

Innovative Clean Transit (ICT) Plan Update

SamTrans Board of Directors
November 1, 2023



AGENDA



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samTrans
Innovative Clean Transit (ICT) Rollout Plan

December 2, 2020

Background

- ✓ **2018: California Air Resources Board (CARB) adopted ICT Regulation**
 - Requires transit providers to transition fleet to 100% Zero Emission (ZE) by 2040
 - Requires 100% of fleet purchases to be ZE by 2029
- ✓ **2020: SamTrans ICT Plan approved by Board**
 - Battery electric buses (BEBs) only
 - Includes diesel bus purchases
 - Complete ZE transition in 2038





SAN MATEO COUNTY TRANSIT DISTRICT

SAMTRANS INNOVATIVE CLEAN TRANSIT ROLLOUT PLAN

NOVEMBER 2023
DRAFT



2023 ICT Plan Update



Mar-2023: Board Workshop

- ZE Technology Review: BEBS vs. Hydrogen Fuel Cell Electric Buses (FCEBs)
- Life Cycle Cost Analysis: BEBs vs. FCEBs



Nov-2023: Update aligns with Mar-2023 Board Workshop

- FCEBs in addition to BEBs
- Eliminates diesel bus purchases
- Enhanced analysis on equity & workforce
- Complete ZE transition in 2034



Existing Conditions – North Base

Photo Credit: [Craig Howell](#)



Location

- 301 N Access Rd South San Francisco



Size

- 27 acres



Vehicles

- Accommodates 175 buses



Zero-Emission Infrastructure Status

- 10 Interim Chargers commissioned
- 1 Hydrogen Mobile Refueler (early 2024)
- 4 indoor FCEB maintenance bays (early 2024)

Existing Conditions – South Base



Location

- 501 Pico Boulevard
San Carlos



Size

- 13 acres



Vehicles

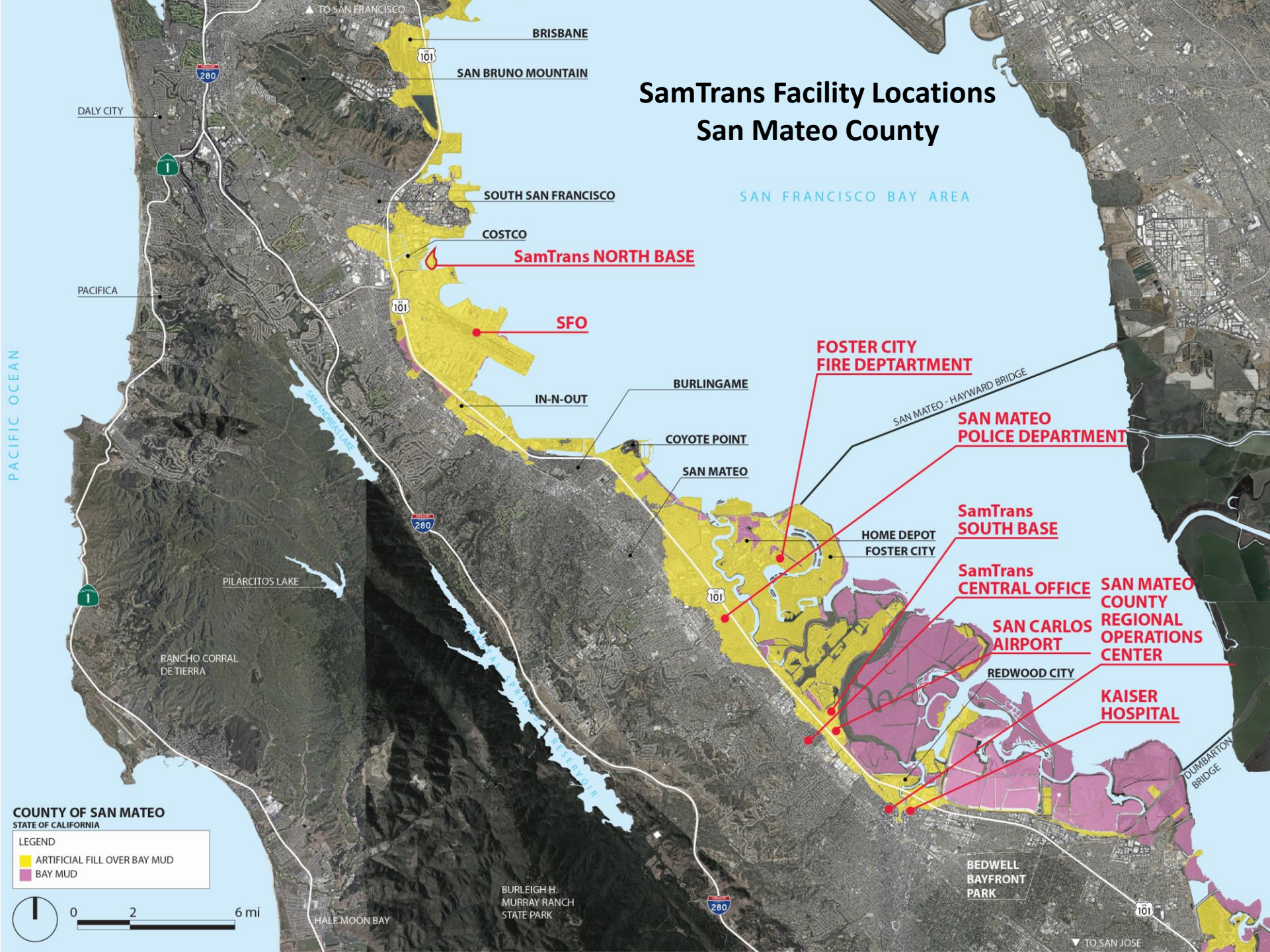
- Accommodates
147 buses



Zero-Emission Infrastructure Status

- 10 Interim Chargers
under construction
(late 2024)
- 37 Permanent BEB Chargers
(late 2026)

