<Project Name>

<Location and State>

Plan for the Before-and-After Study

<Date>

The <name> project will introduce a <length and nature> line extending from <end> to <end> in the <corridor and its location>. The <project> will include <number> stations <and any other key features of the project that fit within this and perhaps one additional sentence>.

Federal law (49 USC 5309(k)(2)(E)) requires a Before-and-After Study (B&AS) for transit projects that receive capital-grant funding through a Full Funding Grant Agreement (FFGA) with the Federal Transit Administration (FTA). The purposes of the study are, first, to document the actual outcomes of the project and, second, to evaluate the accuracy of, and any lessons learned from, the predictions of those outcomes made during planning and development of the project.

As the sponsor of the project, the <agency> is responsible for the B&AS and its successful completion. The <project sponsor> has designated the <position within the agency, not a name> as the point of contact for all B&AS activities and for management of the study. Other <project sponsor> departments will support various elements of the study including <other departments, as appropriate>. Other agencies will support various elements of the study including <other agencies and their responsibilities, as appropriate>.

The study will focus on the five project outcomes identified in federal law: physical scope, capital costs, transit service levels (including capacity), operating and maintenance costs, and ridership. The <project sponsor> has not elected to add any other project impacts to the scope of the B&AS. [Alternatively, this sentence would identify optional topics added by the sponsor.]

To measure the actual outcomes of the project, the <project sponsor> will collect data on actual conditions before and after the opening of the extension.

To support evaluation of the accuracy of the predicted outcomes for the project, the <project sponsor> will document and archive the predictions developed by the <project sponsor> at two decision milestones during the development of the project: at the project’s entry into engineering at the FFGA. Once the actual outcomes are known, the <project sponsor> will compare the predictions to the actual outcomes, examine any significant differences, identify the causes of those differences, and describe any lessons learned from the evaluation.

The FFGA for the project will include this plan by reference and require the successful completion of the study. Any changes in this plan will be made cooperatively by the <project sponsor> and FTA.

**SCOPE OF WORK**

This Before-and-After Study involves seven tasks over an extended period of time. Tasks 1 and 2 occur at milestones during the development of the project and focus on the documentation and archiving of the predicted outcomes of the project. Tasks 3 and 4 collect data on actual conditions in the corridor and the transit system – with Task 3 focusing on conditions before the project opens to service and Task 4 focusing on conditions after opening. Task 5 is the development of technical memoranda documenting the actual outcomes and accuracy of the predicted outcomes. Task 6 is the preparation of the final report summarizing the findings, insights, and conclusions from the study.

1. Archive predictions at entry into engineering

The purpose of this task is to document and preserve predictions at this milestone so that they are readily available to later analyses by the <project sponsor> of their accuracy compared to the actual outcomes of the project.

* 1. For each project outcome, the <project sponsor> will assemble the materials necessary to document the predictions at this milestone according to the specifications in Appendix A.
  2. The <project sponsor> will document the results of this task in a memorandum addressed to the staff who will prepare the technical memoranda in Task 5. For each project outcome, the memorandum will provide an annotated inventory of the archived materials and highlight analyses, special studies, and known uncertainties that may be useful in the later evaluation of the accuracy of the predictions.
  3. The <project sponsor> will prepare three electronic copies of the archived materials and documentation from this milestone, keeping two in separate locations locally and sending the third to FTA for review and safekeeping.

1. Archive predictions at the FFGA

The first purpose of this task is to document and preserve predictions at this milestone so that they are readily available to later analyses by the <project sponsor> of their accuracy compared to the actual outcomes of the project. The second purpose is to examine the apparent accuracy of the predictions at the earlier entry-into-engineering milestone compared to the current predictions at this milestone. This early analysis of predictive accuracy is intended to provide contemporaneous insights into differences in the predictions at the two milestones – insights that may no longer be available if the analysis is deferred until completion of predicted-actual comparisons in Task 5.

