax exempt bonds, the benefits of private-sector transportation development, design, construction, operation, and financing often outweigh the lower financing costs available to the public sector.

Private financing of transportation systems:

- Provides additional sources of financing
- Reduces upfront costs of the municipality for development, design, and engineering
- Increases speed of project development, resulting in lower cost and delivering benefits sooner
► Provides risk transfer to the private sector, maximizing each parties’ expertise
► Leverages third-party revenue and development opportunities
► Focuses on outcomes and accountability through long-term contracting and partnerships
► Provides contractual incentives and disincentives to help ensure on time and on budget construction and a high level of operating service and performance
► Reduces costs and accelerates project delivery by consolidating responsibility for multiple project elements in one private entity
► Incentives to incorporate innovations upfront to reduce whole life costs (O&M and lifecycle costs) as well as implement improvements during the operating life

There is a long list of successful privately developed and financed transportation projects across the U.S., including light rail, bridges, roads, and others.

Glydways taps into both the approach and experience of successfully developed and financed transportation projects and the power of private investment and incentives to deliver a transportation system for East County that is cost attractive and operationally superior to other alternatives. Importantly, that means the private financing approach implemented by Glydways will be able to develop and deliver the East County transportation network much faster than any publicly funded approach, thus saving costs and delivering the service benefits much sooner.

**REVENUE MODEL**

The revenue model for DPMT will be developed in the next phases of the project.
POTENTIAL RECOMMENDED BUSINESS MODEL

A rapid deployment of a Glydways system represents opportunity for significant positive public impact for East County. Given the future challenges for the region, VMT mitigation, greenhouse gas reduction and equitable and safe connectivity, it is beneficial to focus on reducing the total deployment schedule and eliminating public funding hurdles.

Executing on a project of this magnitude requires overcoming a variety of challenges:

- **Funding** - Availability, timing, procedures, competition
- **Rapid deployment** - Ensuring cost and schedule
- **Technology innovation** - Benefits
- **Risks** - Procurement, development, financing, design, construction and operational

To address these challenges, P3 mechanisms are suggested to speed project delivery, bring innovation, and reduce risks:

- **Private financing**
- **Experienced and incentivized** project management
- **PDA** for efficient design
- **DBFOM AP structure** for deployment and ongoing operations

To facilitate execution of the aforementioned P3 mechanisms, Glydways may partner with experienced DBFOM developer and investors who have solid financial backing and have been involved in development of projects with similar complexity:

- **Plenary Americas** - A recognized infrastructure project development and investment firm is a candidate for the development and funding of the DPMT system.

The DBFOM structure proposed by Glydways for other Bay Area projects is applicable and works well for East County. In this structure, a bespoke entity for project execution would be created:

- **Special Purpose Vehicle (SPV) or Project Company** - Responsible for the design and construction, operations, and maintenance, as well as financing of the project for a negotiable period, usually a 30-to-50-year term

The process to implement this DBFOM structure would begin by entering into a PDA which sets out respective roles and responsibilities of the cities/county and the private partner in the project development period. The project is developed, led by the private partner but with full involvement of the cities/county through to financial close when project funding is achieved, and construction can begin. The PDA will include phases as the project is developed and where the cities/county will have different levels of involvement at each phase. The cities and SPV would develop a statement of project goals, priorities, challenges, and constraints, as well as a preliminary project development timetable and budget. Together, and along with the project engineers and designers, a reference concept design is advanced to a level that gives contractors an accurate sense of scope and scale, without prescribing final design solutions – in order to maximize potential for innovation. Risks are shared through a balance of private investment in the design and a project design purchase fee structure should the cities
choose to discontinue the effort with the SPV. The amount of the fee would increase the further advanced the project design and development.

Execution of the PDA is necessary for the comprehensive implementation of the proposed project. The key components are the negotiation of a design-build contract with fixed-price, date-certain design and construction solution, a services agreement (that sets forth the required performance of the system, the AP levels and penalties for performance shortfalls), and financing documents. The private development partner, such as Plenary Americas, will run an open book funding competition for the debt financing in order to achieve an efficient capital structure. With the execution of these project agreements, financial close is reached: financing flows, and final design and construction can begin. Adequate testing is conducted toward the end of the construction phase, followed by a soft launch before the operations period fully begins.

