



Oversight Procedure 32A – Project Transit Capacity Review

1.0 PURPOSE

This Oversight Procedure describes the review, analysis, recommended procedures and reporting requirements that the Federal Transit Administration (FTA) expects from the Project Management Oversight Contractor (PMOC) regarding the transit design capacity, functionality, and project definition for critical project scope elements relative to that required to achieve forecasted conditions and be consistent with sound engineering practices.

2.0 BACKGROUND

In the past, FTA projects have sometimes reduced capacity to meet cost ceilings. This approach emphasized near term capital cost at the expense of the long term use of the infrastructure investment. Project expansions and renovations are expected on some of these projects within ten years of revenue operations. Undertaking a transit capacity review is one tool FTA can use to ensure more efficient use of public funds.

3.0 OBJECTIVES

This review may occur prior to a project's entry into the Engineering Phase and may be conducted prior to awarding a Full Funding Grant Agreement if the project's scope or the project sponsor's operations have changed since the Engineering phase review. However, it can be also ordered earlier if the scope of investment is known and the FTA is concerned about core capacity impacts of the proposed investment.

The evaluation of transit design capacity is critical to FTA's determination as to whether the project:

- can meet its stated project purposes and goals, and at least its 20-year forecasted ridership and level of service;
- is "right-sized" or not too big or small;
- employs economies of scale; and,
- keeps operating, maintenance, and rebuild costs reasonably low over the long term.

In addition, if the project will become part of an existing transit system, the assessment will include the project's impact upon the capacity of the existing transit system. The review should be tailored to the specific Project Sponsor, its track record and the risks associated with implementation of the proposed project.

If the project is proposed as a Core Capacity Improvement Project, the sponsor must demonstrate that the corridor is at or over capacity; or is projected to be at or over capacity within the next 5 years.

4.0 REFERENCES

TCRP Report 100 Transit Capacity and Quality of Service Manual, 2nd edition (2003) - In addition, the statutes, regulations, policies, circulars, and guidance documents noted in OP 01 apply.

Title 49 United States Code Chapter 53 (49 USC 53) Federal Transit Laws as amended by Moving Ahead for Progress in the 21st Century Act (MAP-21).

5.0 PROJECT SPONSOR SUBMITTALS

Information required to accomplish this review include all engineering studies, preliminary reports, drawings and other documents produced on the project to date, which describe the project details. Specifically, the PMOC should review the following documents and information submitted by the Project Sponsor:

- Drawings of proposed transit project;
- Drawings of the existing transit system (civil, architectural, electrical, mechanical, communications);
- Operations Plans;
- Fleet Management Plan;
- Capacity Studies for the proposed project in the context of the existing system (as applicable); the studies should cover applicable items in TCRP Report 100 including but not limited to guideway and station sizing, including platform and support spaces for mechanical and electrical equipment, and pedestrian circulation capacity and access for persons with disabilities (ADA);
- The Project Sponsor's previous experience with past capital projects that are related to the proposed project scope as reported in their Grant Application
- Project Sponsor staffing capacity and Force Account workload during the proposed project implementation period as reported in their Grant Application
- Project Sponsor's cost and schedule performance on past capital projects;
- Project Sponsor's system, facilities and equipment utilization before and after the introduction of the proposed project. as reported in their Grant Application;
- Project Sponsor's plan for financing, staffing and governing the proposed system improvement based on Project Sponsor Finance Plan as updated at each phase of the project;
- Project Sponsor's plans for interfaces with other systems and utilities based on Project Sponsor's Finance Plan as updated at each phase of the project;
- Results of any prior Before and After studies; and
- Project Sponsor's baseline performance on ridership and operating efficiency metrics as reported in annual reports or to the National Transit Database (NTD) program including:
 - System and corridor ridership trends;
 - Peak of Peak hour Ridership at maximum load point in project corridor;
 - Peak hour vs. average daily use in project corridor;
 - System-wide Fare Box Recovery Ratio (Fare Revenue/Operating Cost);
 - Vehicles spare ratio to peak hour needs as reported to NTD; and

- Vehicles Mean Distance Between Failures (MDBF) as reported to NTD or annual reports.
- For Core Capacity Improvement Projects documentation of the current and projected ridership in the corridor, current limitations to expansion of capacity in the corridor; and how the proposed improvement will increase transit capacity in the corridor by 10% or more.

6.0 SCOPE OF WORK

The PMOC should review the Project Sponsor's drawings, operations plans, and capacity analyses. Assess and evaluate the physical capacity of the project and its component parts to accommodate the forecasted ridership and level of service. Assess long-term vs. short-term capital and operating cost and service trade-offs inherent in capacity choices.

If the project will become part of an existing transit system, assess the project's impact upon the capacity of the existing transit system, for example, will the project boost the carrying capacity of the entire system, overload the system or create bottlenecks. Consider whether the Project Sponsor can build, operate, and maintain its entire system without reducing existing public transportation services or level of service to operate the proposed project. Consider the Project Sponsor's financial and staffing capabilities to operate, and maintain the project in addition to its existing system.