SamTrans Facility Locations San Mateo County



COUNTY OF SAN MATEO
STATE OF CALIFORNIA

LEGEND

- ARTIFICIAL FILL OVER BAY MUD
- BAY MUD



Existing Conditions Fixed Route Service

446 square miles
service area

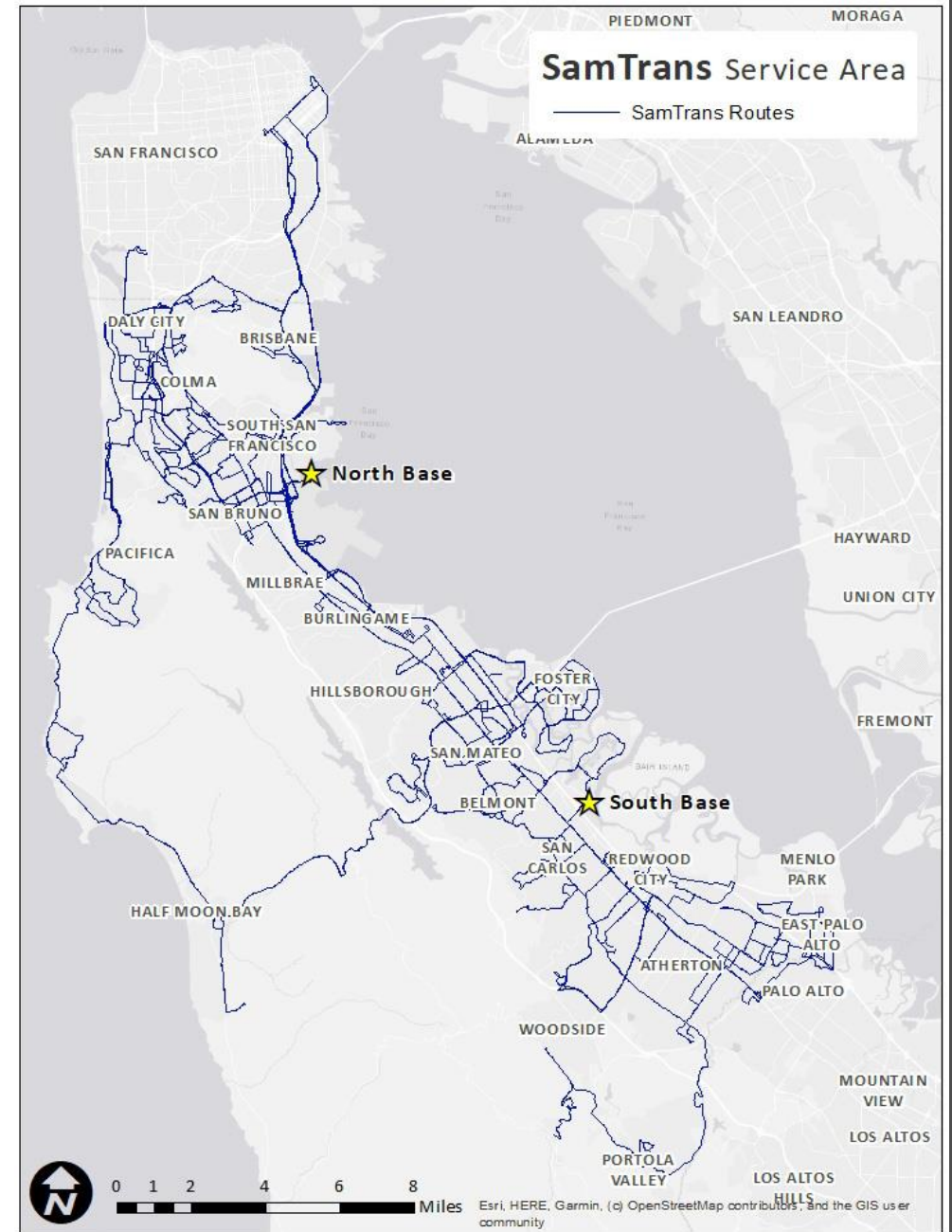


Over 10 million
trips (pre-COVID)



67 Routes

Local | Community |
Express/Limited |
School-oriented | Owl |
& Special Routes



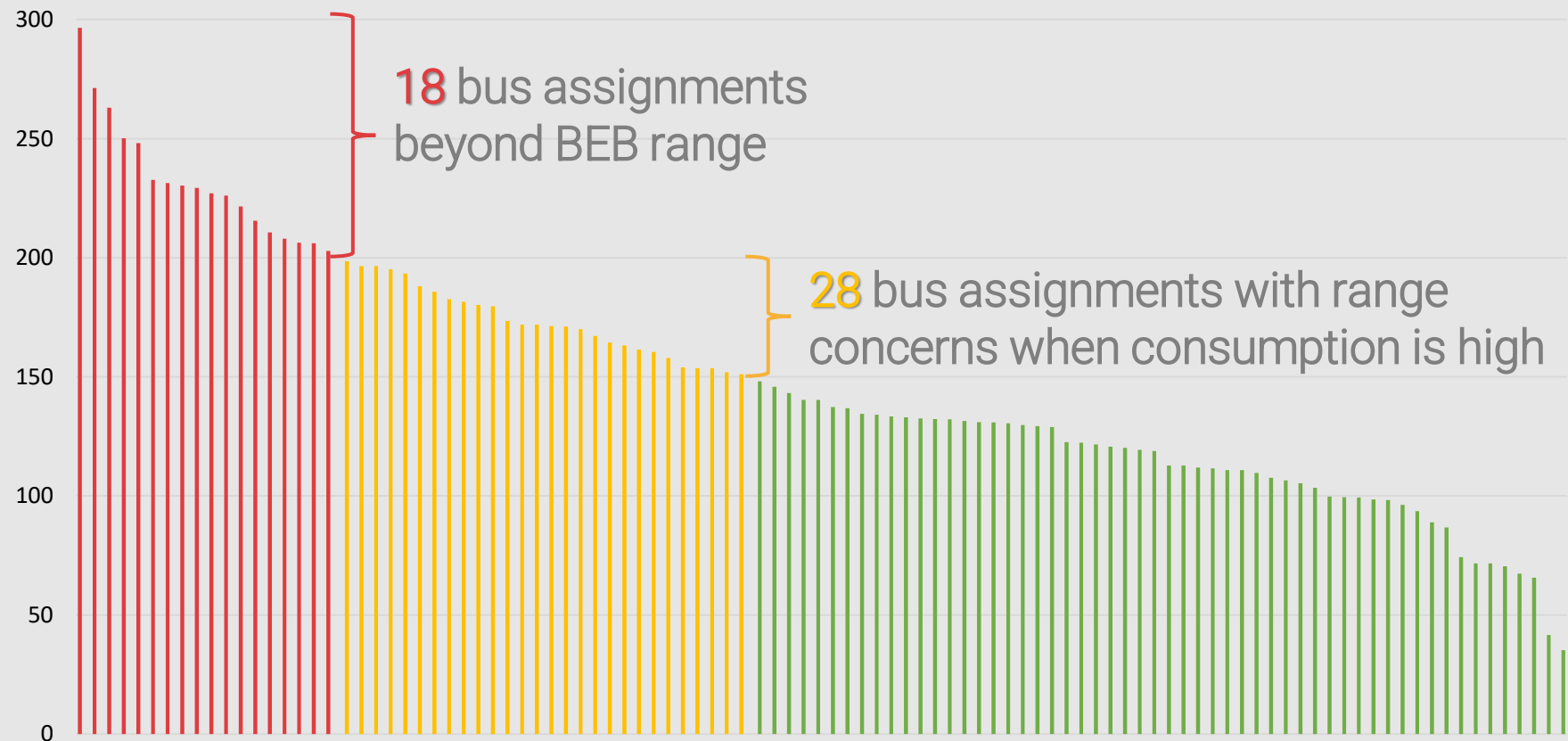
Existing Conditions Fixed Route Service (North Base)

