

The Shade Imperative

STREET TREES AS CRITICAL
PUBLIC INFRASTRUCTURE

AIA Austin Advocacy: Mobility & Resiliency Committees Roundtable
September 28, 2026

AGENDA

- 1 Background
- 2 Green Infrastructure Working Group
Achievements So Far
- 3 Case Study: Austin Light Rail
- 4 Panel Discussion



Learning Objectives

- Evaluate how green infrastructure and street tree networks contribute to pedestrian safety, thermal comfort, environmental quality, and public health in the public realm.
- Understand existing regulatory barriers and practical challenges to creating a broader street tree network.
- Identify key recommendations developed by the Green Infrastructure Working Group and understand their application to street trees and improved streetscape design for public and private projects.
- Compare implementation tools and strategies for urban green infrastructure, including utility coordination, capital improvement projects, development incentives, and code-based requirements.

BACKGROUND

“We have roughly \$25 billion worth of infrastructure starting construction at roughly the same time”

– Matt Geske, VP of Public Affairs,
Downtown Austin Alliance

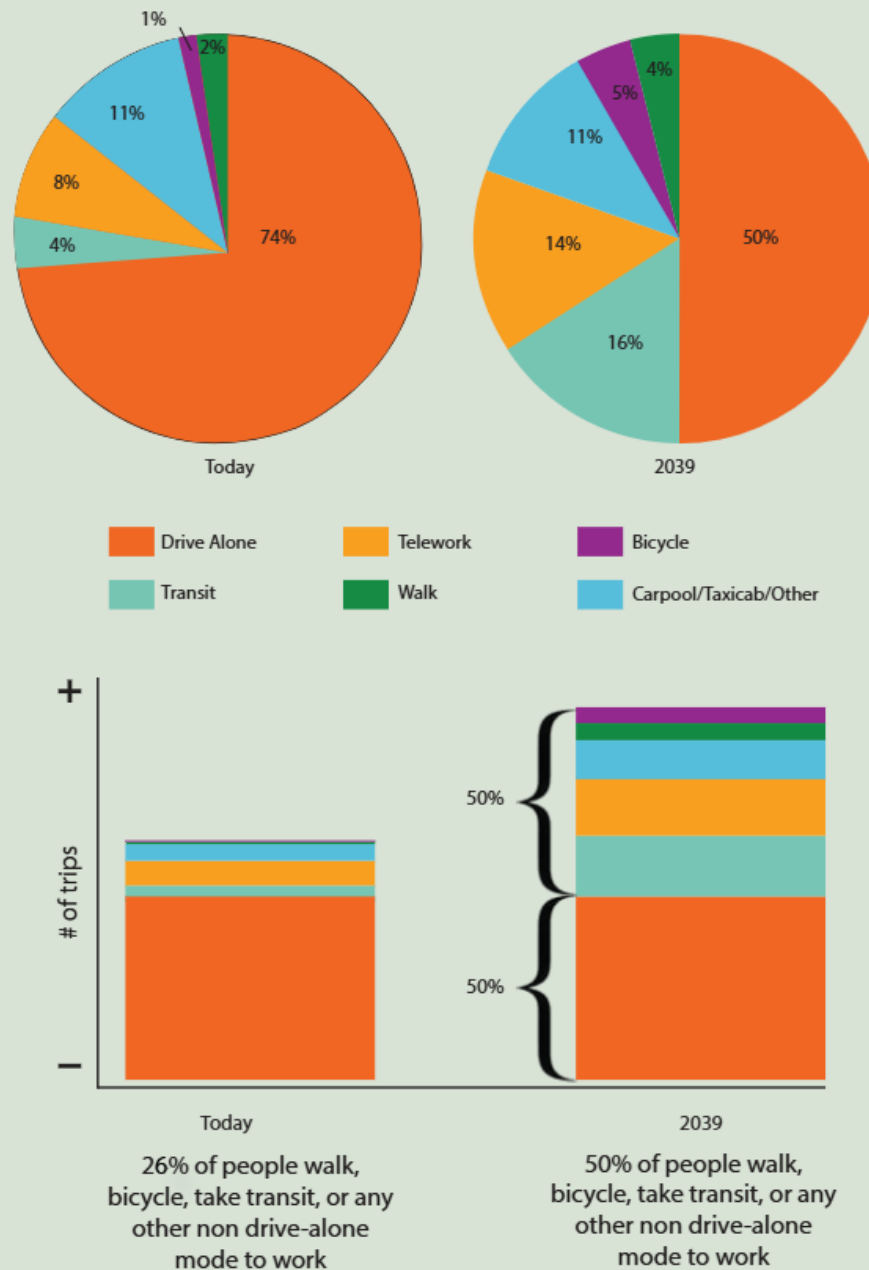
SOME PROJECTS BEING TRACKED BY AIA AUSTIN ADVOCACY COMMISSION:

- Austin Light Rail (Project Connect)
- Equitable Transit Oriented Development (first/last-mile streets around rail stations)
- I-35 ‘Capital Express’ frontage roads
- Great Streets Program
- Congress Avenue Urban Design Initiative
- 6th, 7th, 8th Streets
- West Campus (University Neighborhood Overlay)
- Dog’s Head (update to Austin Strategic Mobility Plan)

BACKGROUND

The Austin Strategic Mobility Plan (ASMP) sets the goal to reach 50/50 mode share by 2039.

This would mean major increases in commuting via transit, bicycle, walking, ride-hailing, and telework.



BACKGROUND

Human-centered urban design is key to enabling trips other than driving.

The ASMP directs the City to plan for trees, to support transportation networks.

Land and Ecology Policy 4

Recognize and plan for trees as vital to supporting the transportation network

Provide and maintain trees in public rights of way to encourage active transportation modes, supply shade, protect pedestrians, and provide other ecosystem benefits

Top Strategies to Reach 50/50 Mode Share by 2039

Reduce traffic fatalities, serious injuries by focusing on safety culture, behaviors

We must strategically promote a culture of safety by emphasizing education and encouragement focused on behaviors that contribute the most to traffic injuries and fatalities, while continuing to incorporate safe design principles into our multimodal infrastructure.

Move more people by investing in public transportation

We should invest in a complete public transportation system, with high-capacity vehicles in dedicated transit pathways, because it has the ability to move the most people in the region and through the core of Austin.

Manage congestion by managing demand

Transportation demand management (TDM) is an approach to tackling congestion through strategies that more quickly reduce our impact on the transportation network rather than adding costly capacity.

Build active transportation access for all ages and abilities on sidewalk, bicycle, and Urban Trail systems

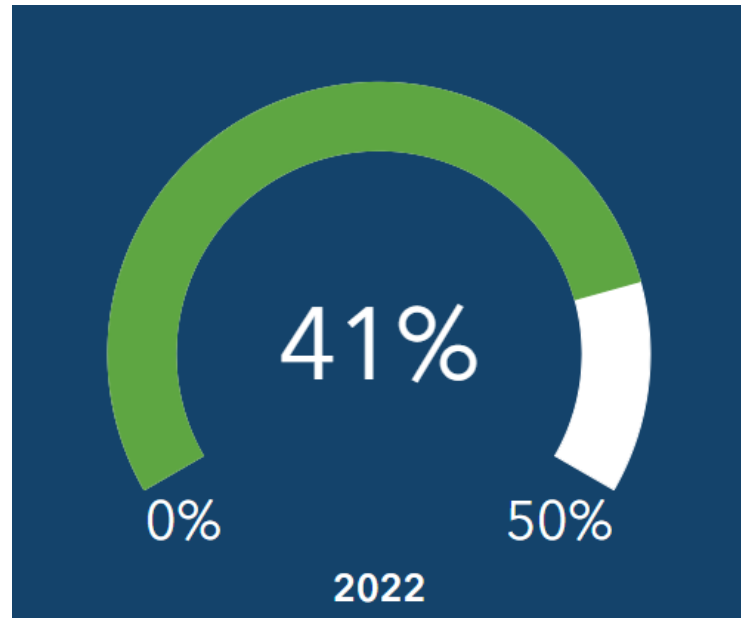
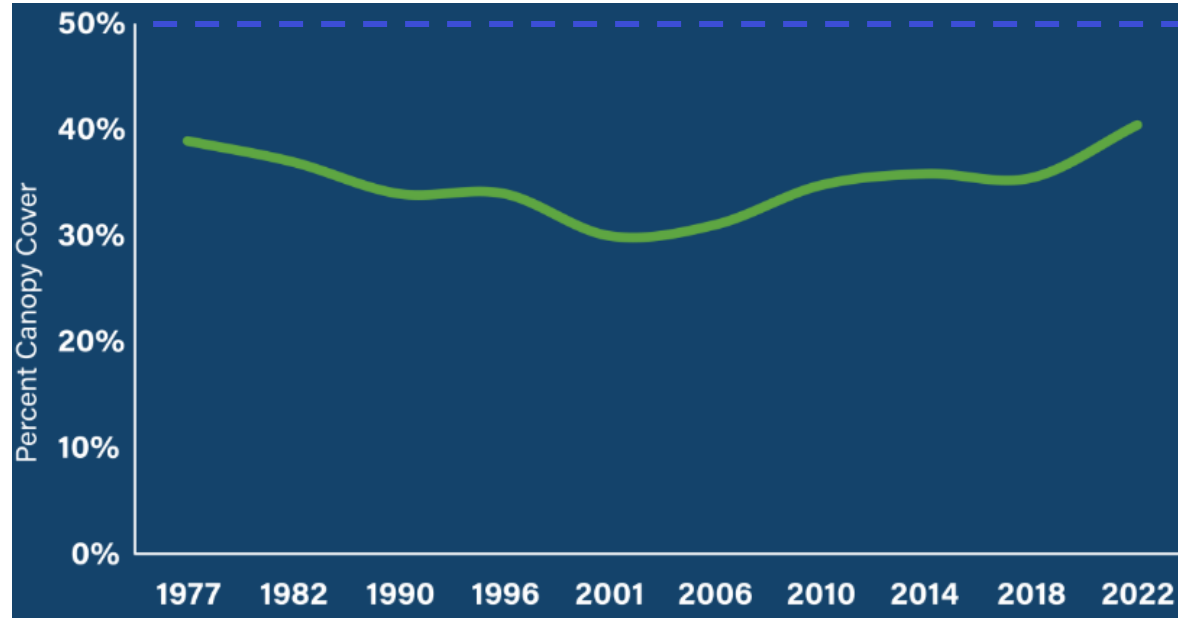
Expand multimodal transportation choices by completing the sidewalk, bicycle, and Urban Trail systems, with a focus on completing the highest priority projects in the near-term.

BACKGROUND

The City aims to increase Austin's tree canopy to 50% by 2050, per its Climate Equity Plan.

Though most of Austin's plantable area is private land, street right-of-ways are half of Austin's *public* land.

However, current policy requires shade trees on less than 5% of Austin's streets.



BACKGROUND

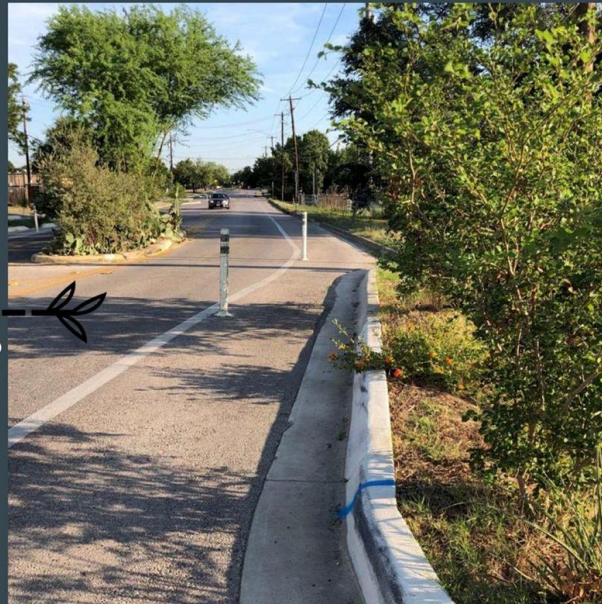
A Citizen-capacity project:

EM Franklin Green Street

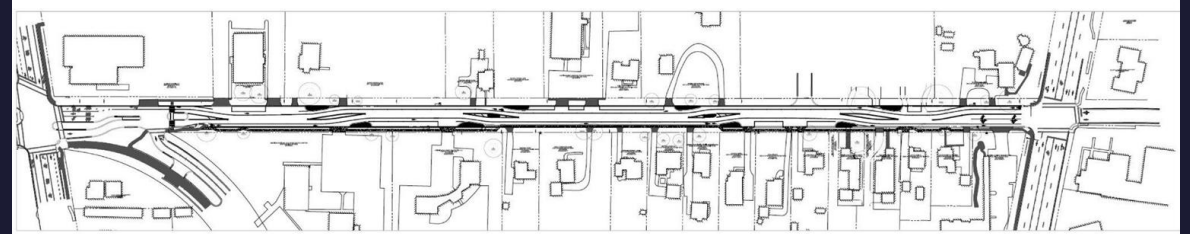
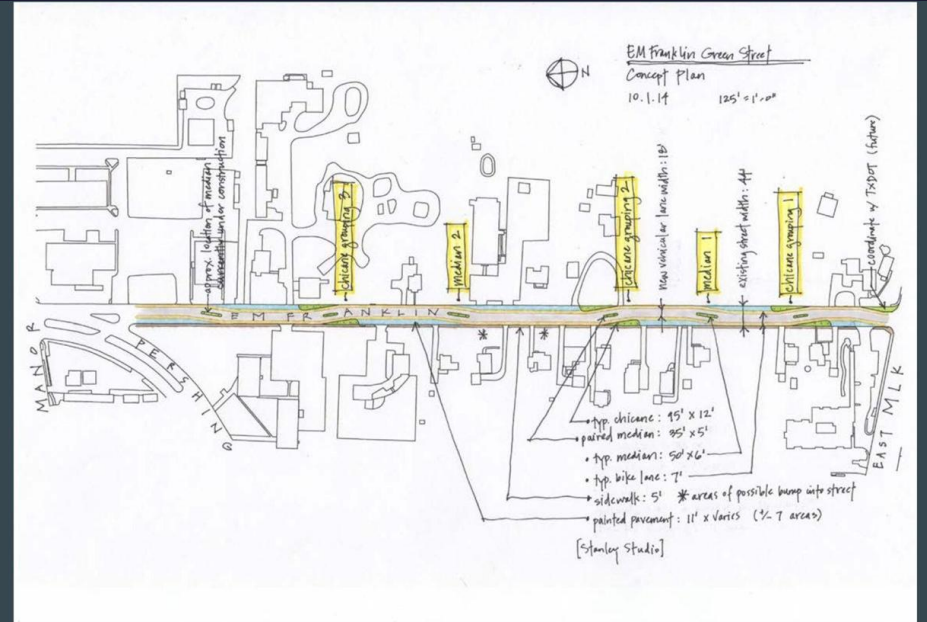
2014 discussions > Neighborhood Partnering Program mantle
2016 installation; twice-yearly neighbor-run work days since
2026 ten-year anniversary party to celebrate neighborhood shade

EM FRANKLIN
GREEN STREET

September 2020
Prepared by Lauren W. Stanley



Concept design
sketch submitted for
Neighborhood
Partnering Program
application
2014



Final plan
March 2017

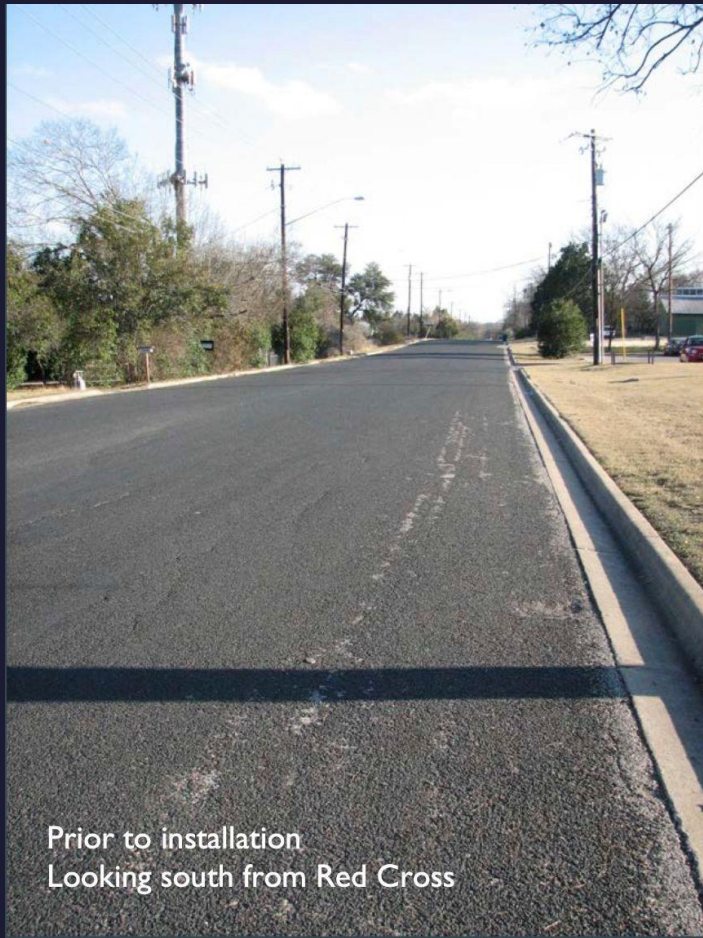
BACKGROUND

A Citizen-capacity project:

EM Franklin Green Street

Chicanes extend real estate for street trees

Pocket forests with understory cool the almost half-mile block



BACKGROUND

A Precursor: Functional Green

Ecosystem services in the urban realm (high I.C.)
DSD led, assisted by Watershed Protection Dept.
Menu of options, Layering of elements
Modeled after GAR and other city programs

- 2001 Landscape Code update
- 2017 CodeNext Functional Green proposal
- 2022 Functional Green re-boot . . . EOY 2023: Trees win!

