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Authors

Ma, Jiaqi

Correa-Jullian, Camila

Publication Date

2026-11-01

DOI

10.82903/B2QP4B

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CENTER OF EXCELLENCE
on New Mobility and Automated Vehicles

AV-Scale Checklist Companion Report Version V1.0

November 2026

About the Center of Excellence on New Mobility and Automated Vehicles

The Center of Excellence on New Mobility and Automated Vehicles focuses on the impacts of new mobility technologies and highly automated vehicles on the evolving transportation system when deployed at scale. Launched in 2023, the center studies the anticipated long-term impacts of increased new mobility technologies and services on land use, real estate and urban design; transportation system optimization; access to mobility and job participation; and municipal budgets and cost-effective allocation of public resources. Established through a cooperative agreement between the Federal Highway Administration and UCLA, the Mobility COE is made up of five core partners and a community of practice from academia and nonprofit organizations. **www.mobilitycoe.org**

Acknowledgments

This material is based upon work supported by the Federal Highway Administration under Agreement No. 693JJ32350027.

The Mobility Center of Excellence at UCLA acknowledges the Gabrielino/Tongva peoples as the traditional land caretakers of Tovaangar (the Los Angeles basin and So. Channel Islands). As a land grant institution, we pay our respects to the Honuukvetam (Ancestors), ‘Ahiihirom (Elders) and ‘Eyoohiinkem (our relatives/relations) past, present and emerging.

Disclaimer

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the Author(s) and do not necessarily reflect the view of the Federal Highway Administration.

Citing This Report

Suggested Citation: Ma, J., & Correa-Jullian, C. (2026). AV-Scale Checklist Companion Report Version V1.0. *UCLA: Mobility Center of Excellence*. http://dx.doi.org/10.82903/B2QP4B

420 Westwood Plaza, 7702 Boelter Hall
Los Angeles, CA 90095-1600

mobilitycoe@ucla.edu
mobilitycoe.org

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Executive Summary

Automated vehicles (AV) are no longer confined to pilot programs or closed testing environments; they are operating today on public streets in multiple U.S. cities. These real-world deployments have demonstrated both the potential benefits of AV technology, such as expanded mobility options and operational efficiencies, and the institutional, operational, as well as the safety challenges that arise when deployment outpaces public-sector readiness. As AV activity expands in scale, geography, and operational complexity, state and local agencies increasingly request identification of actionable practices grounded in ***observed experience*** and adaptable to their level of experience rather than hypothetical analyses with assumptions.

This companion report supports the State and Local AV At-Scale Deployment Readiness (AV-Scale) Checklist by documenting the empirical basis, design rationale, and intended use of the checklist. The AV-Scale checklist represents the first consolidated, experience-driven framework developed to help public agencies define their jurisdiction's AV readiness strategy to manage AV deployments. It is informed by direct evidence from four cities with active AV operations—San Francisco, Los Angeles, Austin, and Phoenix—as well as state-level practices in California, Texas, and Arizona. The analysis draws exclusively from real-world sources, including deployment records, regulatory proceedings, agency policy documents, applicable laws, workshop outcomes from Los Angeles and Austin, structured interviews with subject matter expert panels, and outcomes from federally funded research conducted through the Mobility Center of Excellence.

The checklist reflects the reality that authority, institutional roles, and operational responsibilities vary widely across jurisdictions. Accordingly, it is designed to be adaptable and context-sensitive, emphasizing capabilities and processes that have been observed in practice by early deployment cities and can be implemented under different legal, organizational, and resource conditions. The checklist is organized into seven domains (A–G), spanning shared governance and authority; operator intake and deployment management; public safety operations; physical infrastructure, digital infrastructure and data exchange; performance measurement and transparency; and funding, procurement, and workforce capacity. Each domain is further decomposed into subdomains representing elements observed to be consequential in real-world deployment and specific concerns spanning curb management, universal design, traffic control and operations.

Across all domains, the AV-Scale checklist emphasizes several cross-cutting themes that emerged repeatedly from deployment experience: the need for clear institutional coordination even where local regulatory authority is limited; proactive and collaborative engagement with AV operators and regulators; integration of AV considerations into existing public safety and transportation operations; reliable data exchange and transparency mechanisms; early planning for universal access; and public agency workforce implications. Importantly, the checklist is intended as a public agency ***planning and self-assessment tool***, not as strict requirements, a compliance audit, or a pass-fail scoring mechanism. It is designed as a comprehensive listing of observed practices to help agencies identify readiness gaps, prioritize near-term actions, and support coordinated decision-making as AV activity evolves.

By grounding the public agency self-readiness checklist in observed deployment practices, this companion report and the associated checklist provide agencies with a practical and comprehensive foundation for collaboratively managing AV operations safely, transparently, and effectively as deployments scale. Together, they are intended to support informed decision-making, interagency coordination, and constructive engagement with industry and the public, so AV deployment advances in alignment with public safety, mobility, affordability, economic development, and other community objectives.

Key takeaways for agencies include the following:

- This checklist is designed to support agency-internal assessment, planning, and coordination, regardless of whether agencies have direct permitting authority over AVs.
- The checklist includes a comprehensive listing of observed practices by early deployment cities. **AV readiness does not entail a jurisdiction implementing all the practices; rather, the checklist provides a list of options that jurisdictions may want to consider and tailor for their specific context and community needs.**
- AV readiness is multi-dimensional. Effective AV management depends on shared governance, public safety operations, infrastructure, data, communications, and workforce capacity - not technology alone.
- Use the checklist collaboratively. The most effective assessments involve transportation, public safety, legal, IT, communications, and external partners working together. The checklist helps agencies prioritize checklist items relevant to them, then identify owners and co-owners of each relevant checklist item.
- Not all items apply equally across deployment phases (pre-service and service). Agencies can prioritize checklist items based on current or anticipated AV activity and revisit the checklist as deployments evolve.
- Data, communication, and coordination are recurring enablers. Many observed deployment challenges stemmed from gaps in information flow and institutional alignment rather than technical system failures.
- Early planning reduces downstream risk. Establishing processes, points of contact, and expectations before deployments scale can mitigate operational, safety, and public trust challenges later.

Introduction

Autonomous vehicle deployment in the United States has entered a new phase. In several cities, AVs are no longer experimental demonstrations but part of daily traffic conditions, operating across neighborhoods, interacting with first responders, using curb space, and relying on public infrastructure and data systems. This shift has revealed that AV readiness is not solely a question of technology performance, but also one of institutional readiness across multiple public agencies.

In response to this need, this report presents a **comprehensive State & Local Public Agency AV At-Scale Deployment Readiness Checklist (AV-Scale Checklist)**. The checklist is intended to help public agencies move beyond ad hoc, case-by-case responses to a more systematic understanding of readiness for AV operations at scale [27][28][29]. The checklist is intended to be adaptable, allowing agencies to determine the depth and complexity of implementation based on local context.

Empirical Foundation and Methodology

The checklist and supporting analysis are based exclusively on documented, real-world experience, rather than theoretical projections or speculative policy models. The research draws on a comprehensive set of empirical sources, including:

- Regulatory frameworks, policies, permits, and legal authorities governing AV deployment in California, Texas, and Arizona;
- Publicly available city and state documents, including deployment agreements, incident reports, dashboards, and operational guidance from San Francisco, Los Angeles, Phoenix, and Austin;
- Workshop summary reports from stakeholder workshops convened in Los Angeles and Austin, which brought together public agencies, operators, and subject matter experts to discuss operational challenges and coordination needs;
- Interviews and panel sessions with public-sector practitioners, emergency responders, transportation officials, and AV program managers;
- Applied research outputs from the UCLA Mobility Center of Excellence, including projects related to curbside management, human-centered pickup and delivery, transit integration, data standards and sharing, parking, and literature reviews of the shared mobility regulatory landscape.
- Feedback from a collaborative panel and workshop at ATS 2026, where city, state, ADS operator, independent evaluator and public-perspective groups reviewed selected checklist items for priority and maturity.

While the broader literature on AV policy and planning is extensive, external consultant reports and nonprofit publications are used in this report only for contextual reference. The checklist

itself is derived from observed practices, challenges, and responses documented in real deployments where possible, as supplemented by agency practitioner experiences and opinions.

Purpose and Intended Use of the Checklist

The checklist is intended to serve three primary purposes.

- First, it provides agencies (cities, counties, and states) with a structured way to plan their readiness strategy for AV operations beyond pilot programs by helping them identify institutional gaps, coordination needs, and priority actions across agencies such as transportation, public works, police, fire, first responders, and urban planning.
- Second, it supports both state DOTs and local agencies in understanding how AV readiness responsibilities are distributed across levels of government, particularly where state authority intersects with local operations, such as freeway deployment, traffic control, data exchange, and public safety coordination, as well as potential regional coordination across jurisdictions.
- Third, it offers a shared framework that can facilitate communication among public agencies, AV operators, and regional partners by clarifying expectations, governance structure, and operational interfaces.

The checklist is **not** intended to function as a regulatory mandate or compliance instrument. Instead, it is designed as a **planning, coordination, and learning tool**, adaptable to different regulatory environments, levels of deployment maturity, and institutional contexts.

How Agencies Can Use the Checklist Spreadsheet

The checklist spreadsheet is designed as a public agency ***self-assessment and planning tool***, not a compliance audit or pass-fail scoring system. The checklist produces a summary intended to reflect relative maturity of a jurisdiction's institutional processes for readiness activities relevant to their specific context. It does NOT assess correctness or regulatory sufficiency.

Agencies are encouraged to use it in the following ways:

1. **Start with Contextual Scoping**: Agencies can begin by reviewing the domain and subdomain descriptions in this report to understand how each checklist item relates to real-world deployment experience. Not all items will be equally relevant to every jurisdiction nor at every stage of deployment. Agencies can first identify which domains are most applicable based on current or anticipated AV activity (e.g., testing, commercial service, freeway operations).

2. **Conduct a Cross-Functional Assessment**: The checklist is most effective when completed collaboratively across departments, including transportation, public safety, legal, IT, communications, and—where relevant— public works, school districts, public health agencies, airport or state liaison offices. Many readiness gaps observed in practice stemmed from siloed decision-making rather than technical limitations.

3. **Assess Readiness Spectrum Qualitatively**
   Agencies should treat checklist items as indicators of AV process and institutional maturity rather than yes/no requirements. For each item, agencies may note whether capabilities are:

   - Not Implemented (1)
   - Partially Implemented/Only as Needed (2)
   - Fully Implemented/Institutionalized (3)

   Note that contextual scoping means not every checklist item applies. This approach supports honest assessment tailored to a jurisdiction and avoids overstating and/or overdesigning readiness.

   The relative priority and importance of checklist items is also adjustable. While the checklist pre-populates these priorities based on observed practice, these can be easily tailored to a jurisdiction's own preferences.

4. **Use the Checklist to Identify Priority Gaps and Near-Term Actions**: The checklist is intended to surface gaps that warrant attention before AV activity scales further. Agencies can use it to prioritize near-term actions, such as establishing points of contact, clarifying emergency protocols, or improving data access and coordination processes.