● BEB Travel Range:
~150 miles – 200 miles

● FCEB Travel Range:
~300 miles

Assumed 40' bus with 440 kWh, energy consumption at 2.02 kWh/mile – 3 kWh/mile.

North Base Bus Assignments Distance (Weekday)



● 18% - 45% of bus assignments may have range concerns if only using BEBs

● All bus assignments can be completed by FCEBs

Existing Conditions Fixed Route Service (South Base)

● BEB Travel Range:
~150 miles – 200 miles

● FCEB Travel Range:
~300 miles

Assumed 40' bus with 440 kWh, energy consumption at 2.02 kWh/mile – 3 kWh/mile.

South Base Bus Assignments Distance (Weekday)



● Fewer bus assignments than North Base

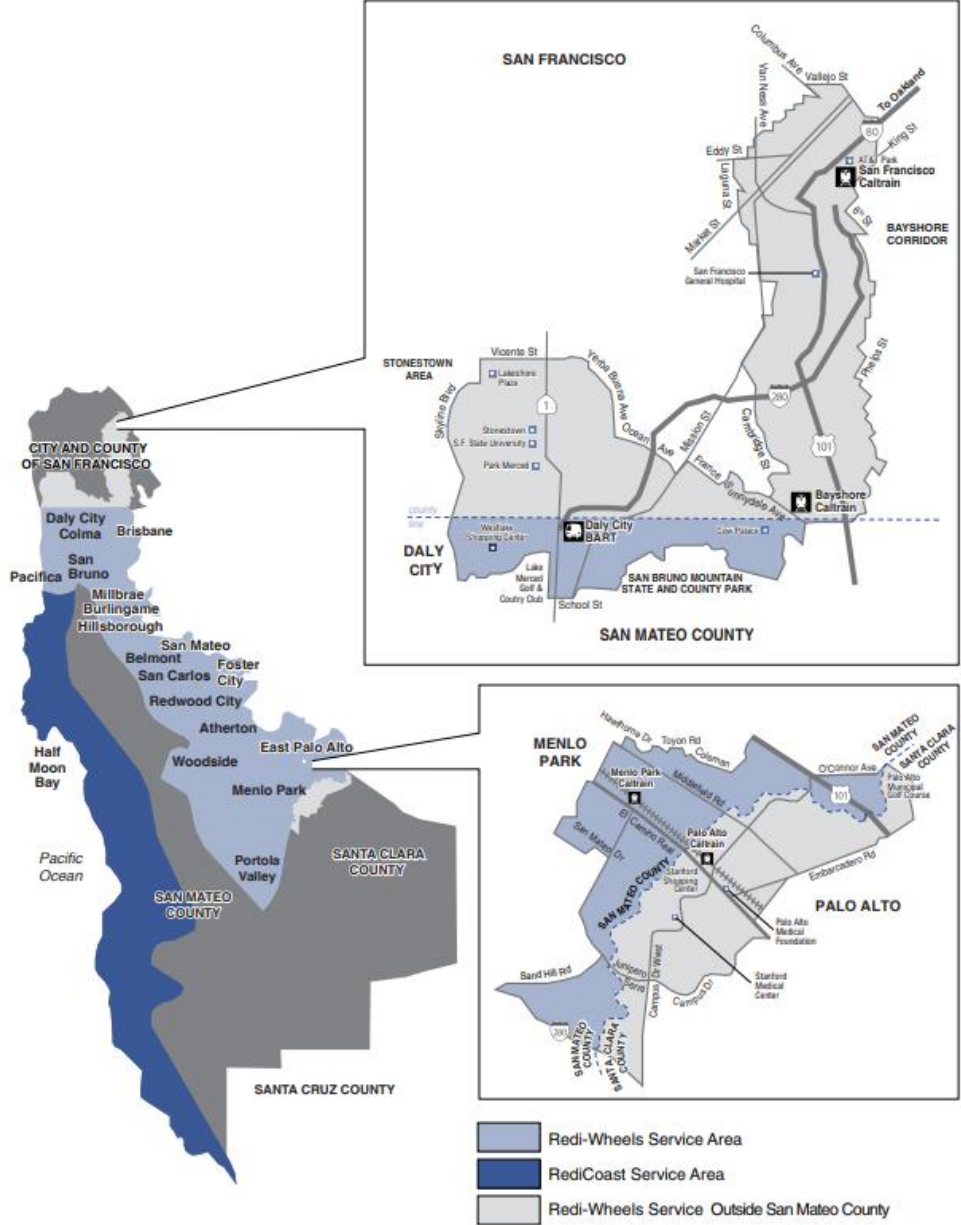
● Most bus assignments are shorter than 150 miles