South Congress Hotel

Functional Green Score: 0.33
Use: Hotel
Site Area: 0.95 acres
Impervious Cover: 95%



South Congress Hotel

As constructed, this hotel achieves a score greater than the target score of 0.3 using

- Planted trees,
- Shrubs & ornamental plants,
- Ground cover, and
- Vegetated walls.

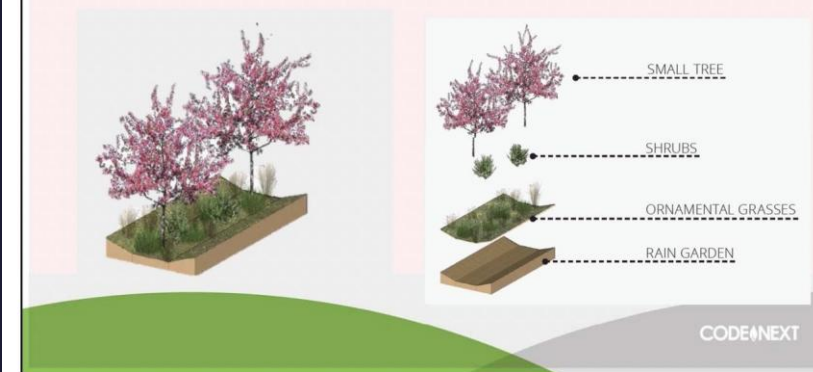
Menu of Landscape Options



The landscape element menu includes, for example:

- Existing and new trees
- Vegetated (green) walls
- Vegetated (green) roofs
- Porous paving
- Rain gardens
- Irrigation with Auxiliary Water Source

Layer Landscape Elements



You can maximize your score by layering landscape elements.

For example, if you build a rain garden, you get the points for the area of the rain garden media. Add ornamental grasses, shrubs, and trees, and you get the points for the area of each of those additional landscape elements.

A short story on how “tree-roots” advocacy can stimulate grow branches of action, progress and **LIVING SHADE CANOPIES**.

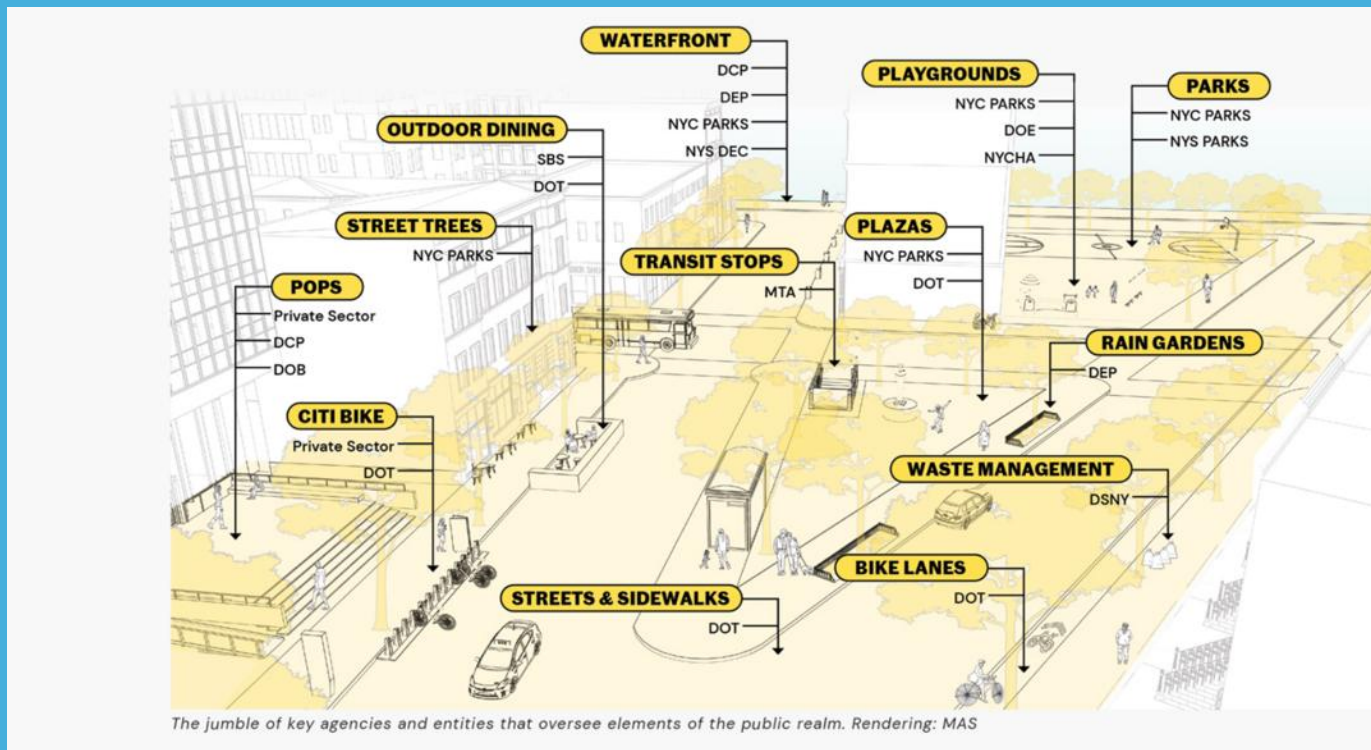
FEB 2023: Hosted first round-up of “the concerned” from DAA, COA, ATP, CNU and design professionals

~APR 2023: Began building a coalition of supporters for insisting on street trees with most new development and on public projects, especially those transportation-related ones

Summer 2023: Kevin Howard (Oliver) joins me in leading the advocacy effort, creating a “roadshow” and gathering support; and UT LBJ School students brings research and develop policy recommendations

~AUG 2023: Mayor Pro Tem Leslie Pool and her staff lead the charge to develop the terms of a Council Resolution. This involved months of work with ACMs and City department heads to craft a resolution that could be workable...

GREEN STREETS (& other public spaces) to Keep Austin Cool (our 2023 advocacy “roadshow”)



September 13, 2023 Austin Outside Presentation & Call to Action
Prepared by Kevin Howard, Urbinden & Jana McCann, FAIA, McCann Adams Studio

WHY AUSTIN NEEDS GREEN STREETS

We can address growth and climate change using urban rights-of-way. As heat increases, shade and evaporative cooling from trees will be necessary for life, health and safety.

Increasing vegetation - particularly trees - is an effective way to make Austin more livable and resilient to the effects of climate change.

Street trees are essential urban infrastructure, not just “nice-to-haves” or beautification”.



Example of continuous shade trees at curbside, providing both protection from the road and shade for sidewalk users.

STREET TREE BENEFITS

LIFE SAFETY



HEALTH



MENTAL HEALTH



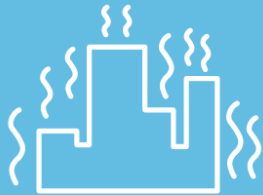
AIR QUALITY



WATER QUALITY



URBAN HEAT



CLIMATE CHANGE



ECOSYSTEMS



PUBLIC FINANCE



CULTURE & IDENTITY



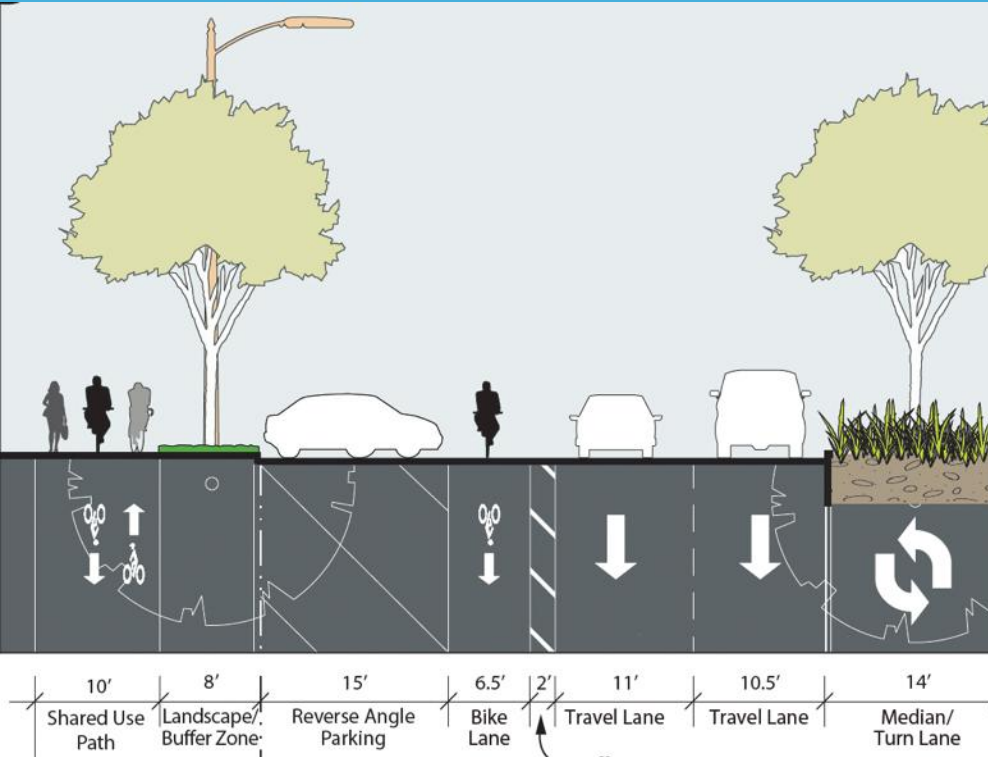
These are all considered “Ecosystem Services”.

WHAT ARE THE **CHALLENGES?**

1. The **LACK OF LEADERSHIP** means that review staff are conducting reviews and making decisions, with little guidance and support.
2. Austin's **REGULATIONS** are not aligned with City and community priorities: if they were, street trees would be required in most public and private development.
3. The City's **DEPARTMENTAL SILOS** preclude design excellence, ie, integrated and responsive urban design.
4. The **PERMITTING PROCESS** – eliminating license agreement process and reduce required discretion and inconsistent implementation.

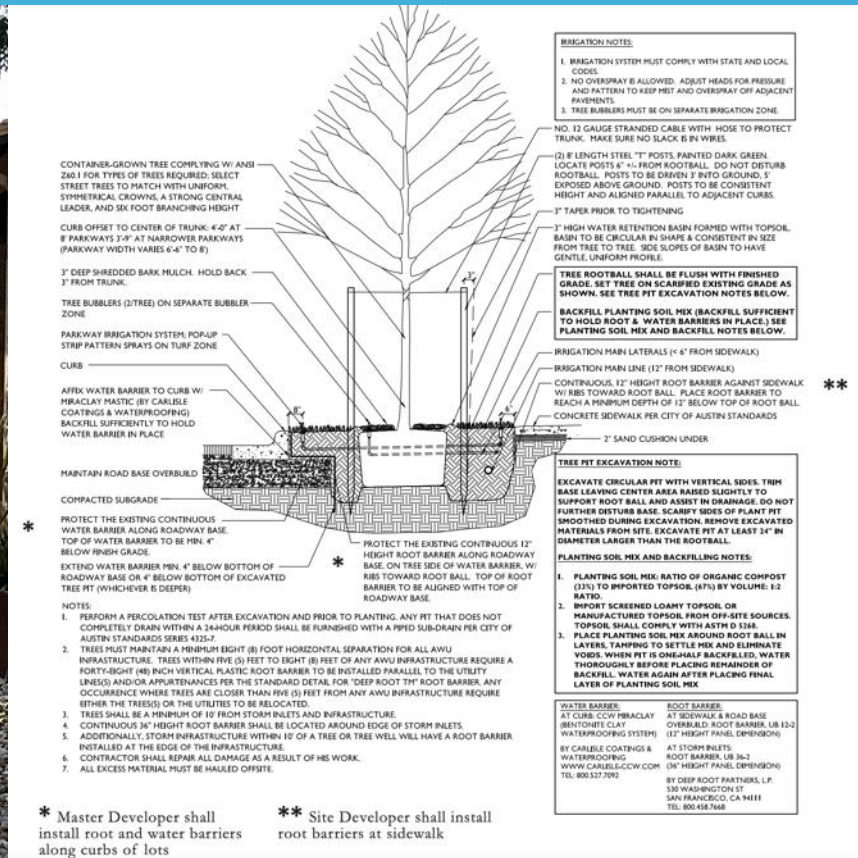
Street trees compete with utilities for space in the ROW and generally come out the losers – along with the community.

WHAT IS THE BUILT OUTCOME OF THESE CHALLENGES?



Above is what was designed (left) for the City's Corridor Construction Program for Airport Blvd, near Koenig Ln, ...and what actually got built (right).

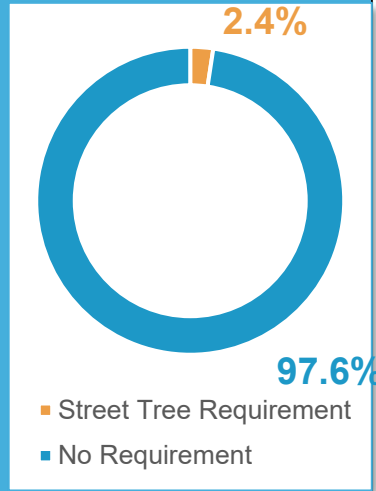
TODAY, A POSITIVE OUTCOME REQUIRES A SPECIAL CASE.



The Mueller community and other PUDs are the exception in requiring street trees along all roadways AND in the public ROW.