5. **Revisit the Checklist as Conditions Change**:
   AV deployments, regulatory environments, and agency responsibilities evolve over time. Agencies may find it useful to revisit the checklist periodically, particularly after:

   - A new AV operator begins service
   - Deployment expands to new areas (e.g., freeways, airports)
   - A significant incident or operational challenge occurs
   - New state or federal policies are adopted

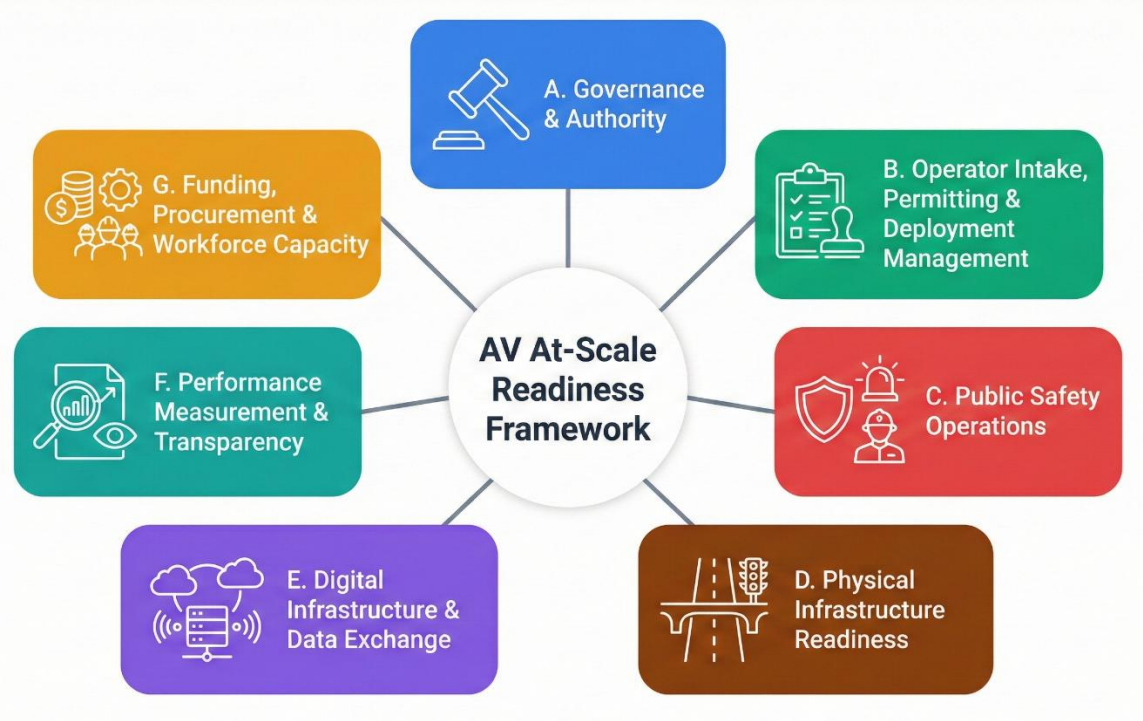
6. **Use the Checklist as a Coordination and Communication Tool**: Finally, the checklist can serve as a common reference for discussions with AV operators, regional partners, regulators, and the public. By grounding conversations in documented experience and clearly defined readiness elements, agencies can more effectively communicate expectations, constraints, and areas requiring coordination and collaboration.

Readiness Framework

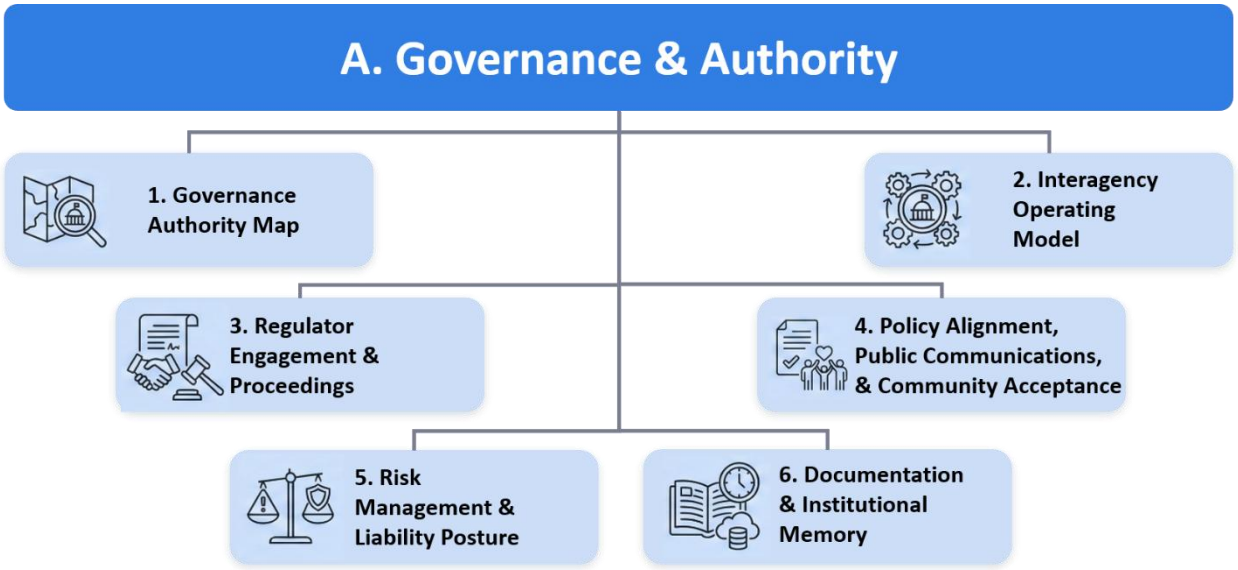
The AV At-Scale Deployment Readiness checklist (AV-Scale Checklist) is organized into **seven interrelated domains (A–G)**, each representing a critical area of public-sector readiness:

- A. Governance & Authority
- B. Operator Intake, Permitting & Deployment Management
- C. Public Safety Operations
- D. Physical Infrastructure Readiness
- E. Digital Infrastructure & Data Exchange
- F. Performance Measurement & Transparency
- G. Funding, Procurement & Workforce Capacity

Each domain is introduced with explanatory text. Each domain is further broken into subdomains and checklist items that represent concrete capabilities, processes, or institutional arrangements observed in practice. Cross-domain elements that need special considerations are also included, such as traffic control, curb management and multimodal interfaces, and accessibility and paratransit items. By organizing readiness in this way, the checklist provides public agencies with a clear, empirically grounded starting point for preparing for AV deployment at scale based on current operational experience. Collectively, these items are intended to help agencies and industry collaboratively prepare to manage AV operations on their streets safely, transparently, and at scale.



A. Governance & Authority



This dimension contains elements related to **who** holds decision-making power over AV operations, and **whether** interagency, regulator, and freeway coordination exist to exercise it.

A1. Governance Authority Map

Across all four study cities, a recurring governance challenge was the lack of clarity regarding which public entity held decision-making authority over AV operations, particularly as responsibilities are often split across state and local levels [1][2]. In California, regulatory authority resides with both the Department of Motor Vehicles (DMV) and the California Public Utilities Commission (CPUC), leaving cities such as San Francisco and Los Angeles without direct permitting power and requiring them to exercise indirect channels such as regulatory petitions and legislative advocacy [3][4]. In Texas and Arizona, state preemption further limits local authority, albeit through different institutional arrangements [5][6]. These experiences demonstrate that it is highly beneficial when cities explicitly document who holds authority over safety, operations, enforcement, and service approval in their jurisdiction. The checklist therefore includes an item for jurisdictions to maintain a clear governance authority map, ensuring staff understand where control resides and how local concerns can be escalated when issues arise (A1-001).

In addition to clarifying external authority boundaries, it is also highly beneficial when jurisdictions define internal decision rights for AV-related actions that affect the public right-of-way. Deployment experience showed that uncertainty over who can authorize geofences, approve curb modifications, adjust signal timing, or impose work zone–related operational constraints can delay response during incidents or degrade coordination with operators. The checklist includes an item about agencies documenting internal approval workflows for AV-related right-of-way (ROW) actions, including which department or role has authority to initiate, review, and approve changes and how such decisions are communicated to AV operators (A1-002). Establishing this internal decision framework enables faster, more consistent responses

while ensuring that AV-related interventions align with existing traffic operations, safety, and asset management processes.

A2. Interagency Operating Model

Empirical evidence from all cities examined highlights the importance of a defined interagency operating model for AV governance [1]. San Francisco relies on an internally coordinated, SFMTA-led task force; Austin centralized AV coordination within its Smart Mobility Office; and Los Angeles convened an AV Working Group through the Mayor's Office to align transportation, public safety, and policy functions. These structures enabled routine coordination among transportation departments, police, fire, IT, and legal staff, even in the absence of local regulatory authority. The checklist reflects this practice by including an item about jurisdictions establishing a formal interagency operating model for AV issues, ensuring consistent internal communication, shared situational awareness, and coordinated responses across departments (A2-003). The working group also provides a venue for routine, risk-based review of AV-related incidents and near-misses, so agencies can jointly decide which issues warrant interagency escalation rather than remaining siloed within individual departments. In addition, deployment experience showed the value of publishing a clear single point of contact (POC) model for both AV operators and the public. In several jurisdictions, uncertainty over whom to contact for operational questions, incident escalation, or public complaints created delays and fragmented responses, particularly outside normal business hours. Experienced agencies have addressed this by designating and publishing official AV POC pathways, such as a dedicated email address, phone number, or 311 routing, supported by defined after-hours escalation procedures for urgent safety or operational issues (A2-004). More information on emergency service coordination can be found in C2 and activities related to workforce development and funding can be found in Section G.

Deployment experience also highlighted the need for a lightweight readiness pathway for smaller cities and counties, leveraging standardized templates, shared regional resources, or joint incident response contacts, to support consistent coordination without imposing disproportionate administrative burden. The checklist includes an item for state DOTs and MPOs to develop lightweight readiness pathways for smaller jurisdictions, leveraging shared templates and regional resources (A2-005).

Additional coordination activities may support operations depending on the deployment's characteristics:

A2.1 State–Local Coordination for Freeways

As AV operations expand beyond local streets to freeways and state-controlled facilities, coordination between state and local agencies becomes increasingly critical. The San Francisco experience demonstrated the limitations of local authority when AV-related incidents occurred on or affected freeway-adjacent operations, requiring rapid coordination with regulators and agencies [7]. In Texas, the introduction of a state-run AV permitting program further formalized the role of state agencies in overseeing operations that may directly impact local jurisdictions [5]. These cases informed the checklist item that covers explicit state–local coordination mechanisms for freeway operations, including defined roles, communication protocols, and escalation procedures (A2-006). In addition, deployment experience highlights the need to explicitly define escalation and coordination procedures for AV operations that transition between city streets and controlled-access facilities. Given that these transition

points, such as freeway on- and off-ramps, operational design domain (ODD) boundaries, shoulder or emergency stopping areas, ramp metering zones, and incident staging locations, often fall under overlapping jurisdictional responsibility, the checklist also includes an item for agencies to document how authority, communication, and operational control shift as AVs move between local and state facilities (A2-007).

A2.2 Construction Coordination

Within interagency activities, special considerations are needed for construction activities. These activities are often managed by private contractors or utilities that may not be aware of AV deployments operating on local streets. This lack of awareness was identified as a recurring coordination gap, as AV operators may receive little or no advance notice of lane closures, detours, or staging activities. Some jurisdictions recognized the value of incorporating AV notification into construction permit and coordination processes, similar to existing practices used for transit agencies or emergency services. The checklist therefore includes construction coordination as a readiness item about jurisdictions integrating AV considerations into construction workflows so that closure information can be communicated to operators in advance and operational conflicts can be minimized [27][28] (A2-008). More information regarding physical and digital readiness items is found in Sections D and E, respectively.

