

DART Transform Briefing: Light Rail Vehicles

Committee-of-the-Whole
Development Subcommittee

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Today's Briefing

- Transform Overview
- Light Rail Vehicle (LRV) Procurement
- Proposed Vehicle Design
- Innovative Concepts and Other Technical Considerations
 - Maintenance Support
 - Business Class
 - Open Gangway



Transform Overview

What is DART Transform?

DART Transform is our 10-year System Modernization program to modernize necessary infrastructure to address state of good repair and improve the customer experience.

Five Core Elements of DART Transform



VEHICLES

Replace oldest LRVs and Buses that have reached the end of their useful life.



UNIFIED SIGNAL SYSTEM

Modernize signal systems on the oldest lines to maximize safety, communications, reliability, and network capacity.



RESILIENCY

Enhance resiliency of operations during extreme weather events.



STATIONS & PASSENGER FACILITIES

Raise platforms to support universal level boarding and improve other passenger facilities.



OPERATING FACILITIES

Modify operating facilities to support new vehicle maintenance activities and future technology advancements.

Transform Approach



Thoughtfully **improve the customer experience** – safety, security, cleanliness and reliability



Continued stewardship of the system considering operability, maintainability, reliability and resiliency



Understand **total cost of ownership** and make program decisions to maximize whole life outcomes



Modernize the system to address current needs while **future proofing network** to accommodate changing mobility needs and technologies



Deliver the program systematically while also maintaining appropriate scalability based on funding availability

A photograph of a city street with a tram, overlaid with a yellow box containing the text "LRV Strategy". The tram is white and yellow, with "LEDBETTER" and the number "171" visible on its front. The street is paved with cobblestones and has tram tracks. In the background, there are modern buildings, including one with a large red sign that says "1505". A street sign on the left reads "Akard St. 300 W".

LRV Strategy

Current Rail Fleet Replacement Plan

- Current fleet has reached end of useful life.
- Plan is to place an order 77 base with 68 options, transitioning to fleet size of 145 vehicles.

Fleets up for Initial replacement

Fleet	Quantity	Year Entered Service	30-Yr. Life Cycle
Fleet 50	40	1995	2025
Fleet 51	34	1997	2027
Fleet 52	21	1998	2028
Fleet 53	20	2008	2038
Fleet 54	48	2010 / 2011	2040 2041
Total:	163		

Initial industry feedback indicates that ordering a minimum of 40 new light rail vehicles helps to keep manufacturer interest.

LRV Procurement Focus Areas

- Improved Safety and Security
 - Passengers can see end to end in the vehicle
 - Meets all modern safety and crashworthiness requirements
 - Minimizing the need for negotiation amongst passengers for shared spaces
 - Upgraded camera system on every vehicle with remote accessible camera system
 - Improved operator cabs with more visibility for operators and supervisor jump seat
 - Passenger emergency intercoms located at each doorway and in the mobility impaired sections.
 - Passenger safe zone monitoring
 - Distracted driving monitoring system

LRV Procurement Focus Areas

- Improved Reliability
 - Integration into DART's digital asset management system
 - Total cost of ownership consideration in the evaluation
 - Future proofing design to minimize obsolescence concerns
- Improved Customer Experience Features
 - Open design so passengers are not confined to one section of the vehicle
 - Enhanced features and information available to on board passengers
 - Universal accessibility through level-boarding at all entrances
 - Lighted doorways indicating operation
 - Horizontal bike racks
- Use this opportunity to test market and pursue innovations while maximizing competition

Financial Strategy

Transform projects, including the LRV Procurement, will be funded through a combination of local funding, grant pursuits, short-term and long-term debt. DART will be prioritizing leveraging outside funding sources. Most programs are competitive.

- Aggressive pursuit of grants
- Exploring private funding
- Highlight federal administration priorities in pursuits
- Private Financing
 - Methods that allow for private financing of the vehicle procurement that minimize the agency's immediate need to issue debt and pay for cost of vehicles over the life of the vehicles. This could include, but is not limited to, lease payment structures, Offeror-provided financing, or availability payments through a long-term maintenance agreement.