● 1% - 8% of bus assignments may have range concerns if only using BEBs



Existing Conditions

Paratransit Service



70 Vehicles

To be replaced by ZEVs starting 2026



Shared Ride, Curb-to-Curb Service

Optional door-to-door



Over **344K** trips (pre-COVID)





2023 ICT Plan Update

SamTrans

2023 ICT Plan Highlights



Updated transition timeline achieving **full ZE fleet in 2034** – 4 years ahead of the 2020 Rollout Plan timeline



Updated **technology** evaluations and review of the zero-emission **market**



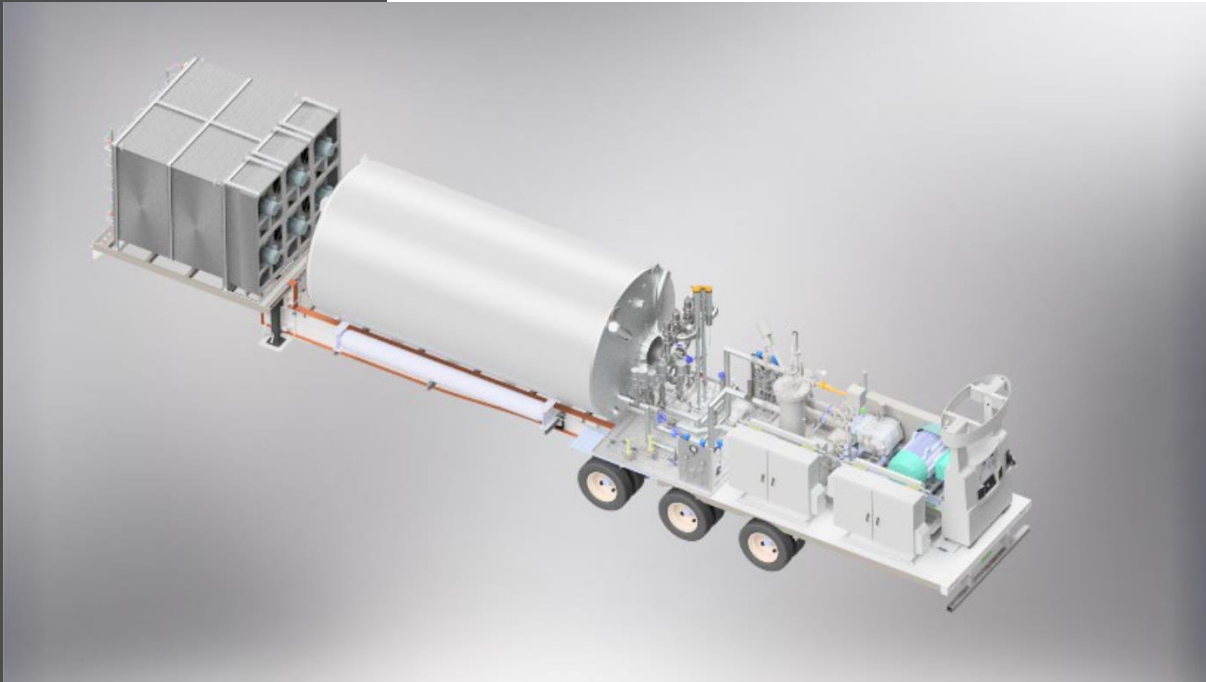
Closer review of the **equity** impact and **workforce** development implications

FCEBs vs. BEBs

ZE Technology Comparison

		Fuel Cell Electric Bus (FCEB)	Battery Electric Bus (BEB)
Market	Number of Manufacturers		☑
Operations	Advertised Range	☑	
	Fueling Time	☑	
	Resilience	☑	
Costs	Maintenance		☑
	Energy/Fuel		☑
Facility	Infrastructure	☑	
Climate	GHG Reduction		☑

FCEB Demonstration



Mobile Hydrogen Refueler

- ✓ June 2022: Board approved purchase of 10 FCEBs for North Base as part of a Demonstration Program
- ✓ May 2023: Board approved purchase of a mobile hydrogen refueler & award of a 2-year hydrogen supply contract for the 10 FCEBs
- ✓ May 2023: Board approved contract to modify 4 maintenance bays at North Base to enable indoor maintenance of FCEBs

2023 ICT Plan Lifecycle Costs – North Base

- **FCEBs** have lower infrastructure costs
- **BEBs** have lower energy costs
- 12-year lifecycle cost savings of FCEB fleet estimated at **\$94 M**

CAPITAL & OPERATING COSTS (12-year Lifecycle)		
Item	BEB Option	FCEB Option
Number of Buses	185	162
Buses	\$252,393,157	\$247,008,174
Infrastructure	\$144,950,000	\$36,150,000
Maintenance	\$40,492,886	\$50,686,882
Energy (Electricity & Hydrogen)	\$41,096,703	\$51,129,786
Lifecycle Cost Total (NB)	\$478,932,746	\$384,974,842