A2.3 Regional scaling strategy

As AV deployments expand geographically, regional coordination becomes increasingly important, particularly for jurisdictions with limited individual capacity. Deployment experience suggested that regional or county-level approaches, such as shared AV coordinators, pooled funding, or metropolitan planning organization–led initiatives, may offer a scalable solution for smaller cities. State DOTs may also play a coordinating role as deployments extend to highways and freight corridors (see A2.1). The checklist includes a regional scaling strategy item, so jurisdictions consider collaborative models that support consistent readiness across metropolitan areas, avoid fragmented or duplicative efforts, and execute agreements needed to support incident management, work zone, and data sharing practices across agencies (A2-009). Aligning funding and institutional strategies will strengthen the ability to scale deployment readiness [15]. In addition, intergovernmental agreements, memoranda of understanding, or other coordination mechanisms can clarify roles, enable data sharing, and support joint funding or staffing arrangements. The checklist includes intergovernmental agreements as an item so jurisdictions can formalize these relationships, particularly where local authority over AV operations is limited [3] (A2-010).

A3. Regulator Engagement & Proceedings

Because many critical AV regulatory decisions occur at the state level, effective engagement with regulators emerged as a core governance function rather than an ancillary activity. San Francisco's formal participation in CPUC proceedings [3] and Austin's regular coordination meetings with the Texas Department of Motor Vehicles [5] illustrate how cities can assert local operational and safety concerns despite limited direct authority. These experiences informed the checklist item about jurisdictions defining structured approaches to regulator engagement, including participation in formal proceedings, regular information exchanges, and documented escalation pathways, so cities are not left without a voice when deployment-related issues arise (A3-011, A3-012).

Deployment experience demonstrated that cities could use localized performance evidence to inform state level policies, particularly in regulatory environments where local authority is limited. In San Francisco, aggregated incident data and documented operational impacts were used to prompt interventions following repeated disruptions affecting emergency services [7]. Jurisdictions may choose to establish formal channels for sharing performance findings with relevant agencies and using empirical evidence to support policy adjustments (A3-012).

A4. Policy Alignment, Public Communications, & Community Acceptance

Governance readiness also depends on aligning AV deployment with broader local policy objectives and maintaining community acceptance. In Los Angeles, AV governance has been closely tied to mayoral priorities related to safety and mobility access, shaping how AV issues are framed and addressed within the city's broader transportation agenda [4]. Similarly, public reactions to AV incidents in San Francisco underscored the importance of demonstrating responsiveness to community concerns [7]. These experiences support the inclusion of a checklist item in which jurisdictions designate which governance structure or role owns AV policy alignment and community engagement and review how AV deployment aligns with adopted transportation, safety, and other policies, and maintaining mechanisms for public communication and feedback (A4-013). See B9 for more details.

A4.1 Universal access goals (A4-014)

Ensuring that AV services advance universal access and expand mobility options for disabled and/or elderly populations emerged as a common readiness consideration across study jurisdictions. In San Francisco, disability advocates raised concerns that robotaxi approvals proceeded without sufficient accessibility requirements, applying pressure that contributed to renewed focus on WAV development [14]. In Phoenix, the success of the paratransit pilot was attributed in part to early and sustained engagement with users, including focus groups and iterative feedback facilitated by researchers [13]. Except for some special programs, current robotaxi deployments do not yet include wheelchair-accessible vehicles (WAVs) in active service, creating a gap relative to ADA-equivalent expectations [14]. Some jurisdictions were also interested in improving geographic coverage since operators often prioritize initial service areas based on technical feasibility, demand, and commercial considerations, which may result in uneven access. For example, California AV operators must submit accessibility plans as part of their operating approvals, outlining how they intend to serve riders with disabilities over time. This informed the checklist option in which jurisdictions consider how to make AVs more universally accessible, especially for those with currently limited travel options, by potentially including disability and elder care advocates in AV advisory groups, working groups, or pilot design processes, as well as structured opportunities for user testing and feedback.

A5. Risk Management & Liability Posture

Deployment experience across jurisdictions highlighted the need for clear and consistent risk management and liability posture. Cities maintained that AVs remain subject to traffic laws and local enforcement, regardless of automation status. As one Austin AV program lead noted, *"No law requires anyone to tell us how many vehicles they have, but we'll cite them if they run a red light"* [1]. In California, this enforcement stance was reinforced through legislation clarifying that AV companies are liable for moving violations committed by driverless vehicles, addressing prior enforcement ambiguities [3]. Cities such as San Francisco further mitigated risk by requiring indemnification clauses in agreements with AV operators. These practices directly

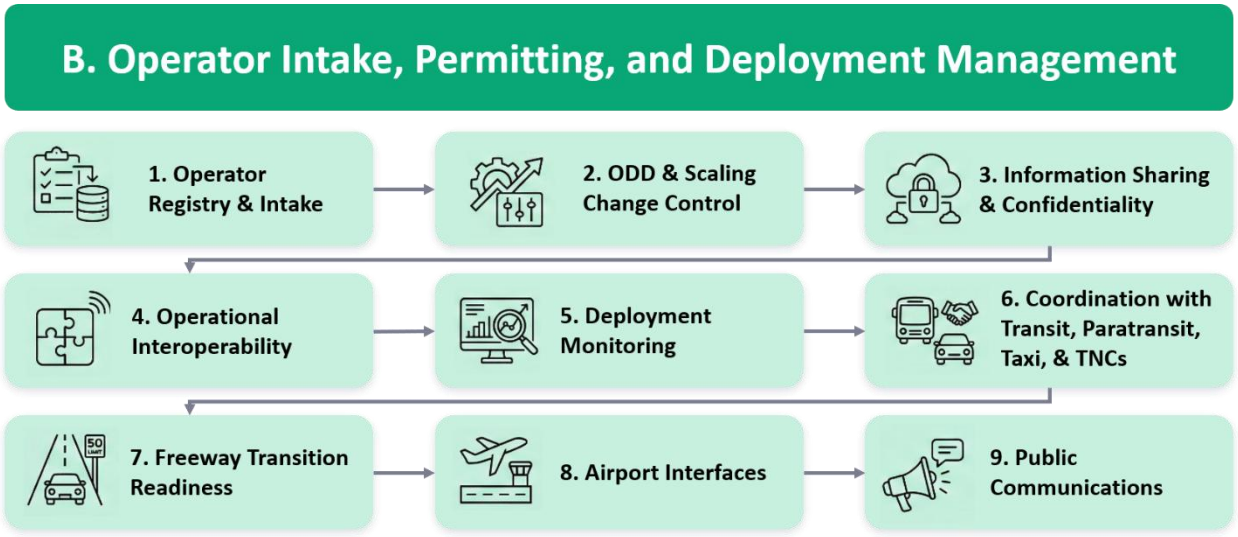
informed the checklist item about jurisdictions establishing clear approaches to liability, insurance, enforcement responsibility, and indemnification (A5-015). This risk posture also extends to the authority to impose and lift temporary operational constraints, such as geofenced no-stop zones or event-driven restrictions (A5-016), as applicable in each jurisdiction.

A6. Documentation & Institutional Memory

Finally, cities emphasized the importance of maintaining documentation and institutional memory related to AV governance. Turnover in staff, evolving regulatory environments, and the rapid pace of AV deployment make informal knowledge insufficient for sustained readiness [1]. Cities relied on meeting notes, MOUs, internal guidance, and regulatory correspondence to preserve lessons learned and ensure continuity over time. The checklist therefore includes an item about jurisdictions systematically documenting governance structures, decisions, engagements, and incidents related to AV deployment, supporting continuity and learning as deployments evolve (A6-017).

B. Operator Intake, Permitting, and Deployment Management

This dimension contains elements related to whether agencies **permit/track** operators and ODD changes, exchange operational data, and manage transitions into specialized zones.



B1. Operator Registry & Intake

Across all study jurisdictions, the process by which AV operators formally enter a city varies substantially depending on state law. In California, AV testing and deployment require state permits issued by the DMV and CPUC, with no local permitting authority; cities such as San Francisco and Los Angeles are typically notified when deployments begin, but do not operate a formal intake process [2]. San Francisco explicitly notes that it does not issue AV permits and directs public feedback either to 311 or to state regulators [2]. Texas historically required no permit until the enactment of SB 2807 in 2025, which introduced a state authorization process

for Level 4–5 AV operations administered by TxDMV, including safety self-certification and revocation authority [1][5]. Austin has sought to leverage this state permit process as a de facto intake mechanism by maintaining close coordination with TxDMV. In Arizona, no formal permit exists; intake relies largely on executive guidance encouraging voluntary coordination, with cities such as Chandler integrating AV operators into local initiatives through economic development partnerships. These experiences informed the checklist item calling for cities to maintain an internal registry of AV operators, including deployment phase, service area, and key contacts, and request deployment summaries when formal permitting mechanisms do not exist (B1-001). As one Austin official noted, tracking mapping and testing phases across operators has proven essential for situational awareness [5]. In addition to basic operator identification and contact tracking, deployment experience suggests that it is beneficial that intake processes include structured safety assurance documentation or similar, even where cities lack formal permitting authority (see A1).

State/local permitting processes may include requesting safety assurance documentation. Available safety assurance documentation (e.g., voluntary safety self-assessments or state permit filings) can inform discussions with operators about the specified Operational Design Domain (ODD) of the AV deployment. These discussions may then help collaboratively manage risks of stressing or exceeding the ODD. Examples of documentation may include: stated safety goals and assumptions; the defined ODD and its constraints; the operator's risk assessment methodology and assumptions; safety mitigation strategies and operational controls; a safety performance monitoring plan with defined leading and lagging indicators, escalation triggers, and response pathways; incident reporting and corrective action processes; change management procedures for software updates and/or ODD expansion; considerations for special zones (e.g., hospitals, school zones, railways, airports, pedestrian-only areas, work zones, charging/maintenance hubs/depots); and a clear delineation of roles and responsibilities across the operator, city, state DOT, and public safety agencies (B1-002). Having this information on file materially improves readiness, transparency, and interagency coordination [2][3][27].

It is beneficial when intake processes standardize the collection of information on the operator's service type and operating concept (B1-003). This includes whether the deployment involves passenger services or goods delivery; fleet-operated versus privately owned AV integration; relationships with transportation network companies or subscription models; planned hours of service; geofencing and staging strategies; rider eligibility and access policies; accessibility accommodations; and customer service and escalation pathways. Standardizing this information supports downstream coordination with transit agencies, curb management, public safety, and communications teams [13][2][27].

Finally, experienced jurisdictions highlighted the importance of understanding fleet maintenance, lifecycle management, and supporting infrastructure needs at the outset of deployment (B1-004). Some requested a fleet maintenance and lifecycle plan addressing preventive maintenance, safety-critical recalls, sensor cleaning and calibration practices, post-collision inspection procedures, and responsibility for towing and repair logistics. For jurisdictions hosting electric AV fleets that may require additional permitting to address charging needs, it is beneficial to understand operators' depot, staging, and charging approaches, including charging locations, power requirements, queuing or traffic impacts, and required permits [1][2][27].