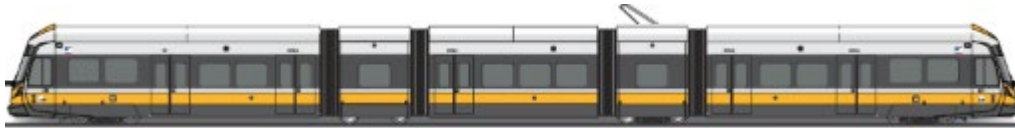
Project Timeline Schedule



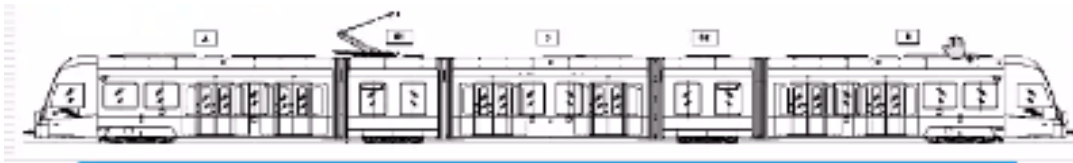
Potential Proposers of Standard LRVs



Alstom Citadis 124'



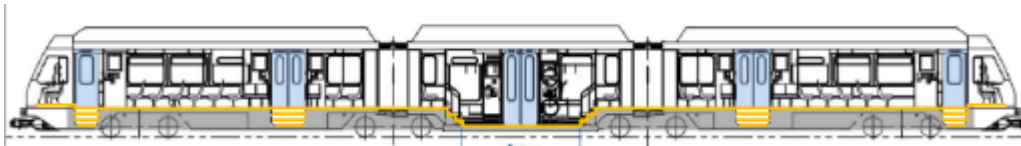
Kinki Sharyo LRV 124'



CAF URBOS 131'



Siemens S700 92'



Stadler LRV 124'

A photograph of a city street with a yellow tram. The tram is moving away from the camera, and its destination sign reads 'EDBETTER'. The tram has the number '171' on its rear. The street is paved with cobblestones and has tram tracks. In the background, there are modern buildings, one of which has a sign that says '1505'. A street sign on the left reads 'Akard St. 309 W'. A yellow text box is overlaid on the image, containing the text 'Proposed Vehicle Design' in a bold, blue, sans-serif font.

Proposed Vehicle Design

New LRV – Overview of Conceptual Design



New LRV – Overview of Conceptual Design



New LRV – Conceptual Design



- Accessibility via level boarding at all doors
- Improved passenger information displays, door indications and larger windows
- Improved lighting on vehicles

New LRV – Conceptual Design



A photograph of a city street with a yellow text box overlay. The street is paved with cobblestones and has tram tracks. In the background, there are several tall buildings, including one with a sign that says "1505". A white van is visible in the middle ground. The text box is yellow with a black border and contains the following text:

**RFP Section: Innovative
Concepts and Other
Technical Considerations**

Innovative Concepts

Carbuilders are encouraged to provide innovation concepts to address:

- Technical advancement beyond the scope of the project specifications
 - Reduce interior and exterior noise levels
 - Increase vehicle reliability
 - Reduce part obsolescence
 - Vehicle collision detection systems
 - Improve the passenger and operator experience
- Total Cost of Ownership / Reduction of Lifecycle Costs
 - Reduce energy consumption
 - Reduction of consumables
 - Reduction of the maintenance costs
 - Increase in revenue from advertising
 - **TSSSA / Maintenance agreements***

Innovative Concepts, Cont'd

- Financing
 - Private financing
 - Lease payment structures
- Safety and Security
 - **Open gangway*** or improved movement or visibility for security between cars
 - Advanced Camera system to detect undesired behavior

****Bolded items will be discussed further.***

Business Class car configuration is not expressly mentioned in the LRV specification but will be covered in this presentation.

A photograph of a city street with a yellow tram. The tram is moving away from the camera, and its destination sign reads 'LEDBETTER'. The tram has the number '171' on its side. The street is paved with cobblestones and has tram tracks. In the background, there are several tall buildings, including one with a sign that says '1505'. A street sign on the left reads 'Akard St. 300 W'. A yellow box is overlaid on the image, containing the text 'Maintenance Support' in a bold, blue font.

Maintenance Support

Potential Maintenance Contract

Include Options for Technical Support and Spares Supply Agreement (TSSSA) in LRV procurement to provide support for maintenance of light rail vehicles. Scalable terms for agreement (e.g. 5, 10, 15-year options, etc.)

TSSSA/Maintenance Options*

1. Maintenance planning and guarantee of supply of Parts, Spare Parts, and Obsolescence Management
2. Technical Service Support and Training
3. Upgrades and Modernization
4. Overhaul Support and Components
5. Digital Solutions (remote diagnostics tools/services) to support Maintenance and Performance Optimization to guarantee reliability
6. Full-service maintenance support to maximize availability by managing the vehicles and performing preventive and corrective maintenance

**DART Board Policy No. V.03 outlines examination of service to see if able to be operated more effectively by private sector; Sec. 452.105.b states that the transit authority shall encourage to the maximum extent feasible the participation of private enterprise*

A photograph of a city street with a yellow tram. The tram is moving towards the camera and has 'LEDBETTER' displayed on its destination sign. The tram is numbered '171'. The street is paved with cobblestones and has tram tracks. In the background, there are several tall buildings, including one with a sign that says '1505'. A street sign on the left reads 'Akard St. 309 W'. A yellow rectangular box is overlaid on the image, containing the text 'Business Class' in a bold, blue, sans-serif font.