Glydways and Plenary Americas are partnering on other DPMT system deployment projects around the Bay Area currently which are in the project development and technology validation phases; including South San Francisco CalTrain – Oyster Pt. commuter and San Jose Airport-Diridon-Stevens Creek Transit Connection.

To facilitate the efficient deployment of Glydways technology the DBFOM project development approach structure leverages both conventional development mechanisms, funding efforts in parallel with technology development at the Glydways Demonstration Facility in Concord, CA. The roles and responsibilities of project stakeholders in the development and deployment of the project are included in Table 10.

Table 10: Roles and Responsibilities

<table>
<thead>
<tr>
<th>Agency</th>
<th>Pre-Development</th>
<th>Project Development</th>
<th>Project Implementation</th>
<th>Post Implementation</th>
</tr>
</thead>
</table>
| Glydways Team     | - System design  
|- Co-develop business model  
|- SPV formation | - Design  
|- System Certification  
|- Assist agencies with securing funding | - Construction  
|- Fleet Acquisition  
|- System Certification  
|- Private financing | - Operations and Maintenance  
|- Own the facility |
| Cities/County     | - Facilitate Glydways as public transit option for residents and stakeholders  
|- Assist with business model development  
|- Implement PDA | - Support public and private funding opportunities  
|- Right of way acquisition | - Supervise Construction  
|- Own the facility |
| CCTA               | - Facilitate Glydways as public transit option | - Pursue and facilitate funding opportunities | - Program Sponsor  
|- Monitor Operations with KPIs |
Conclusion

The assessment of various criteria in this feasibility study determines that the DPMT is feasible in East County. A phased, ATN-based DPMT solution will bring micro transit connectivity to East County to provide a faster, smoother, and higher quality mobility experience for its residents. Conceived as a “system of systems,” Glydways delivers high-capacity micro transit, up to 10,000 persons per hour per direction, through a given corridor in a private, safe, and on-demand experience, and in a way that is environmentally sustainable.

Glydways is designed using elevated or at-grade paved pathways and flexible implementation in mind to minimize many of the costs, potential environmental impacts, and scheduling pitfalls of large mass transportation systems. The Glydways system delivers a scalable transit solution by leveraging existing, off-the-shelf technologies and established construction techniques. Additionally, Glydways has proactively identified a path towards a regulatory certification framework. As a mass micro transit solution, Glydways will not only allow East County to meet the transit demand of today, but also prepare a sustainable pathway for future growth along the proposed corridor.

The low unit economics of the system’s construction and operations allows for incrementally scalable implementation, with a shared vehicle mode, as well as the option for a private journey experience that will entice riders to opt out of driving alone or reliance on Transit Network Companies such as Uber and Lyft. This will enable reduction of vehicles on roads and reduce congestion. Furthermore, the low-cost nature of Glydways system allows a sustainable business model from an operational perspective, which unlocks many layers of benefits to East County.

In DPMT implementation, there are additional barriers/issues beyond traditional transit system to overcome but these are foreseeable and manageable. DPMT implementation requires close cooperation from many kinds of local officials and may be best implemented through a carefully negotiated PDA and P3 approach.

To the extent of this feasibility study’s evaluation and analysis, DPMT implementation is feasible in East County and is recommended to decision makers to move forward to include DPMT as a sustainable urban transportation option in East County.

NEXT STEPS

This feasibility study concludes that the Glydways system is a viable public transit option for East County providing connectivity between the cities and access to regional transit services. To implement the proposed DBFOM structure for deployment of an exclusive right of way DPMT system in East County, the next steps would begin with a PDA which sets out respective roles and responsibilities of the project stakeholders in the project development period. Project stakeholders in East County will have flexibility to choose their level of involvement at each stage.

Execution of the PDA instigates a negotiating period during which project stakeholders are to negotiate and finalize the implementation agreements that are necessary for the comprehensive implementation of the Glydways System. The key components are the negotiation of (a) a design build contract with
fixed-price, date-certain design and construction solution, (b) a services agreement, and (c) project financing documents. With the execution of these implementation agreements, financial close is reached: financing flows, and final design and construction can begin. Adequate testing can be conducted toward the end of the construction phase, followed by a soft launch before the operations period fully begins.