B2. ODD & Scaling Change Control

A recurring challenge identified across deployments is the limited ability of cities to influence changes in operational design domains (ODDs), fleet size, or service areas as AV programs scale. San Francisco raised concerns through CPUC proceedings regarding the risks of unrestricted fleet expansion and geographic growth [7]. Although the CPUC initially approved expansion in August 2023, subsequent operational issues led to the suspension of additional deployments. Los Angeles has similarly advocated for greater local input into deployment decisions, particularly as AV services scale beyond initial pilots [4]. These experiences support the inclusion of a checklist item about structured deployment phasing plans, such that AV expansion proceeds incrementally, starting with limited fleets and service areas, followed by performance review and coordination prior to scaling, and planned modifications are communicated at each stage (B2-005). This phasing is paired with a defined notice and change-control mechanism, so operators can communicate planned ODD, fleet, or service-area changes to the jurisdiction before they take effect (B2-006). While cities may lack authority to mandate such controls, negotiated phasing and public advocacy remain important indirect levers (see A3).

B3. Information Sharing & Confidentiality

Deployment experience indicates that effective AV management depends on regular information exchange between cities and operators, even in the absence of formal regulatory authority. Austin established biweekly coordination calls with AV companies to discuss incidents and upcoming roadway changes, while Los Angeles maintains ongoing engagement through its AV Working Group, with information shared in both directions as part of deployment management. Cities have also benefited from leveraging operators' dedicated City Partnerships teams to establish consistent communication channels. Likewise, confidentiality can facilitate information exchange, as operators feel better protected when disclosing information. These practices informed the checklist item about defined information-sharing expectations, confidentiality provisions, and designated points of contact between cities and operators (B3-007, B3-008). These practices provide a practical mechanism for cities to obtain timely operational information and manage deployments proactively [3][10][27].

B4. Operational Interoperability

Operational interoperability between AV systems and city services emerged as an important, though often informal, aspect of deployment management. Cities reported challenges when AV operations did not align with local traffic management practices, emergency response workflows, or construction activities. Regular coordination meetings and shared situational awareness, such as advance notice of mapping activity or service area expansion, are reported to help mitigate these issues in cities like Austin and Los Angeles. The checklist reflects this experience by identifying the need for cities to assess how AV operations interface with existing transportation, traffic management, and public safety systems, and establish processes for resolving operational conflicts as they arise [10][27][28] (B4-009, B4-010). For information on potential mechanisms and formats, refer to Section E.

B5. Deployment Monitoring

Cities increasingly relied on deployment monitoring tools to manage AV operations in real time. Austin's public AV incident dashboard functions not only as a transparency mechanism but also

as an internal management tool, enabling staff to identify incident clusters and allocate resources accordingly [1]. Other jurisdictions explored mechanisms to help make AVs identifiable to law enforcement and emergency responders, such as external vehicle identification numbers used by Waymo vehicles in San Francisco, which were referenced in police reports [7]. These practices informed the checklist item about deployment monitoring capabilities that support situational awareness, enforcement, and incident response, even where cities lack direct regulatory authority (B5-011).

B6. Coordination with Transit, Paratransit, Taxi, & TNCs

As AV services increasingly overlap with transit corridors, taxi, and transportation network company (TNC) operations, cities identified the need for coordination to avoid service conflicts and unintended impacts. While formal integration remains limited, cities such as Los Angeles have begun addressing AV deployment within broader mobility policy discussions, including transit priority, curb use, and multimodal operations [4]. These experiences informed the checklist item about cities considering AV deployment management in the context of existing transit and TNC services.

B6.1 Transit priority and conflicts (B6-012)

AV curb activity can interfere with transit operations if not carefully coordinated, particularly where bus stops, transit-only lanes, or station access points overlap with high-demand pickup and drop-off locations. In early deployments, AVs occasionally stopped in or near transit stops, disrupting service and passenger boarding. In response, cities such as San Francisco and Los Angeles pursued voluntary coordination with AV operators to avoid transit priority zones and maintain clear access for buses and rail feeder services. The checklist includes transit priority and conflicts as an item to ensure that AV curb use is planned in a manner that preserves transit reliability, particularly as cities explore AVs as first- and last-mile connectors to high-capacity transit [7][9][28].

B6.2 Paratransit Coordination (B6-013)

Deployment experience demonstrated that AVs have the potential to augment, rather than replace, traditional paratransit services when thoughtfully integrated. The Valley Metro–Waymo pilot provided proof of concept that AVs can offer on-demand mobility for paratransit-eligible riders who are able to transfer independently, at lower per-trip cost and with improved flexibility compared to conventional services [13]. While not all jurisdictions currently have the scale or partnerships to implement similar pilots, these experiences informed the checklist item about cities and transit agencies exploring AV–paratransit coordination where feasible. Such coordination may include limited pilots, targeted service for specific user groups, or complementary deployment alongside existing paratransit operations.

B7. Freeway Transition Readiness

When AV deployments expand from local streets to freeways and limited-access facilities, deployment management responsibilities shift toward state agencies. Cities and states have therefore identified the need for explicit transition planning. Austin and other jurisdictions emphasized coordination with state agencies to understand how city-level monitoring and communication practices connect to state-managed highway operations [5]. The checklist includes freeway transition readiness as a distinct subdomain (B7-014), covering the operational mechanics of that transition: how operators manage shoulder stops, ramp closures,

and incident staging, and how monitoring and communication practices are maintained as vehicles move between city- and state-managed facilities. Authority, escalation, and jurisdictional ownership for these transitions are addressed in section A2.1.

B8. Airport Interfaces

When AV deployments expand into airport service, curbside and operational coordination shift toward the airport authority's separate regulatory framework — covering terminal access rules, staging/holding lots, geofenced routes, signage, customer service, and enforcement (B8-015). Because airports operate under separate regulatory and operational frameworks from the surrounding jurisdiction, curbside coordination may be paired with a defined interagency relationship — typically with the city transportation agency serving a facilitative role between the AV operator and airport authority, rather than direct operational control.

Airports represent distinct operational profile and curb management strategies due to their controlled access, high passenger volumes, and established permitting requirements for commercial ground transportation. Deployment experience at Phoenix Sky Harbor demonstrated that AV operators can be successfully integrated into airport operations when clear rules and designated pickup areas are established, with Waymo negotiating access to rideshare zones under airport authority oversight. Los Angeles World Airports is similarly developing policies for AV operations that may include safety record review, data sharing requirements, and use of designated curb areas. These cases highlight the importance of permitting coordination between AV operators and airport authorities, with city transportation agencies often serving a facilitative role. The checklist therefore includes airport interfaces as a dedicated subdomain about AV deployment planning to account for intermodal hubs governed by separate operational and regulatory frameworks [10][28] (B8-015).

B9. Public Communications

Cities consistently emphasized the importance of clear public communication regarding AV deployment status, expectations, and points of contact. A recurring failure mode identified in Austin was the lack of statutory requirements for operators to disclose fleet size or deployment details, summarized by the observation that “no law requires them to tell us vehicle count” [1]. This gap was partially addressed through Texas’ new state permitting requirements, which mandate disclosure of fleet information [5]. In other contexts, cities relied on voluntary disclosures, public dashboards, or media engagement to inform residents. The readiness checklist therefore includes an item about cities establishing public-facing communication practices related to AV deployment (B9-016), to support transparency and public trust even when formal reporting requirements are absent (refer to A4 for more information on governance-related activities).

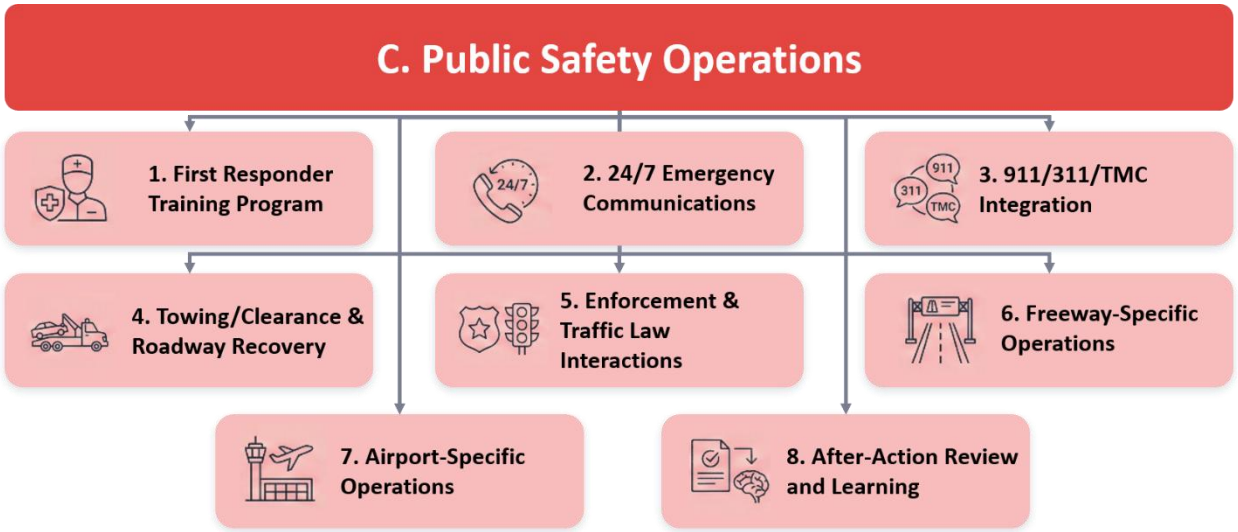
B9.1 Customer service and complaints

Public feedback and complaint mechanisms played an important role in identifying curb-related issues during early AV deployments. In San Francisco, reports from residents, transit operators, and city staff helped surface recurring problems such as blocked lanes, obstructed crosswalks, or interference with transit stops [7][9]. These complaints informed both city-agency engagement with operators and subsequent operational adjustments by AV companies. The checklist includes customer service and complaints as a readiness item for jurisdictions to have

clear processes for receiving, tracking, and escalating public concerns related to AV behavior, enabling timely response and continuous improvement (B9-017).

C. Public Safety Operations

This dimension contains elements related to whether first responders are **trained** for AV interactions, and 24/7 **communication, enforcement, and coordination channels exist** with operators.



C1. First Responder Training Program

Across all four study jurisdictions, first responder preparedness emerged as one of the most critical determinants of safe AV deployment. Empirical evidence shows that police, fire, and emergency medical services need specific training on how to interact with driverless vehicles, including safe approach procedures, immobilization methods, and towing considerations [8][9]. AV operators such as Waymo provide training materials, and national resources such as the Governors Highway Safety Association (GHSA) course are freely available. Cities including Austin and Chandler conducted early hands-on demonstrations with Waymo vehicles, while San Francisco expanded training following a series of AV-related incidents. These experiences informed the checklist item about structured AV training programs for first responders (C1-001, C1-002), with readiness considered mature when personnel have participated in drills or exercises involving AVs in operational settings. Differences in procedures across operators (e.g., vehicle access and immobilization) have been noted to complicate responder training; consistent responder information across operators, coordinated regionally or at the state level, can simplify field response. Training content can be updated as new operators enter service, using the operator registry and documentation maintained under B1.