Business Class

Current Status of Business Class Considerations

- The current specification does not include any considerations for business class
- Business class cabins have not been implemented on light rail vehicles on the market today
- Light rail vehicles are typically utilized for short trips. While commuter rail or intercity passenger trips, which may include a business class cabin, are typically longer train rides made up of multiple train sets
- Cabin configuration changes would be separate from car configuration changes. Isolating a vehicle as business class would vary from isolating a seating section as business class
- Changes made to cabins on legacy fleet would be challenging

Business Class

- Commuter Rail and Intercity Rail uses of Business Class in United States:

Regional Service	Metro Region	Business Class?
NJ Transit	New Jersey	✗
Metra	Chicago	✗
MBTA	Boston	✗
Caltrain	SF Bay Area	✗
Souder	Seattle	✗
Tri-Rail	South Florida	✗
Coaster	San Diego	✗
FrontRunner	Utah	✗

Intercity Service	Region	Business Class?
Amtrak	Various	✓
Brightline	Florida	✓

Dubai Metro Business Class



Standard Cabin (x4)

Seating – 25
Standing - 137

Seating – 25
Standing - 142

Seating – 27
Standing - 143

Seating – 27
Standing - 143

Women & Children Cabin

Gold Class Cabin

Seating – 32
Standing - 78



Standard Cabin



Women and Children Cabin



Gold Class Cabin

Gold class fare = 2x regular fare



Doha Metro Business Class



Standard Cabin



Gold Club Cabin

Gold club fare = 5x regular fare



DART Business Class Example

36 Seats + 41 Standees*

20 Seats + 35 Standees* + 2 Wheelchair

18 Seats + 0 Standees + 1 Wheelchair

* Standees calculated at AW2 – 4
passengers per square meter

Cabin
Partition

Wheelchair
Space

Business Seat Width: ~22 Inches
Leg space increased by ~ 5 to 6 Inches

- Governments in previous examples can subsidize separate classes of seating – US Title VI requires this exclusive service to be self-funded (100% farebox recovery of capital and operating cost)
- Approximate business class ticket price ~ \$50
- Note that this example uses the existing DART LRV design as a comparative tool. A wheelchair lift is needed to load the business class cabin due to boarding steps. This could be resolved with new low floor vehicles.

Requirements for Implementation

- Service changes and updates to capacity and loading requirements
- Additional police/fare staffing
- Additional cost for operating more vehicles as we would always need to run multiple train sets
- Analysis of impact on number of seats available in vehicles, especially during peak period
- Fare restructuring and potentially additional fare technology
- Title VI analysis – disparity related to fare, crowding, amenities, security
- Complete replacement of all existing DART SLRVs. Unlikely to be cost effective to implement on the existing vehicles.
- Closed business class cabin may be a shift in DART's design guidelines for the new LRVs. DART Police would no longer be able to see throughout the complete vehicle. May also impact competitiveness of procurement.



Open Gangway

Current System Environment

- Current open payment system allows for passengers to board without their tickets being checked
- Multiple cars coupled together prevent officers from being able to move from one end of train to another
- Stations, especially those in open business areas such as the Central Business District, CityLine/Bush, Victory Park, Fair Park, and Downtown Plano do not lend themselves to easily installing fare gates and blocking the platforms
- DART currently runs two-LRV trains during peak service and single LRVs during off-peak and weekends. Three-car trains are utilized in special events. Future capacity needs indicate three-car trains required in peak

Current Security Protocols

- Fare enforcement officers, police and transit security officers on vehicles and platforms
- Passengers can contact police through GoPass, phone, or texting
- Blue light phones on station platforms
- Targeted approach in areas of concern
- Dispatch operations in Consolidated Dispatch Command Center (CDCC) allow for closer coordination with bus and rail ops

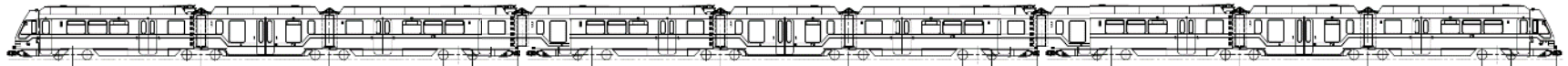
Open Gangway Overview

- An **open gangway** on rail vehicles refers to a continuous, fully enclosed passageway that connects adjacent train cars, allowing passengers to freely move between them while the train is in motion
- Open gangway is typical on heavy rail, subway and intercity rail vehicles
- Once coupled, open gangway vehicles typically maintain this married configuration and become a fixed consist. They are not routinely decoupled upon entering the yard.