2023 ICT Plan

Fleet Procurement Plan

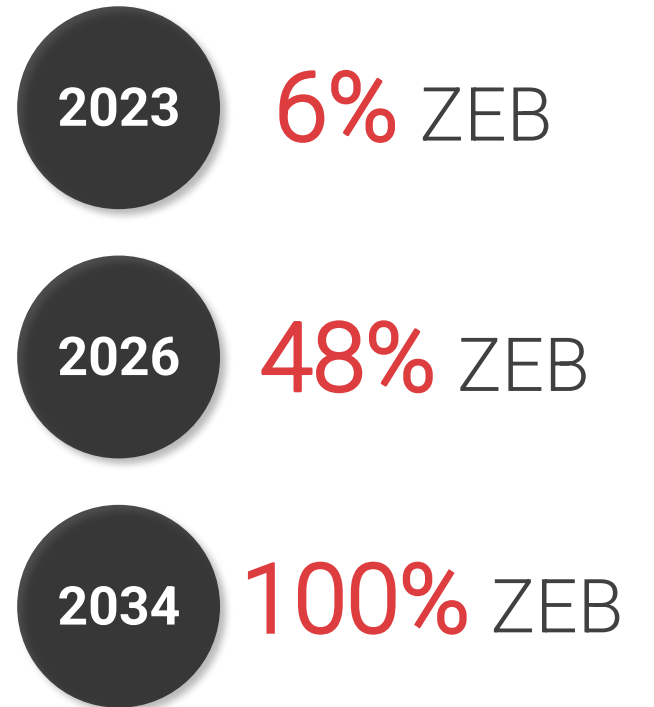
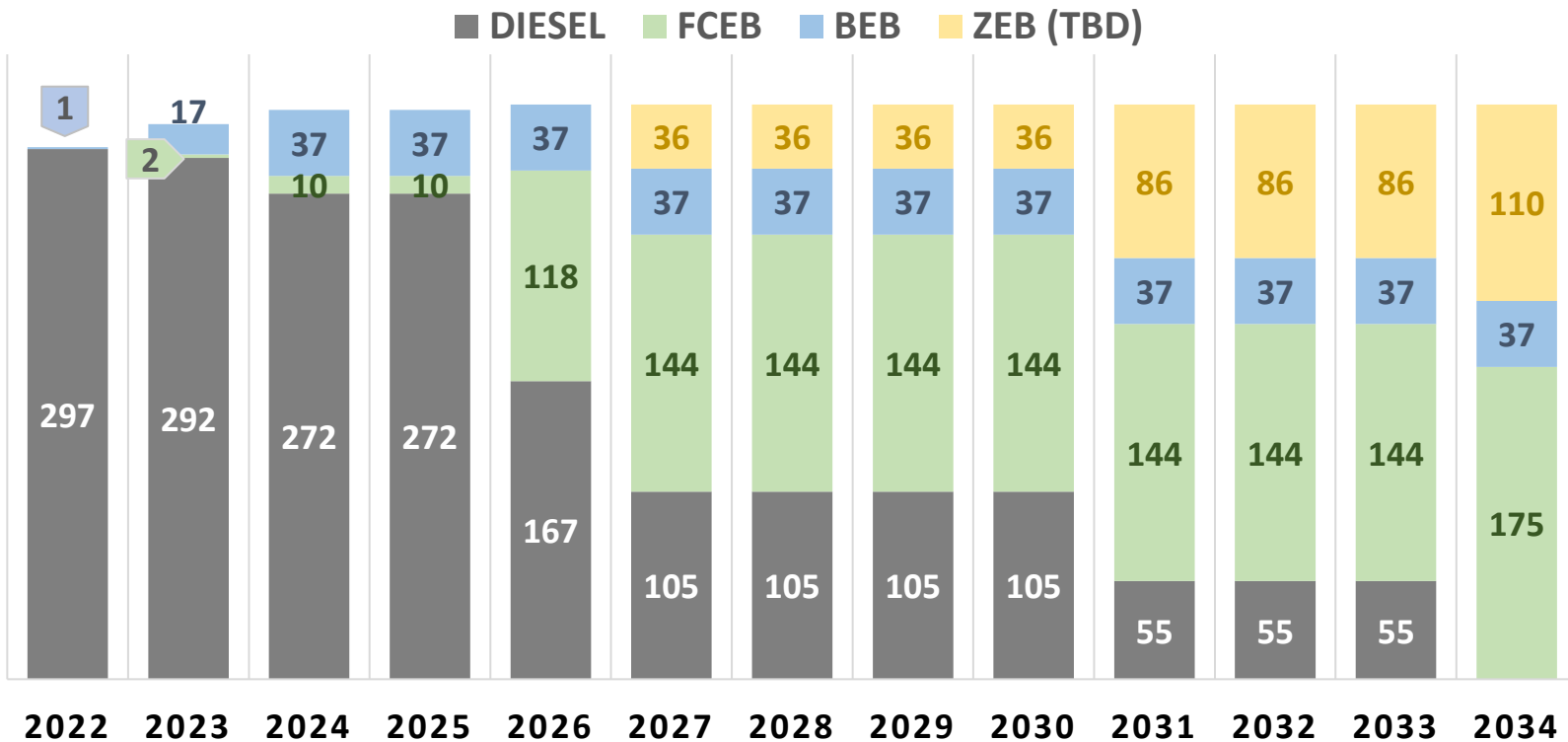
Procurement Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
FCEBs (No. Base)	0	10	20	88	26	0	0	0	0	0	0	31
BEBs (So. Base)	7	30	0									
ZEBs (So. Base)*				0	36	0	0	0	50	0	0	24