2. Regulations vs. City Policies

- Private development is only required to provide street trees on ~**2.4% of the streets** in Austin.
- Where street trees *are* required, it is **easier to get relief** from the requirement than to comply.
- Codes & Criteria Manuals are not aligned with City policies - something *CodeNEXT* would have addressed.



RECOMMENDATIONS

Build a **wide coalition** of industry orgs and equity, environmental and mobility advocates to sign support letter for upcoming Council Resolution resolution to:

- **Appoint a Public Realm Coordinator** within the City to balance priorities in our public ROWs and spaces.
- **Remove barriers to street trees and require them in most projects – by code.**
- **Incentivize both the planting and maintaining of street trees** in ROWs through access to the City's new tree supply contract, City's Urban Heat Island mitigation funds, City's TreeFolks grant, City's tree mitigation funds, etc.

Then what happened?

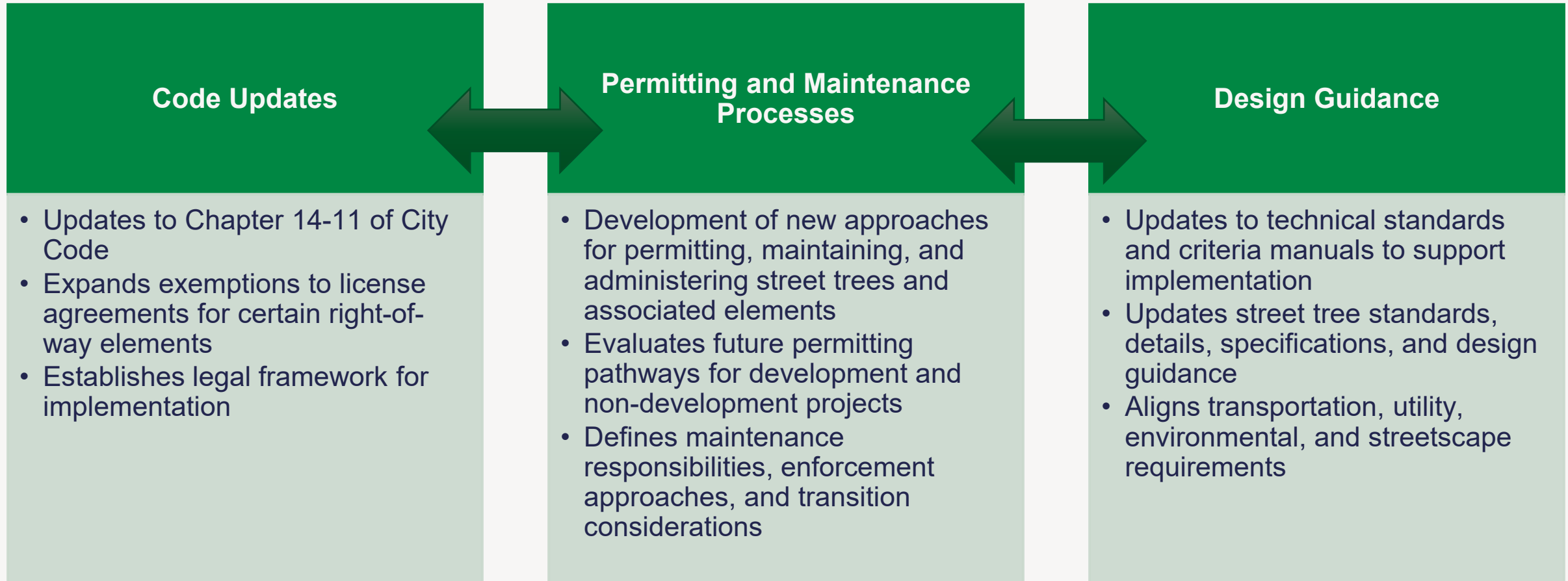
We gathered letters of support from 20+ local community and professional organizations and the City's Design Commission, including RECA, ULI, AIA and ASLA, The Mueller Foundation, Mueller, NH Assn, TreeFolks, Austin Outside and others.

On March 21, 2024, the City Council unanimously passed the “Green Infrastructure Resolution”, which led to the formation of the multi-disciplinary, Green Infrastructure Working Group (GIWG), comprised of industry professionals and City staff members. The GIWG's “Roadmap” recommendations were presented to Council in Sept 2025, which set a course of phased, next steps.

Now, Brianna Frey, AICP is leading the charge on behalf of Austin Transportation & Public Works department...



From treating street trees as an exception → making them a standard ROW improvement



Code Updates: Policy & Process Realignment



Led by: City Staff

Purpose: Connect to adopted Chapter 14-11 revisions.

- Shift review of street tree and associated elements from license agreements to site plan/other permits
 - Begin planning for sunset/transition process for existing agreements
- Establish clear permitting and review processes for required elements (site plan and permits).
- Confirm installation parameters for all permitted elements.
- Define maintenance obligations.
- Set enforcement actions, such as 311 responses, City authority for emergency work, Notice of Violations.

Designing a one-coordinated street-tree system



- **TCM** → street-tree design guidance
- **AW UCM** → underground utility/tree relationships
 - In addition, we're working through who owns emergency utility and tree impacts' restoration obligation and how it gets funded/performed.
- **AE UCM** → overhead/electrical compatibility
- **ECM** → landscape, mitigation, species/cross-reference issues
- **Development review** → who reviews what
- **Inspection/enforcement** → who makes sure what was approved actually survives implementation
 - We're mapping those responsibilities rather than assuming "inspection" is one function.

Road to TARP adoption

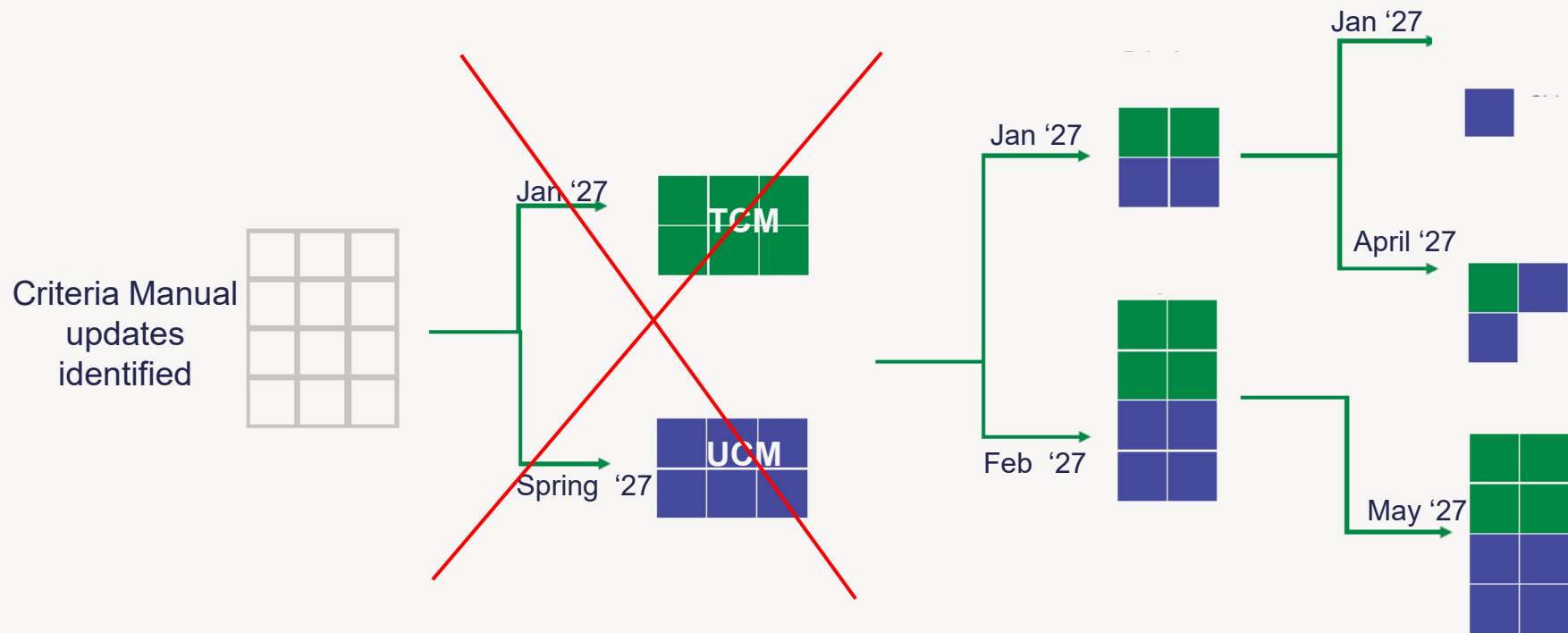


** Phased approach may impact this milestone*

January - May 2027

Multi-month adoption approach of:

- Street Tree Species List
- TCM, UCM, ECM updates
- Standard Details



Make it easier to do the right thing



- Moving away from rigid standards that result in no trees, waivers
 - Examples:
 - Soil Volumes
 - Tree grates
 - Tree caliper
- Creating a new Approved Street Tree Species List - outside of Appendix F
- Consolidate Street Tree criteria into TCM

TCM Audit: PROPOSED Section 15



OUTLINE:

15.1.0 – General

- 15.1.1 – Reference Standards

15.2.0 – Street Tree Placement

- 15.2.1 – Street Trees and Streetscape Elements
- 15.2.2 – Street Tree Spacing
- 15.2.3 – Street Trees and Urban Trails

15.3.0 – Street Trees and Utilities

- 15.3.1 – Street Trees and Overhead Utilities
- 15.3.2 – Street Trees and Underground Utilities
 - 15.3.2.1 – Street Trees and Electric Utilities
 - 15.3.2.2 – Street Trees and Water and Wastewater Utilities
 - 15.3.2.3 – Street Trees and Franchise Utilities (gas?)
 - 15.3.2.4 – Root Barriers

15.4.0 – Street Tree Planting

- 15.4.1 – Street Tree Selection
- 15.4.2 – Street Tree Planting Space
- 15.4.3 – Street Trees and Soils
 - 15.4.3.1 – Soil Volumes
 - 15.4.3.2 – Suspended Pavement: Soil Cells
 - 15.4.3.3 – Suspended Pavement: Structural Soils
- 15.4.4 – Tree Well Surface Treatments

15.5.0 – Street Trees and Construction

15.6.0 – Street Tree Maintenance

Appendix X – Street Tree List

Draft Tree Planting Details & Graphics

Recommended Core Details & Graphics

1. 1a & 1 b Tree Planting Details with separate notes page
REVISED STD DETAILS (Combined portions of 432S-7A & 432S-7F sheets 1&3) & TCM GRAPHIC
 2. Tree Planting Drainage Manifold Layout **REVISED STD DETAILS (Combined Std Details 432S-7A & 432S-7B sheets 4)**
 3. Tree Well **REVISED STD DETAIL (Revised 432S-7F sheet 2)**
 4. Tree Soil Cell Plan **NEW STD DETAIL**
 5. Tree Soil Cell – Sections & Notes **NEW STD DETAIL**
 6. Proposed Utility Protection (Root Barriers and/or Encasement) **NEW STD DETAIL UNDER DEVELOPMENT**
 7. Existing Utility Protection (Root Barriers) **NEW STD DETAIL UNDER DEVELOPMENT**
 8. Utilities and Tree Soil Cells for Constrained Locations **NEW STD DETAIL UNDER DEVELOPMENT**
9. Tree Grate Section - **NEW TCM TEXT & GRAPHIC**
 10. Furnishing Zone Paving (Outside Tree Well) - **NEW TCM TEXT & GRAPHIC**
 11. Tree Well Surface Treatments **NEW TCM TEXT & GRAPHIC**
 12. Street Furnishing Placement **NEW TCM GRAPHIC & TEXT UNDER DEVELOPMENT**
 13. Tree Spacing & Placement / Utility Clearances **NEW TCM GRAPHIC & TEXT UNDER DEVELOPMENT**

Proposed
Standard Tree
Planting
Details

Recommended Text Only

1. Tree Soil Volume **TCM TEXT & Referenced on 1B Tree Planting Detail Notes)**

Next Phase



- Exploring the feasibility of:
 - Landscape + Street Tree Regulatory Alignment
 - ASMP Typical Cross Sections with Utility Corridors assignments (TCM Section 2.8)
 - Furnishing/planting zone surface treatments (irrigated and drought resistant landscaping)
 - Replacing waiver with fee-in-lieu
 - Existing tree preservation options from Comprehensive Tree Manual
 - Street tree in the parking lane
 - Joint trenching for service lines
 - Share access/utility easement standard details (for HOME/ Siteplan Lite)

Case Study



CASE STUDY:

Austin Light Rail

Developing a compact, walkable transit-oriented environment offers advantages that extend beyond improved connectivity.

Austin Light Rail (ALR) will drive a ripple effect of benefits, transforming how we achieve priorities for our growing city.



GOALS OF THE SYSTEM

The 5 Big Ideas

- A comprehensive light rail journey encompasses more than just the ride on the train; it includes:
 - planning the trip,
 - navigating to Stations,
 - waiting near or on Platforms,
 - and reaching the final destination.
- the user's experience should be paramount
- Every public-facing element of the light rail corridor should prioritize or improve comfort, human scale, site-specificity, Universal Design, resilience, and sustainability.

We embrace an innovative approach to designing the Austin Light Rail around framing goals, rather than prescribing solutions that dictate specific materials, components or construction methods. To that end, this Design Guidelines document considers performance-based outcomes to deliver excellence on five big ideas:



1 User Experience



2 The Outdoors



3 Culture



4 Place



5 Legacy

WHY SHADE IS VALUABLE TO US

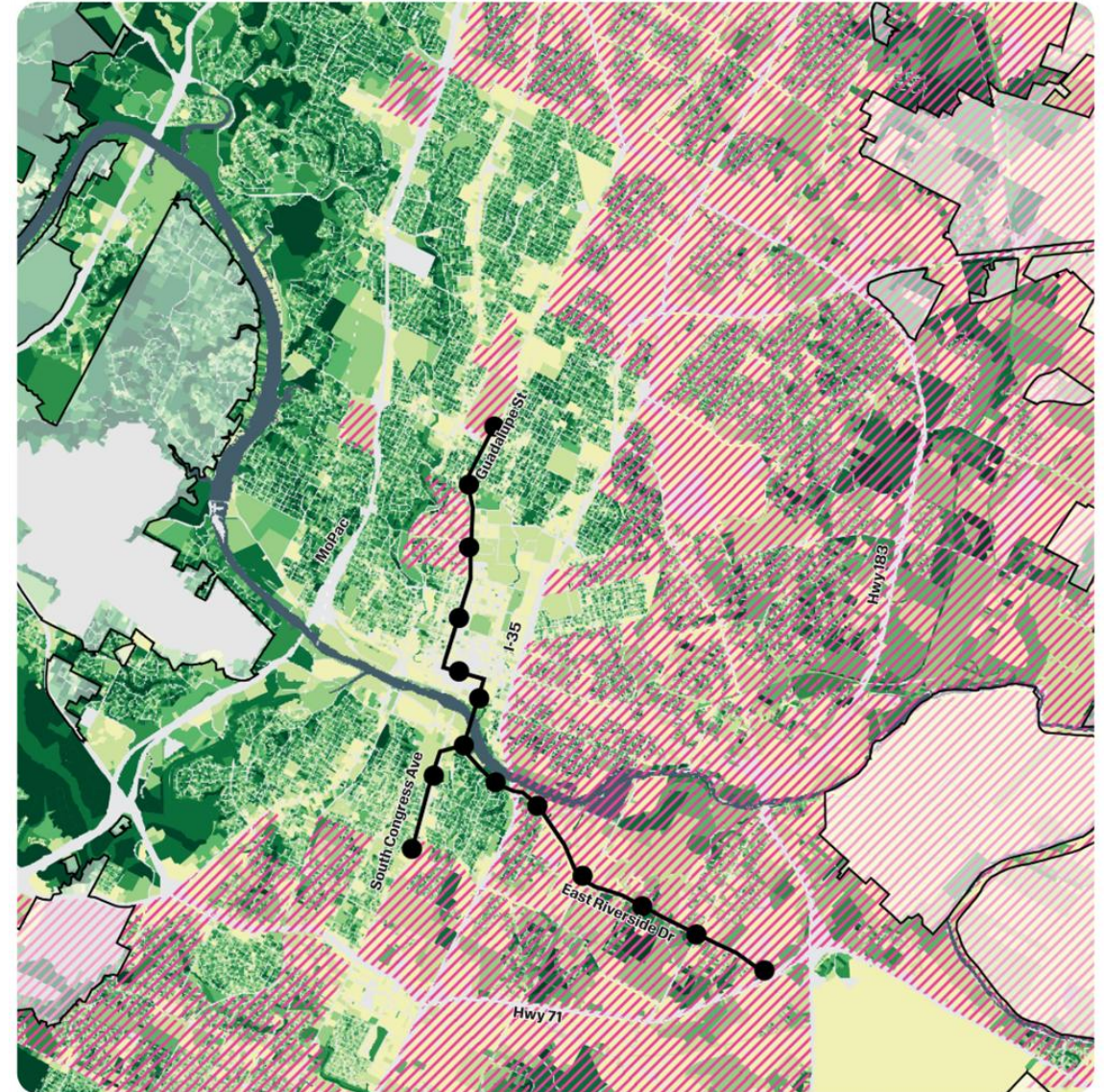
User Experience & Ridership



TACKLING THE SHADE DEFICIT

Identifying the need for trees

- Initial studies and analyses were collected from the City of Austin, Urban Forestry, Community Tree Preservation Division that displayed an inequality in tree canopy for the LRT Corridors.
- These studies and mappings made it clear that the success of the system and the greater benefit of the transit user hinged upon a betterment to the urban streetscape holistically.
- It was evident that trees were necessary as a pertinent design component of the system for ALR to achieve the goals set forth.