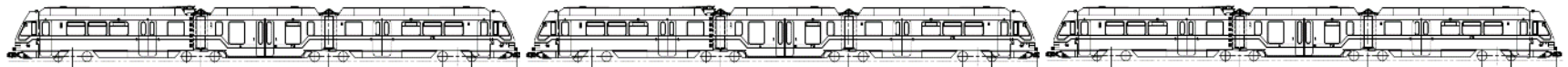


Comparison of Current and Open Gangway

- Fixed - open gangway (equivalent to 3 single LRVs)= 326 seats



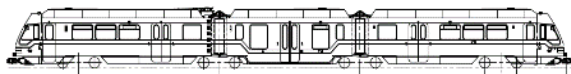
- Triple -- 3-car train currently = 276 seats



- Double -- 2-car train currently = 184 seats



- Single -- 1-car train currently = 92 seats



Impact – Open Gangway

Operational:

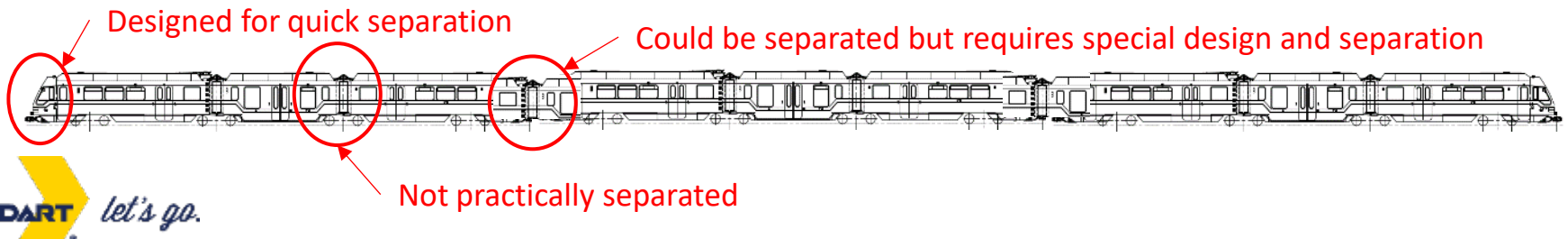
- If DART is unable to run shorter trains during off-peak hours due to trains being permanently fixed, there will be an **approximate 17% increase** in traction power costs and an **approximate 10% increase** in maintenance costs.

Financial:

- Limited competition and unique design would likely increase capital costs.

Infrastructure:

- DART maintenance and storage facilities are setup for single LRVs. Fixed three-LRV trains requires one of two solutions:
 - 1) Open gangway being able to be easily split into three sub-vehicles for maintenance requires custom design, limiting competition and raising procurement cost.
 - 2) Modify existing infrastructure to accommodate 3x longer vehicles.



Pros and Cons of Fixed Fleet (Open Gangway)

Pros

- ✓ A single security person would be able to walk the length of the train
- ✓ Provides up to 10% increased passenger capacity and 72 feet of standing space per train
- ✓ Open gangway would allow people to migrate to open seats on other car selection

Cons

- ✗ Lack of operational flexibility will increase operating and maintenance costs
- ✗ Lack of operational flexibility will impact service reliability
- ✗ Lack of competition will increase vehicle cost
- ✗ Facility infrastructure must be modified to support longer vehicles
- ✗ Track infrastructure near curves may need to be modified
- ✗ May impact speed of travel
- ✗ Lack of isolation between vehicles which could create some security challenges

Next Steps

- Finalize and issue LRV solicitation inclusive of questions associated with innovative ideas.
- Evaluate business cases presented in those proposals that might differ from the technical specification.
- Short list based on evaluation criteria and request phase 2 pricing that may include innovations or alternative technical concepts.
- Business class or open gangway proposals would likely be considered a cardinal change to the spec and will result in need to modify specification and reprocure.





Appendix

Other Innovations Advanced Through Design

- Express vehicle service
- Improve speed in CBD
- Addition of AI camera technology for security
- AI technology for fare enforcement
- “Voice of God” technology at platforms
- Predictive analytics for maintenance
- Journal bearing temperature monitoring system
- System resiliency improvements

History of Fleet Replacement Plan



2004 – DART commits to the FTA to transition to level boarding at all doors by 2030 to remain compliant with the Americans with Disabilities Act Accessibility Guidelines and applicable regulations set out in 49 CFR Parts 37 and 38.



2016 – Evaluated decision to make major repairs or pursue future replacement of the oldest fleet.



2019 – Executive decision to move forward with replacement incorporated into FY20 budget and capital plan with new LRVs arriving by 2023. This program was disrupted by the covid-19 pandemic.