Referring to TCRP Report 100, identify the topics applicable to the project. The capacity sections of the manual provide both planning and detailed operations analysis procedures for assessing capacity for transit modes and the individual components within transit projects. Employ the building-block approach suggested in the manual. Initially address the capacity characteristics of individual transit stops and station components, and then expand the concepts to address the capacity of broader transit services, facilities, and systems.

The PMOC shall review the relevant items according to the current project phase as follows:

1. Reviews for entry into Engineering
2. Reviews during Engineering
3. Reviews for Full Funding Grant Agreement (FFGA)

The PMOC shall gain an understanding of the following with respect to the project and the Project Sponsor's updates relevant to the current project phase at the time of the PMOC review. For Core Capacity Improvement Projects, the PMOC shall also gain an understanding of the current or projected limitations to expansion of transit capacity within the selected corridor and how the proposed improvements will increase transit capacity by 10% or more in the corridor.

- Route information
 - Selection
 - Route and station coordination for ease of transferring among passenger transport agencies
 - Requests and requirements by customers, public officials, other departments or the general public
 - Paratransit operations

- Schedule and staffing¹
 - Headways
 - Schedule adherence
 - Operational constraints
 - During construction (access to construction, shut down of transit and utilities, etc.)
 - During full revenue service
 - Due to weather-related emergencies and other unexpected occurrences
 - Verify sufficiency of staffing
 - Verify sufficiency of funding for operations considering agency finances
- Station design²
 - Pedestrian access from public way; intermodalism or connectivity with other passenger transport;
 - Consider fire exiting design criteria for public areas, platforms, stairways;
 - Capacity of escalators, elevators, stairs;
 - Dimensional and clearance requirements of the Americans with Disabilities Act.

The PMOC's evaluation shall include:

- 1) "Line capacity" or theoretical capacity of the project, as defined by TCRP Report 100 as "the maximum number of trains that can be operated over a section of track in a given period of time, typically one hour... The factor providing the lowest capacity—the weakest link—will constrain the capacity of a given section of a line." As the report notes, "ideally, the combination of the train signaling system being used and the station with the longest dwell time will control the line capacity. However, under less-than-ideal conditions, any number of other factors may control line capacity." The PMOC shall analyze other factors that may control line capacity including:
 - a) Line capacity and vehicle capacity, both relating to the number of trains that can be operated per hour, are equivalent terms for rail.
 - b) Station dwell time and the minimum train separation produced by the signaling system.
 - c) Signaling systems designed for the minimum planned train headway, rather than maximum capacity.
 - d) Speed restrictions due to sharp curves or steep downgrades on the approach to the station with the longest dwell time.
 - e) Line crossings and merges, particularly at-grade track junctions.
 - f) Time required to turn back a train at a terminal station.
 - g) Mode-specific issues, such as light rail trains operating in mixed traffic or commuter rail trains sharing tracks with freight trains.
 - h) Traction power substation type and characteristics, DC distribution systems including the OCS, DC feeders, and return rails, and the power characteristics of the vehicles to be used on the system.

¹ Starting with Entry into Engineering unless the scope of investment is known earlier. Re-reviewed for FFGA as indicated by changes in details of the system design or the Project Sponsor's operations.

² Typically only reviewed for Engineering Phase and for FFGA when design or conditions are substantially changed from Engineering Phase.

- i) Person capacity after adjustments to line capacity.
 - j) Capacity modeling shall develop static and dynamically elements for traffic operations and other guideway elements such as vertical and horizontal curvature and line of sight restrictions.
 - k) Capacity of the project's maintenance infrastructure (as-built) such as shops, yards, secondary maintenance, component rebuilds or capital inventory requirements using a structured and methodical approach that makes maximum use of previous TRB work and other existing engineering data.
- 2) Capacity of the transit project as required to meet the passenger load requirements forecasted for the revenue operations date (peak hour passenger boardings) and the recommended "mature capacity" identified in TCRP 100. When the transit project is forecast to operate with crowding consider how long the typical passenger will be expected to ride on a crowded vehicle and what fraction of the overall forecast ridership will be riding under crowded conditions.
- 3) This assessment shall also address the relationship between cost and transit design capacity for the project and the system. Consider capital costs, operating, maintenance, and replacement costs.
- a) Consider forecasted ridership for the project for milestones including opening day of service, the 20-year forecast year, and system-specific milestones that may be noted in the fleet management plan.
 - b) Estimate the useful economic life for major project elements. Refer to the "Build Annualized Worksheet" within FTA's Standard Cost Category (SCC) Workbook on FTA's public website for useful life lengths.
 - c) Assess for cost effectiveness the proposed "build out" approach for the transit project given the revenue operations date, and the 20-year, 50-year, and 100-year horizons (if specified in project plans). Recommendations should consider the time value of money at the prevailing public bond rate as well as the costs associated with various construction approaches where specified for possible future expansions.
 - d) Potential enhancements and benefits to the existing transit systems (Transfer Stations, Intermodal Connections, Passengers Comfort and Travel Time Savings)
 - e) Urban Development Enhancements and Potential Benefits to the Communities.
- 4) Technological and organizational risks posed by the proposed project including:
- a) Is the proposed technology new or proven in the industry?
 - b) Is the proposed technology new or proven on the Project Sponsor's system and how does it fit with the existing system and support facilities including those for maintenance and storage?
 - c) Do relationships among stakeholders and funding partners seem durable and realistic?
 - d) Are interfaces with systems and utilities likely to succeed?
 - e) Does the track record of the Project Sponsor or design of the proposed project indicate possible risks relative to:
 - i) Failure to meet forecast growth in ridership after opening year
 - ii) Overcrowding or underutilization during peak periods
 - iii) Meeting fare revenue and operating cost forecasts
 - iv) Maintaining appropriate spare ratios (too low or too high)