Tree canopy cover across the City of Austin Displays the inequity of tree canopy between east and west and the general lack of tree canopy along the LRT alignments. Source: City of Austin, Urban Forestry, Community Tree Preservation Division

TACKLING THE SHADE DEFICIT

Avoiding a greater deficit

- As initial corridor layouts began to take shape for ALR's Environmental Impact Statement with the Federal Government, it became clear that the long-term effects of poorly located back-of curb improvements could prove harmful for Austin's urban tree canopy as well as the project's programmatic improvements themselves.
- *Project attitude shift:*

Preservation + Implementation = Urban Canopy Success



ARCHITECTURE & URBAN DESIGN GUIDELINES

Corridor Landscape Focus

- Prior to Preliminary Engineering, the ALR Architecture & Urban Design Guidelines were developed to steer performance-based design solutions.
- In these guidelines, Corridor Landscape is highlighted as an elevated Systemwide design element of ALR due to its **significance to the User Journey**.
- Shade Tree & Functional Landscape considerations were outlined at length to provide an array of solutions available to future designers.
- Back-of-Curb studies and Mobility Separation strategies were also included to provide a guideline for urban streetscape layouts where trees would inevitably play a large role.



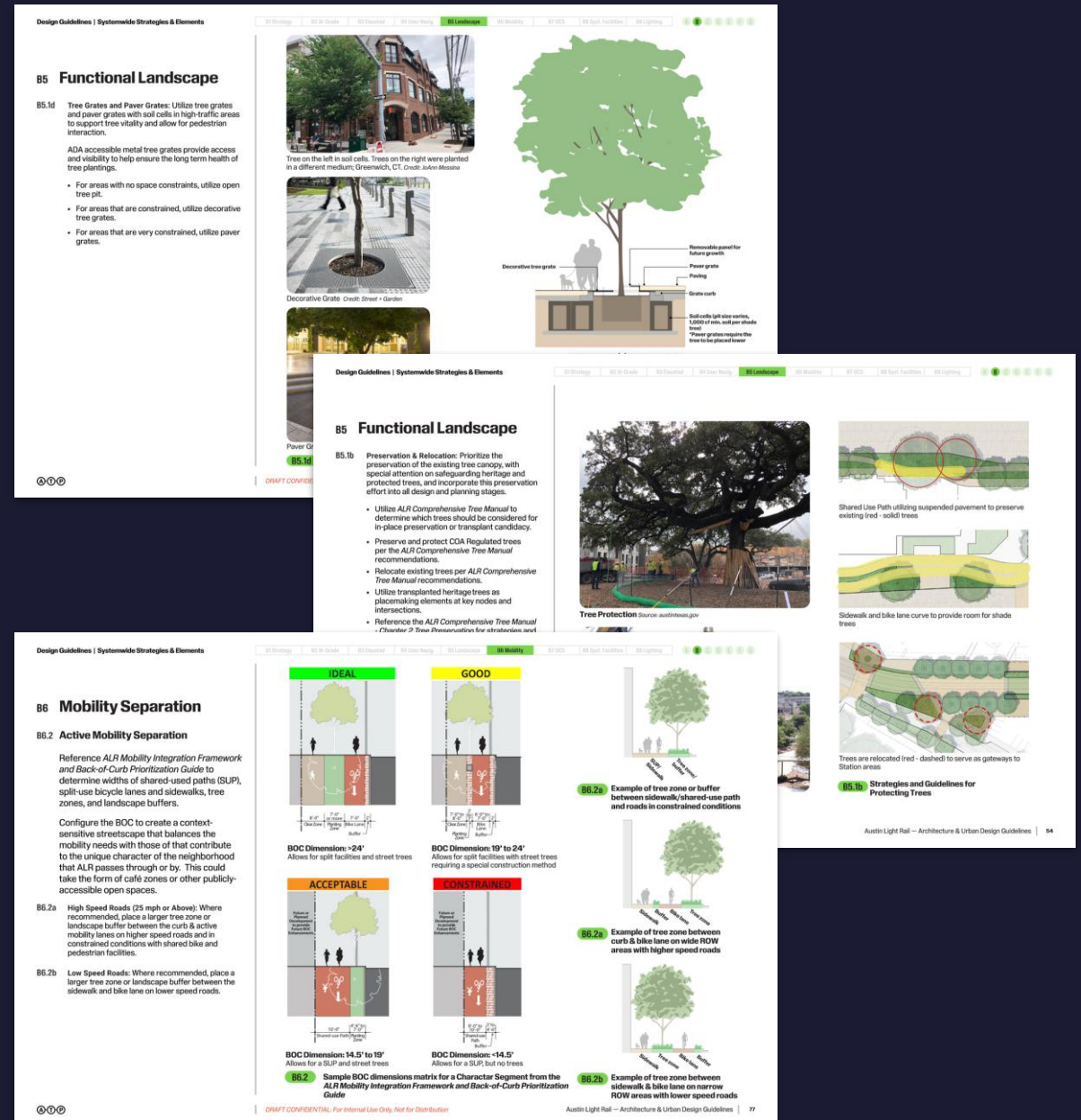
B5.1a

Maximize tree coverage for shade Images: (1) K Street, Sacramento - Source: visitsacramento.com; (2) 2nd Street, Austin - Source: Jane Yun; (3) RMIT New Academic Street - Source: TCL; (4 & 5) Central Wharf Plaza, Boston - Source: Reed Hilderbrand

ARCHITECTURE & URBAN DESIGN GUIDELINES

Design Criteria & Tree Manual Development

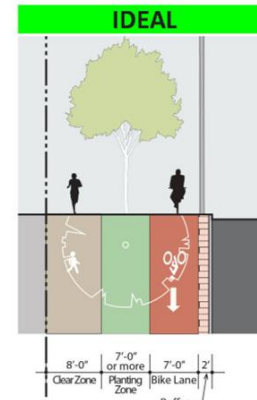
- While the ALR Architecture & Urban Design Guidelines provided an important foundation for the importance of integrating trees into the system from Austin Transit Partnership's perspective, development of these ideals and concepts into real-world translations were necessary to put it all into action
- Crafted alongside City Partners to materialize the content of the Design Guidelines, two major pieces of documentation were developed:
 - **Project Connect Design Criteria (PCDC)**
 - **Comprehensive Tree Manual**



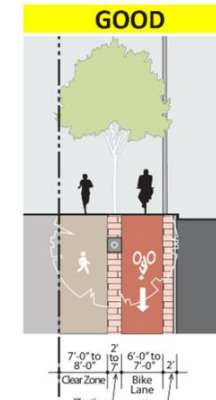
PROJECT CONNECT DESIGN CRITERIA

Transportation Criteria Accommodates ALR

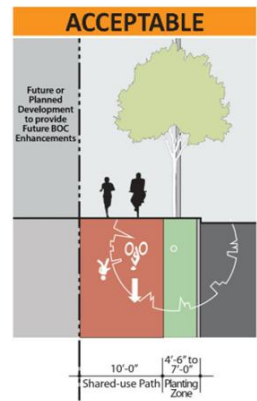
- In May of 2026, the City of Austin adopted specific design criteria and code amendments allowing **Project Connect Design Criteria** to streamline high-capacity transit and supersede conflicting local transportation chapters
- The standards incorporate localized streetscape requirements, programmatic water quality rules, and administrative reviews for heritage trees along light rail alignments.
- Most importantly, it outlines a framework for back-of-curb layouts throughout the ALR system... **making way for trees.**



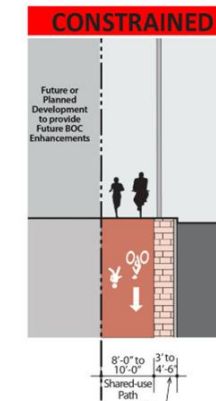
BOC Dimension: >24'
Allows for split facilities and street trees



BOC Dimension: 19' to 24'
Allows for split facilities with street trees requiring a special construction method



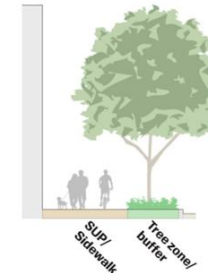
BOC Dimension: 14.5' to 19'
Allows for a SUP and street trees



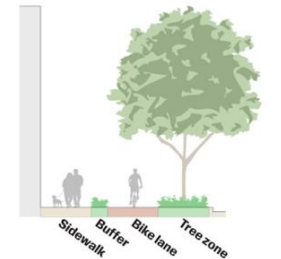
BOC Dimension: <14.5'
Allows for a SUP, but no trees

B6.2

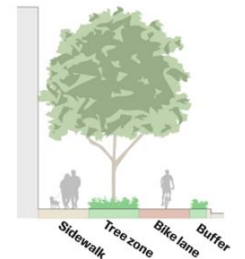
Sample BOC dimensions matrix for a Character Segment from the ALR Mobility Integration Framework and Back-of-Curb Prioritization Guide



B6.2a Example of tree zone or buffer between sidewalk/shared-use path and roads in constrained conditions



B6.2a Example of tree zone between curb & bike lane on wide ROW areas with higher speed roads



B6.2b Example of tree zone between sidewalk & bike lane on narrow ROW areas with lower speed roads

COMPREHENSIVE TREE MANUAL

Trees as Infrastructure

- In partnership with the City Arborist Office, Austin Transit Partnership (ATP) worked to integrate previous efforts within the Corridor Program Office into the project by defining how new tree plantings can be incorporated into the urban realm as a component to overall streetscape infrastructure.
- As well as defining how new trees would be accommodated, ATP also worked to provide a range of solutions for infrastructure implementation around valuable, existing trees within the project's boundaries.
- Lastly, definition on long-term operations and maintenance relative to trees within the system was outlined within the Manual.

SCM 5 | Suspended System | Pin Pier

Description

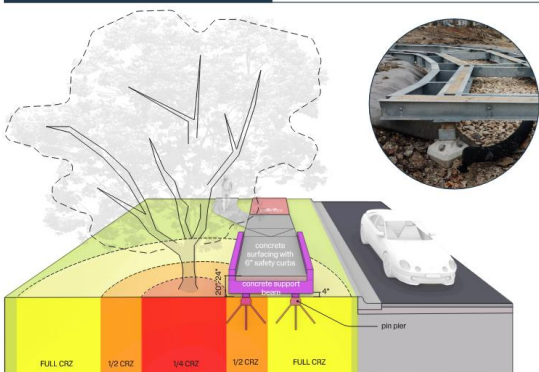
The Pin Pier suspended system uses small, precast concrete piers that sit atop (or just within) existing grade and are secured in place by pin piles which are driven into the ground using hydraulic or mechanical equipment. This system provides minimal soil disturbance and minimal excavation. Pin piers act as shallow footings and maintain the structure of existing soil profiles.

This system also maintains soil strength with little-to-no disturbance to root systems providing a strong foundation with high load-bearing capacity within CRZs

Pre-Construction Requirements

- Feasibility review of geotechnical soils report
- Investigative root mapping, air spading, or hand spading will be required to properly place piers to avoid conflicts with roots
- City Arborist review and approval for construction within critical root zone of protected/heritage tree species.
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in required pathway

Fig. 2.3.F: SCM 5

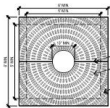


Benefits

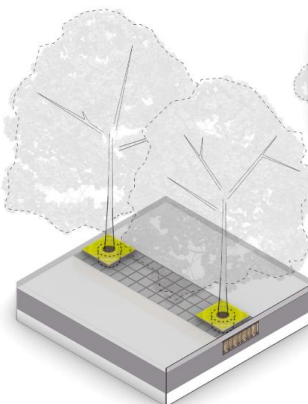
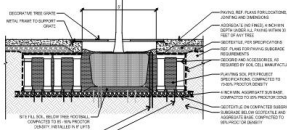
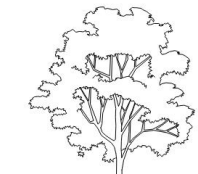
- Minimal disturbance to soils and root systems
- Easy leveling and adjustments
- Simplistic installation

4/3_DTG_SOIL_CELL_SUSPENSION_DECORATIVE_TREE_GRATE

continuous [4] or root corridor [3] soil cell suspension method



	4/3	3	1
Branch [A]			X
2" [B]			X
3" [C]			X
4" [D]			X
5" [E]			X
6" [F]			X
7" [G]			X
8" [H]			X
9" [I]			X
10" [J]			X
11" [K]			X
12" [L]			X
13" [M]			X
14" [N]			X
15" [O]			X
16" [P]			X
17" [Q]			X
18" [R]			X
19" [S]			X
20" [T]			X
21" [U]			X
22" [V]			X
23" [W]			X
24" [X]			X
25" [Y]			X
26" [Z]			X



- UNDISTURBED
- GRATE
- PAVING
- COMPACTED SUBGRADE
- AGGREGATE
- BACKFILL

Note: Diagrammatic section intended to illustrate adjacent conditions. All detail guidelines should be analyzed on a project segment by segment basis and updated with appropriate accessories per Special District overlays as required