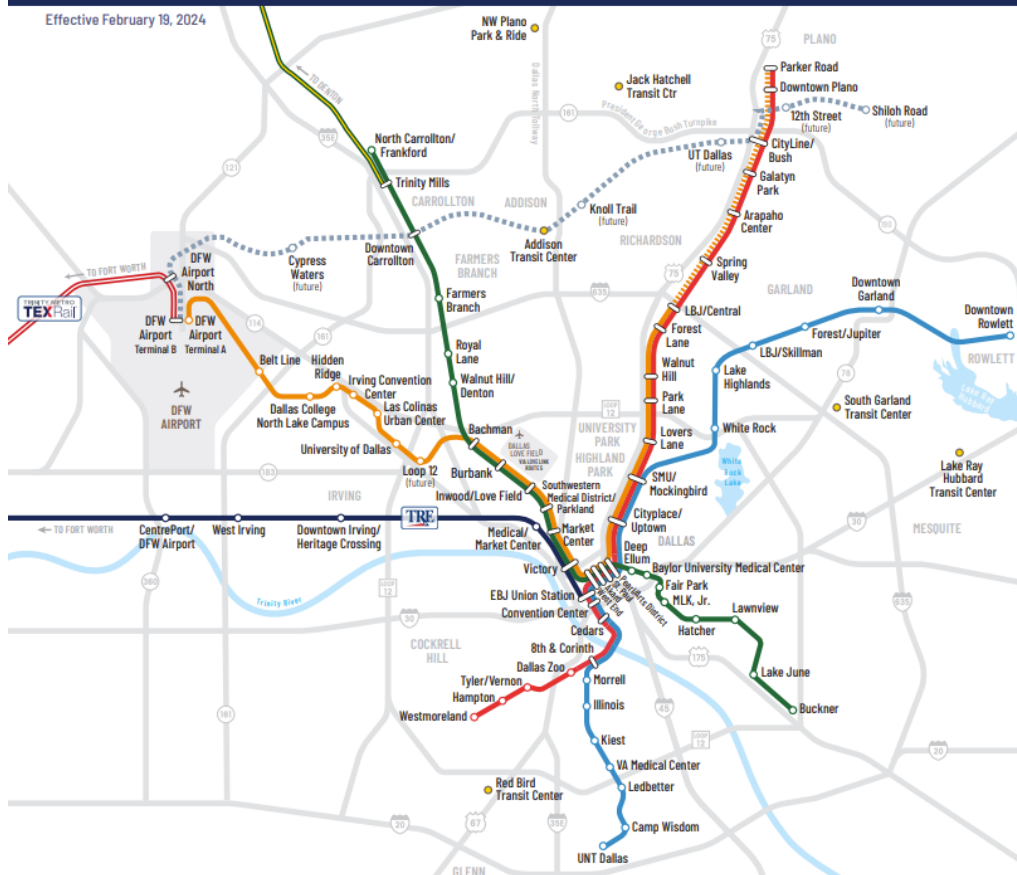


2022 – Recommendation was made to move forward with fleet replacement.

