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Bus Maintenance Facility Working Group

Architectural and Engineering Design for a Transit Operating and Maintenance Facility

Abstract: This *Recommended Practice* provides the steps necessary to implement a new bus transit facility project and an example of a scope of services procurement document for the basic architectural and engineering services needed to assist the agency in the design, engineering and construction of a new transit facility.

Keywords: architectural and engineering, bus transit facility, construction, RFP, scope of service

Scope and purpose: This document is intended as a resource to provide the basic scope information needed as part of a request for proposal (RFP) procurement.

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Section I

1. Transit operations facility process checklist

The following are the steps necessary to implement a new bus transit facility project.

1.1 Planning

1.1.1 Transit projections

Agencies may have a five-year or 10-year plan that identifies service needs, improvements and capital needs based on transit demographics, ridership and funding. This information may be included in the Master Plan or Feasibility Study. The project may require coordination with regional growth strategies.

1.1.2 Key personnel

Identify key personnel to be involved in the project, and solicit a project manager (PM) or coordinator for the project. Determine if a background in facilitation of the integrated design process is required.

> NOTE: After evaluating your personnel, you may consider hiring a construction manager or other consulting firm to manage the process.

1.1.3 Determine facility needs (assessment)

Fill out the Facility Space Needs Calculator (FSNC) to determine basic space needs for employees and buses for operating the facility. (see Facility Space Needs Calculator APTA-CALC-BT-002-10)

1.1.4 Funding

The purpose of developing a Transportation Improvement Program (TIP) or Statewide Transportation Improvement Program (STIP) is to provide for a fiscally sound capital improvement plan for the transportation program and to fulfill a requirement to get funding from the FTA to include public-private partnerships (PPP). The TIP/STIP is not just a document, but also a fully integrated transportation planning process for transportation planning and transportation project selection. The TIP is updated annually and follows this planning cycle closely to ensure that projects are identified, selected and prioritized. The facility should be identified in the TIP/STIP and updated as changes in funding dictates.

1.1.5 FTA requirements

Construction of any type of a transit facility is eligible under many FTA funding programs. Key components:

- **Transit feasibility study:** The planning process of identifying public transit operation facility needs and defining a project to meet those needs.
- **FTA Region VII Feasibility Study and Environmental Analysis checklist**

If it is determined that a new, expanded or renovated facility is needed, then the following steps are recommended to complete the process.

- Early coordination with your metropolitan planning organization (MPO), State Department of Transportation (DOT), and FTA.
- Determine whether the project is solely for public transit or a shared-use facility or a project that involves joint development including PPP (see the FTA's Best Practices Procurement Manual, section 1.3.3.9).
- Begin the public involvement process.

All procurements must conform to all required FTA clauses.

1.1.6 Existing facilities comparison

Contact other transit agencies that have a new, expanded or renovated facility. The purpose is to evaluate different building aspects and to investigate lessons learned.

Use Appendix B, **Site selection criteria**, for the analysis to ensure consistency in the comparisons and evaluations.

1.1.7 Feasibility analysis or study

Conduct a feasibility study that will determine the needs and impact to the organization. The plan should consist of but is not limited to the following:

- Ensure consistency with local plans .
- Verify land use and zoning.
- Determine land acquisitions and relocations required.
- Determine public transit needs.
- Determine the characteristics of a fixed facility that will meet those needs.
- Determine the financial feasibility of such a facility.
- Identify initial sites to be evaluated, and conduct the site analyses.
- Evaluate the final sites and recommend a preferred location.
- Conduct an environmental analysis of the preferred site.

1.1.8 Site analysis sample format

See **Appendix B**.

1.1.9 Environmental analysis checklist

The environmental analysis should take into account the following categories:

- land use and zoning
- Land acquisitions and displacements
- socioeconomics, community disruption and environmental justice
- air quality
- noise and vibration
- water quality and wetlands
- floodplains
- ecologically sensitive areas and endangered species
- traffic and parking
- historic properties
- parklands
- Section 4(f)
- hazardous materials
- safety and security

1.1.10 Designing shared-use facilities

Shared use refers to those instances whereby a project partner, separate from the transit agency or grantee, occupies part of a larger facility and pays for its pro rata share of the construction, maintenance and operation costs.

Non-transit use of FTA financially assisted project property is acceptable so long as it is incidental, does not interfere with transit use (i.e., transit has priority), and income any generated is retained by the grantee for transit use.

1.1.11 Consultant procurement

Facilitate procurement of a consulting firm that can provide architectural and programming, engineering and maintenance-related design. FTA language must be used in procurement documentation. Review for Conventional Design Team Organization or Integrated Design Team Organization. Review consultant experience with building information modeling (BIM).

1.2 Conceptual design

1.2.1 Consultant fee proposal, negotiations and contract signing

Evaluate procurement documentation to retain designer that will provide the necessary services (interviews and information analysis). Use forms such as scope of services to identify in detail what services you expect of the consultant. This form could be incorporated into a request for proposal (RFP) that details the format in which the replies must be made. An RFP assists greatly in the analysis and comparison of firms. This process can be used for the initial stages or for the entire project.

1.2.2 Space needs assessment

Review FSNC for the interior and exterior space needed for employees, passengers and buses for operating the facility. Develop a space needs assessment based on existing operations and anticipated growth. Review the facility planning guidelines to identify optimum operational space needs.

Facility staffing levels are crucial to the design team when determining the number of parking spaces, sizing of support facilities, and developing occupancy levels. Vehicle numbers are essential to the design team when determining the number of parking spaces.

1.2.3 Sustainability

If the proposed facilities will include Leadership in Energy and Environmental Design (LEED) certification or “green” design and if the current structures are capable of incorporating any of the green design features, then the guidelines of the U.S. Green Building Council (USGBC) should be incorporated in the design. USGBC has organized the LEED program into five categories of scoring criteria, plus an optional category for use of innovative technology:

- Sustainable sites
- Water efficiency
- Energy and atmosphere
- Materials and resources
- Indoor environmental quality
- Innovative technology

NOTE: There are other guidelines, like Energy Star, for sustainable building that can be used.

1.2.4 Site master plan

Develop documents that apply the scope and requirements of the facility and its operation to the selected site. Planning sessions with consultants and the transit agency should be held to determine optimum operational requirements, programming requirements and space needs. The master plan could reference sustainable guidelines.

The consultant should submit the master plan to management for review. The agency must review and approve the master plan to determine if the determinations will meet the organization's needs.

1.2.5 Building conceptual design

Prepare conceptual building plans that identify functional relationships and adjacencies between departments and individual program spaces. Conceptual design should include preliminary floor plans, building sections, elevations, three-dimensional renderings, HVAC strategies and significant energy conservation strategies.

1.2.6 Peer review

FTA funding requires transit agencies to conduct a peer review of the master plan and conceptual design. This process consists of finding impartial participants from other transit agencies who can review the documents to make recommendations and provide lessons learned to assist in the development of the design documents.

1.2.7 Project budget and funding

Use the conceptual design documentation to update project cost estimates from the master plan in order to further refine the conceptual estimate to determine any required changes in funding needed for the project. This include hard and soft costs and incremental costs to the agency. Life cycle costing could be used to evaluate sustainability options.