- v) Maintaining an acceptable level of in-service vehicle failures

7.0 REPORT, PRESENTATION, RECONCILIATION

The PMOC shall provide FTA with a written report of its findings, analysis, recommendations, and professional opinions, including a description of the review activities undertaken, as well as supporting diagrams, calculations, etc.

After FTA approval, the PMOC should share the report with the Project Sponsor. In the event that differences of opinion exist between the PMOC and the Project Sponsor regarding the PMOC's findings, the FTA may direct the PMOC to reconcile its findings with the Project Sponsor and provide FTA with a report addendum covering the agreed modifications by the Project Sponsor and PMOC.

The report formatting requirements of OP 01 apply. When necessary, PMOC shall perform data analysis and develop data models that meet FTA requirements using Microsoft Office products such as Excel and Word and use FTA-templates when provided. The PMOC may add other software as required but documentation and report data shall be made available to FTA.

APPENDIX A

Acceptable Quality Level

	DESIRED OUTCOME	PERFORMANCE REQUIREMENT	CHECK LIST	ACCEPTABLE QUALITY LEVEL	PERFORMANCE MEASURE	MONITORING METHOD
1	The PMOC shall review and analyze Project Capacity.	R1a. The PMOC shall develop and document a process for review and analysis of Project Capacity at all phases of the Project.		Q1a. Process exists and has been followed.	M1a. Evidence of a documented process.	MM1a. Periodic review by FTA or its agent.
		R1b. The PMOC shall use its process to analyze and make recommendations concerning Project Capacity at all phases of the project.		Q1b. Review must be made and the PMOC provides internal verification that the process as documented has been followed.	M1b. Documented review and analysis of reporting requirements and project capacity review.	MM1b. Periodic review by FTA or its agent.
2	The PMOC shall review and evaluate Project Sponsor's capacity analyses and other documentation, evaluate physical capacity, assess long-term and short-term capital choices and, where necessary, evaluate impact on existing transit facilities during the various phases of the Project.	R2a. The PMOC shall evaluate Project Sponsor's documentation for Route Information, Schedule and staffing for proposed operations and Station design.		Q2b. Professional opinion of Project Sponsor's route, staffing and station design.	M2b. Documented evidence of a thorough review of Project Sponsor's route, staffing and station design documents, supported by a professional opinion.	MM2b. Periodic review by FTA or its agent.
		R2b. The PMOC shall make a full assessment and evaluation of the Project's Transit Capacity and Quality of Service using the TCRP Report 100 Manual, beginning with analysis of individual stops and stations then expanding the analysis to address broader system issues.		Q2b. Professional opinion of Project Sponsor's transit capacity using TCRP Report 100 Manual.	M2b. Documented evidence of a thorough review of Project Sponsor's Project transit capacity characteristics, supported by a professional opinion.	MM2b. Periodic review by FTA or its agent.
		R2c. The PMOC shall evaluate and address Line capacity of Project Sponsor's Project, capacity to meet forecasted loads, relationship between cost and design capacity, forecasted ridership, estimate useful economic life, cost effectiveness for time value of money and construction approaches and make suitable recommendations.		Q2c. Professional opinion of critical elements of scope, cost and capacity.	M2c. Documented evidence of evaluation of line capacity, transit capacity, cost effectiveness and other matters together with recommendations, supported by a professional opinion.	MM2c. Periodic review by FTA or its agent.
3	The PMOC shall document its findings, professional opinions, and recommendations in a report to the FTA.	R3. The PMOC shall present its findings, conclusions, and recommendations to FTA and, upon FTA approval, reconcile those recommendations with the Project Sponsor to the extent possible.		Q3. Reports and presentations are professional, clear, concise, and well written. The findings and conclusions have been reconciled with other PMOC reports and have been reconciled with Project Sponsor to the extent possible.	M3. PMOC's findings, conclusions, recommendations, and presentation.	MM3b. Periodic review by FTA or its agent.