COMPREHENSIVE TREE MANUAL

Austin Transit Partnership

Comprehensive Tree Manual

DECEMBER 2025



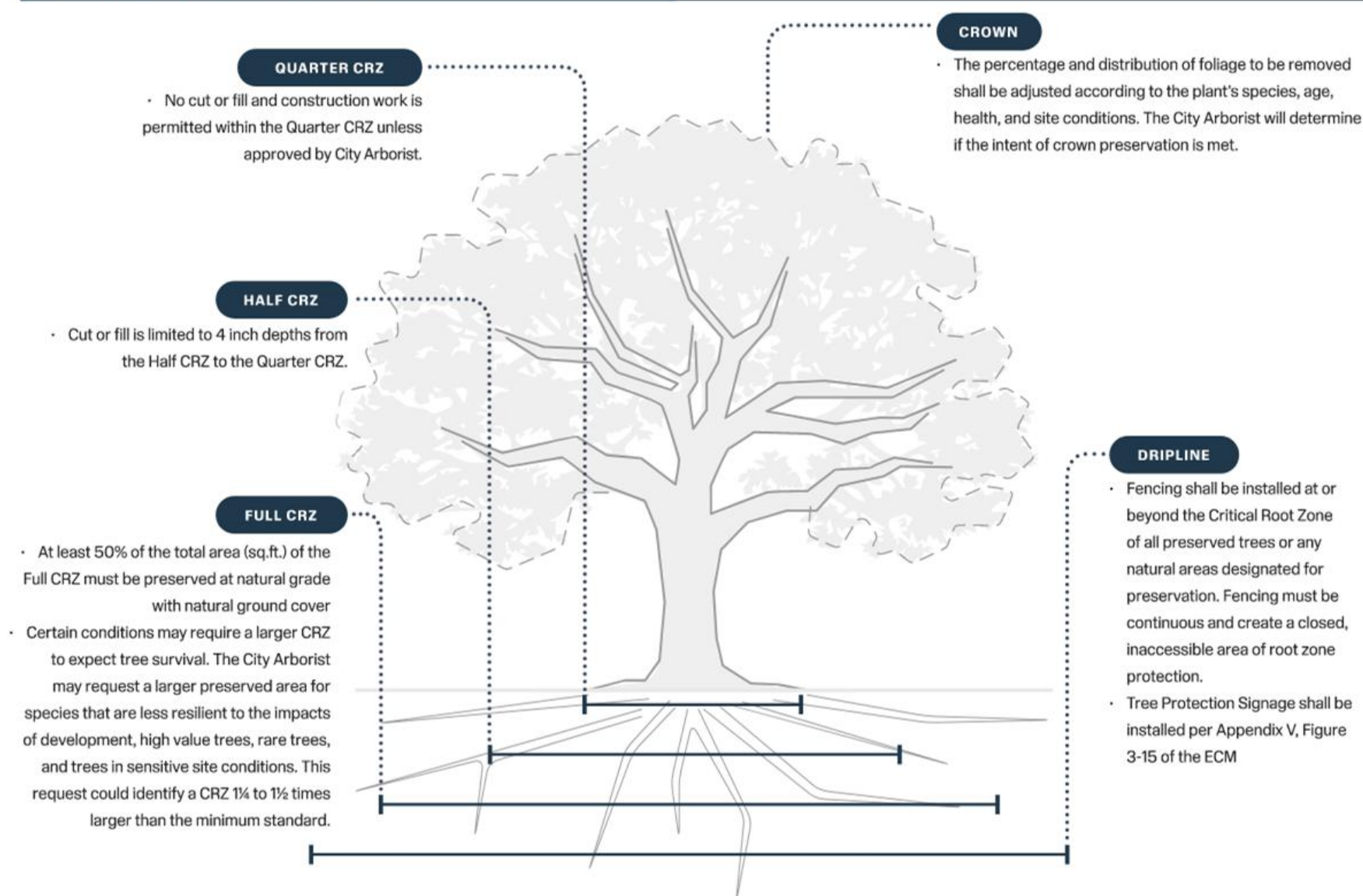
Confidential For Internal Use Only. Subject To Change Do Not Distribute.

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COMPREHENSIVE TREE MANUAL - Code & Criteria for Existing Trees

Fig. 2.1.B: Tree Preservation Criteria by Zone



COMPREHENSIVE TREE MANUAL

- Common Preliminary Conflicts with Existing Trees

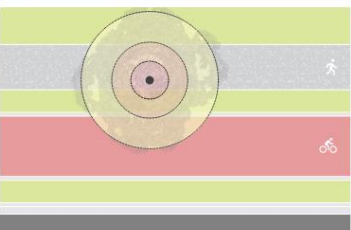
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2.2 Back-of Curb Conditions

BOC improvements such as pedestrian/cyclist surface facilities and overhead (OH)/subsurface utilities most commonly present a challenge when designing in and around existing trees. Long-term effects of poorly located BOC improvements can prove harmful for existing trees as well as the improvements themselves. In optimal BOC spatial conditions where proposed improvements have the flexibility to shift, adjustments for improvements should be made to avoid CRZs of mature trees. This section of the manual intends to serve as a general guideline for those adjustments.

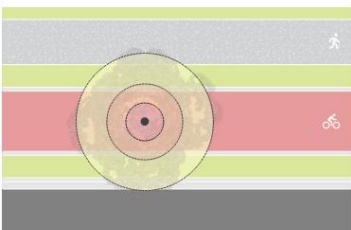
Surface Conflicts

Fig. 2.2.A: Surface Conflicts



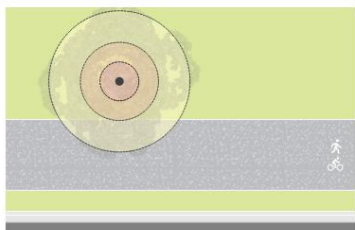
Sidewalk

Separated sidewalk facilities are the preferred method for pedestrian safety and function, but tend to be located along the outer edges of the ROW where most existing trees are present within the System. These facilities present conflicts with existing tree CRZs.



Bike

Separated ped/cyclist facilities are the preferred method for safety and function as well, but similar challenges with expansive built surfaces arise with existing tree CRZs. These facilities are located between roadway curbs and separated sidewalks. Existing trees - inclusive of previously planted street trees - are present in these areas.

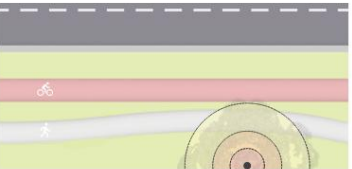


Shared-Use Path

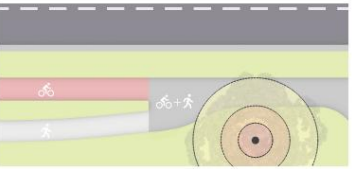
A strategy for consolidation of improvements comes in the form of combined surface facilities - also known as Shared-Use Paths (SUPs.) The physical SUP dimension is collectively smaller than the sum of both separate facilities. While this strategy can be a less intrusive approach in relation to existing tree CRZs, conflicts may still exist as the footprint of the combined facility is large.



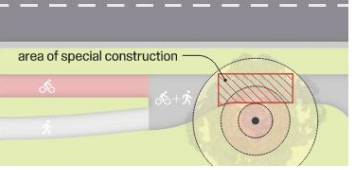
Fig. 2.2.B: Surface Adjustments



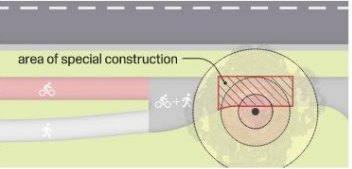
1 - Move sidewalk and bike path to avoid Half CRZ



2 - Combine sidewalk and bike path into SUP to avoid Half CRZ



3 - Apply SCM to minimally disturb Half CRZ.



4 - Apply SCM to span Half CRZ and to avoid Quarter CRZ.

In special cases, spanning the Quarter CRZ can be explored in conjunction with the City Arborist.

Surface Adjustments

In BOC areas where space is less constrained, simply moving the layout of facilities for Half CRZ avoidance should be explored as a first approach. Where separated facilities cannot be moved to avoid Half CRZs, the combination of separated facilities into a SUP should be considered as a second approach to reduce surface impact adjustments. When SUPs are still unable to avoid Half CRZs, Special Construction Methods (SCMs) are further strategies that can accommodate proposed facilities and CRZs. SCMs are further explained in the following sections of this manual.

Note - In special districts such as the University Neighborhood Overlay Zoning District and the Central Business Zoning District where the Great Streets Program applies, SUPs may not be a viable strategy for program consolidation, however strategies for Tree Preservation outlined in further sections of this manual should be explored for BOC improvements.

BIKE PATH

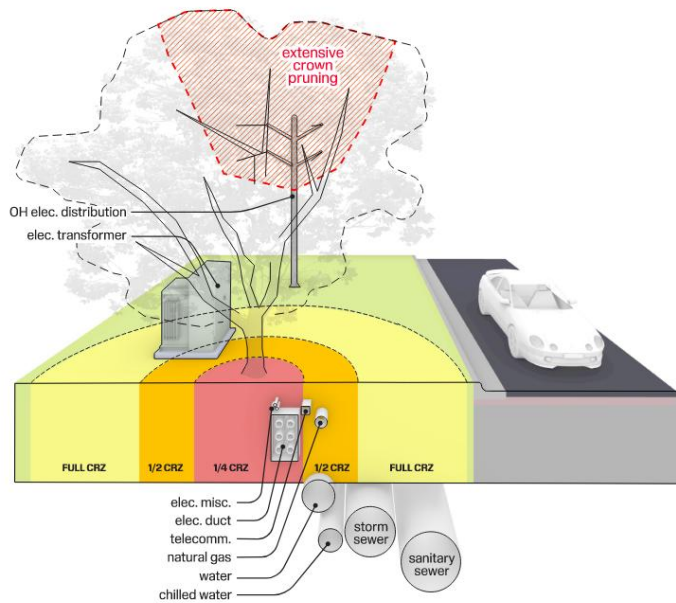
SIDEWALK

SHARED-USE PATH

COMPREHENSIVE TREE MANUAL - Common Preliminary Conflicts with Existing Trees



Fig. 2.2.C: OH & Subsurface Conflicts

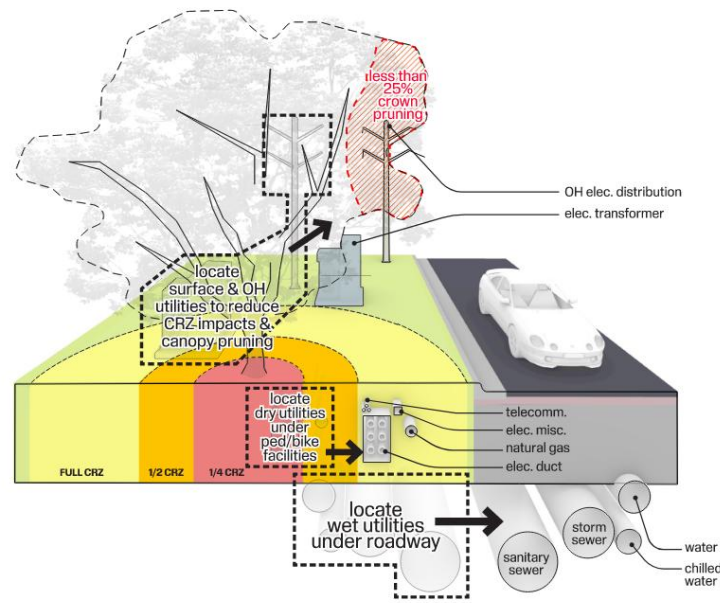


Overhead & Subsurface Conflicts

Electrical high voltage and distribution lines are common overhead (OH) utilities that conflict with existing trees in BOC areas. Extensive pruning can occur to the canopies of existing trees when OH electrical lines are located without careful consideration. In addition, the placement of related electrical transformers and power boxes can also be disruptive to CRZs of existing trees.

A multitude of sub-surface utilities both “dry” (underground electric lines, telecommunications lines, natural gas lines, and electrical ducts) and “wet” (sanitary sewer lines, storm sewer drain lines, and water lines) can prove to be very impactful to existing tree CRZs as installation methods involve extensive open trenching in which primary root cutting occurs and root barriers are then required.

Fig. 2.2.D: OH & Subsurface Adjustments



Overhead & Subsurface Adjustments

The preferred placement for OH utility lines is in BOC areas where less than 25% canopy pruning of an existing tree would be required. Related surface utilities like transformers or power boxes would preferably be placed outside of the Full CRZ of an existing tree to reduce impacts related to construction of utility pads. Where spanwires are proposed in the system, it is preferred that design locations avoid canopy pruning altogether, but when unavoidable, canopy pruning should not exceed 25% for the accommodation of all proposed OH infrastructure elements.

“Dry” utility lines and ducts are preferred to be placed outside of Half CRZs and should target less than a 50% impact to the entire CRZ area of existing trees. Due to large pipe sizes, installation methods and the nature of tree roots being drawn to water-based utilities, “Wet” utilities are preferred to be placed outside of the BOC area and underneath roadway, but in instances where the location in the BOC area is absolutely necessary, they should be placed fully outside of a CRZ. Where spanwires are proposed in the system, it is preferred that design locations avoid canopy pruning altogether, but when unavoidable, canopy pruning should not exceed 25% for the accommodation of all proposed OH infrastructure elements.

SOLUTIONS FOR CONSTRUCTION WITHIN CRITICAL ROOT ZONES



CONSTRUCTION WITHIN CRITICAL ROOT ZONES

- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - **Modified Concrete Base**
 - Pervious Pavement
 - Suspended Systems
 - Pier & Beam
 - Helical Pier
 - Pin Pier
 - Grates
 - Transplantation

SCM 1 | On-Grade System | Concrete Pavement

Description

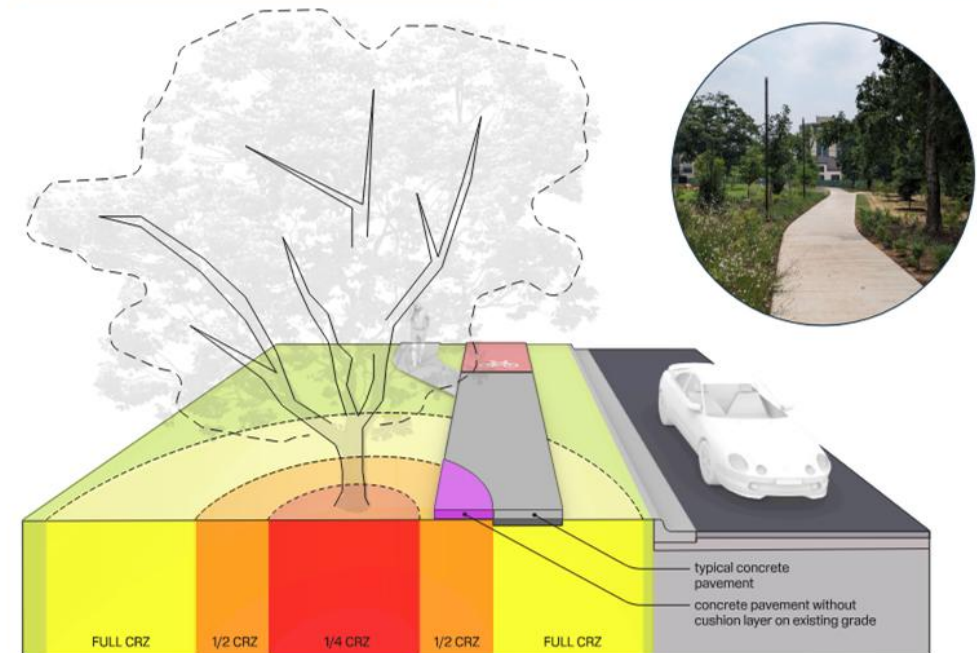
In suitable areas with minimal grade change, this modified version of a standard concrete sidewalk omits subgrade layers traditionally found in concrete sidewalk construction and instead proposes the concrete slab to rest directly on existing grade.

This small modification does not disturb the existing grade or soil below, but instead builds on top of the existing grade within the allowable excavation depth limits set by the City of Austin rules (maximum of 4in cut or fill ECM 3.5.2.A.1)

Pre-Construction Requirements

- Confirmation of soil stability for area of special construction
- City Arborist review and approval for construction within critical root zone of protected/ heritage tree species
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.
- Collaboration for modification of COA Standard Detail for sidewalk with TPW/Urban Forestry.