C2. 24/7 Emergency Communications

Deployment experience demonstrated that continuous, around-the-clock emergency communication capability is essential once AVs operate on public streets. AV-related incidents may occur at any time, and delays in reaching an operator's incident response team can exacerbate safety risks or roadway disruption. Jurisdictions with mature deployments

emphasized the importance of ensuring that AV operators maintain 24/7 emergency contact mechanisms accessible to dispatchers and first responders. Cities reported that direct access to operators' incident response teams improved response times and reduced confusion during field operations. This operational need informed the checklist item about uninterrupted emergency communications between jurisdictions and AV operators as a baseline public safety practice [5][1][27][4] (C2-003, C2-004). Dedicated emergency procedures may be developed to address different types of hazards and potential mitigation actions (e.g., geofences) (C2-005).

C3. 911/311/TMC Integration

Operational experience indicates that emergency communications centers play a central role in managing AV-related incidents. In San Francisco, 911 dispatch protocols were updated to include scripted questions such as whether the vehicle involved is automated and which operator is responsible, enabling faster notification of the appropriate company [7]. Phoenix implemented a more advanced integration by enabling dispatchers to conference Waymo's incident response center directly into 911 calls when an AV is involved. These practices demonstrate the importance of integrating AV-specific procedures into 911, 311, and traffic management center (TMC) workflows. Accordingly, the checklist includes an item about jurisdictions with active and ongoing AV deployments establishing formal dispatch protocols and communication pathways that account for AV identification and operator notification (C3-006, C3-007).

C4. Towing/Clearance & Roadway Recovery

The removal and recovery of disabled or damaged AVs posed practical challenges for cities and towing operators. Traditional tow providers may be unfamiliar with AV systems, including locked wheels, vehicles remaining in gear, and/or unique vehicle form factors. San Francisco encountered this issue when a Cruise vehicle became immobilized in wet concrete, requiring specialized handling. During a June 2022 incident involving multiple stalled Cruise vehicles, company field teams manually relocated vehicles, prompting Cruise to subsequently station standby drivers for rapid response. These experiences informed the checklist item about jurisdictions establishing towing, clearance, and roadway recovery protocols for AVs, including coordination with operator rapid response teams and briefing contracted tow services on AV-specific procedures [9] (C4-008). Responsibility for towing logistics and field retrieval should be coordinated with operators as part of the intake process (B1).

C5. Enforcement & Traffic Law Interactions

Law enforcement interactions with AVs presented early challenges, particularly during traffic stops and enforcement actions. Initial incidents in San Francisco and Phoenix demonstrated confusion when driverless vehicles did not respond as expected to police signals [9]. In response, AV operators published guidance describing expected vehicle behavior during stops, typically indicating that vehicles will pull over, activate hazard lights, and await remote instructions. Law enforcement agencies subsequently developed field guidance: for example, following the "headlights off" incident involving Cruise, the San Francisco Police Department issued instructions advising officers to contact the operator hotline and not expect a human driver [7]. These experiences informed the checklist item about law enforcement agencies issuing AV-specific field guidance (including how enforcement protocols apply, for instance, to issue tickets for non-compliance) to support consistent and safe interactions (C5-009).

C5.1 Curb enforcement

Effective curb management for AVs aligns curb regulations, pricing, enforcement practices, and AV system behavior. Deployment experience demonstrated that when curb rules are overly restrictive or poorly communicated, AVs may default to unsafe or disruptive stopping locations, such as travel lanes or crosswalks [7][9]. Mitigation efforts included both software improvements by operators and informal coordination with cities to clarify acceptable short-duration stopping behavior. These experiences informed the checklist item about the need to map curb regulations and management, integrate them into AV operational logic where possible, and ensure enforcement agencies understand how AVs interpret and comply with curb rules (C5-010).

C6. Freeway-Specific Operations

As AV deployments expand to freeways and other state-controlled facilities, state-level public safety agencies become integral to response planning. Research identified coordination between AV operators and the California Highway Patrol as an emerging practice, including Waymo's engagement with CHP and the involvement of retired CHP personnel within operator safety teams [8]. State patrol agencies have begun considering AV-specific response scenarios, including how to manage driverless vehicles during enforcement actions or incidents at highway speeds. These experiences informed the checklist item about coordination between local first responders and state highway patrol agencies as AV operations transition from city streets to regional and freeway networks (C6-011).

C6.1 Freeway Work Zone and Traffic Control Readiness

Traffic control readiness on freeways and other limited-access facilities is primarily a state DOT responsibility. State agencies manage highway construction zones, lane closures, and traffic control devices that introduce high-risk conditions for AVs operating at speed. States such as Texas have begun testing connected work zone messaging as part of broader connected and automated vehicle initiatives, enabling closure and lane shift information to be broadcast directly to vehicles. The checklist lists freeway work zone readiness as a critical state-level function, including potential adoption of standardized digital work zone practices that support AVs and connected human-driven vehicles alike and reduce operational risk during construction and maintenance activities [10][27] (C6-012).

Freeway readiness also explicitly considers other traffic control conditions that materially affect AV behavior at higher speeds. These include temporary and permanent lane closures, dynamic or variable speed limits, shoulder use restrictions, ramp metering, and incident-related traffic management strategies. For AV freeway operations, jurisdictions may record operators' stated procedures for responding to these controls, particularly where conditions change rapidly or rely on dynamic signage (see B7 and D2, D5). The checklist therefore includes an item about state DOTs discussing freeway traffic control plans with operators to ensure that relevant information is distributed through both physical signage and potentially digital channels. Incident management is a further critical dimension of freeway traffic control readiness. AVs may encounter lane blockages, emergency responders operating on shoulders, or law enforcement traffic breaks that necessitate rapid compliance. Coordination with state Highway Patrol agencies is essential to ensure that enforcement actions, rolling closures, and incident response procedures are understood by AV operators and reflected in operational playbooks. The checklist highlights the importance of aligning freeway traffic control practices, law

enforcement protocols, and AV operational procedures to support safe and predictable AV behavior during both routine operations and abnormal events on controlled-access facilities [10].

C7. Airport-Specific Operations

Airport AV access is expected to align with aviation security, emergency response, and incident management protocols. Unlike typical city curb environments, airports operate under heightened security requirements and tightly coordinated emergency response structures involving airport police, fire, operations, and federal partners (refer to B8). The checklist therefore includes an item for airport authorities to integrate the emergency contact information and incident response procedures of AV operators authorized to serve airports into airport operations centers, including clear points of contact for security incidents, disabled vehicles, or evacuation scenarios (C7-013). Aligning AV access rules with airport emergency and security protocols helps prevent operational conflicts, ensures rapid response during incidents, and maintains the integrity of airport safety and security systems [14].

C8. After-Action Review and Learning

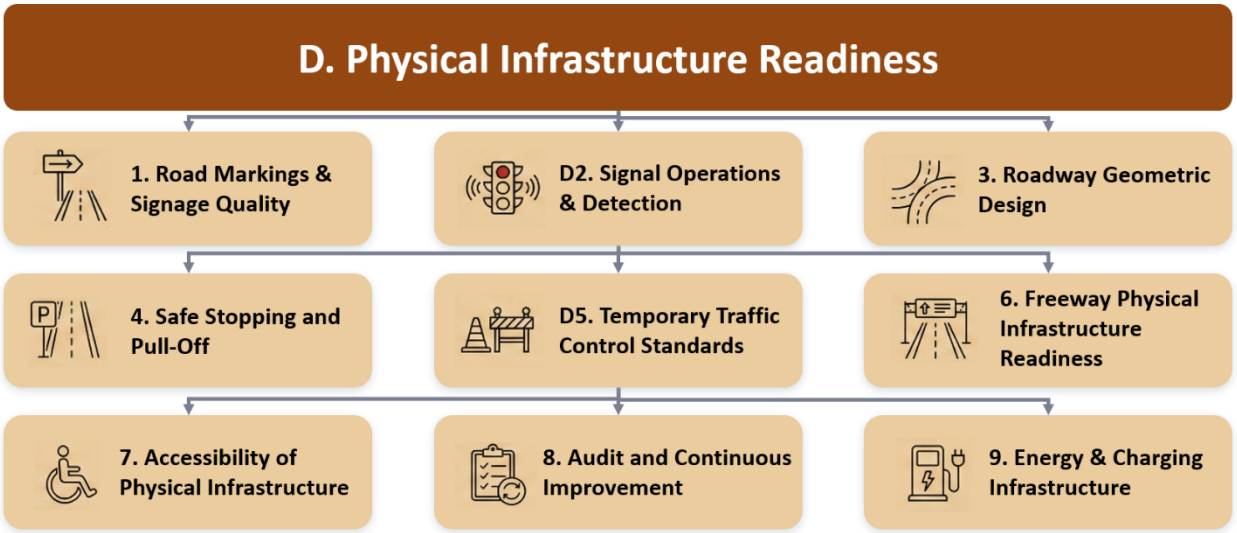
Repeated AV-related incidents underscored the importance of systematic after-action review and institutional learning. San Francisco documented at least 55 instances of AV interference with emergency response activities, prompting software updates by ADS developers to improve detection of hoses and sirens following complaints from the fire department [7]. In one case, responders resorted to breaking a vehicle window to stop it, illustrating that emergency personnel will act decisively to protect life even in the absence of formal guidance. The checklist therefore includes an item about jurisdictions conducting after-action reviews of AV incidents, particularly those involving emergency response and safety operations (traffic control-specific AARs are addressed in F1), documenting lessons learned, and updating training, protocols, and agreements, accordingly, including clarifying indemnification protections for responders acting in good faith (C8-014).

D. Physical Infrastructure Readiness

This dimension contains elements related to whether **signal, staging**, and **curb infrastructure** support safe AV stopping, incident recovery, and PUDO.

D1. Road Markings & Signage Quality

Deployment experience across all study jurisdictions demonstrates that clear, consistent, and well-maintained roadway markings and signage are essential for reliable AV operation. Industry feedback and incident analysis indicate that degraded or faded lane markings, inconsistent temporary striping, and non-standard signage can confuse AV lane-keeping and perception systems, particularly in construction environments [10]. Multiple ADS operators such as Waymo and Cruise reported challenges interpreting temporary markings, prompting some jurisdictions to take corrective action. In Chandler, Arizona, lane repainting was accelerated following early Waymo testing that revealed sensitivity to degraded markings. Cities such as Austin also reported proactively notifying AV operators when experimental signage or signal treatments were deployed. These observations informed the checklist item about routine auditing and maintenance of pavement markings and signage along AV operating corridors [30] (D1-001, D1-002).



D2. Signal Operations & Detection

The physical visibility, placement, and consistency of traffic signals directly affect AV perception and compliance. AV camera systems need unobstructed views of signal heads, standardized mounting locations, and sufficient contrast to reliably detect indications. Cities such as Austin and Chandler, which operate modern LED signal systems with consistent placement, reported fewer perception-related challenges. In contrast, older urban environments may face issues related to vegetation obstructions, unconventional mounting, or atypical signal configurations. These experiences provide the basis for the checklist item about review of signal operations and detection conditions as part of AV infrastructure readiness [8][7][27] (D2-003). Additionally, physical traffic signal control devices and systems need to be maintained regularly and due to their criticality in AV operations, it is beneficial to provide a process to publish signal outage and planned maintenance notifications via a machine-readable feed (where feasible) for operator ingestion [8][27][28] (E1-001).