* Defer decision on type of ZEB for remaining So. Base fleet until 2024

2023 ICT Plan

Fleet Replacement Plan



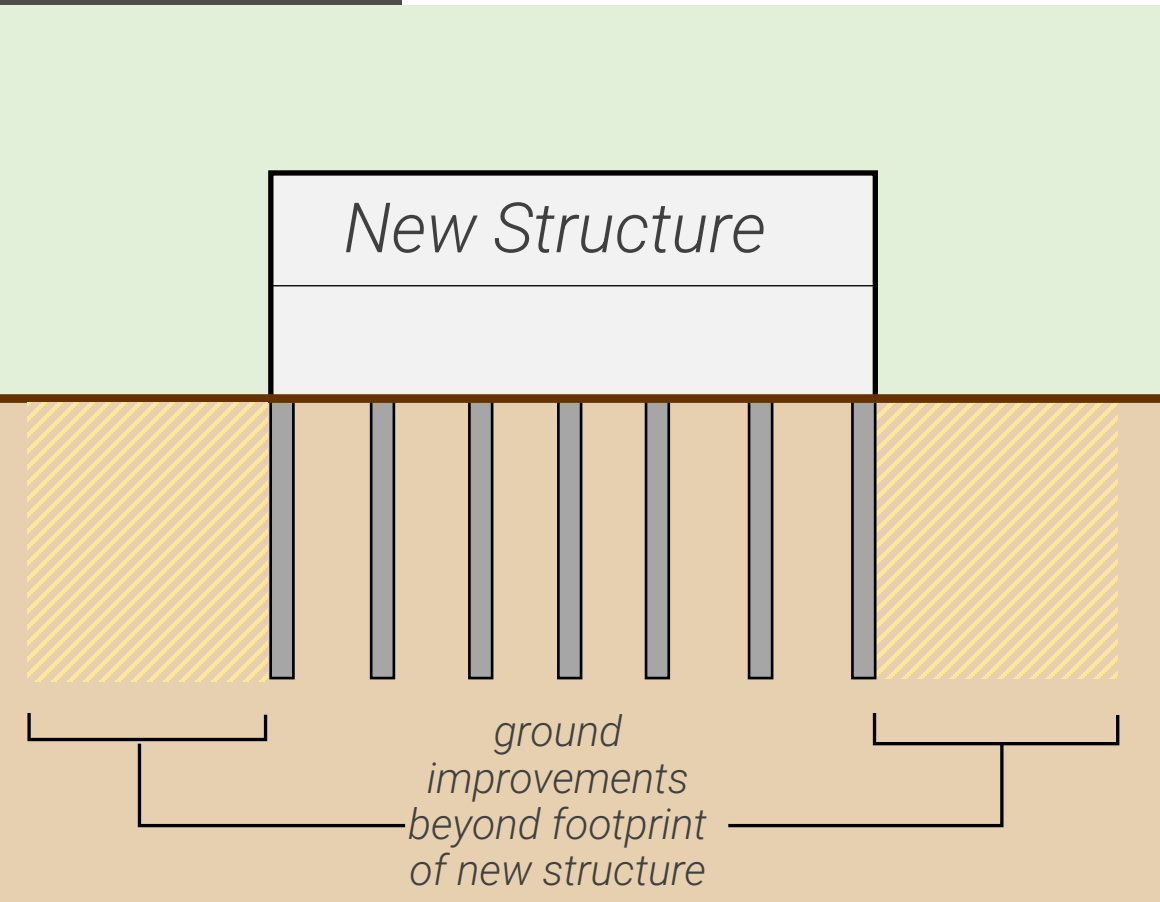
Infrastructure



Hydrogen Storage & Fueling Station

- ✓ Hydrogen Storage & Fueling Station at North Base
- ✓ Additional Modifications to North Base Maintenance Building
- ✓ Additional Permanent BEB Chargers and/or Hydrogen Fueling Station at South Base, depending on decision for remaining fleet

Soils & Foundations

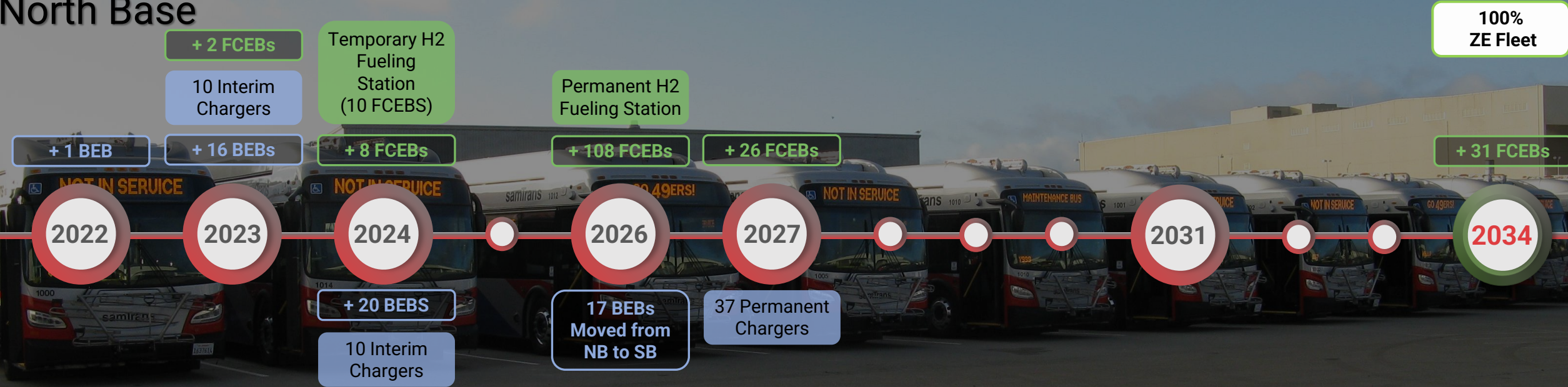


- ✓ Add materials to strengthen soil
- ✓ Install deep foundations to reduce settlement potential
- ✓ Place ground improvements beyond the building's footprint to confine soil
- ✓ Engage an independent third-party geotechnical engineer to review foundation design