Fig. 2.3.B: SCM 1



Benefits

- No disturbance to existing grade and root system
- Minimal modification to standard sidewalk construction
- Does not require the use of heavy equipment to be installed

CONSTRUCTION WITHIN CRITICAL ROOT ZONES



- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - **Pervious Pavement**
 - Suspended Systems
 - Pier & Beam
 - Helical Pier
 - Pin Pier
 - Grates
 - Transplantation

SCM 2 | On-Grade System | Pervious Pavement

Description

Pervious pavement provides a system of structural concrete paving where void space between aggregate particles create porosity allowing for the exchange of air and water to tree root systems below. This method is best used in areas with minimal grade change.

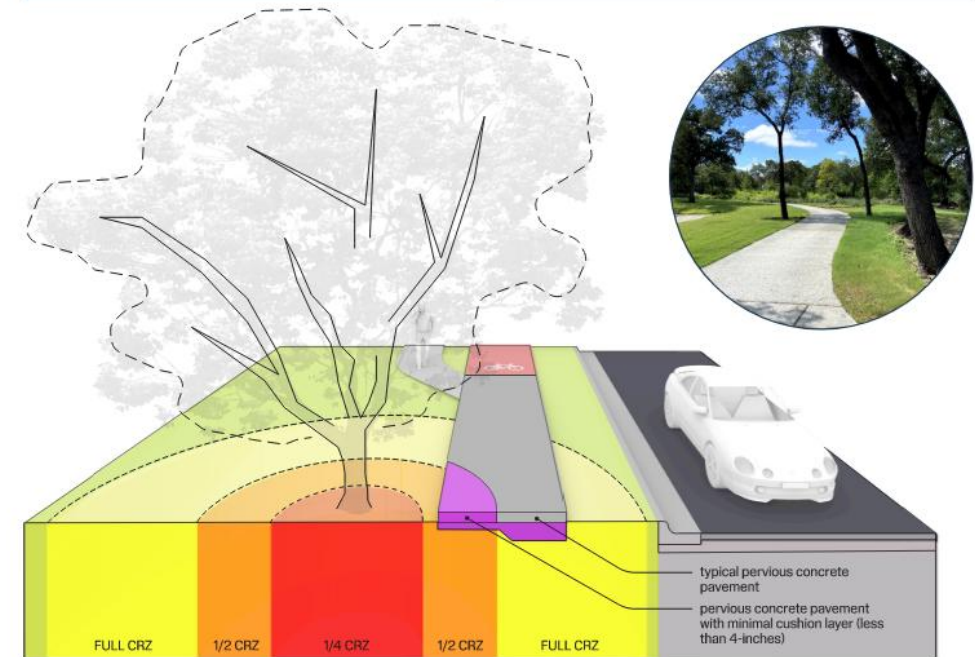
Pervious pavement does require some subgrade preparation. A modified drainage profile is to be used where the proposed hardscape intersects with the Half CRZ resulting in a shallow drainage layer on top of existing grade. The installation of previous pavement can be installed monolithically or modularly.

On-going maintenance for the prevention of void-space clogging is required.

Pre-Construction Requirements

- Maintenance plan
- City Arborist review and approval for construction within critical root zone of protected/ heritage tree species
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.
- Collaboration with TPW/Urban Forestry for development of Pervious Pavement Sidewalk Detail.

Fig. 2.3.C: SCM 2



Benefits

- Allows for infiltration of water and oxygen to root system directly below
- Minimizes compaction to root system
- Prevents tree root uplifting of hardscape
- Heavy-duty drainage systems not required

CONSTRUCTION WITHIN CRITICAL ROOT ZONES

- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - Pervious Pavement
 - Suspended Systems
 - **Pier & Beam**
 - Helical Pier
 - Pin Pier
 - Grates
 - Transplantation

SCM 3 | Suspended System | Concrete Pier & Beam

Description

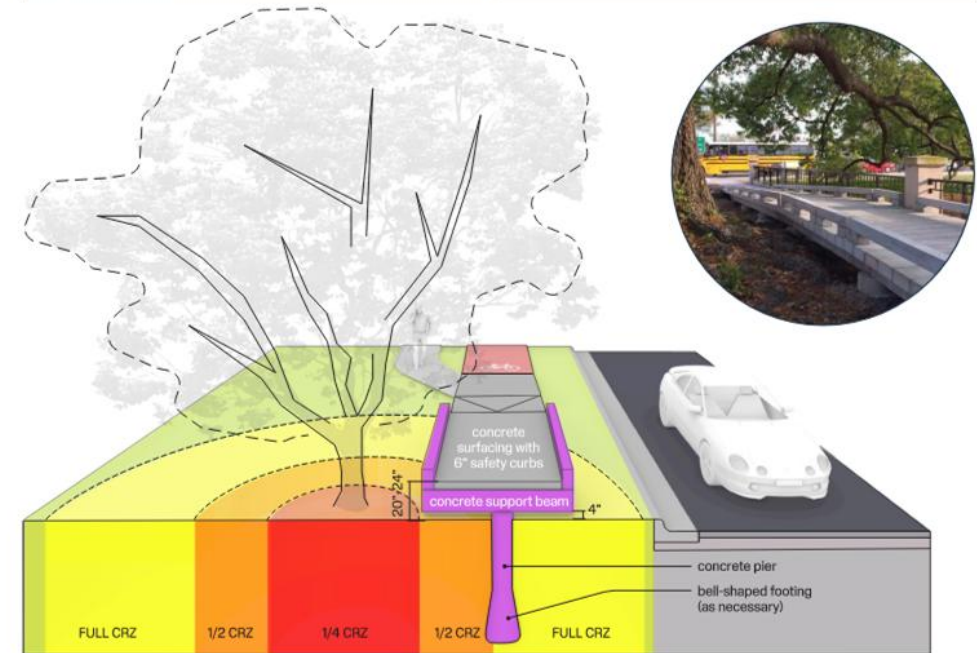
The Concrete Pier and Beam suspended system consists of reinforced concrete piers and beams that provide structural support to elevated surface improvements. Piers are typically installed by excavating into the existing grade and pouring concrete into formwork to create a solid foundation to support above grade construction.

This suspended system provides a traditional method of construction while considering CRZ disturbance in locating and placing foundation elements for BOC surface improvements. Sidewalk piers located within CRZs will need strategic sizing and placement to minimize harm to existing tree roots.

Pre-Construction Requirements

- Feasibility review of geotechnical soils report
- Investigative root mapping and air spading will be required to properly place the piers to avoid conflicts with roots
- City Arborist review and approval for construction within critical root zone of protected/heritage tree species
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.

Fig. 2.3.D: SCM 3



Benefits

- Ability to navigate around tree roots and underground utilities
- Ability to apply spread footing in places of shallow depths outside of Half CRZ
- Ability to span greater surface improvement distances than other methods
- Can navigate some grade change

CONSTRUCTION WITHIN CRITICAL ROOT ZONES



- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - Pervious Pavement
 - Suspended Systems
 - Pier & Beam
 - **Helical Pier**
 - Pin Pier
 - Grates
 - Transplantation

SCM 4 | Suspended System | Helical Pier

Description

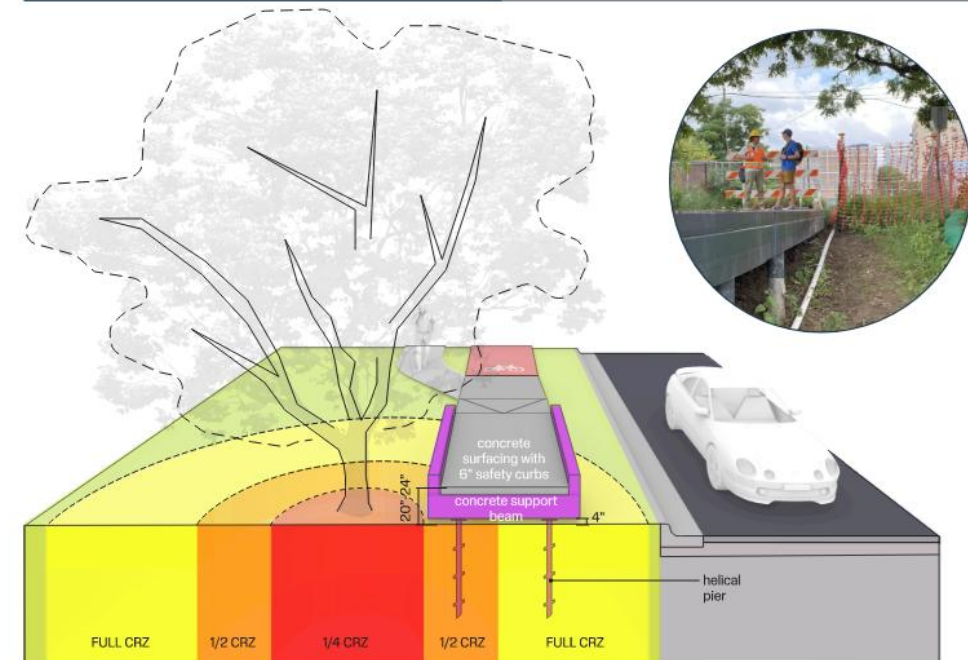
Consisting of steel shafts with helically-shaped blades, helical piers are drilled into the ground using hydraulic equipment to provide support foundations for surface improvements.

While helical piers are most commonly used in situations where soils are unstable or too weak for traditional foundation methods, they have also been proven as an exemplary foundation method in environmentally sensitive areas - like CRZs - where minimal construction footprints are desired. Piers located within CRZs will need strategic sizing and placement to minimize harm to existing tree roots.

Pre-Construction Requirements

- Feasibility review of geotechnical soils report
- Investigative root mapping, air spading, or hand spading will be required to properly place piers to avoid conflicts with roots
- City Arborist review and approval for construction within critical root zone of protected/ heritage tree species
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.

Fig. 2.3.E: SCM 4



Benefits

- Minimal excavation required
- Minimal disturbance to soils and root systems
- Smaller equipment required for installation
- No curing time or settlement issues
- Suitable for instances where deep foundations are necessary

CONSTRUCTION WITHIN CRITICAL ROOT ZONES

- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - Pervious Pavement
 - Suspended Systems
 - Pier & Beam
 - Helical Pier
 - **Pin Pier**
 - Grates
 - Transplantation

SCM 5 | Suspended System | Pin Pier

Description

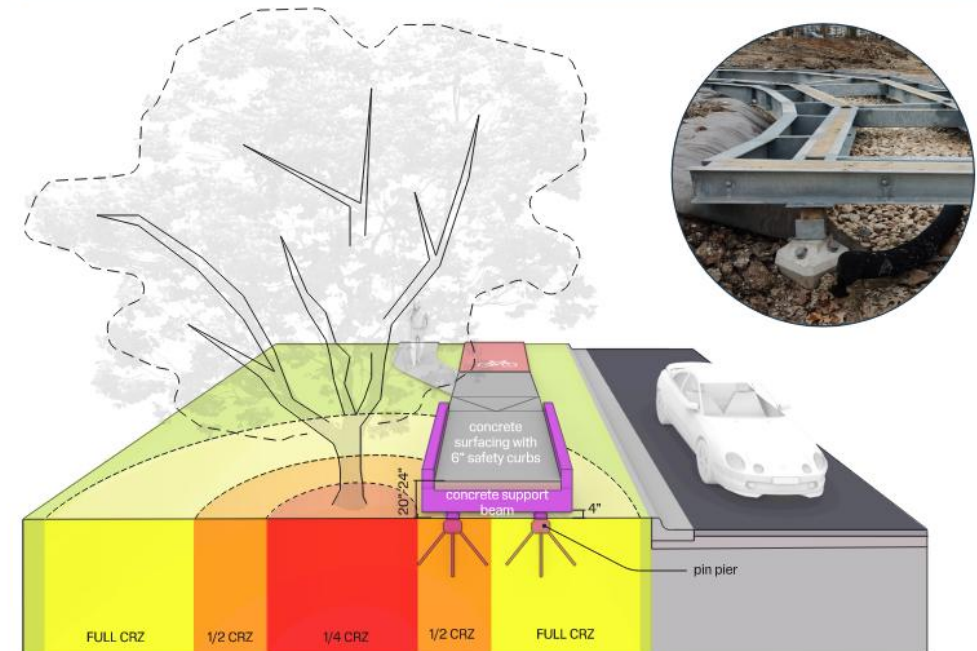
The Pin Pier suspended system uses small, precast concrete piers that sit atop (or just within) existing grade and are secured in place by pin piles which are driven into the ground using hydraulic or mechanical equipment. This system provides minimal soil disturbance and minimal excavation. Pin piers act as shallow footings and maintain the structure of existing soil profiles.

This system also maintains soil strength with little-to-no disturbance to root systems providing a strong foundation with high load-bearing capacity within CRZs

Pre-Construction Requirements

- Feasibility review of geotechnical soils report
- Investigative root mapping, air spading, or hand spading will be required to properly place piers to avoid conflicts with roots
- City Arborist review and approval for construction within critical root zone of protected/heritage tree species.
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.

Fig. 2.3.F: SCM 5



Benefits

- Minimal disturbance to soils and root systems
- Easy leveling and adjustments
- Simplistic installation
- Resistant to frost heave
- Can be used in areas with high water tables or expansive soils

CONSTRUCTION WITHIN CRITICAL ROOT ZONES



- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - Pervious Pavement
 - Suspended Systems
 - Pier & Beam
 - Helical Pier
 - Pin Pier
 - **Grates**
 - Transplantation

SCM 6 | Suspended System | Grating

Description

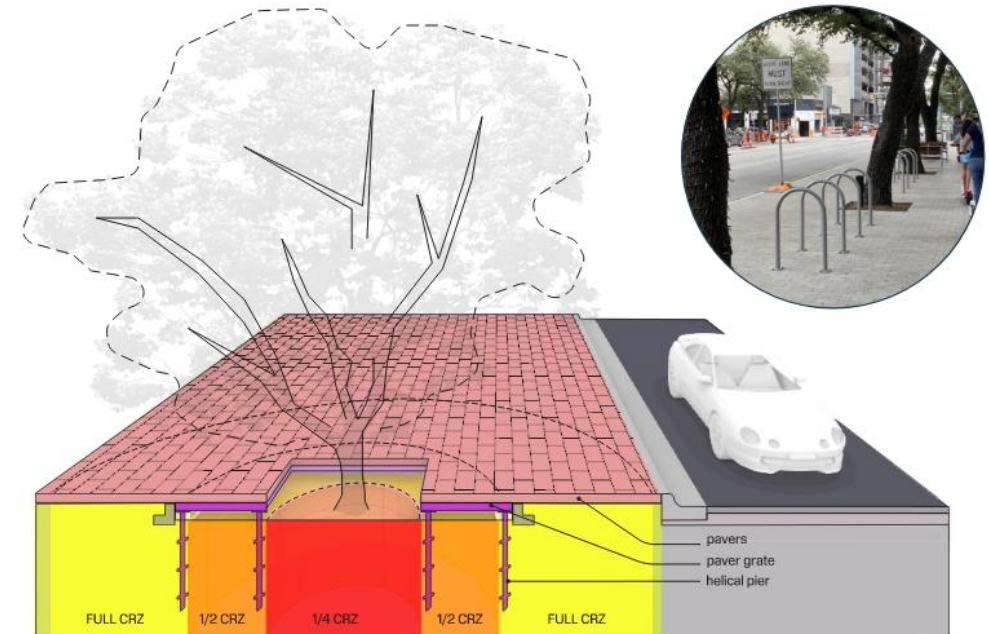
Grating in the form of Paver Grates consists of a suspended system where minimal structural support mechanisms (ie. helical piers) are provided below surface improvements and pedestrian surfaces hover slightly above grade. This method is mainly intended for highly urbanized areas where large specimen trees exist in constrained BOC conditions.