Determine whether available funding is in line with the cost estimate.

1.2.8 Conceptual plan finalization

Based on the comments received during peer review, revise the concept plan to incorporate accepted suggestions and revisions. A conceptual design report should be developed by the design firm outlining a preliminary scope, cost estimate for construction, and ancillary project costs, as well as a preliminary project schedule. Prepare design documents that include the basis of design, space needs program, design criteria and building requirements revised to incorporate changes from the environmental study and the master plan requirements.

1.2.9 Conceptual design review complete

The agency may then approve the conceptual design in order to start the schematic design.

1.2.10 Funding for construction

Identify approved funding for construction

1.2.11 Jurisdictional reviews/approval

State or local agencies may be required to evaluate the site for regulatory requirements. They will also be onsite intermittently to review and approve construction methods and the work performed. A permit will be issued upon their approval. Jurisdiction may require green building certification.

1.3 Design

1.3.1 Schematic design

The consultant should use conceptual design to develop detailed schematic designs for the facility in preparation for development and construction documentation. The plans and drawings prepared under this task should be sufficiently detailed to define the construction of the individual spaces for the approved site plan and building layouts. This task reflects a 35 percent completion point of the design phase and can be used as a bridging document should the facility proceed as a design-build project.

1.3.2 Cost estimate

Develop a cost estimate to determine schematic design probable construction costs.

1.3.3 Value engineering/analysis

Value engineering or value analysis provides the design team with recommendations that can be incorporated in the design with the greatest cost benefit to the project. It is recommended to bring in an independent value engineering team to evaluate the proposed design (see FTA Circular 5010.1C).

1.3.4 Schematic design client review/approval

The agency reviews and approves the schematic design to allow for design development.

1.3.5 Design development

This task begins the final engineering design of the facility and the development of the detailing that will give the facility its character and appearance once the scope is defined including the number and type of structures and phasing options. The consultant team will begin to finalize the design of various building systems through the investigation of alternative systems that may be more energy or cost efficient and that could be integrated into the project.

A preliminary listing of the work items to be developed in the design development task can be found in the sample scope of service (Section 2).

1.3.6 Design development review

Submit construction documents to transit agency and regulatory agency for the required building permits. This task reflects a 65 percent completion point of the design phase. This is recommended prior to construction to allow for fewer changes in the construction process and to reduce delays due to regulatory controls.

The process includes the following steps:

- Expedited review.
- Review comments.
- Revise documents.
- Planning/zoning/jurisdictional reviews.

1.3.7 Submittal reviews

The agency should determine what review points are necessary to review progress submittals from designers. The design should also be reviewed with suppliers of utility services, as necessary, to develop the final construction documents and obtain any necessary permits. Reviews should include drawings, specifications

and cost estimates. Allow sufficient time in the project schedule for internal reviews and comments to designer. This task reflects a 95 percent completion point of the design phase.

1.3.8 Construction documents

Work under this task will include the completion of all construction contract documents in conformance with the previously approved preliminary design plans that will permit construction contractors to bid competitively. This includes the incorporation of agency front ends and required DBE/SBE/MBE requirements and FTA standard clauses into bid specifications for issuance. Submit final construction documents to the procurement department.

1.4 Construction

1.4.1 Bidding/permitting

Facilitate selection of a construction firm that can provide best results from the construction documents. It is recommended to pre-qualify bidders in accordance with local, state and federal regulations. If FTA funds are used, FTA language must be used in procurement documentation.

The following lists pre-construction activities as part of the procurement and services to be performed by the design team:

- **Permitting:** Resubmit revised documents to review agencies for final approval. Final comments should be documented and incorporated into construction and permit documents.
- **Pre-bid conference:** Schedule and attend a pre-bid conference with the designer to answer contractor questions and to facilitate the site walkthrough.
- **Respond to questions:** Answer questions raised by prospective bidders regarding the contract documents at the pre-bid conference and during the bidding period.
- **Addenda:** Prepare addenda to the contract documents in response to questions, if required.
- **Review bids:** Review contract bids with designer assistance for conformance with the contract drawings and specifications, and evaluate bids and prepare recommendation of award of contracts for board concurrence.
- **Analyze substitutions:** Analyze substitution requests and recommend disposition.
- **Green procurement:** Green procurement emphasizes hiring of firms whose sustainability values are in alignment with those of the agency. Review construction firm experience with BIM.

1.4.2 Construction phase

Retain services (internal or external) to monitor construction, provide testing services and monitor contractor billing and work progress.

1.4.3 Construction phase services

During the construction phase of the project, the designer should provide the following services to assist with the completion and occupancy of the new facilities:

- **Shop drawings review:** Provide for review and approval of shop drawings, erection drawings, requests for substitutions, samples, manufacturer’s specifications and catalog cuts submitted by the contractors as required by the contract documents. Reviews should be scheduled to be completed within two weeks of the submission.
- **Consultation:** Throughout the construction phase, the designer should provide consultation and advice on a continuing basis.

- **Attend construction meetings:** The designer's project manager, project architect, consultant (PMC) or other key member should attend weekly construction meetings directed by the agency during the construction period.
- **Requests for information:** The design team should provide, as needed, investigation of and consultation on anticipated problems or conditions encountered during construction; preparation of supplementary sketches for resolution thereof; review of construction engineering proposals submitted by the contractor; and interpretation of plans and specification requirements.
- **Periodic observations:** Key members of the designer team, including the engineers, will visit the site on a regular basis to observe construction activity and to determine if the project is being constructed consistent with the design.
- **Onsite inspection:** A full-time onsite inspection is recommended to be contracted as a supplemental service to monitor construction progress and to provide a daily record of contractor activity and progress. Photo documentation may be considered for future access.
- **Equipment testing and startup:** The design team will review selected service items and maintenance equipment to be installed in the new facility. Manufacturer's specifications and catalog cuts submitted by the contractor and suppliers will be reviewed for compliance with the specifications. The designer and the contractor will provide assistance during testing of equipment and recommend final acceptance.
- **Commissioning:** Commissioning is recommended to ensure that the contractor has built the facility in accordance with the construction documents. A third-party commissioning agent may be required for this function.
- **Final inspection:** A pre-final inspection will be conducted in conjunction with the agency to develop a punch list of work items required to complete the project. Upon completion of the punch list items, a final inspection will be performed. Confirm whether FTA participation is necessary during close-out activities.
- **Certificate of occupancy (CO):** A CO is a certificate provided by the jurisdiction's regulatory authority in which the facility is located, identifying that the facility is habitable and ready for move-in. This certificate should be maintained in perpetuity. If the certificate is final, a full move-in can take place immediately; if it is a conditional CO, certain corrections/completions may need to be made by the contractor. The warranty period typically begins at issuance of the CO.

1.5 Post-construction

1.5.1 Maintenance manuals

The contractor, via the manufacturers, should prepare maintenance manuals covering all facility equipment installed during construction. These manuals must include installation specifications, operating instructions, warranties and any preventive maintenance/ repair schedules of all installed fixtures, equipment and building systems, as well as UL fire-rated documentation. Manuals and warranties should be turned over to the owner prior to the owner's final acceptance of the construction and commissioning.