2023 ICT Plan

Path to Zero Emissions

North Base



South Base

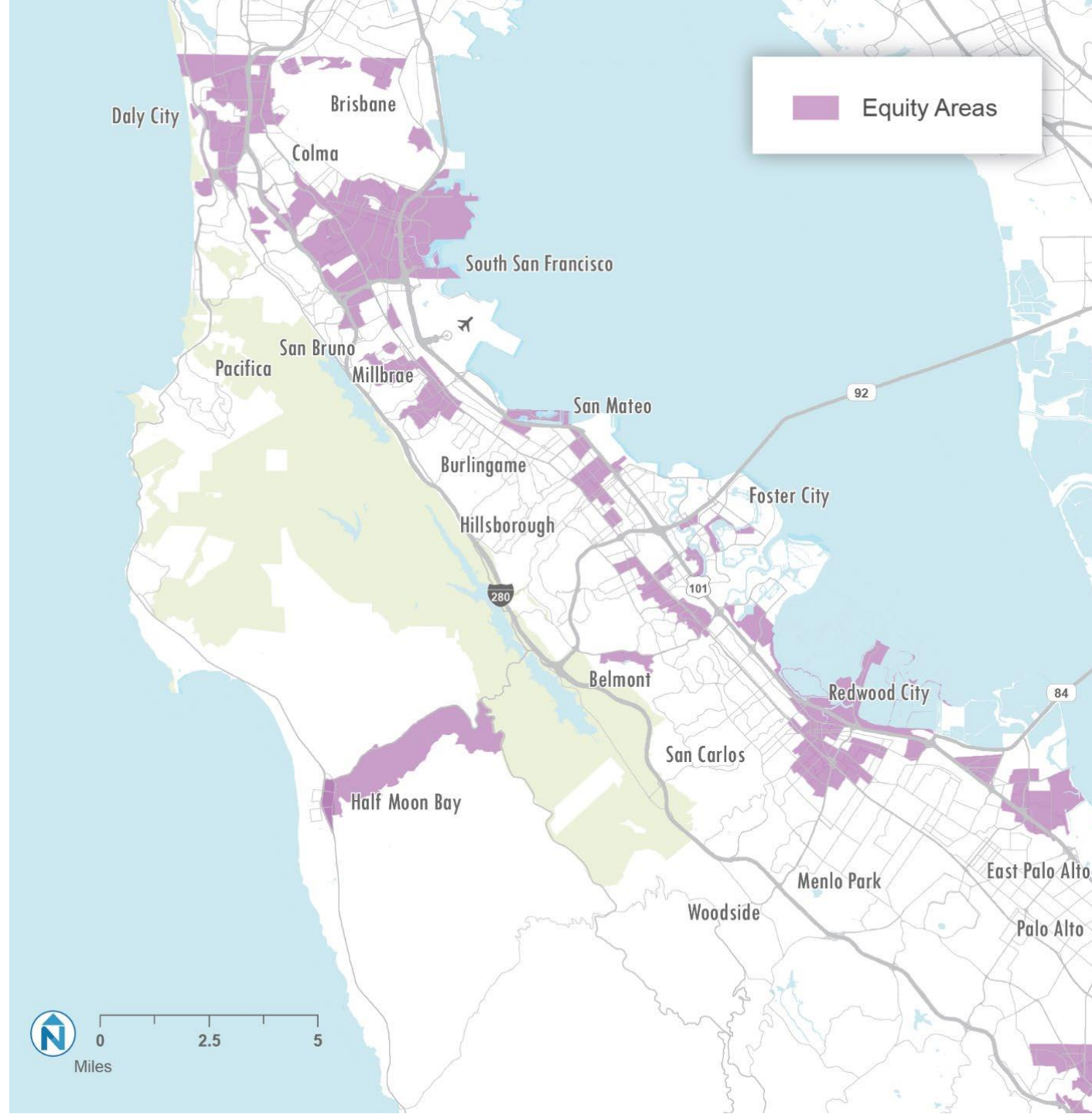


2023 ICT Plan Equity Analysis

Equity Priority Areas

- Low-income households
- Racial and ethnic minorities
- Zero-car households

**Goal: Prioritize service in
Equity Priority Areas**



Improve Air
Quality



Reduce
Ambient Noise



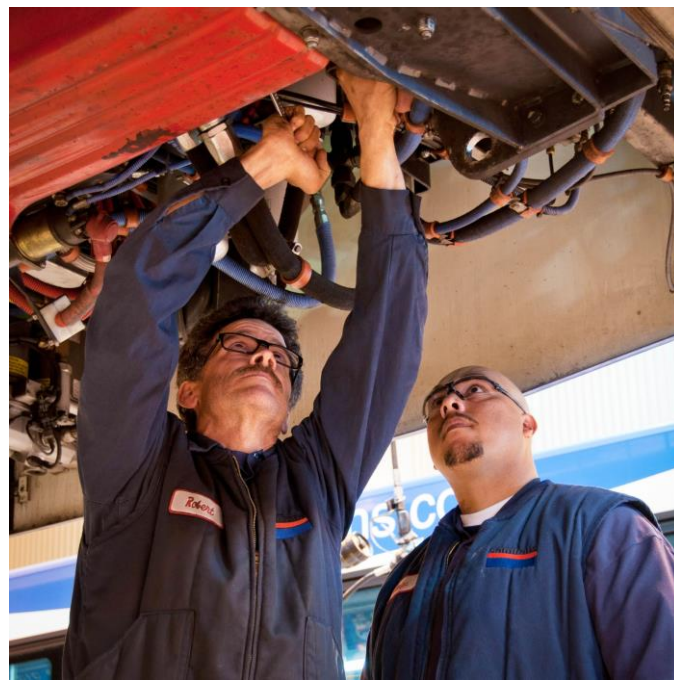
Reduce
Pollution

2023 ICT Plan Workforce Training

Similar job duties/descriptions.
New skills!

- ✓ Training
- ✓ Skills gap assessment
- ✓ Re-skilling modules

SamTrans commits to
training staff!