In many cases, proposed improvements for these areas will present opportunities for improvement of CRZs where tree growth has exceeded initial, spatial expectations. This method reduces compaction to CRZs by proposing to minimize surface construction altogether by spanning the majority of the CRZ. Paver Grates also provide the ability to span over Quarter CRZs.

Pre-Construction Requirements

- Investigative root mapping and air spading required for placement of structural support system to avoid root conflicts
- City Arborist review and approval for construction within critical root zone of protected/ heritage tree species.
- Tree Preservation and Protection measures per ECM 3.5.2
- Canopy conflicts and pruning (if necessary) should be assessed in conjunction with the City Arborist for required pathway clearances.

Fig. 2.3.G: SCM 6



Benefits

- Betterment to most CRZ cases in highly urbanized settings
- Reduces compaction to root zones in highly urbanized settings
- Tree Grate openings and Paver Grate void space allow for air and water infiltration to root systems below
- Walkable/accessible paths of travel can be strategized/located in closer proximity to trunks in BOC constrained conditions

CONSTRUCTION WITHIN CRITICAL ROOT ZONES



- Inevitably, existing trees and proposed ALR elements will need to coexist.
- ATP worked alongside the City Arborists Office to develop a series of Special Construction Methods for program surface elements to be utilized in future design phases.
- Special Construction Methods to consider:
 - On-grade Systems
 - Modified Concrete Base
 - Pervious Pavement
 - Suspended Systems
 - Pier & Beam
 - Helical Pier
 - Pin Pier
 - Grates
 - **Transplantation**

Tree Relocation by Transplant

Description

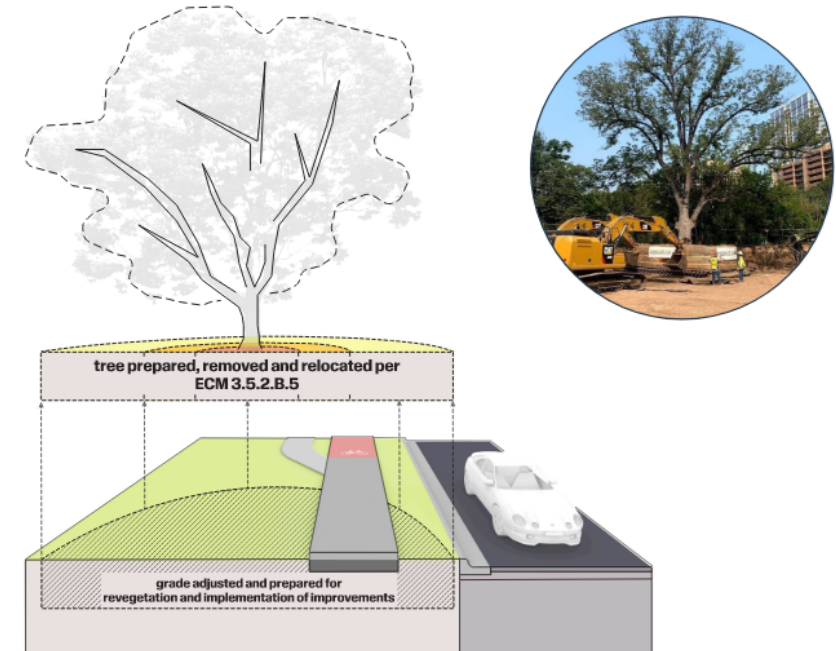
ECM 3.5.2.B.5.

Transplanting trees may be an option for preservation at the discretion of the City Arborist. Transplanting trees has a significant risk for tree mortality if it is not performed with a high level of technical expertise. Not all trees are good candidates for transplant. Due to the inherent difficulties of this type of operation, a transplant proposal prepared by a qualified Arborist with proven experience transplanting large trees must accompany such a request.

Pre-Construction Requirements

- Site suitability planning/ permitting, preparation and readiness of relocated tree's new location.
- Procurement of qualified Arborist with proven experience transplanting large trees
- Assessment of condition/suitability of tree proposed for transplant
- Definition of excavation and root ball stabilization method.
- Preparation of: transport method/ schedule, tree storage method and remedial tree care plan.
- City Arborist review and approval for transplant.

Fig. 2.3.H: Tree Relocation



Benefits

- Highly preferred alternative to tree removal where in-place preservation is not possible
- Maintains ecological value, carbon offsets and urban character that the single species provides
- Relocation of transplanted tree can enhance another locale
- Potentials for species longevity

NEW TREE PLANTINGS - A Plan for Succession

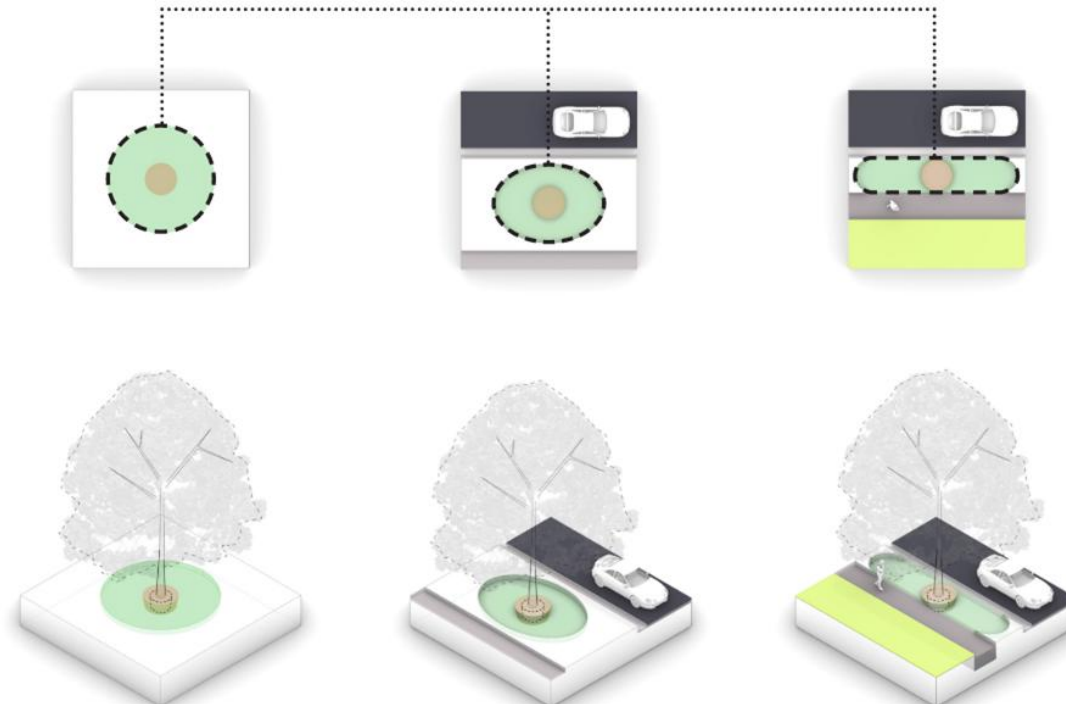
- With the PCDC framework in place, ATP researched the diligent efforts of the Corridor Program Office for reference to advanced tree planting details recently developed with the City Arborist.

- This past work explored a multitude of tree implementation methods in an array of scenarios **to promote sufficient soil volumes for the long-term success of tree growth.**

- ATP and the City Arborist Office reviewed and implemented most of these strategies as the ALR project proved to be a direct correlation.

	base	convenience power	drainage	rain garden
continuous tree trench	 A	similar to PW	similar to DR	RG
extensive tree zone tillage (12+)	 B	PW	DR	X N/A
expanded tree pit (3X)	 C	similar to PW	similar to DR	X N/A
current COA standard	 D (432S-7F)	X standard does not exist	X standard does not exist	X standard does not exist

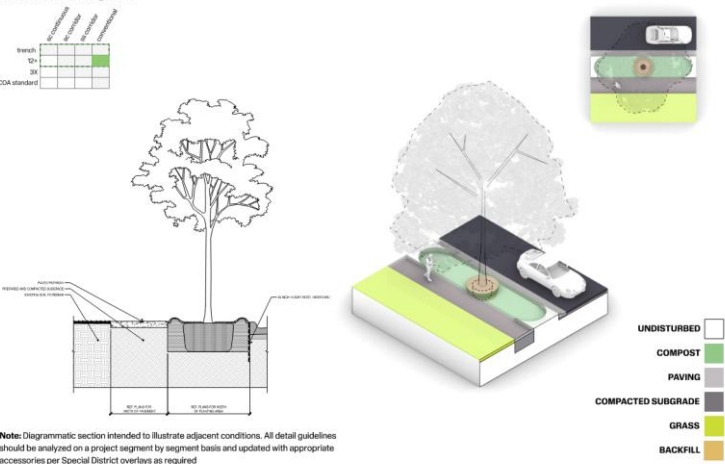
Soil quality and volume is paramount for root development.
Aim for superior methods of achieving maximum quality and quantity of soil



NEW TREE PLANTINGS - CPO Tree Planting Details Adoption

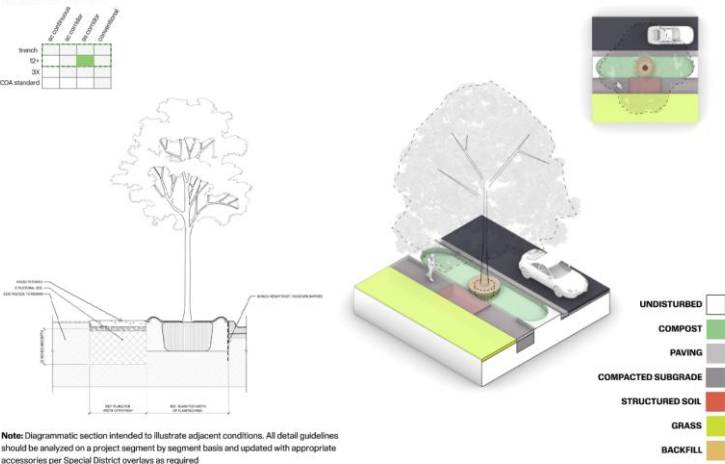
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B1 [12+] CONVENTIONAL COMPACTED SUBGRADE SUSPENSION



70

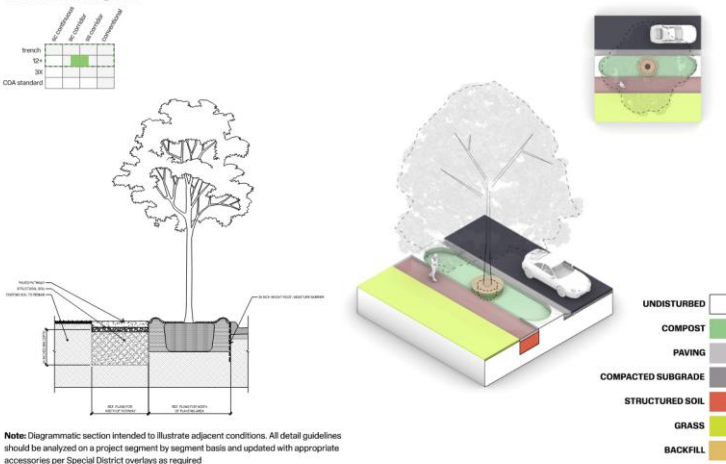
B2 [12+] STRUCTURAL SOIL SUSPENSION (ROOT CORRIDOR)



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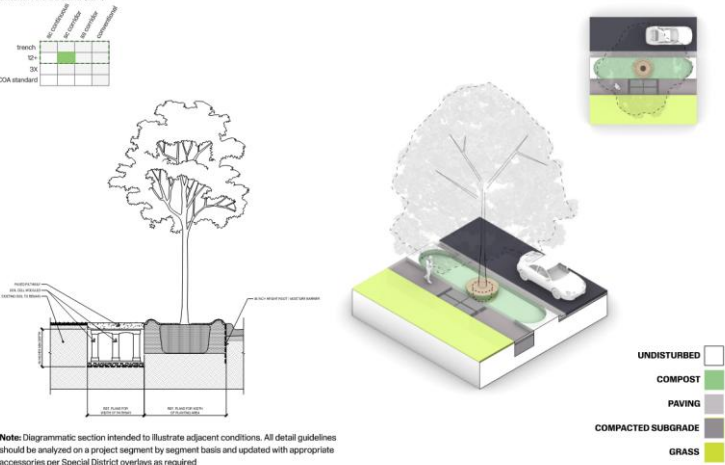
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B2.5 [12+] STRUCTURAL SOIL SUSPENSION (CONTINUOUS)



68

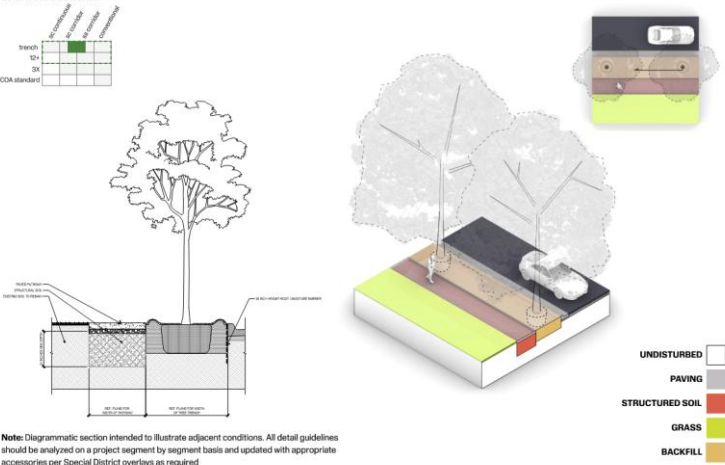
B3 [12+] SOIL CELL SUSPENSION (ROOT CORRIDOR)



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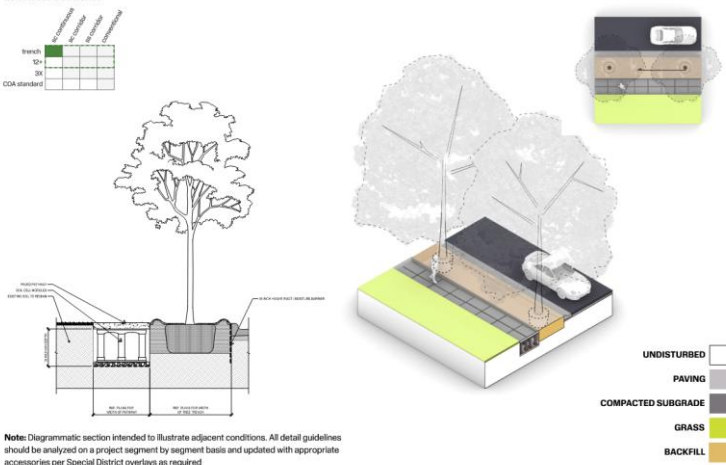
A2.5 [trench] STRUCTURAL SOIL SUSPENSION (CONTINUOUS)



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A4 [trench] SOIL CELL SUSPENSION (CONTINUOUS)

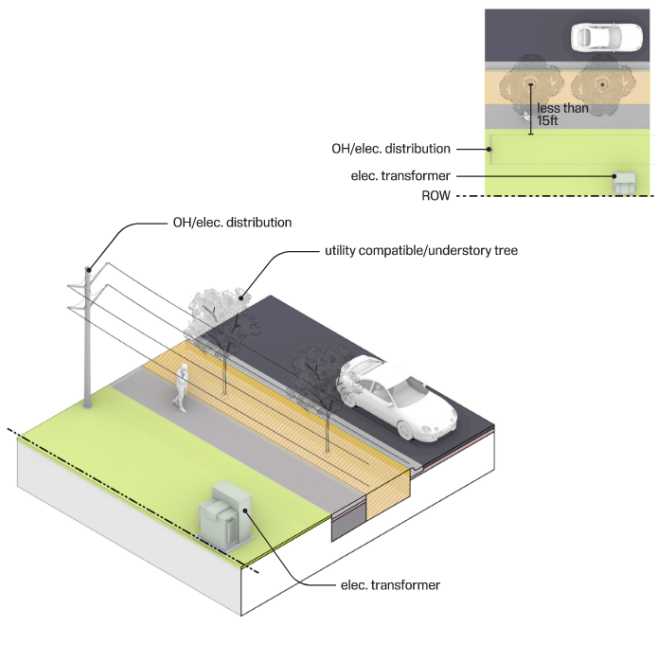


62

NEW TREE PLANTINGS - Framework for Utility Free Tree Zones



Fig. 3.2.C: OH & Surface Utility Placement



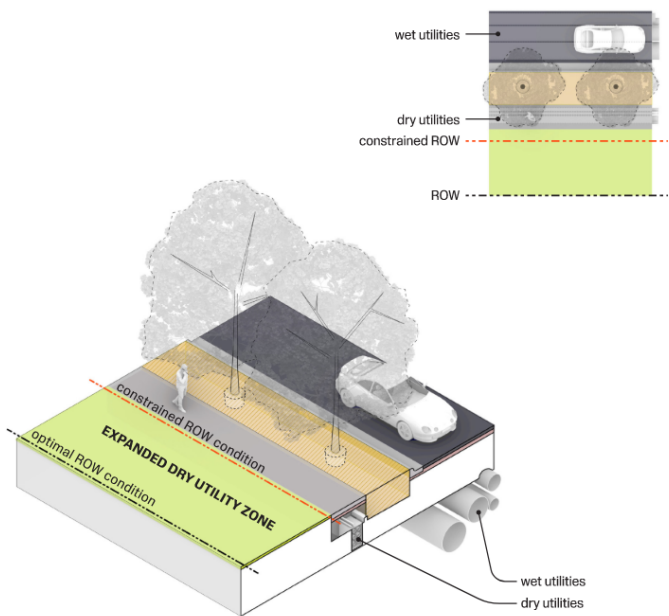
Proposed Utility Placement - Overhead & Surface

Proposed design locations for electrical distribution lines, power boxes and transformers need to be carefully considered when planning for the implementation of street trees. When OH electrical distribution lines cannot be located at least 15 ft. from proposed street tree trunks, then Utility Compatible/Understory tree species must be utilized.