1.5.2 As-built drawings

It is recommended to require the contractor to supply a set of as-built drawings.

1.5.3 Operations plan

Develop an operations plan or checklist that will be used during move-in and facility commissioning.

1.5.4 Move-in

Based on the facility, move-in may take place over an extended period of time, which may require development of a phased move-in schedule that best suits the operations. Move equipment, personnel and

vehicles to the facility. The owner should develop a list of items to be addressed by the contractor before, during and after move-in.

1.5.5 Facility turnover

The contractor should be required to provide operations and building maintenance staff training on fixtures, equipment and building systems. Training should include operating instructions and preventive maintenance procedures. The owner should witness all start-up, testing and commissioning activities and receive product manuals and warranties.

1.5.6 Implement operations plan

Review the operation plan and responsibilities with operations, facilities, administrative and maintenance staff.

1.5.7 Facility maintenance plan

Utilizing operations and maintenance manuals provided by the contractor and equipment suppliers, develop a facility maintenance plan for building maintenance staff, procedures for preventive maintenance and repairs, as well as a list of spare parts and components to be kept on hand. The list should include critical parts as well as parts that can be obtained on an as-needed basis. The project manager should develop this checklist as a part of the documentation.

SECTION II

Sample scope of service

The remainder of this document provides an outline of a scope of services that transit agencies may use in its entirety to select a consultant team for the complete design of a transit operations and maintenance facility. This scope of services can also be edited to a scope for facility planning services only (tasks 1 through 5), or edited for preparation of bridging documents for a design-build procurement.

Tasks from within the scope of services can also be utilized to select consultants for specialized work efforts such as environmental studies.

Introduction

[Provide an introduction that describes the need for the project, the Agency and the ensuing process for delivery of the new facility.]

Description of the project

[Describe the project in terms of the proposed site, including known environmental issues and clearances required; operating fleet size; functions that the facility shall support; construction budget; fuels to be used; whether sustainability certification is desired; special features of the proposed facility; and the overall project schedule.]

Technical disciplines

The selected design firm (Design Team) shall provide professional services for the following architectural and engineering planning and design of the proposed facility. The proposed Design Team shall provide a detailed description of each deliverable to be included in the proposal response.

- project management
- architectural design
- structural engineering design
- civil engineering
- mechanical engineering (HVAC) design
- plumbing design
- fire suppression design
- maintenance equipment selection
- cost estimating
- (FTA) independent cost estimate
- traffic engineering
- process engineering
- electrical engineering design
- security analysis
- geotechnical engineering (may be a separately contracted service)
- environmental engineering (may be a separately contracted service)
- surveying (may be a separately contracted service)
- landscaping
- gas detection engineering (if alternative fuels are required)
- sustainability program management (if certification is desired, work with third-party commissioning agent)
- fire and life safety design
- hazard analysis

Sustainability design is assumed to be embedded in each of the applicable design disciplines.

All other support staff, such as computer-aided drawing and drafting (CADD), building information modeling (BIM), technician assistance, and technical editing, shall be provided as required. If the consultant firm selected for the design does not have the full capability to provide all the necessary services listed above (such as geotechnical engineering, sustainability program management, or other specialty services) the firm should be required to hire personnel or subcontract firms to provide services required.

SCOPE OF SERVICES

The scope defines the Agency requirements for delivering services for the planning, design, construction and permitting of the proposed transit operating and maintenance facility and providing the necessary services to bring the project to fruition. The proposed scope itemizes the various tasks and subtasks develop a level of detail on each task that shall lead to providing a functional bus maintenance and operating facility.

The scope of services comprises eight major tasks, discussed on the following pages:

Site Master Planning

- ✓ **Task 1:** Review Existing Conditions
- ✓ **Task 2:** Facility Programming
- ✓ **Task 3:** Site Selection
- ✓ **Task 4:** Environmental Documentation
- ✓ **Task 5:** Conceptual Layouts

Architectural and Engineering Design

- ✓ **Task 6:** Schematic Design
- ✓ **Task 7:** Design Development
- ✓ **Task 8:** Contract Documents

Bid Phase and Construction Phase Services

- ✓ **Task 9:** Bidding and Award
- ✓ **Task 10:** Construction Services

> **NOTE:** Tasks 1 and 2 can run concurrently. Survey and geotechnical services are often contracted directly by the Agency outside of the planning and design contract.

Task 1: Review Existing Conditions

Task 1 consists of identifying existing conditions and criteria to be used during the other project tasks.

1.1 Field topo/utility survey of selected site

A surveyor shall be contracted (either by the Design Team or the Agency), in scope or additional service, to provide current topographic surveys of the proposed site based on the most current USGS data. Additional survey information that shall be required by the project shall be identified by the Design Team and shall be gathered by whatever additional survey efforts are necessary. Utility locations are to be identified, as well as any restrictions that may be attached to the proposed site. As part of the overall effort, the Design Team is to study existing site conditions to identify possible site issues that may affect locations of new structures. The Design Team shall verify (or perform) measurements on the survey and provide documentation to the owner.

1.2 Site visit

The Design Team shall visit the proposed site to become familiar with site constraints. The Design Team shall review the drainage characteristics of the proposed site, including any existing drainage channels and

structures, outfalls, and the need for oil/water separators. The Design Team shall review access and egress opportunities and determine the need for traffic control or roadway improvements. The condition of the site shall be reviewed, as well as locations of incoming utilities. The Design Team shall perform photo-documentation and provide documentation to the agency.

1.3 Phase I geotechnical investigation (if required)

The Design Team shall conduct a Phase I geotechnical investigation at the project site to provide an initial assessment of soil conditions that may affect planning efforts. The Phase I investigation shall include compilation and review of available geotechnical and geological information regarding the study area, including past site usage. Laboratory tests shall also be carried out on recovered soil samples to aid soil classification and determination of pertinent engineering properties. Mapping of exposed bedrock in the area shall also be conducted to assess rock type, rock quality and joint set orientation with respect to cut slope stability.

The results of the Phase I geotechnical investigation are to be summarized in a written report with all test results attached and forwarded to the Agency. The report shall include preliminary assessments of site preparation needs, foundation support considerations, cut slope stability and recommendations for additional investigation at the site that shall be required for final design.

TASK 1 DELIVERABLES:

- Topographic and boundary surveys
- Utility location survey
- Geotechnical report

Task 2: Facility Programming

Task 2 consists of research and validation of any existing space programming and operating requirements for each functional area in the proposed facility, such as office space, maintenance bays, storage and vehicle parking areas, and areas to be allocated to nonrevenue vehicles, employee and visitor parking, fueling, and landscaping to include areas required by local jurisdictional agencies (e.g., water retention/detention).

2.1 User group interviews

During the kickoff meeting, the Design Team shall meet with Agency staff to discuss the Scope of Services, the plan of action, and the project schedule. Participants shall include the operations manager(s), the maintenance manager and the general manager/executive director. The intent of these meetings is to ascertain the operating characteristics of the proposed facility and any special operating conditions or methods that would impact the programming and design of the facility. This shall be the first step in developing the facility space program.