D3. Roadway Geometric Design

AVs generally perform reliably on standard roadway geometry but may encounter difficulties in locations with atypical or complex designs. San Francisco's deployment experience highlighted challenges associated with steep grades and unconventional intersections, including multi-leg junctions, where AVs occasionally exhibited overly cautious behavior such as prolonged or awkward stopping. In these cases, feedback from the city enabled operators to refine system behavior over time. These observations informed the checklist item about jurisdictions identifying operational design constraints—such as unusual geometry or constrained sightlines—and coordinating with operators to ensure deliberate testing and monitoring in these locations (D3-004).

D4. Safe Stopping and Pull-Off

The ability for AVs to safely stop and pull out of traffic when encountering an issue emerged as a recurring infrastructure consideration. In dense urban environments with limited shoulder space, AVs have at times stopped in active travel lanes, creating congestion and operational

disruption. While cities may have limited ability to create new shoulder infrastructure, some jurisdictions explored identifying wide curb lanes, off-street facilities, or predefined fallback locations that could be incorporated into AV operational planning. Operators such as Waymo reportedly pre-map safe pull-over locations as part of deployment preparation. These experiences informed the checklist item addressing safe stopping and pull-off planning for both local streets and highways [8][27][28] (D4-005). Predefined fallback locations should be shared with first responders and incorporated into towing and clearance procedures (C4).

D4.1 Designated pickup/drop-off (PUDO)

As AV ride services expand, unmanaged curbside pickup and drop-off behavior emerged as a recurring operational and safety challenge, mirroring early issues observed with transportation network companies. In San Francisco, initial deployments of Cruise and Waymo generated complaints regarding vehicles stopping in travel lanes, bus stops, bike lanes, or near intersections when conducting passenger loading and unloading, particularly during early rollout phases [7][9]. These behaviors created conflicts with transit operations, cyclists, and general traffic flow. In response, cities explored providing clearer guidance to operators on acceptable stopping behavior and considered the designation of specific pickup and drop-off locations where feasible. Although local permitting authority over AV operations may be limited, jurisdictions can enforce existing curb regulations and coordinate voluntarily with operators. These experiences informed the checklist item about the identification and communication of designated or preferred PUDO locations to support safe and predictable AV operations (D4-006). Acceptable stopping behavior should also be communicated to operators through the intake process (B1) and reflected in curb enforcement coordination (C5).

D4.2 Micromobility and VRU interactions

Curb management decisions directly affect interactions between AVs, micromobility users, and other vulnerable road users (VRUs). Early deployment experience showed that AVs stopping in bike lanes or crosswalks can create significant safety risks, even when such behavior results from conservative system logic or uncertainty about curb rules [7][9]. At the same time, AVs are generally programmed to yield to pedestrians and comply strictly with right-of-way rules, which can improve safety outcomes when curb interactions are well managed. The checklist includes an item about minimizing traffic conflicts by avoiding PUDO activity in active bike lanes and pedestrian crossings. Cities may want to design curbside facilities that support safe coexistence among AVs, cyclists, pedestrians, and micromobility devices (D4-007).

D4.3 Freight and delivery AVs

While most early deployments focused on passenger services, stakeholders noted that freight and delivery AVs will introduce additional curb management challenges. These vehicles may need longer dwell times, access to commercial loading zones, or staging areas distinct from passenger PUDO locations. Although large-scale freight AV deployment was not observed in the study cities, existing curb management practices for commercial loading provide a foundation for future planning. The checklist therefore includes freight and delivery AVs as an item to remind jurisdictions to consider how curb allocation, permitting, and enforcement policies may need to evolve as automated delivery services emerge [7][9][27] (D4-008).

D5. Temporary Traffic Control Standards

Temporary traffic control practices, including cones, barriers, arrow boards, and lane shifts, play a critical role in safe AV operations. Empirical deployment experience showed that inconsistent or non-standard temporary traffic control configurations can confuse AV perception systems, resulting in unsafe or unintended maneuvers. A documented incident in Phoenix involved inconsistent cone placement that led an AV to enter a closed lane, illustrating the sensitivity of automated systems of current technologies to deviations from standard traffic control layouts [8]. These observations reinforce that adherence to established traffic control plans and temporary traffic control standards benefit both human drivers and automated systems. Accordingly, the checklist item covers how temporary traffic control deployments conform to recognized standards and how agencies actively monitor contractor compliance, particularly in areas with active AV operations (D5-009).

D5.1 Post-Work Zone and Traffic Control Verification

Ensuring that roadways are accurately represented after construction activities conclude is a necessary but often overlooked component of traffic control readiness. Temporary lane shifts, cones, or signage that remain in place longer than intended can mislead AV systems and human drivers alike. The checklist therefore includes post-work zone verification, so agencies can confirm that both physical traffic control devices and associated digital records are updated promptly once work is complete, reducing the risk of lingering operational inconsistencies [7][27] (D5-010).

D6. Freeway Physical Infrastructure Readiness

Physical infrastructure readiness on freeways and other limited-access facilities introduces additional considerations, particularly related to construction zones, higher operating speeds, and incident response. State departments of transportation in Arizona and Texas have begun testing connected work zone warnings intended for all drivers, which also benefit AV operations. Stakeholders also noted the need for freeway-specific planning related to AV operations, including coordination for future applications such as automated freight and platooning. These considerations informed the checklist item about freeway infrastructure readiness as a primarily state-level responsibility [8][27][28].

Beyond work zones alone, readiness for controlled-access facilities benefits from a broader, system-level approach to freeway operations. For AVs operating at higher speeds and with limited maneuverability, consistent freeway design and predictability of traffic control conditions are especially critical. The checklist therefore includes an item about work zone configurations, temporary and permanent signage, lane shifts, shoulder closures, and ramp closures on freeways adhering strictly to established standards and being implemented consistently across corridors (D6-011).

D7. Accessibility of Physical Infrastructure

Physical infrastructure readiness also includes ensuring that physical roadway features support safe and accessible interactions for all users. Clear curb ramps, detectable edges, and unobstructed pedestrian pathways are essential not only for people with disabilities but also for AV perception of pedestrian activity. Deployment experience suggested that poorly maintained or ambiguous pedestrian infrastructure can complicate AV decision-making in dense urban environments. The checklist therefore includes accessibility of infrastructure as a readiness

consideration, aligning AV deployment with broader accessibility and complete streets objectives [27] (D7-012).

D7.1 Accessibility of curb operations

For elderly riders and/or riders with disabilities, considerations extend beyond vehicle design to include curbside interactions and pickup conditions. The safety and usability of pickup and drop-off locations, such as proximity to curb ramps, sidewalk quality, and traffic exposure, directly affect the usability of such services. Early deployments revealed that curb constraints or poorly chosen stopping locations can create barriers for riders with mobility, visual, or cognitive impairments. The checklist therefore includes accessibility of curb operations as an item, so jurisdictions consider how AV pickup and drop-off locations align with ADA-accessible infrastructure and how to coordinate with operators so that vehicles can reliably stop at locations that support safe boarding and alighting [13][27][28][34] (D7-013, D7-014) These considerations complement the accessibility goals and the operator-level accessibility plans (A4, B6).

D8. Audit and Continuous Improvement

A key lesson from deployment experience is that infrastructure readiness is not a one-time achievement but an ongoing process. Roadway conditions, signage, and work zones change frequently, and AV interactions with infrastructure evolve as systems and environments adapt. The checklist incorporates audit and continuous improvement, so jurisdictions periodically review infrastructure performance, identify recurring issues, and implement corrective actions informed by AV performance and incident history (D8-015). This approach reinforces the importance of institutionalizing infrastructure oversight rather than relying solely on initial readiness assessments [10][27][28].

D8.1 Design standards and pilots

Several jurisdictions explored pilot projects and design standards to test new curbside configurations that could better accommodate AV operations. Chandler's Flex service demonstrated how AVs can be integrated into existing mobility platforms through deliberate design and piloting [12], while regional transit agencies such as Valley Metro incorporated AVs into paratransit service models through structured pilots [13]. These experiences suggest that incremental pilots and design experimentation can help cities identify effective curb treatments before scaling. The checklist therefore includes an item about jurisdictions using pilots and evolving design standards to test AV-specific curb solutions in controlled settings prior to wider deployment (D8-016).

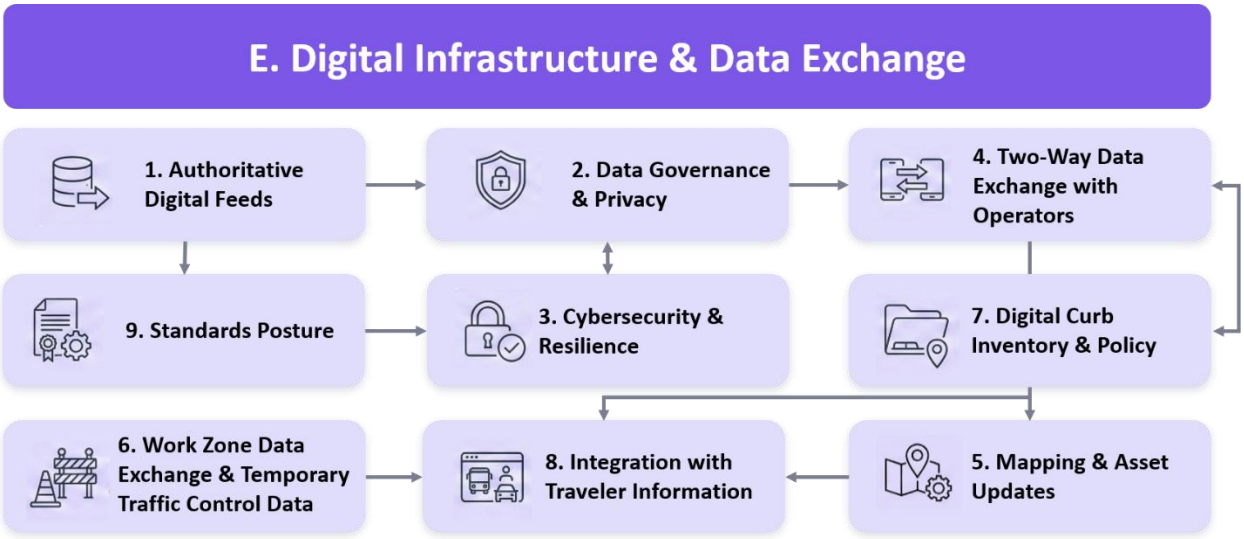
D9. Energy & Charging Infrastructure

Energy and charging infrastructure emerged as a forward-looking readiness consideration since they can be long-lead items. As AV fleets scale, particularly for electric robotaxi and shuttle services, access to reliable charging and staging facilities will become increasingly important. Some jurisdictions accommodated early needs through off-street facilities, such as allowing AV operators to use underutilized parking lots for fleet staging and charging. The checklist includes an item about energy and charging infrastructure so cities and states can anticipate future demand and integrate AV considerations into broader electrification and infrastructure planning efforts [3][9] (D9-017, D9-018). Charger location (centralized hubs versus dispersed locations) can affect traffic patterns, as well as power requirements and potentially time-of-day electricity

demand. Funding and utility coordination for charging infrastructure is addressed in domain G (G1).

E. Digital Infrastructure & Data Exchange

This dimension contains elements related to whether **standardized, machine-readable feeds** and real-time **incident-coordination channels** exist.