In general, the area between the BOC and sidewalk/SUP facility is considered to be designated for street trees and/or street furniture. It is preferred that all OH and surface utilities be located outside of the street tree/furniture zone to avoid tree canopy and growth conflicts over time.



Fig. 3.2.D: Subsurface Utility Placement



Proposed Utility Placement - Subsurface

Designing subsurface utilities and street trees requires careful consideration of root growth and utility protection. Ensuring the coexistence of trees and utilities is crucial for both long-term tree health and infrastructure integrity.

Generally, subsurface wet utilities are desired to be placed within the roadway and physically separated from street tree/furniture zones by root barriers. Additionally, service manholes and cleanouts can present significant conflicts with street trees if located in the BOC area.

In optimal ROW scenarios, dry utilities are preferred to be located in open landscape/BOC areas where service hatches are not in conflict with pedestrians or bikes. In constrained ROW scenarios, dry utilities are preferred to be located underneath pedestrian/bike facilities to maintain a utility-free tree zone to the greatest extent possible.

MAINTENANCE & PROTECTION OF THE SHADE INVESTMENT

- Lastly, the development, definition and implementation of an Extended Tree Care Plan was deemed to be pertinent to the success of preservation and planting efforts set forth for the ALR project.
- This section of the Manual outlines an approach to developing and defining a tree care plan that will **ensure the long-term success of the urban canopy - both existing and new.**



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4.1 Extended Tree Care

The development, definition and implementation of an Extended Tree Care Plan is pertinent to the success of preservation and planting efforts set forth for the ALR project. This section of the Manual outlines an approach to developing and defining a tree care plan that will ensure the long-term success of the urban canopy - both existing and new.

Extended Tree Care in Three Phases

A comprehensive approach to installation and maintenance is a unique aspect of any urban corridor tree planting project. Quality and maintenance standards have been established for three distinct phases in an effort to promote optimal tree performance and longevity.

Phase 1

Regular maintenance during the vendor's growing period prior to the tree reaching a marketable size and being available for sale needs to be evident to the installation contractor purchasing the tree.

It is imperative that the care and maintenance requirements specified from grower point-of-sale through project completion and turnover to the long-term maintenance contractor are not modified or removed from design specification sections (Design Criteria Manual). Establishing this clear expectation allows the installation contractor to know the exact quality level they will be required to purchase from the approved vendor and what is expected to be provided for the project.

Phase 2

The installation contractor's planting of the tree and its care through the warranty period and maintenance period shall be included within the scope of work for installation.

Phase 3

The ultimate caretaker's long-term maintenance (post-installation and post-warranty period) will sustain enhanced tree care practices, ensuring the best possible outcome in terms of optimal tree health into the future. A long-term maintenance plan shall be developed in partnership with TPW/Urban Forestry or other designated caretakers.

PRUNING

- Pruning that results in trees that do not meet purpose.
- Dead or damaged limbs on trees, including those that are removed.
- All pruning shall be accomplished with proper technique.
- Prune any low-hanging branches and vines from trees that obstruct sight lines, power lines, or parking areas.
- Cut branches with clean, sharp pruning instruments.
- The disinfecting of tools before and after pruning.
- The pruning of Oak species should be avoided when Oak Wilt outbreaks are most prevalent.

STAKING

- Trees that are staked, guyed, or braced for support should be removed after the warranty period.
- Any adjustments to make trees plumb again should be the responsibility of the installation contractor.

WATERING

- The Contractor is responsible for ensuring that adequate water is provided to all trees from the point of installation until the end of construction. Typically, for most species in this region in conjunction with the specified improved soils, the ideal range of volumetric water is 10 to 30%.
- Immediately after initial tree planting, each root ball is to be hand-watered to ensure moisture above wilting point and below field capacity has been achieved. Tree root balls are to be tested to determine the water content after the completion of the automatic irrigation watering cycles.
- For areas where an automatic irrigation system may not be feasible, watering bags may be installed for each tree to be maintained.
- Tree canopies are to be gently sprinkled with water to remove any accumulation of dust or residue as a result of construction activities on an as-needed basis.

DISEASE & PESTS

- Any signs of tree stress are to be immediately reported.
- Any signs of disease or pests are to be immediately reported for review of best integrated Pest Management procedures to consider options and formulate an appropriate response to the observed issues.

FERTILIZATION

- Soluble fertilizers are not to be applied to plantings during the first year after planting unless a soil test determines that they are required.

Phase 3

The ultimate caretaker's long-term maintenance (post-installation and post-warranty period) will sustain enhanced tree care practices, ensuring the best possible outcome in terms of optimal tree health into the future. A long-term maintenance plan shall be developed in partnership with TPW/Urban Forestry or other designated caretakers.

- Measuring Replacement Trees** - Replacement trees shall be measured at six inches above the ground. On trees with multiple stems only those stems with a caliper of at least one inch shall count towards mitigation. Full credit shall be given for the largest qualifying stem and half credit for all other qualifying stems.
- Qualifying Species** - Eligible replacement tree species are listed in Environmental Criteria Manual Appendix F. The City Arborist may approve species not listed in Appendix F for mitigation credit. At least seventy-five percent of the total caliper of all replacement trees shall be from species designated Significant Shade Providers in Appendix F. The remaining twenty-five percent may be of any Appendix F species.
- Planting Requirements** - The planting locations of replacement trees shall comply with the requirements of other regulating authorities such as Austin Energy or Austin Water. Replacement trees shall be planted on the property where the mitigated tree was located unless an alternative planting location is approved. Alternative planting locations should be in close proximity to the original property.
- Quality Stock** - Replacement trees shall be planted in accordance with the ANSI 300 standard for tree care. Replacement trees shall be free of pests, disease, and significant damage or structural defects. They shall have a visible root flare at the soil line and be planted at the proper depth.
- Irrigation** - Replacement trees shall be provided with irrigation for their establishment. When added to an existing irrigation system they shall have their own zone so that they can be watered at a frequency and rate appropriate to newly planted trees. On sites without existing irrigation a programmable temporary system or a service such as a water truck may be used. Irrigation must be approved prior to planting.
- Fiscal Surety** - Fiscal security may be required by the City Arborist when tree planting will occur under a different development plan than that under which the removals were approved.

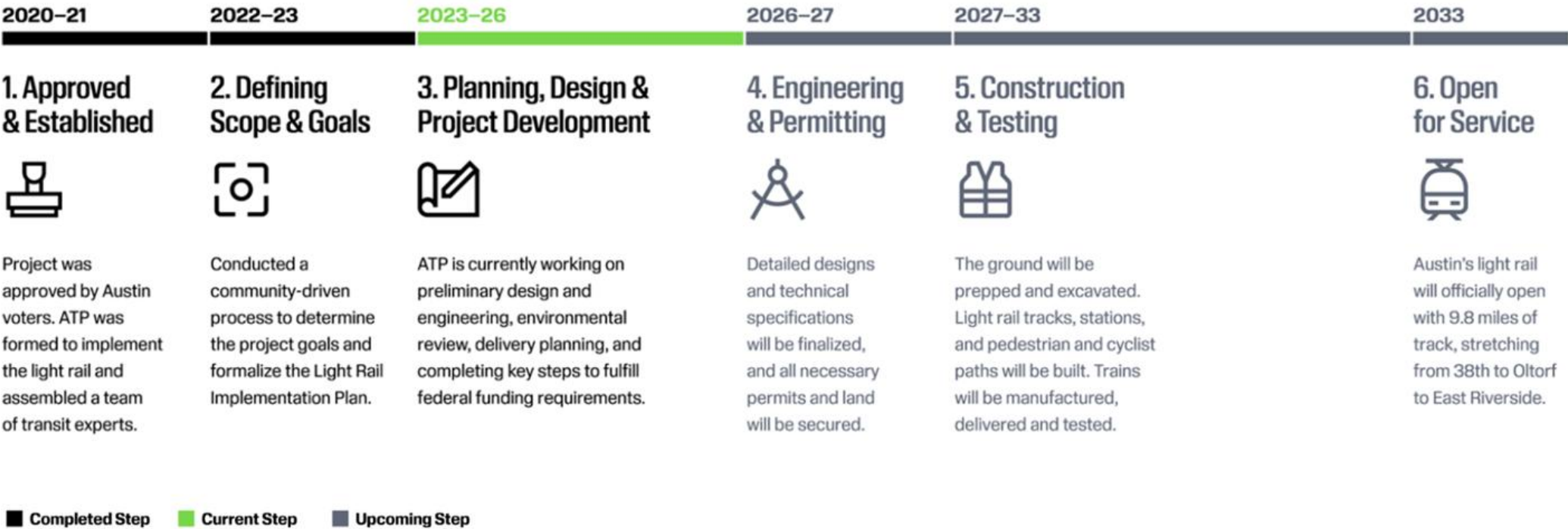
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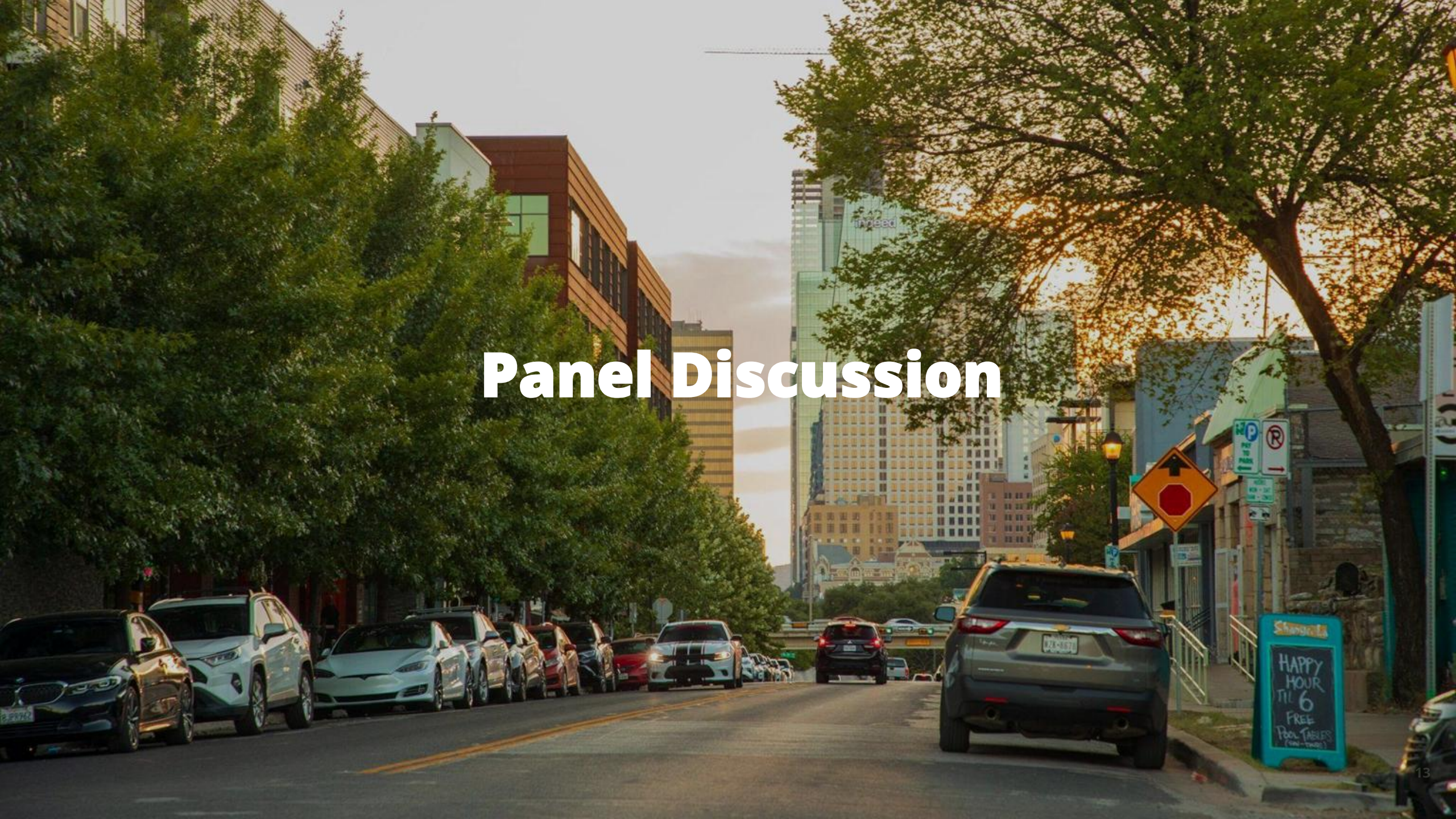
COMPREHENSIVE TREE MANUAL

Current Project Status - Design Milestone 1 (40% Design)

Austin Light Rail **TIMELINE**



Panel Discussion



PANEL DISCUSSION

Brianna Frey

Division Manager, Strategic
Projects, Austin
Transportation and Public
Works

Kevin Howard Oliver

Green Infrastructure Working
Group, Strategic Advisor
and Subject Matter Expert

Robert Infanger

Special Materials Expert,
Austin Transit Partnership

- **In practice, what are the strengths and weaknesses of different street tree implementation mechanisms?**
 - Incentives (e.g. density bonus programs)
 - Voluntary programs (e.g. Urban Forest Grant)
 - CoA Capital Improvement Plan
 - Code requirements (criterial manuals, etc.)
- **What challenges or lessons have arisen from ongoing projects (such as Austin Light Rail or Congress Avenue UDI), regarding integration of trees?**
- **What projects elsewhere in the US have been valuable case studies, for how the Green Infrastructure resolution can be implemented?**
- **How can architects, landscape architects, engineers, and advocates best support the City's implementation of new policies in 2027?**