Management staff interviews: The management staff will help to identify Agency employees for the various functional areas and work with the project team in setting up user interviews and detailed tours of the functional areas. This will be the first step in developing the facility space program.

User group interviews: As part of the ongoing interviews, the team will meet with supervisors, foreperson and lead personnel to understand the operational and functional requirements of each area of the building. Members of the Design Team specializing in programming and functional requirements will interview personnel and gather information to determine space and equipment needs. The team will generate equipment lists, design criteria and space needs for the individual shops, bays, offices and storage areas.

Operation observations: As a continuation of the user interviews, members of the Design Team will observe operations and maintenance personnel during shift operations to better understand needs and identify current constraints that may prevent personnel from functioning at a peak level of production. This function is critical in identifying restrained performance due to space or equipment needs. Observations will also provide valuable input in the preparation of the facility concept plans.

2.2 Functional criteria

Members of the Design Team shall meet with operating personnel and gather information to determine space and equipment needs. This shall allow the Design Team to generate equipment lists, design criteria and space needs for the individual shops, bays, offices and storage areas.

2.3 Program development

This sub-task consists of research and validation of the space program and operating requirements for each functional area in the proposed administration, operations and maintenance facility, such as office space, maintenance bays, storage and vehicle parking areas, and public works areas to be allocated to salt storage, employee and visitor parking, fueling, landscaping and other department shops and storage spaces.

2.4 Draft facility program

Upon completion of the user interviews, the Design Team will prepare a detailed space allocation program identifying space requirements for major functions such as shops, work bays, vehicle storage, maintenance and repair areas, parts storage, employee amenities, and administrative spaces. Site spatial needs for requirements such as bus storage, fare retrieval, fueling and wash facilities, and employee parking will also be identified. The program will reflect specific code issues such as ADA compliance and applicable building codes. A program report to document proposed alternatives will be prepared and verified with Agency personnel during the design forum.

Based on the number and types of vehicles to be maintained, criteria and standards will be developed for the number of maintenance bays, servicing requirements and support equipment necessary to carry out the proposed functions. The program will reflect the following:

- Definition of all functions to be provided in the facility.
- Dimensional criteria for both horizontal and vertical (e.g., height of bays) directions.
- Definition of all rooms, bays and spaces proposed for the facility.
- Parking requirements for vehicle fleets including number of spaces and total area.
- Preliminary equipment list for shops and vehicle maintenance equipment.
- Site operations requirements, including minimum turning radii, minimum distances between obstructions for turning, backing and deliveries.
- Offsite requirements such as turn lanes, acceleration/deceleration lanes, esplanades and identified utility extensions.
- Preliminary fueling and service station requirements.

The product of this subtask deliverable will be input to a program manual that includes a draft space allocation program as a part of a document summarizing the information gathered during this task. The program manual, which is a flexible working document, will be submitted for comment and concurrence.

2.5 Sustainable building considerations (if desired)

> **NOTE:** If a sustainable design that shall require certification from a sustainability agency such as LEED, Energy Star, Green Globes, etc., is desired, then the following task shall be required in the scope of services.

The Design Team shall assist the Agency in determining whether sustainability certification is desired and the proposed certification level for the proposed facilities. The Design Team shall investigate the appropriate level of certification, as well as the probable costs associated with certification. Sustainability programs are generally organized into five categories of scoring criteria, plus an optional category for use of innovative technology. The Design Team shall evaluate those categories to determine where maximum achievable results are possible. Every attempt shall be made to identify energy- and resource-conserving measures that can be accommodated into the project, at minimum cost impact. The general categories that shall be reviewed:

- Sustainable sites
- Water efficiency
- Energy and atmosphere
- Materials and resources
- Indoor environmental quality
- Innovative technology

> **NOTE:** For the purposes of this scope of services, it is assumed that a building will be designed to a LEED Silver or comparable rating, as a basis of design for the facility.

If this project is to be considered for certification, the process shall be intended to identify sustainability options that can later be targeted for incorporation into the final design once a determination of costs and final certification level is established. The Design Team sustainability specialists shall work with the Agency to help identify measures to meet the ultimate requirements of the project to incorporate the targeted sustainable development and energy efficient practices into the project. As a part of this overall task, the Design Team shall:

- Conduct initial and follow-up sustainability strategy meetings and charrettes, as needed, to determine the most appropriate sustainable design strategies to achieve required sustainability certification.
- Prepare a conceptual design narrative outlining the strategies to achieving the sustainability rating.
- Research various “green” materials and systems to incorporate into the project.
- Conduct additional meetings for coordination of sustainable design strategies.
- Conduct necessary energy analyses and systems modeling required to achieve desired energy savings levels.
- Provide documentation, reports and other analysis for each of the sustainability credits to be submitted as required.
- Assemble all sustainability documentation and supporting data, maintain contact with the U.S. Green Building Council and provide necessary additional supporting documents as required to achieve the desired certification level and compile into submission document. Submit the data to the selected sustainability agency as required, and manage the submittal process.

2.6 Facility needs assessment report

Upon completion of the staff interviews, the Design Team shall prepare a detailed space program identifying space requirements for all functions such as shops, work bays, vehicle storage, maintenance and repair areas, parts storage, employee amenities, and administrative and operations spaces. Site spatial needs for requirements such as bus storage, fare retrieval, fueling and wash facilities, and employee parking shall also

be identified. The program shall conform to specific and applicable building codes and laws such as ADA requirements. A program report to document proposed alternatives shall be prepared and verified with Agency personnel during the design charrette.

Space requirements for various functions shall be calculated based on approximate areas required to perform major functions, such as preventive maintenance inspections, vehicle maintenance and repair, welding, tire storage/repair, parts and material storage, operations and dispatching, employee amenities, and administrative space requirements.

Based on the number and types of vehicles to be maintained, criteria and standards shall be developed for the number of maintenance bays, servicing requirements and support equipment necessary to carry out the proposed functions.

The product of this subtask shall be a facility needs assessment report that includes a draft space allocation program as a part of a document summarizing the information gathered during the previous tasks. The program manual shall be submitted to Agency staff for review and comment.

2.7 Agency review

The Agency will review the draft documentation and reports from the Design Team and provide comments for incorporation into the final documents prior to authorizing future tasks.

TASK 2 DELIVERABLES:

- Program manual (space allocation program)
- Sustainability report
- Facility needs assessment report

Task 3: Site Selection

Task 3 shall include a thorough assessment of proposed sites that could meet all of the requirements of the program manual.

3.1 Prototype facility plan

Based on the previously developed program, the team will develop site and facility layouts for the new facility. These layouts will allow the Agency to see the program requirement graphically represented.

The site plan will be a conceptual level plan and will depict the following:

- buildings and other structures
- fleet and employee parking
- wash and fueling facilities
- entrance and egress points
- landscaping areas

The building plans will be conceptual-level plans showing functional areas and will reflect the operating desires of the Agency staff developed earlier.