E1. Authoritative Digital Feeds

Authoritative and up-to-date digital feeds were consistently identified as a critical enabler for safe and predictable AV operations. While human drivers rely on visual cues and last-minute adjustments, AVs can significantly improve performance when they receive reliable information in advance, such as planned road closures, lane restrictions, or signal status. Cities including Los Angeles, Austin, and San Francisco recognized the value of sharing authoritative digital information with AV operators through local data platforms or direct coordination mechanisms [5]. Arizona's engagement with standardized work zone data initiatives further reflects growing state-level recognition of this need. These experiences informed the checklist items about jurisdictions publishing and maintaining authoritative digital feeds that AV operators can access consistently (E1-001). In practice, jurisdictions wishing to maintain authoritative feeds need to establish and document a clear "source of truth" for digital information relevant to AV operations. This includes maintaining an internal registry that identifies each authoritative feed, its URL or API endpoint, data schema or standard used, update frequency, system owner, and primary technical and policy contacts (E1-002). Such a registry supports consistency across departments, reduces the risk of conflicting or outdated information being shared externally, and enables operators to reliably integrate the correct feeds into their systems (see A2).

E1.1 Special Events and Planned Closures

Major planned events introduce complex and rapidly changing traffic control conditions that can challenge AV operations if not proactively managed. Events such as large sport games, concerts, festivals, marathons, or citywide celebrations often involve extensive street closures, unfamiliar traffic patterns, and elevated pedestrian activity. Deployment experience in Austin

highlighted operational disruptions when AVs encountered event-related congestion without adequate advance coordination, reinforcing the need for structured communication with operators. The special event traffic is usually complicated by lane closures, temporary traffic control and rerouting, complex traffic flows, and extreme congestion. The checklist therefore includes the development of special event AV management procedures, so jurisdictions can define advance notification timelines, closure perimeter sharing, and direct communication channels during events (E1-003). Los Angeles' long-term planning for major international events provides an example of how early and systematic coordination can mitigate these risks [10][27][28]. These digital coordination procedures should align with the change-control and no-surprises communications protocol established in B2.

E2. Data Governance & Privacy

Data exchange between cities and AV operators raises important governance and privacy considerations. Cities often seek granular operational data, such as routes, incident logs, or service performance metrics, while operators cite privacy, security, and competitive concerns. In California, regulatory requirements resulted in data being collected for the state but released publicly only in aggregated form, limiting local agencies' ability to respond to emerging operational or safety concerns [3][5]. This limitation contributed to local frustration and subsequent policy changes aimed at increasing transparency. These experiences informed the checklist item about jurisdictions proactively establishing data governance frameworks that define permissible uses, anonymization practices, and confidentiality protections (E2-004). For more information refer to B3.

E3. Cybersecurity & Resilience

As jurisdictions expand digital connectivity and data exchange with AV systems, cybersecurity and system resilience emerged as essential readiness considerations. Although the research did not identify specific cyber incidents involving AV data systems, stakeholders emphasized that communication channels need to be secure, authenticated, and resilient to prevent unauthorized access or the dissemination of incorrect information to vehicles. State DOTs and large cities often possess established cybersecurity expertise, which can be extended to AV-related digital infrastructure. The checklist therefore includes an item about applying appropriate cybersecurity and system resilience protocols to any V2X, SPaT, or data-sharing system supporting AV operations [3][27][28] (E3-005).

E4. Two-Way Data Exchange with Operators

Beyond one-directional information sharing, several jurisdictions explored or piloted two-way data exchange mechanisms with AV operators. Los Angeles's Mobility Data Specification (MDS), originally developed for micromobility services, has been evaluated as a framework for enabling AV operators to share operational data with the city while receiving public agency information such as geofenced areas or speed restrictions in return. This approach effectively establishes a digital interface between the city and AV fleets, allowing agencies to monitor deployment management even in the absence of direct permitting authority. Los Angeles began piloting this approach in 2024, which informed the checklist item about jurisdictions exploring two-way digital information exchanges for AV deployment awareness. More recently, similar concepts have been tested through pilots in other jurisdictions. In 2025, the City of Seattle initiated a pilot focused on structured data exchange between AV operators and municipal agencies to support deployment monitoring, curb management, and incident awareness. While

implementation details vary, the Seattle effort reinforced the feasibility of city–operator data exchange outside of traditional permitting structures and highlighted the importance of clearly defined data scopes, access controls, and operational use cases. [3][27][28]

Deployment experience also indicates that not all data exchanges need the same cadence or degree of timeliness. Many regulatory, planning, and performance datasets, such as service area updates, fleet size summaries, or historical trip metrics, can be shared on an offline or non-real-time basis without operational risk. However, data related to active incidents, unexpected stoppages, emergency closures, or on-scene coordination require real-time or low-latency exchange. The checklist therefore includes an item about establishing a secure, real-time operational coordination channel for incident management, which may include shared digital map layers, closure polygons, designated staging zones, and direct communication links between agency operations centers and operator response teams (E4-006, E4-007). This distinction between planning-oriented data exchange and real-time operational coordination is critical to ensure that two-way data systems meaningfully support safety and response needs and may include exercise such as rehearsing incident coordination through tabletop exercises ahead of major events [3][27][28] (refer to C2).

E5. Mapping & Asset Updates

Accurate and up-to-date roadway asset information, including lane configurations, signage locations, and curb regulations, supports both AV mapping and ongoing operational reliability. Deployment experience indicated that changes to roadway assets, particularly in construction environments, can introduce discrepancies between physical conditions and digital representations if not promptly updated. While AV operators maintain proprietary high-definition maps, they benefit from timely access to authoritative city asset data. The checklist therefore includes a subdomain focused on mapping and asset updates (E5-008), so coordination between infrastructure maintenance activities and digital records can minimize operational inconsistencies [27][28] (refer to E1).

E6. Work Zone Data Exchange & Temporary Traffic Control Data

Providing real-time, machine-readable information on work zones emerged as one of the highest-impact actions agencies can take to support AV operations [11]. Unlike human drivers, AVs can proactively reroute or avoid restricted areas when they receive accurate closure and lane configuration data in advance. Cities such as Los Angeles, Austin, and San Francisco recognized this need and began sharing planned closure information with AV operators through various mechanisms, while Arizona's participation in Work Zone Data Exchange initiatives reflects growing state-level adoption [5]. The checklist highlights the importance of publishing planned and active work zones through standardized data feeds that AV operators can access automatically, noting that even informal or transitional communication practices can meaningfully improve safety and operational predictability (E6-009, E6-010, E6-011).

Beyond physical devices, the digital representation of temporary traffic control elements, including lane closures, detours, and staging areas, was identified as an important enabler of AV-safe operations. When AVs receive structured temporary traffic control data in advance, they can plan compliant maneuvers rather than reacting late to visual cues. Jurisdictions that shared local knowledge informally with operators demonstrated improved operational outcomes, reinforcing the checklist item about agencies publishing or transmitting temporary traffic control data through digital channels wherever feasible [5].

E7. Digital Curb Inventory & Policy

Accurate dynamic digital representation of curb regulations and usage emerged as an enabling layer for effective AV management. While physical curb rules govern stopping, loading, and parking, AV behavior depends on machine-readable representations of those rules. Deployment experience showed that uncertainty around curb permissions contributed to inappropriate stopping behaviors, particularly during early robotaxi operations. The checklist therefore includes a digital curb inventory item, so jurisdictions can map and maintain curb regulations in formats that can be shared with AV operators and integrated into vehicle decision-making systems, complementing physical curb management strategies discussed in Domain D [13][27][28] (E7-012). This digital inventory complements the physical PUDO designation and signage (D4) and supports curb enforcement integration (C5).

E8. Integration with Traveler Information

Digital integration of AV services into broader traveler information and mobility platforms emerged as a promising best practice. In Chandler, riders can request AV trips through the Flex app, with Waymo vehicles dispatched as part of an integrated service offering [12]. In the Phoenix region, Valley Metro incorporated Waymo into its paratransit booking platform, RideChoice, enabling coordinated service delivery for eligible riders [13] (refer to B6). These examples demonstrate how digital interfaces can support seamless integration of AV services with transit and paratransit systems, improving user experience and enabling agencies to monitor performance through existing traveler information platforms (E8-013).

E9. Standards Posture

The effectiveness and scalability of digital infrastructure depend on the adoption of common data standards and interoperable interfaces. Deployment experience highlighted challenges when AV-related data were provided in proprietary or inconsistent formats, limiting cross-jurisdictional coordination and operational use. National transportation-related digital infrastructure initiatives promoting standardized work zone data, signal data, and AV reporting frameworks offer a pathway toward transferable solutions. The checklist therefore includes an item about maintaining an explicit standards posture, so jurisdictions align with emerging national standards rather than developing stand-alone or incompatible systems (E9-014). Additionally, safety organizations have recommended that standardized digital messages, including SPaT and emergency-vehicle preemption/approach information, be made available in forms that AVs can consume to improve operational safety and predictability [10].

F. Performance Measurement & Transparency

This dimension contains elements related to whether agencies define and agree on operator **performance metrics** and **review** incidents/traffic-control events.

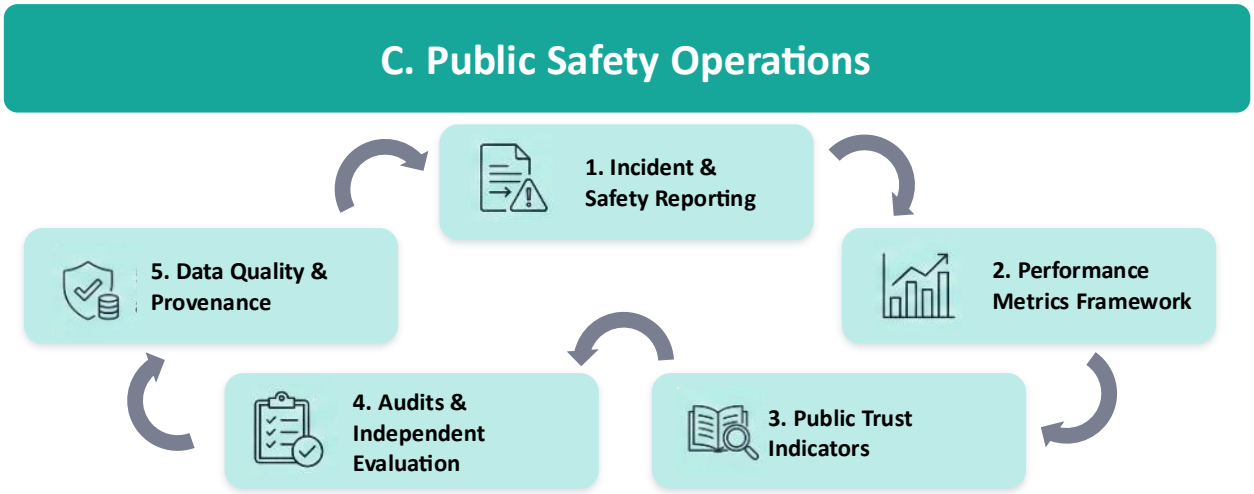
F1. Incident & Safety Reporting

Systematic incident and safety reporting emerged as a foundational element of AV readiness, enabling cities to understand the frequency, severity, and nature of AV-related events. Deployment experience demonstrated the value of tracking not only collisions, but also non-crash incidents such as vehicles blocking traffic, emergency access obstructions, or other unusual operational disruptions. Austin's documentation of more than 130 AV-related incidents

over a one-year period illustrates how routine logging can surface operational patterns that would otherwise remain anecdotal [1]. San Francisco similarly tracked "unusual occurrences" involving AVs, particularly those affecting emergency response. These experiences informed the checklist item about the establishment of consistent incident and safety reporting mechanisms that allow jurisdictions to monitor AV performance relative to human-driven baselines and identify emerging risks (F1-001). For more information, refer to B5-C8.