DART Current and Future Rail Services



Effective February 19, 2024



Current Operation

Red Line – 1/4 of weekday trips are singles

Blue Line - 1/3 of weekday trips are singles

Orange Line – All weekend trips are singles

Blue Line – All weekend trips are singles

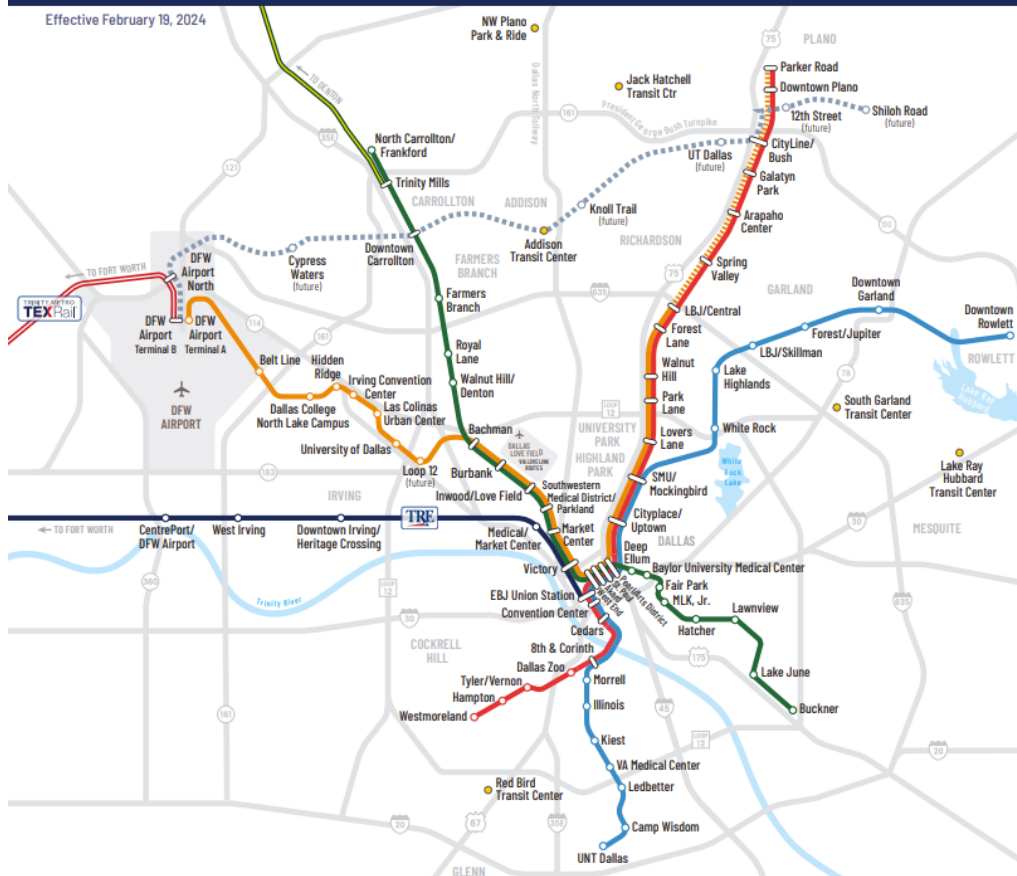
Green Line and all of the rest of the trips are doubles with the exception of special events and/or holidays

This provides an **8% reduction** in overall fleet operating miles vs running all doubles (2-LRV trains)

DART Current and Future Rail Services



Effective February 19, 2024



Future Scenario

Red Line – 1/4 of weekday trips are singles. All weekend trips are doubles.

Blue Line - 1/3 of weekday trips are singles. All weekend trips are singles.

Orange Line – All weekday trips are triples. All weekend trips are singles.

Green Line – All weekday trips are triples. All weekend trips are doubles.

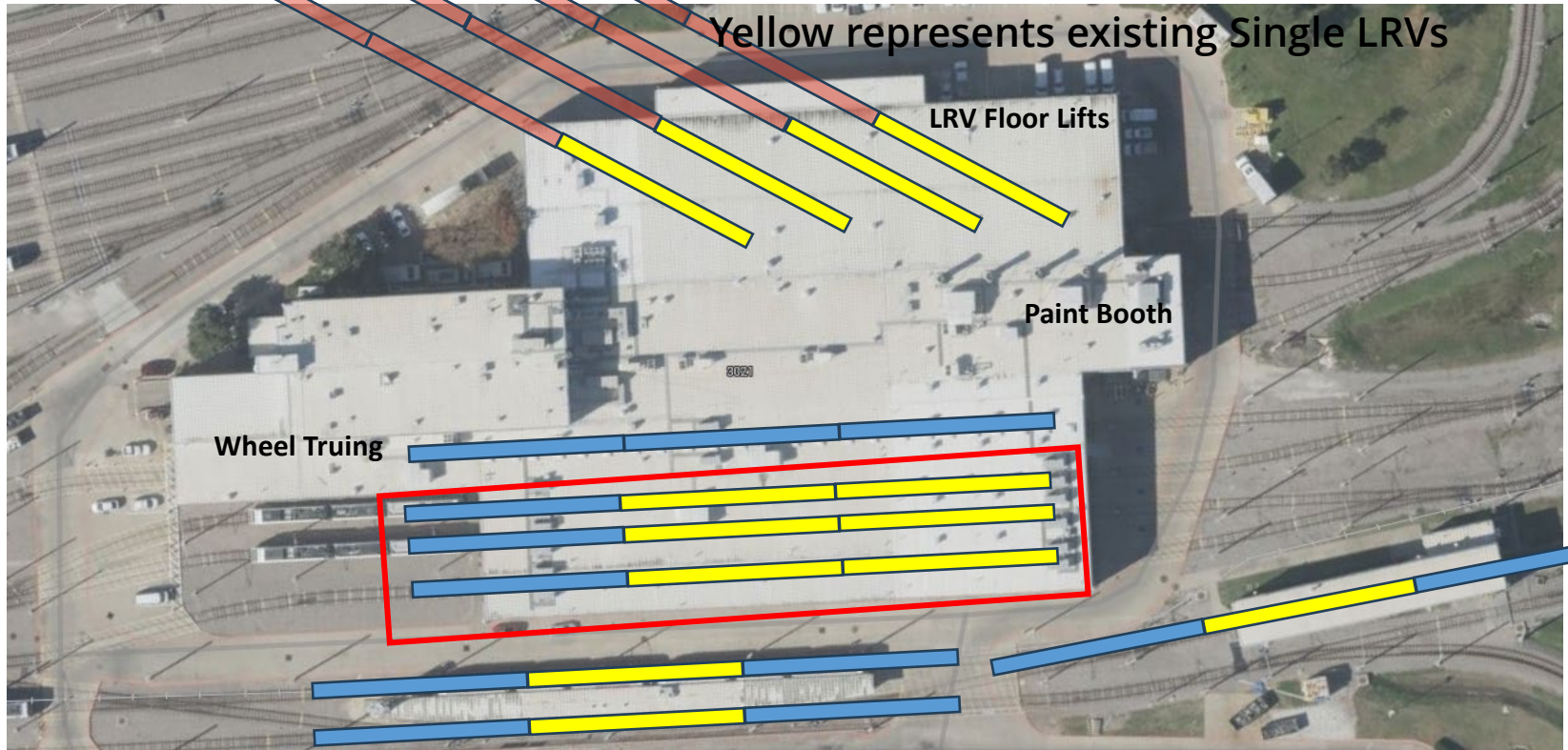
All of the rest of the trips are triples with the exception of special events and/or holidays