Site plans will emphasize points of access, both for employees as well as for transit revenue vehicles. The opportunity for single structure options and multiple structure options will be investigated.

Based on the site plan and building layouts, a conceptual level cost estimate will be developed using cost per square foot factored for the various functional building and site areas.

3.2 Develop site selection criteria

In conjunction with the program manual and prototype facility development, the Design Team will review previously developed site selection criteria used to identify and test sites for the integrated facility. In addition to minimum lot size, site selection criteria may include the following:

- current ownership
- availability
- cost of acquisition
- development cost
- ease of acquisition
- land area and lot shape
- relocations required
- flood potential
- existing zoning and adjacent land use
- availability of utilities
- access to major streets
- distance from service area center to minimize deadhead mileage
- environmental impacts
- local traffic impacts
- operational efficiency
- neighborhood impacts

3.3 Site identification

The first step of this process will be to identify potential sites for construction of a bus operating and maintenance facility. A list of prospective sites will be compiled from the following sources (at a minimum):

- previously identified sites
- contacts with municipal-approved Realtors
- agency staff suggestions
- adjacent/existing maintenance/industrial facility sites

Another technique would be to place a newspaper advertisement outlining the size, approximate location and zoning requirements, and solicit confidential inquiries. This technique has been successful in site selection studies in various parts of the country.

Sites will be considered candidates if they have parcel sizes (and other easily evaluated characteristics) that make them appropriate for the program. From these sources, a listing of suitable, available sites will be prepared for analysis.

3.4 Site analysis

Analysis of the identified available sites will be conducted to apply the site selection criteria developed in the previous task. A windshield survey will be made to identify any potential areas of concern or possible conflict before the Agency considers acquisition, further detailed analysis or development.

The windshield survey will include the following:

- Conduct preliminary site inspection.
- Determine proximity to route access.
- Identify potential adverse environmental, traffic and neighborhood impacts.
- Identify possible site development problems.
- Identify available utilities.
- Identify potential drainage problems.
- Identify potential main and secondary access to the site.
- Identify unusual site development costs.

A matrix of site factors will be prepared for the reviewed sites.

3.5 Site selection report

The Design Team will prepare a report outlining the procedures used to identify sites and the resultant analysis and proposed disposition of each of the sites. The report shall include results of windshield surveys and environmental scoping of each site.

3.6 Agency review

The Agency will review the draft documentation and reports from the Design Team and provide comments for incorporation into the final documents prior to authorizing future tasks.

TASK 3 DELIVERABLES:

- Prototype facility plan
- Site analysis matrix
- Site selection report

Task 4: Conceptual Layouts

Task 4 shall begin the process of generating site and building alternatives based on the information gathered during interviews and on the program manual. The layouts shall bring the program report to life and shall generate site and building layouts that shall be the foundation of the overall product.

4.1 Develop conceptual alternatives

The Design Team shall use the criteria presented in the program manual to prepare material flow diagrams depicting the movements of buses, equipment, automobiles, repair parts, materials and employees through the functional areas located onsite. The diagrams shall assist in developing individual site, building and functional area floor plans.

Using the information obtained in developing the program manual, the Design Team shall develop three alternatives covering site and building plans for the facility. Through discussion with Agency personnel, the Design Team shall develop alternatives that meet the Agency's criteria and expectations. The alternatives shall consider the site development boundaries, access to site and sight distances, location of utilities, parking, storage, and site mobilization.

4.2 Design charrette

The design charrette shall incorporate appropriate personnel from the Design Team as well as Agency management staff and users. Through a proposed two to three-day work session, the alternative plans developed in Subtask 3.1 shall be reviewed and evaluated. Plans considered workable by the charrette participants shall be further refined during the work session to establish a general consensus on the building layouts and site plans.

Early in the charrette process, the joint Design Team, including key members of the Agency management and consultant staff, shall identify and evaluate the immediate, short-term and long term issues and desired improvements. The Design Team also shall brainstorm other potential improvements that may be considered in the planning process. During the process, the Design Team can review potential fast-track design, operational quality improvements and new methods and equipment. The format of the charrette is aimed at obtaining the necessary information for quality decision making.

The Design Team shall conduct the charrette exercise with Agency personnel, who shall jointly determine the direction of the project. Plans that the group considers to be workable shall be further refined. During the charrette, the joint Design Team shall consider all the immediate, short-term and long-term issues and desired improvements including future expansion identified as goals for the transit operations and maintenance facility. It is important that all considerations be evaluated and programmed in the planning stages to account for the necessary infrastructure improvements in the designs.

The proposed plans shall be consistent with the overall immediate, short-range and long-range goals for the facility. The result of the charrette shall be a selected alternative that shall be refined prior to presentation to Agency board of directors, if required.

4.3 Presentations

Design Team personnel shall make presentations to Agency decision makers to review the selected alternative as required. The selected participants and the Design Team shall review and discuss the alternatives and the reasons that led the charrette participants to the preferred alternative.

4.4 Conceptual design report

A conceptual design report shall be prepared to document the progression from the facility needs assessment report to the selected concept plans. The report shall include plans for future expansion (if appropriate) as well as meeting the immediate program needs of the Agency.

4.5 Agency review

The Agency will review the draft documentation and reports from the Design Team and provide comments for incorporation into the final documents prior to authorizing future tasks.

TASK 4 DELIVERABLES:

- Material flow diagrams
- Alternatives covering site and building plans
- Facilitate design charrette
- Conceptual design report

Task 5: Environmental Documentation

Prepare environmental documentation for the project in accordance with Federal Transit Administration National Environmental Policy Act Regulations (23 CFR 771.119) and FTA Circular 5620.1. The assessment should include, but is not limited to, the following environmental impacts:

- land acquisitions and displacements
- land use and zoning
- air quality
- noise
- water quality
- wetlands
- flooding
- navigable waterways and coastal zones
- ecologically sensitive areas
- endangered species
- traffic and parking
- energy requirements and potential for conservation
- historic properties and parklands
- construction
- aesthetics
- community disruption
- safety and security
- secondary development
- consistency with local plans
- environmental justice

The level of documentation should be in accordance with FTA requirements.

5.1 Environmental scoping/overview

The purpose of this subtask is to evaluate the candidate site from an environmental perspective in order to identify any obvious “fatal flaws” early in the process. A field review of the site will be made to identify any visible environmental constraints. Existing information such as previous ownership, if readily available, will be obtained as an indication of environmental condition.

Assessment of known environmental issues, surrounding land use and infrastructure constraints will be performed. An overall assessment of known and potential site constraints will be provided for the selected site and may include the analysis following parameters as described in the sections below, as required by the FTA.

Floodplain locations

Federal Emergency Management Agency (FEMA) flood insurance maps will be reviewed to identify and map 100-year and 500-year flood hazard areas within each prospective site.

Subsurface conditions

Natural Resource Conservation Service (NRCS) soil survey reports and maps will be reviewed. Principal soil types and characteristics that present a potential constraint to facility development will be identified and described. USGS national seismic hazard maps and databases will be reviewed to determine the seismic zone for each potential site and the potential for slight, moderate or severe seismic risk.