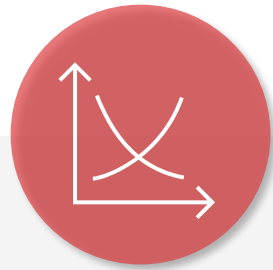


2023 ICT Plan

Considerations & Challenges



Significant Supply Chain & Production Delays



BEB Market Fluctuations & Limited FCEB Options



New Protocols for Emergency, Safety, and Resiliency Management



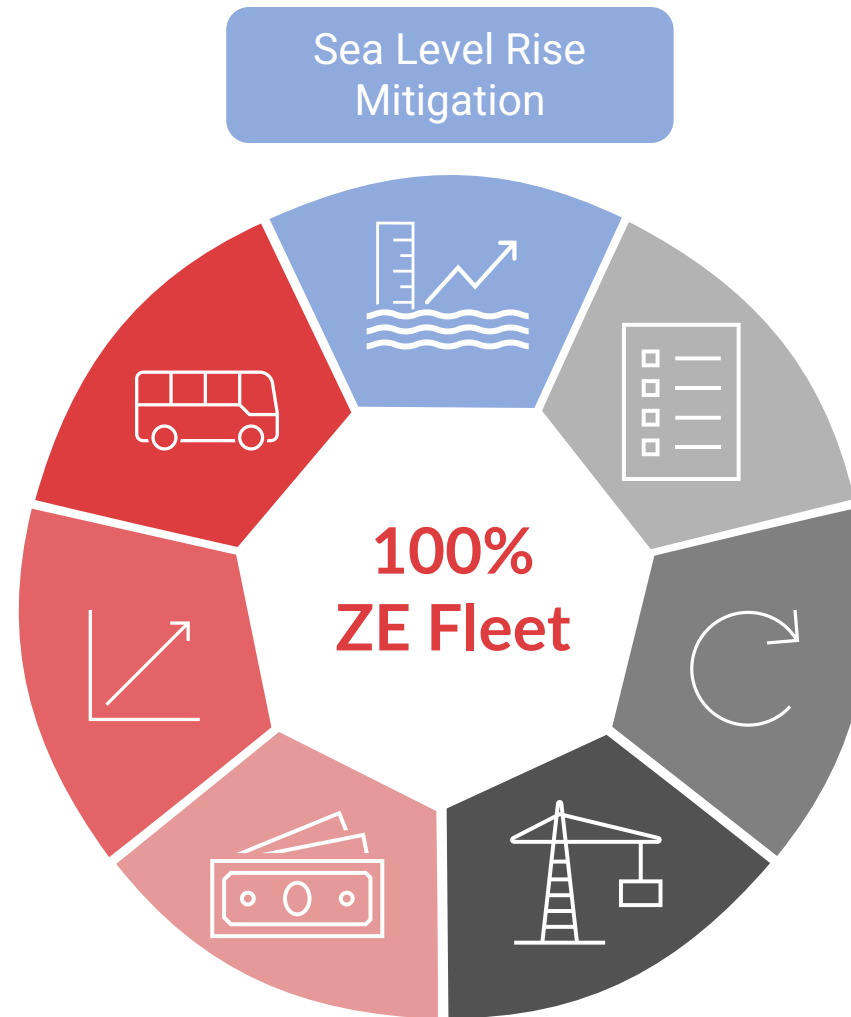
Material Sourcing & End-of-Life Sustainability

Ongoing Efforts

BEB & FCEB
Real-World Data
Collection

Continued
Monitoring of the
Market

Funding
Applications



Periodic Review of
Plan

ICT Regulation
Annual Fleet Update

Facility Upgrades
and Vehicle
Procurements

emission ZERO

Progress

H₂

CA 58295



Progress
17 BEBs delivered to No. Base
10 BEBs in revenue service



Progress

1 FCEB delivered to North Base



Progress North Base Facility Modifications for 10 FCEBS



General Work Activities

Lighting relocation



Electrical Work



Progress

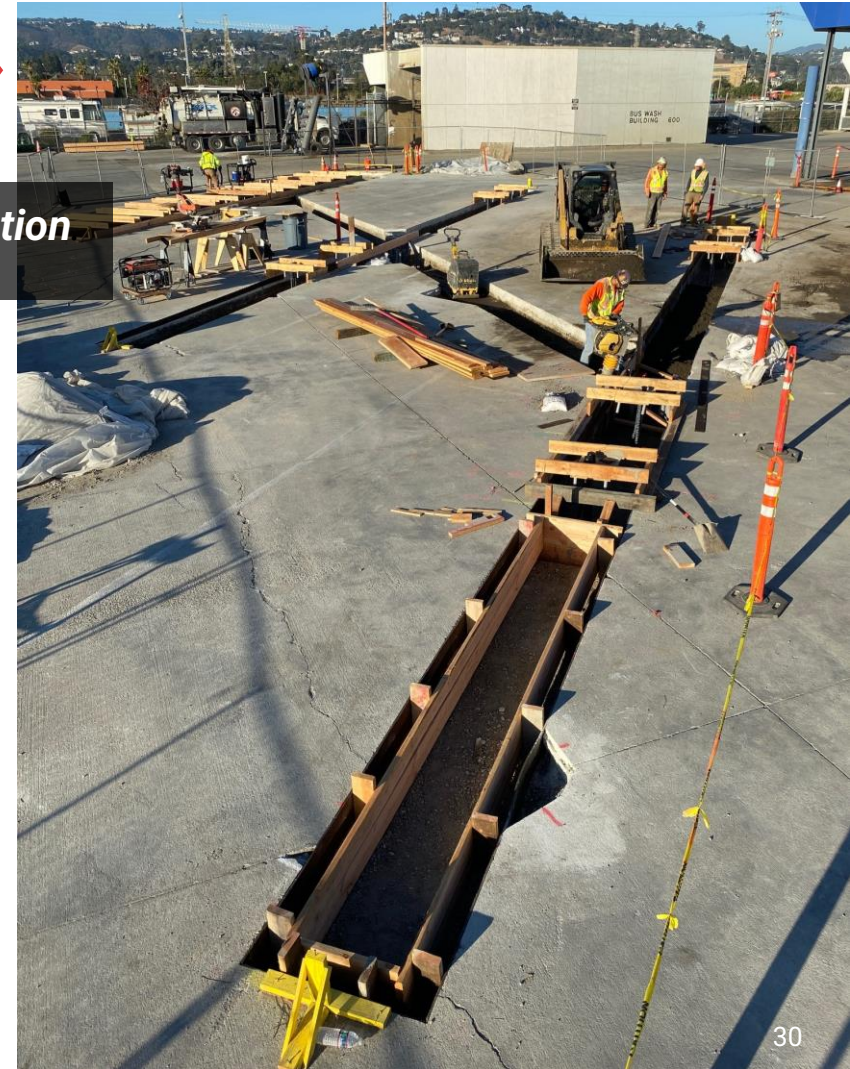
South Base Installation of 10 Depot Chargers



Construction of Charger Pads.



Conduit installation



NEXT STEPS



- ✓ **Seek Board Approval of Updated ICT Rollout Plan at December 2023 BOD Meeting**
- ✓ **Submit Updated ICT Plan to California Air Resources Board**
- ✓ **Seek Board Approval for Purchase of up to 108 FCEBs at December 2023 BOD Meeting**



3000 SamTrans

Q&A

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