F1.1 Traffic Control After-Action Reviews (AARs)

Deployment experience highlighted the value of structured review following traffic control-related AV incidents or operational challenges. Interactions involving flaggers, hand signals, or emergency detours were not always interpreted as intended by AV systems, as illustrated by Austin's observation that vehicles must respond appropriately to emergency scenes without city intervention [1], and by documented law enforcement interactions in Phoenix [6]. These cases underscore the importance of after-action reviews to identify root causes, refine procedures, and update guidance for both human traffic controllers and AV operators. The checklist includes an item about jurisdictions conducting traffic control AARs for significant events, using lessons learned to inform future planning, training, and coordination efforts (F1-003).



F2. Performance Metrics Framework

Beyond individual incidents, jurisdictions benefit from a structured framework for measuring AV performance across multiple dimensions. Research across study cities identified several categories of metrics as particularly relevant, including safety outcomes (collision rates and severity), operational performance (response time to disabled vehicles, duration of stoppages, fallback mode frequency), mobility impacts (wait times, utilization, empty vehicle miles traveled), and traffic system effects (vehicle miles traveled and potential impacts on transit ridership). San Francisco expressed particular interest in understanding whether AVs contribute to increased vehicle miles traveled through empty repositioning, a concern that may be addressed through expanded reporting [3]. The checklist therefore includes a performance metrics framework subdomain, so jurisdictions can define a core set of indicators and report on them consistently over time (F2-004, F2-005). Operational metrics can also include 'stuck vehicle' response time targets agreed with operators (e.g., minutes to remote resolution versus tow), incorporated into incident management KPIs (F2-009).

F2.1 System performance monitoring

The reliability of digital infrastructure depends not only on connectivity but also on data accuracy, completeness, and ongoing maintenance. Deployment experience demonstrated that incorrect or outdated digital information, such as erroneous signal timing data in early connected vehicle pilots, can mislead automated systems and undermine trust. More critically, gaps in incident data limited cities' ability to detect emerging safety risks (see related F5). These experiences informed the checklist item about system performance monitoring, including validation, quality assurance, and continuous oversight of all digital feeds and interfaces (F2-006).

F2.2 Service coverage

Geographic coverage emerged as a recurring concern in early AV deployments, as operators often prioritize initial service areas based on technical feasibility, demand, or commercial considerations. In San Francisco, early Cruise and Waymo service zones avoided some lower-income neighborhoods and public housing sites, prompting concerns from city officials and community advocates. Subsequent expansions partially addressed these gaps but did not eliminate uneven access. Similarly, smaller cities and rural jurisdictions with limited technical or administrative capacity face distinct challenges: they may lack transit agencies, have fewer public resources, and/or lack the leverage to negotiate customized pilot programs due to low density travel demand. These experiences informed the checklist item about jurisdictions reviewing AV service coverage against local maps [13][27][28] (F2-007, F2-008).

F3. Public Trust Indicators

Public trust emerged as both an outcome of transparency and a measurable indicator of deployment success. In the absence of reliable information, misinformation and speculation can undermine confidence in AV programs. San Francisco's experience demonstrated that releasing concrete incident data, such as the publication of fire department reports documenting AV interference, helped replace rumors with factual discussion and informed public debate [7]. Additional indicators, such as the volume of 311 complaints or trends in public sentiment, were identified as useful proxies for community acceptance. The checklist includes an item about jurisdictions monitoring public trust indicators alongside technical performance metrics, recognizing that sustained deployment depends on maintaining public confidence as much as operational reliability (F3-010, F3-011).

F4. Audits & Independent Evaluation

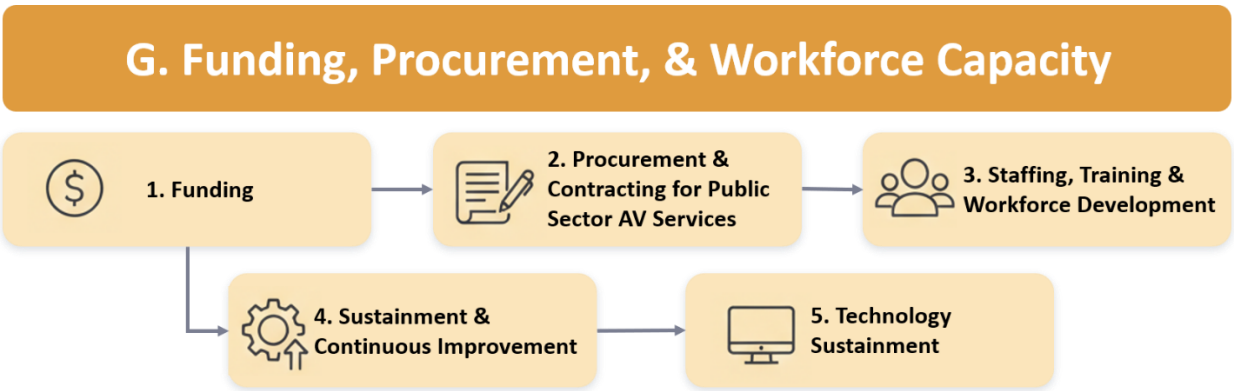
Reliance on self-reported data from AV operators was identified as a limitation in existing oversight frameworks. In California, required disengagement and performance reports are not independently audited and lack sufficient geographic granularity for local analysis, a shortcoming highlighted by San Francisco officials [3]. These constraints prompted cities to seek additional verification mechanisms, including cross-referencing company-reported data with police reports, fire department logs, and public complaints. Based on these observed practices, the checklist lists an option for third-party review, validation, or supplemental data collection practices that strengthen confidence in reported performance metrics (F4-012).

F5. Data Quality & Provenance

The usefulness of performance measurement depends on the quality, completeness, and traceability of underlying data. Deployment experience showed that fragmented or incomplete data can obscure emerging safety issues and delay corrective action. In San Francisco, officials were forced to manually compile fire department reports to understand the extent of AV-related disruptions, revealing significant gaps in automated reporting [7]. These experiences informed the checklist item about data provenance and quality assurance, so jurisdictions can establish processes for validating data sources, reconciling discrepancies, and maintaining reliable records across agencies and reporting channels (F5-013).

G. Funding, Procurement, & Workforce Capacity

This dimension contains elements related to whether agencies have dedicated **funding, staffing**, **training**, and **lifecycle** support for (A-F).



G1. Funding

Establishing a clear program funding model is essential to sustaining AV readiness activities over time. Deployment experience showed that AV readiness is most effective when there are dedicated resources for staff coordination, data analysis, digital infrastructure, training, and targeted physical improvements, many of which align with, but extend beyond, traditional transportation budgets. Cities such as Austin and Los Angeles invested in dedicated staff roles and data platforms to manage AV-related activities, while other jurisdictions relied on time-limited project funding. The checklist therefore includes an item about jurisdictions defining how AV readiness activities will be funded long term, rather than treating them as ad hoc or unfunded responsibilities (G1-001). This includes identifying baseline funding commitments and aligning AV readiness with broader transportation and innovation programs [27][28] (G1-002). Funding commitments should reflect the full scope of readiness activities identified across domains A through F, including staffing and interagency coordination (A2), data systems and technology investments (E), and first responder training (C1).

G2. Procurement & Contracting for Public Sector AV Services

Traditional public-sector procurement processes are often ill-suited to rapidly evolving AV technologies and pilot deployments. Deployment experience highlighted the value of flexible procurement approaches that allow jurisdictions to enter into short-term pilot agreements, research partnerships, or innovation-focused contracts without the delays associated with full-scale competitive procurements. Some cities developed streamlined templates for pilot

projects, enabling faster engagement with AV shuttle providers or data service vendors. The checklist includes procurement and contracting as a readiness subdomain, so jurisdictions review and, where possible, adapt procurement rules to support innovation while maintaining transparency and accountability [3][27][28] (G2-003).

G3. Staffing, Training & Workforce Development

AV readiness places new demands on public-sector staffing with expertise in automated systems, data analysis, interagency coordination, and policy development. Large cities built internal capacity by creating dedicated AV or automated driving policy roles, while others relied on consultants or regional expertise. Deployment experience showed that insufficient staffing can slow response to incidents, limit effective data use, and reduce a jurisdiction's ability to engage proactively with operators and regulators. The checklist therefore includes an item to clearly define staffing roles and responsibilities for AV readiness, including identifying lead coordinators and ensuring continuity as deployments scale [1][27][28] (G3-004).

G3.1 Training and workforce development

Beyond staffing levels, workforce readiness depends on training and skill development across multiple functions. City staff can benefit from understanding AV technologies and data flows, while first responders and operations personnel need specialized training to safely manage AV-related incidents. Smaller jurisdictions may depend on state agencies or regional partners for technical support and training resources. The checklist includes training and workforce development as an item, so jurisdictions review workforce skill gaps, provide targeted training, and plan for evolving workforce needs as AV deployments become more complex [7][27][28] (G3-005, G3-006).

G4. Sustainment & Continuous Improvement

AV readiness is not a one-time effort but an ongoing program that adapts as technologies, policies, and deployment patterns evolve. Deployment experience demonstrated that initial pilot funding or staffing models may be sufficient in early stages but become inadequate as AV activity increases. The checklist therefore includes an item about sustainment and continuous improvement, so jurisdictions can plan for long-term operational support, periodic review of readiness activities, and iterative updates to policies and practices based on deployment experience and performance data [12][27][28] (G4-007). The performance data and after-action findings generated in domains C and F provide the empirical basis for these iterative updates.

G5. Technology Sustainment

Technology investments supporting AV readiness - such as data platforms, connected infrastructure, or digital communication tools - need ongoing maintenance, quality assurance, and upgrades. Deployment experience highlighted the risk of underinvesting in sustainment, leading to outdated or unreliable systems that undermine operational effectiveness. The checklist therefore includes technology sustainment as a distinct subdomain, identifying the need to plan for lifecycle costs, redundancy, and long-term support for digital and physical technologies used in AV management [3][27][28] (G5-008). See domain E for more information on the data platform uses.

Conclusion

This companion report documents the empirical foundation, design logic, and practical intent of the State and Local Public Agency AV At-Scale Deployment Readiness Checklist (AV-Scale Checklist). Drawing from real-world deployment experience in San Francisco, Los Angeles, Austin, and Phoenix, as well as state-level practices in California, Texas, and Arizona, the checklist translates observed lessons, failure modes, and effective practices into a structured, actionable readiness framework. The checklist spreadsheet is designed as a public agency ***self-assessment and planning tool***, and its comprehensive organization reflects the variety of legal authority, institutional capacity, and operational context across jurisdictions, while highlighting common readiness needs that emerged consistently across deployments.

Given the rapidly evolving nature of AV deployments as they scale across U.S. cities and globally, this checklist captures the observed practices at the time of writing and may need to be updated as new common practices emerge. For future information, please check the Mobility COE website at https://www.mobilitycoe.org.

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AV-Scale Checklist Companion Report Version V1.0

Jiaqi Ma, Professor at the UCLA Samueli School of Engineering and Director of Mobility Center of Excellence

Camila Correa-Jullian, Ph.D., Postdoctoral Scholar and Program Manager of Mobility Center of Excellence

November, 2026

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