Biological resources

Identify wetlands and other waters of the U.S. (streams and impoundments) within each site using existing information. National Wetlands Inventory maps, NRCS soil maps and limited onsite observations will be used to identify those resources. Include wetlands located within or near human-made ditches, canals, basins and flow control measures and intermittent and permanent streams, lakes, reservoirs and drainage ways. Map preparation will address soil mapping units, vegetation community types and drainage patterns. Preparation of wetlands delineations and jurisdictional determinations are not included as part of this task.

Local and state environmental agencies and U.S. Fish and Wildlife Service will be contacted to determine the potential presence of threatened and endangered animal and plant species. Information from those agencies will be evaluated alongside site-specific habitat information to assess the potential for use of the site by threatened and endangered species.

Hazardous materials contamination

Evaluate the site to determine the potential for contamination by hazardous or toxic substances or petroleum products based on readily available information. Observations of past and present uses and conditions will be noted. Any areas of concern based on visual observations will be photographed, reported and their approximate location recorded with a navigation-grade GPS unit.

Cultural resources

If the initial scoping has indicated that cultural resources may be present onsite, then a cultural resource specialist with experience working with the local historic commission will visit the site and review background information from records and other readily available historic research sources to identify known National Register listed and eligible properties within a one-mile radius of the prospective site.

Utilities

The availability, type, current capacity and capabilities of public utility services will be determined, including water supply wastewater treatment, natural gas, electric power, solid waste services and telecommunications. Potential development constraints and limitations to providing utility services resulting from past land use activities will be identified based on a review of federal and state geological and mining regulatory agency information, soil survey data and readily available information on mineral rights ownership. Information collected regarding the availability of onsite utilities will be sufficient to make comparisons between onsite utilities and utility providers.

Site access/traffic issues

Readily available state or local traffic counts and capacity data will be reviewed. The conditions of the roads immediately adjacent to the site will be observed. Traffic survey may be warranted if FTA or local authorities determine that traffic impacts may be significant.

Land use issues

Readily available land use and zoning data and aerial photos shall be reviewed. The nearest noise receptors including residences, schools, hospitals, churches and retirement homes shall be identified.

The review will provide a qualitative discussion of these factors for each potential receptor based on review of existing data and the Agency’s knowledge of the area. A planning level cost estimate of potential mitigation costs will be developed if applicable.

Other studies pertinent to the proposed site and locale may be required, as defined by FTA or other local agencies having jurisdiction.

5.2 Environmental documentation

The Design Team will prepare a categorical exclusion (CatEx), environmental assessment (EA), finding of no significant impact (FONSI) or environmental impact statement (EIS) document under the requirements of Federal Transit Administration's National Environmental Policy Act regulations (23 CFR 771.119) and guidance (FTA Circular 5620.1). The documentation will be prepared using information developed under the previous task and meet the stated requirements in accordance with the results of the Subtask 5.1 studies.

Results of environmental studies will be documented in the appropriate level document in accordance with FTA 5620.1 Guidelines. The documentation will be a concise summary of results of all relevant studies and will be organized in the following format:

Section 1: Need for and Description of Proposed Action
Section 2: Alternatives to the Proposed Action
Section 3: Environmental Impacts
- A. Land Acquisition and Displacements
- B. Land Use and Zoning
- C. Air Quality
- D. Noise
- E. Water Quality
- F. Wetlands
- G. Floodplains
- H. Navigable Waterways and Coastal Zones
- I. Ecologically Sensitive Areas
- J. Endangered Species
- K. Traffic and Parking
- L. Energy Requirements and Potential for Conservation
- M. Historic Properties and Parklands
- N. Construction
- O. Aesthetics
- P. Community Disruption
- Q. Safety and Security
- R. Secondary Development
- S. Consistency with Local Plans

Section 4: List of Agencies and People Contacted

The Design Team will provide FTA and appropriate local agencies having jurisdiction with a draft of the documentation report and incorporate responses to comments received from FTA and others into the document. Written comments received from agencies and the public will be included in the document in an appendix.

5.3 Public involvement

Public involvement for the environmental documentation will consist of documentation of previous contacts with surrounding land owners and local agencies having jurisdiction, as well as formal tribal coordination, if the project impacts any tribal lands. Public meetings will be held as part of this documentation, if required by the FTA regional representative.

A public notice of availability (NOA) of the environmental document will be published in the local newspaper, and the document will be made available for review at a local library. The draft final document will be published for agency and public review and comment at the same time a public hearing will be

advertised to obtain further public input. At the conclusion of the 45-day review period, the comments and other public/agency input will be addressed and included in the comments and coordination section of the environmental documentation.

The Design Team will produce a final document incorporating public involvement documentation and results, to be submitted to the Agency and FTA for final distribution.

TASK 5 DELIVERABLES:

- Environmental Assessment

Task 6: Schematic Design

The preferred alternative shall be further developed and the Design Team shall identify appropriate design criteria, costs and existing conditions that shall affect the design and construction of the facilities. The Design Team shall generate schematic building and site plans identifying new structures, renovations and site improvement issues. A cost estimate based on the schematic plans design shall be part of the overall schematic design submittal to the Agency.

> **NOTE:** If previous survey and geotechnical work was conducted under Task 1, the Subtasks 6.1, 6.2 and 6.3 will not be necessary. If the work of this contract starts with the Task 6 scope, then these items should be included.

At the initiation of schematic design, the Design Team shall begin investigations relating to the site and site conditions so the elements of the facility design that are dependent on soils/geotechnical information, utilities investigation, or accurate survey and mapping data shall be available to proceed in a timely manner.

> **NOTE:** Survey and geotechnical services are often contracted directly by the Agency outside of the design contract.

6.1 Surveys and mapping

Topographic, boundary, horizontal and vertical control surveys shall be necessary for the project. These surveys shall also locate and identify sources of power, water, communications and other utilities such as existing storm water, waste water and natural gas lines. The most current existing property survey information on file shall be field checked and verified; any differences shall be provided in writing to the Agency. The data obtained from field surveys shall be used to develop soil, topographic, utility and base maps for the site. The surveyor shall also lay the grid and indicate soil boring locations on the site drawings.

6.2 Phase II geotechnical investigation

Based upon the planned location of the new structure(s) and the results of the Phase I geotechnical investigation described under Task 2, a Phase II geotechnical investigation program shall be developed for design review and approval. It is anticipated that the Phase II scope can be optimized and minimized as a result of the Phase I investigation. The Phase II scope may include additional soil borings at the locations of the planned structures. The Phase II subsurface investigation shall be made to determine soil characteristics at specific structure locations, depth to bedrock and foundation conditions for the final design of the structure(s). A complete analysis, study and written report of subsurface conditions and geotechnical design criteria shall be made by the consultant team and submitted to the Agency.

6.3 Utility connections

Tie-ins to existing utilities within the project area, including drainage structures and those utilities that shall be required to provide service to the proposed facility, shall be identified, sized and located. Appropriate invert elevations on any drainage structures shall be verified or obtained in the field. Any proposed extension of utilities that would impact onsite development shall be investigated. Utility work shall be coordinated with the survey team to provide updated mapping and to verify any available utility as-builts.