* 1. For each project outcome, the <project sponsor> will assemble the materials necessary to document the predictions at this milestone according to the specifications in Appendix A. The assembly of relevant materials will be an ongoing activity throughout engineering, coordinated at no less than quarterly meetings between the <project sponsor>, FTA, and FTA’s project management oversight contractor (PMOC).
  2. For each project outcome, the <project sponsor> will evaluate the accuracy of predictions at the previous milestone compared to current predictions. This evaluation will identify and explain the causes of any significant differences and suggest any lessons learned that may be useful in future project-development efforts.
  3. The <project sponsor> will document the results of this task in a memorandum addressed to the staff who will prepare the technical memoranda in Task 5. For each project outcome, the memorandum will provide an annotated inventory of the archived materials, highlight materials that may be of particular utility in the later evaluation of the accuracy of the predictions, and document the accuracy of predictions at the previous milestone compared to current predictions.
  4. The <project sponsor> will prepare three electronic copies of the archived materials and documentation from this milestone, keeping two in separate locations locally and sending the third to FTA for review and safekeeping.

1. Collect and archive data on conditions before project opening

The purpose of this task is to establish the basis for measuring the actual impacts of the project on transit service levels (including capacity), O&M costs, and transit ridership. Many of the project-impact measures for these three outcomes are differences in conditions before and after the project opens for service. At this milestone, the <project sponsor> will collect the “before” data to support isolation of those differences. This milestone does not include any data collection on the physical scope or capital costs of the project.

* 1. The <project sponsor> will prepare designs for data collection at this milestone, consistent with the specifications in Appendix C, which will also apply to the parallel data that will be collected in Task 4 on transit service levels, O&M costs, and transit ridership after the project opens to service. The <project sponsor> will ensure consistency in scope, sources, rider-survey methods, and other aspects of the designs so that computed differences between the before and after datasets reflect actual changes in conditions rather than inconsistencies in data-collection methods. The <project sponsor> will provide to FTA an opportunity to review and comment on the designs for data collection.
  2. The <project sponsor> will collect, document, and archive data on current transit service levels (including capacity), O&M costs, and ridership according to the designs for data collection. The <project sponsor> will collect the data before the beginning of any project construction that would cause disruptions of transit services.
  3. The <project sponsor> will document the results of this task in a memorandum addressed to the staff who will prepare the technical memoranda in Task 5. For each of the three outcomes, the memorandum will provide an annotated inventory of the archived data and provide summaries of the data that will be useful in the later comparisons of conditions before and after project opening.
  4. The <project sponsor> will prepare three electronic copies of the archived data and documentation from this milestone, keeping two in separate locations locally and sending the third to FTA for review and safekeeping.

1. Collect and archive data on conditions after project opening

The purpose of this task is to collect the data needed to establish the actual outcomes of the project for all five project outcomes – physical scope, capital costs, transit service levels, O&M costs, and transit ridership.

* 1. The <project sponsor> will collect and document data on the actual physical scope and capital costs of the project, consistent with the specifications in Appendix B, as this information becomes available over the period of project construction. Data on physical scope will include any redesigns and change orders that alter the scope definition in the FFGA. Data on capital costs will include actual expenditures by month for the detailed (two decimal place) Standard Cost Categories.
  2. At approximately two years after project opening, the <project sponsor> will use the data-collection methods designed in Task 3, consistent with the specifications in Appendix C, to collect and document data on actual transit service levels (including capacity), O&M costs, and ridership.
  3. The <project sponsor> will document the results of this task in a memorandum addressed to the staff who will prepare the technical memoranda in Task 5. For each of the five project outcomes, the memorandum will provide an annotated inventory of the archived data and provide summaries of the data that will be useful in the preparation of the memoranda.

1. Document actual project outcomes and the accuracy of predicted outcomes

The purpose of this task is to analyze and document in detail both the actual outcomes and the accuracy of the predictions for all five project outcomes. The five technical memoranda that the <project sponsor> will produce in this task will become appendices to the final report prepared in Task 6. This arrangement permits full documentation of the analyses in whatever length is needed and enables the final report to focus on big-picture findings, insights, and conclusions in a relatively brief, readable document. For any topic where full documentation requires only a few pages, an appendix will not be needed and the documentation may serve instead as the chapter in the body of the report.