This provides an **17% reduction** in overall fleet operating miles vs running all triples (3-LRV trains)

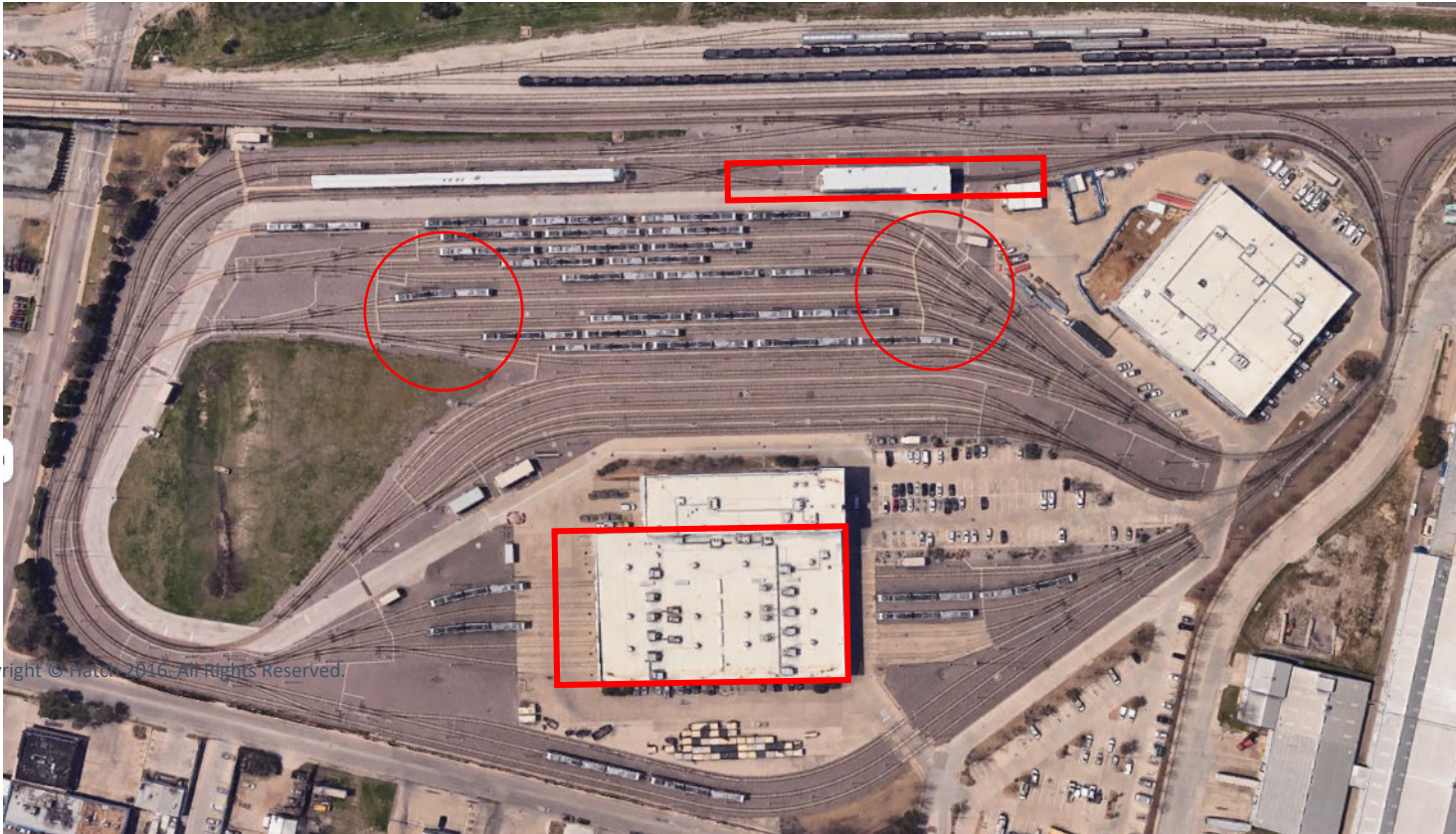
CROF Limitations



CROF Limitations



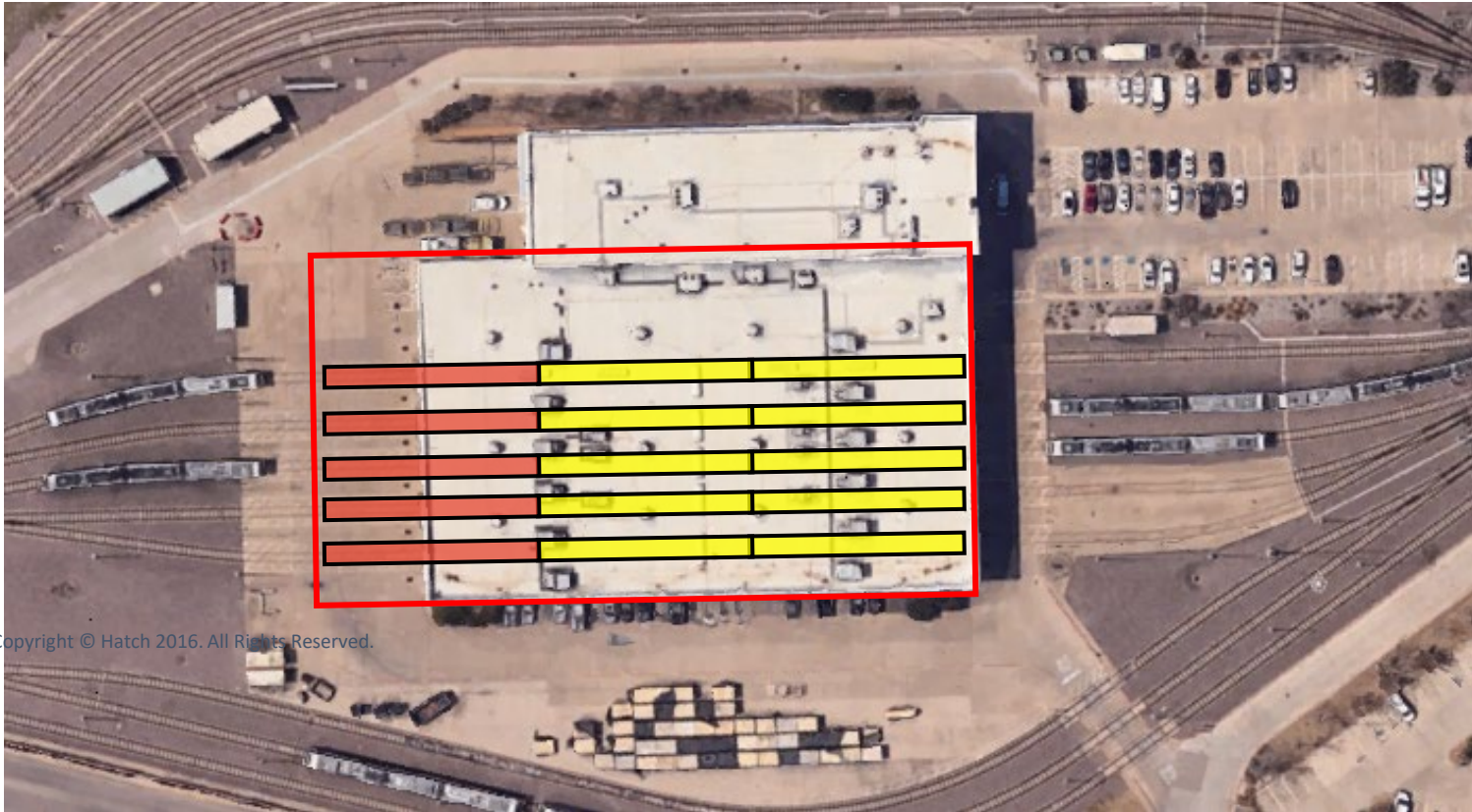
NWROF Limitations



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NWROF Limitations

Yellow represents existing Single LRVs



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NWROF Limitations