6.4 Detailed schematic plans

The final conceptual design shall provide plans with sufficient detail to be able to show building improvements, new buildings and the proposed location of future facilities on the site. The plans shall have sufficient detail to provide information on the recommended location and sizes of offices, hallways, shops, employee facilities, storage rooms, vehicle bays, vehicle storage, wash bay, building risers, and utility areas (including communications). Should the project require construction phasing, the Design Team will develop a construction phasing plan to minimize disruption to any ongoing operations at the site.

6.5 Cost estimates and milestone schedule

The Design Team shall provide schematic level cost estimates to quantify the future construction costs, by both initial and future phases, to implement all the desired improvements to the facility. Costs at the level are to be based on RSMeans' "Square-Foot Costs Methodology" for similar facilities in the general geographic area and verified through cost estimating and staff knowledge of the locale. The Design Team shall provide the Agency with a milestone schedule at this juncture. Should the project require construction phasing, the Deign Team will indicate the individual phases on the schedule.

6.6 Schematic design submittal

The final subtask shall be to prepare the final schematic design package for Agency review and approval. Ten copies of the final schematic design submittal shall be delivered to the Agency for distribution. The Agency shall receive a drawing package, a programming report and an order-of-magnitude cost estimate for the transit operations and maintenance facility.

6.7 Agency review

The Agency will review the schematic design submittal from the Design Team and provide comments for incorporation into the final documents prior to authorizing future tasks.

TASK 6 DELIVERABLES:

- Schematic building and site plans
- Topographic and boundary surveys
- Geotechnical report
- Schematic design submittal
    - Schematic plans
    - Cost estimate
    - Milestone schedule

NOTE: For a design-build project, it is recommended that the design proceed through Task 6 at a minimum, and the information from Tasks 1-6 be presented in an RFP to form the basis of the design-build project team bids. For design-bid-build projects, Tasks 7-10 can be included in the overall scope of services or contracted separately.

Task 7: Design Development

Task 7 begins the final architectural and engineering design of the facility and the development of the detailing that will give the facility character and appearance. The plans and drawings prepared under this task shall be sufficiently detailed to define the construction of the individual spaces for the approved site plan and building layouts.

7.1 Final design

The Design Team shall begin to finalize the design of various building systems through the investigation of alternative systems that may be more energy- or cost-efficient and that could be integrated into the project. These systems are briefly described below.

Architecture

Overall, this work item shall identify the architectural treatment proposed for the facility and shall provide a design that meets functional and aesthetic needs as well as applicable building codes, but shall enhance the surrounding area and create a positive visual impact to include the most energy conservative environment.

Structures and foundations

Information on alternative foundation and structural systems shall be assembled and evaluated. Existing soils information and soils data obtained during earlier tasks shall be reviewed. Local, state and federal codes, regulations and requirements shall be considered to recommend the best system for the existing conditions. Based on this information, foundation and structural systems shall be evaluated relative to the responsiveness to the building operation, the economic merit and the long-term durability.

HVAC

Alternative HVAC systems shall be evaluated for the new facilities. The design for the facility should emphasize energy conservation to minimize annual HVAC costs by use of insulation, programmed thermostats, makeup air system, use of local unit heaters, spot heating by means of radiant panels or a combination of these methods.

One important function of the ventilation system design is the removal of exhaust gases. Pollutants from vehicles shall generally be dispersed inside the maintenance facility as the vehicles enter, leave and are tested/repaired inside the building. Exhaust for this situation is best handled by the use of ducted vehicle exhaust fans.

Plumbing

Various piping systems shall be introduced in this project. Aside from conventional domestic hot and cold water systems and drainage systems for shops and toilet/locker areas, certain specialty systems shall be considered. Examples of such systems include the following:

- Oil/water separators for discharging the drainage to the site system shall be required in the vehicle servicing and maintenance areas.
- Sand interceptors shall be provided on the drainage system for areas where vehicles will be washed.
- Compressed air system shall be designed suitable for plant usage.

Fire protection

Automatic or manual deluge systems with associated fire detection systems shall be designed in high hazard areas. In addition, carbon dioxide or valve fire suppression systems shall be designed in areas critical to the bus operating systems.

Maintenance equipment

Major equipment items required for the new facility shall be finalized with Agency personnel. A list is to be developed indicating the equipment, including specifications and cut sheets, necessary to carry out all required functions. The list also shall identify any existing owned/leased equipment to be incorporated into the new facility. Any long-lead items, as well as shorter-term alternates, shall be identified by the Design Team at this time.

Electrical

Lighting systems shall utilize energy-efficient, high-intensity discharge light sources wherever practical. Site power distribution systems and voltage levels shall be analyzed on the basis of site distribution requirements for the purpose of economical first costs and operating costs. The interior power distribution systems design shall be based upon flexibility and economics. Plug-in bus ducts in shop areas shall be considered for ultimate flexibility.

Life safety systems

The identification of requirements for life safety systems and the preliminary design of those systems shall be undertaken as part of this work item. Fire alarms systems shall be investigated and appropriate systems recommended for inclusion in the design. Other related work shall include coordination of alarm panels with emergency power and radio communications systems. All systems shall be designed in accordance with the all applicable codes and regulations including ADA.

Site and utilities

Work under this discipline shall include the development of site geometry, the preparation of contract drawings for access points, site grading, pavement design, utilities, drainage, provisions for underground tanks, fencing, curbing and connections to existing utilities. The site drawings shall present placement of curbs, driveways, street improvements, sidewalks, fencing, gates and other security and safety features. Utility coordination, connection and interface shall be an important aspect of this subtask.

7.2 Design development documents

The following is a preliminary listing of the work items to be developed in the design development task:

- horizontal and vertical control (all conveyance types)
- grading plans
- site plans
- utility plans
- foundations
- elevations and cross-sections
- landscape
- structural
- architectural
- mechanical (HVAC) plans
- plumbing plans
- electrical schematic plans
- equipment layouts
- details
- landscape
- civil
- specialties

- finishes
- life safety
- security
- communications

7.3 Outline specifications

In addition to the plans and drawings provided under this task, outline specifications for systems and equipment shall be developed for review by Agency. The outline specifications prepared shall illustrate materials proposed for use, interior finishes, applicable codes and standards and methods of construction. Any long-lead items shall be identified, together with alternates, at this time.

7.4 Cost estimates

During design development, the Design Team shall prepare a construction cost estimate in conjunction with the writing of the outline specifications. The cost estimate shall contain an itemized list of the major methods, materials, and items used in the design. The cost breakdown shall be presented by specification section using the Construction Specifications Institute (CSI) format. The estimate shall take into consideration an anticipated cost escalation over the life of the specific contract, current labor contracts, materials availability and market conditions, restricted work conditions and other pertinent factors. It is anticipated that this estimate shall be used as a basis for value engineering review.

7.5 Schedule

The Design Team shall develop and provide the Agency, in critical path format, a detailed project schedule to reflect the status of the project and ensure the delivery of construction documents on schedule.