* 1. For each of the five project outcomes, the <project sponsor> will prepare a technical memorandum that documents the actual outcome of the project, evaluates the accuracy of the predictions compared to those outcomes, determines the causes of any significant predicted-actual differences, and identifies any lessons learned that may be useful in the development of future projects.
  2. The <project sponsor> will initiate the analyses of physical scope and capital costs as soon after project opening as possible. In the interest of the timely capture of insights on project scope and cost, the analysis will be done before the scope and cost information is finalized, unless outstanding scope items and costs (claims, etc.) are so large as to affect the findings in substantive ways. Adjustments can be made to scope details and final costs as the final information because available.
  3. The <project sponsor> will initiate the analyses of transit service, O&M costs, and ridership when information for those outcomes becomes available for the “after” milestone.
  4. As the individual memoranda are prepared, the <project sponsor> will provide drafts to FTA for review and comment.
  5. The <project sponsor> will prepare final versions of the memoranda in response to FTA comments.

1. Prepare the final report

The purpose of this task is to produce a concise final report from the Before-and-After Study that presents the findings, insights, and conclusions drawn from the individual memoranda in Task 5.

* 1. The <project sponsor> will prepare a draft of the final report consistent with the outline in Appendix D.
  2. The <project sponsor> will provide the draft report to FTA for review and comment.
  3. Within 36 months of project opening, the <project sponsor> will prepare the final version of the report in response to FTA comments.

Anticipated Schedule for the Before-and-After Study

|  |  |
| --- | --- |
| Task | Completed by: |
| 1. Archive predictions at entry into engineering |  |
| 1. Archive predictions at the FFGA |  |
| 1. Collect and archive data on conditions before project opening |  |
| 1. Collect and archive data on conditions after project opening |  |
| 1. Document actual project outcomes and accuracy of predictions |  |
| 1. Prepare the final report |  |

Labor-Hour Budget for the Before-and-After Study (person-days)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Task | Principal/ Manager | Senior Planner/ Engineer | Junior Planner/ Engineer | Total |
| 1. Archive predictions at entry into engineering |  |  |  |  |
| 1. Archive predictions at the FFGA |  |  |  |  |
| 1. Collect and archive data on conditions before project opening |  |  |  |  |
| 1. Collect and archive data on conditions after project opening |  |  |  |  |
| 1. Document actual project outcomes and accuracy of predictions |  |  |  |  |
| 1. Prepare the final report |  |  |  |  |
| Totals for the Before-and-After Study |  |  |  |  |

Estimated Costs of Rider Data Collection for the Before-and-After Study

|  |  |
| --- | --- |
| Task | Total Cost |
| Rider survey(s) to support Task 3 |  |
| Rider survey(s) to support Task 4 |  |
| Total for the Before-and-After Study |  |

Appendix A

Documentation and Archiving of Predicted Project Outcomes

**Table A-0. Items Archived at Prediction Milestones: Public Documents**

1. **Materials**
2. Draft/Final NEPA Documents
3. Documentation provided to FTA per FTA reporting instructions to support FTA project ratings at decision points

**Table A-1. Items Archived at Prediction Milestones: Physical Scope**

1. **Materials, as available at each milestone**
2. Specifications
3. Design plans/sheets
4. Concept design drawings
5. Technical memoranda, engineering design reports, facilities design reports
6. Basis-of-design report, utilities report, permitting report
7. Estimate of fleet needs for rail and bus services
8. Real Estate Acquisition Plan
9. Request for Bids or proposals; construction contracts and addenda
10. **Analyses**
11. Documentation of predicted project scope in detailed Standard Cost Category format
12. Comparison of predicted scope from previous milestone (if any) against current predicted scope
13. Explanation of significant differences between previous and current predictions

**Table A-2. Items Archived at Prediction Milestones: Capital Cost**

1. **Materials**
2. The Standard Cost Category workbook documenting predicted costs in base-year and inflated dollars
3. Technical memoranda and supporting materials prepared in the course of the costing work
4. **Analyses**
5. Comparison of predicted scope from previous milestone (if any) against current predicted scope
6. Explanation of significant differences between previous and current predictions

**Table A-3. Items Archived at Prediction Milestones: Transit Service Levels**

1. **Materials**
2. Service plan for the project in its opening year (plus the following if not in the service plan document)
3. Design philosophy/policies for the service plan
4. Map(s) of planned bus and rail routes in the project corridor
5. Table of individual routes in and near the project corridor documenting planned differences between current services and opening year (no change, added, dropped, adjusted routing, adjusted headways, adjusted spans of service)
6. Table of individual routes in and near the project corridor documenting current and planned end-to-end run time with key time-points
7. Table of individual routes in and near the project corridor documenting current and planned vehicle-miles and vehicle-hours of revenue service and peak-hour capacity
8. **Analyses** (if not already provided in the service plan document)
9. Comparison of anticipated service plan from previous milestone (if any) against current service plan
10. Explanation of significant differences between previous and current service plans

**Table A-4. Items Archived at Prediction Milestones: Operating and Maintenance Costs**

1. **Materials**
2. Documentation of the cost models and the data supporting their development
3. Predicted O&M costs by transit mode, shown in the O&M cost models implemented for the anticipated service plan for the project
4. **Analyses**
5. Comparison of predicted O&M costs from previous milestone (if any) against predicted O&M costs
6. Explanation of significant differences between previous and current O&M cost predictions

**Table A-5. Items Archived at Prediction Milestones: Travel Forecasts**

1. **Materials**
2. Information from development/update of the locally developed model used to prepare the forecasts for this milestone (not applicable to STOPS but does apply to any special-market models used in conjunction with STOPS)

* Existing report(s) documenting the travel model and its validation
* Transit-rider survey data that supported model development and testing
* Validation forecast of “current” conditions demonstrating the model’s grasp of transit travel patterns
* The application procedures for the travel model (good practice, but optional) to support future revisions to the forecasts using actual conditions in the opening year

1. Predictions
   * forecasts for current year (and separately for opening year, if needed) – no-build and build
   * forecasts for the horizon year (if prepared) – no-build and build
2. Details for each forecast

* The coded highway and transit networks
* Zone attributes – population, employment, densities, parking costs, etc.
* Transit and highway-impedance tables – zone-to-zone travel times, transfers, distance, tolls, etc.)
* Trip ends – trips produced from and attracted to each zone, by trip purpose, etc., as available)
* Person-trip tables – zone-to-zone trips in production-attraction format, total, by purpose, mode, etc.)
* Person-trip table of trips on the project
* Loaded transit and highway networks with assigned volumes, and predicted (highway) speeds
* File dictionary for each file type to define its contents
* Boundary files for zones and summary districts to define their geographies and relationships

1. **Analysis**
2. District-to-district summaries of predicted trips and deltas between build and no-build scenarios
3. Transit volumes on the project – on individual links and at stations by access mode
4. Differences in predicted district-to-district trips and transit volumes compared to the previous milestone (if any)

Appendix B

Documentation and Archiving of Data on Actual Outcomes

On Physical Scope and Capital Costs

**Table B-1. Items Archived During and After Project Construction: Physical Scope**

1. **Materials**
2. Executed change orders; construction contract amendments; claims; settlements
3. As-built drawings
4. Actual scope of the completed project formatted in the detail Standard Cost Category codes
5. Actual project schedule and schedule adjustment(s)
6. **Analyses**
7. Comparison of the project scope anticipated at the FFGA against the as-built scope for each of the detailed SCC codes
8. Explanation of significant differences between the anticipated scope at the FFGA and the actual outcomes

**Table B-2. Items Archived During and After Project Construction: Capital Cost**

1. **Materials**
2. Executed change orders; construction contract amendments; claims; settlements
3. A Standard Cost Category workbook documenting actual costs by detailed SCC category
4. Table of actual annual expenditures in year-of-expenditure (YOE) dollars by aggregate SCC category
5. **Analyses**
6. Comparison of baseline cost estimate at the FFGA with actual costs by detailed SCC category
7. Comparison of annual YOE expenditures anticipated at the FFGA with actual expenditures by aggregate SCC category
8. Explanation of significant differences between predicted and actual costs and expenditures

Appendix C

Documentation and Archiving of Data

On Actual Transit Service, O&M Costs, and Ridership

Both BEFORE and AFTER Project Opening

**Table C-1. Items Archived Both Before and After Project Opening: Transit Service Levels**

1. **Materials**
2. Public schedule and map (if available) for each bus and rail route affected by the project
3. Current General Transit Feed Specification (GTFS) data for affected transit providers.
4. Documentation of peak-hour capacity of each affected route
5. **Analyses** (at the “after” milestone)
6. Identification of changes in actual service/capacity between the “before” and “after” milestones
7. Identification of the causes of changes: integration of the project into the transit system versus causes unrelated to the project

**Table C-2. Items Archived Both Before and After Project Opening: O&M Costs**

1. **Materials**
2. Actual expenditures by cost center for the most recent complete fiscal year
3. Actual staffing levels by cost center for the most recent complete fiscal year
4. **Analyses** (at the “after” milestone)
5. Identification of changes in actual expenditures between the “before” and “after” milestones
6. Identification of the causes of changes: introduction/expansion of fixed-guideway service and changes in existing transit services to integrate the project into the transit system versus causes unrelated to the project

**Table C-3. Items Archived Both Before and After Project Opening: Transit Ridership**

1. **Materials**
2. Database of counts of passenger boardings and alightings at stops/stations, annually between the “before” and “after” milestones
3. Survey of transit riders expanded with passenger counts to represent travel on transit services affected by the project; survey design provided to FTA for review well in advance of the survey
4. Survey dataset and documentation
5. **Analysis**
6. District-to-district flows of expanded transit trips in production-attraction (P-A) format stratified by trips purpose, access mode, etc. and, at the “after” milestone, tabulation of flows on the project, calculation of changes in overall transit flows, and explanation of those changes
7. Transit volumes on the project – on individual links and at stations by access mode, in P-A format

Appendix D

Standard Outline of the Final Report

**Standard Outline of the Final Report**

**from Before-and-After Studies**

# Brief introduction:

## Identification of the project

## Purposes of the Before-and-After Study

## Calendar of milestones in project development

Unusual aspects of project development with implications for the study (if any)

# Scope of the Project

## As-built scope of the project (organized by FTA’s Standard Cost Categories)

## Accuracy of predictions of project scope; causes of differences

## Lessons learned

# Capital Cost

## Capital cost of the as-built project (in FTA’s Standard Cost Categories)

## Accuracy of predictions of capital cost in $(year of expenditure) and $(year of opening)

Causes of differences: scope, base-year prices, unanticipated inflation; schedule slippage

## Lessons learned

# Transit Service and Fare Policies

## Characteristics of service and capacity provided on the project

## Changes in other transit services to integrate the project into the transit system

## Accuracy of predictions of service levels and service integration; causes of differences

## Lessons learned

# O&M cost

## O&M costs for the project

## Changes in O&M costs for the transit system caused by the project and its integration

## Accuracy of predictions of O&M costs for the project and for its impacts on the system

## Causes of differences

## Lessons learned

1. **Ridership** (and fare revenues if project revenues are very different from expectations)

## Ridership on the project (flows in production-attraction format; key rider characteristics)

## Changes in system ridership (flows in production-attraction format; key rider characteristics)

## Accuracy of predictions project ridership and changes in the corridor; causes of differences

## Lessons learned

# Other Impacts (i.e., economic development) at Option of the Project Sponsor

**Appendices**

Technical memorandum on the detailed analysis for each of the five project outcomes