7.6 Agency review

The Agency will review the design development submittal from the Design Team and provide comments for incorporation into the final documents prior to authorizing future tasks.

TASK 7 DELIVERABLES:

- Design development drawings
- Outline specifications
- Cost estimate
- Project schedule

Task 8: Contract Documents

Task 8 shall include the completion of all construction contract documents in conformance with the previously approved preliminary design plans that shall permit construction contractors to bid competitively. Continuous coordination with the Agency shall be maintained throughout the design phase to reduce time required for detailed reviews. Milestone reviews shall be scheduled at 60 and 90 percent completion; however, the continual coordination mechanisms in place shall allow the Design Team to continue work as the documents are being reviewed.

> **NOTE:** 60 and 90 percent submittals are traditional milestones in the development of contract documents; however, the Agency can schedule other design submittal reviews at selected completion points in the final design if desired. At all submittal points, the Agency should respond in writing to the Design Team with comments and revisions.

8.1 Contract documents

Contract bid documents shall provide complete descriptions of work involving the architectural, civil, structural, mechanical, electrical, special systems, interior design, landscaping components and all other drawings noted in the design development task of the proposed improvements. The documents shall describe, locate and dimension, as well as give the physical properties, workmanship requirements, performance characteristics and other pertinent information relating to each component. Any required construction methodology and sequencing as well as special provisions due to phasing requirements shall be described. Contract drawings, specifications, cost estimates and project schedules shall be submitted at the 60 and 90 percent completion points for Agency review and approval.

The design disciplines are described below:

- **Architectural and interior design:** This task shall provide a design that meets the facility's functional and aesthetic needs, as well as applicable national, state and local building codes, as well as the ADA. The drawings shall present security, building maintenance, graphics and future flexibility, and reflect a sensitivity to the proposed location of the facility. These work elements culminate in the preparation and completion of the final architectural contract drawings.
- **Site, civil and utility design:** Work under this discipline completes the development of site geometry, the preparation of contract drawings for access points as they interface within the master plan of the area, site grading, pavement design, utilities, drainage, provisions for underground or aboveground tanks, fencing, curbing and connections to existing utilities. The site drawings shall present placement of curbs, driveways, street improvements, sidewalks, fencing, gates and other security and safety features.
- **Landscape design:** The materials that shall be selected to landscape the perimeter of the complex shall be chosen to ease the visual impact of the hard surfaces of the facility and present a pleasing appearance.
- **Geotechnical design:** Soils and subsurface information shall have been completed, reviewed and evaluated to design foundations requiring special consideration during construction. Recommendations on foundation types, as well as bearing capacity and settlement characteristics of the soil contained in the subsurface investigation report, shall be utilized to design foundations for various structures.
- **Structural engineering:** This discipline shall design the facility's structural system based upon applicable codes and site conditions, perform the building foundation design, and design supports for the specialized equipment to be placed in this facility, as well as upgrading of the building slabs in the existing facility. The design shall meet all applicable codes, regulations and requirements for fire and safety.
- **HVAC and energy conservation systems:** Work under this discipline shall include the finalization of the design for heating, ventilating and air conditioning for the different parts of the building based upon applicable codes as well as the unique design conditions presented by the facility.
- **Electrical engineering:** Electrical design work shall include finalization of power and lighting requirements and design of an efficient electrical distribution system for a new facility. Other related work shall include design for gas detection, fire alarm systems, life/safety, emergency power, security and communication systems. The work shall include power and electrical requirements for maintenance and servicing equipment, the HVAC system and other mechanical systems.
- **Maintenance equipment specifications:** Based on the finalized list of shop equipment approved during the design development task, equipment available from various manufacturers shall be finalized, and detailed specifications and required interface drawings shall be prepared. Long-lead items shall be identified within this scope.

- **Specifications:** Specifications for the entire facility shall be developed following the CSI format. A set of construction specifications, together with the standard bidding and contract documents, general conditions and special provisions shall be prepared. Where applicable, standard specifications shall be utilized — particularly for the site work items. The general conditions shall include standard contract provisions required by the Agency. Also, long-lead items shall be identified within this scope.

8.2 Construction cost estimates and schedule

During building design, complete construction estimates shall be prepared and submitted to the Agency for each scheduled submission in conjunction with the writing of the contract specifications. Each cost estimate shall contain an itemized list of materials and methods used on the project, along with the associated unit and installation costs. The estimates shall be based upon standard bid items and formats and shall be used as a standard against which all bids shall be evaluated. A detailed construction schedule, in critical path format, shall be developed and provided to the Agency to assist in controlling the construction schedule and budget.

8.3 Permitting and review

The Design Team shall review the design with Agency and the appropriate departments and other agencies having jurisdiction within the locale to obtain the necessary development permits for the new facility. The design shall also be reviewed with suppliers of utility services, as necessary, to develop the construction documents and obtain permits. The Design Team consultant shall coordinate and furnish documentation required for approvals, permits, utility service and connections, and the relocation of existing utilities and other facilities.

The Design Team shall submit the construction documents to the Planning Department, Building Department, and other agencies having jurisdictional authority over the project for permit review and approval, and shall assist in gaining all necessary approvals. Following receipt of comments from the various reviewing agencies, the Design Team shall make all necessary revisions to the documents in order to receive the permit approvals.

8.4 Agency review

The Agency will review the contract documents submittal from the Design Team and provide comments for incorporation into the final documents prior to authorizing that the project be let for bidding.

TASK 8 DELIVERABLES:

- 60 and 90 percent contract document review packages:
  - Drawings
  - Specifications
  - Cost estimate
  - Project schedule

Task 9: Bidding and Award

NOTE: The Agency should include a proposal format by which all respondents shall comply in order to facilitate ease of review by the Agency of the following components:

- Confirmation of understanding and compliance with the services to be performed
- Standard terms and conditions
- Special terms and conditions
- Procurement boilerplate

- FTA terms, conditions and standard clauses, if required
- Fees
- Personnel/experience
- References – on similar size projects
- Miscellaneous. – firm history, background, and other pertinent info
- Proposal evaluation criteria in order of importance

9.1 Bid phase services

The Design Team shall provide the following services should it be determined that the project shall be bid, either in whole or in part, to obtain the most competitive pricing.

- **Pre-bid conferences:** Schedule and conduct contractor pre-bid conference and site visit.
- **Long-lead items:** Identify items with long lead times and propose alternates for consideration.
- **Respond to questions:** Answer questions raised by prospective bidders regarding the contract documents at the pre-bid conference and during the bidding period.
- **Addenda:** Prepare addenda to the contract documents, as required.
- **Review rids:** Review contract bids for conformance with the contract drawings and specifications, and evaluate bids and make recommendation of contract awards.
- **Analyze substitutions:** Analyze substitutions request and recommend disposition.

TASK 9 DELIVERABLES:

- Minutes of pre-bid meeting
- Log of contractor questions and responses
- Addenda
- Bid analysis and recommendation

Task 10: Construction Phase Services

During the construction phase, the Design Team shall provide the following services to assist with the completion and occupancy of the new operations and maintenance facility.

10.1 Shop drawings review

The Design Team is responsible to coordinate through the general contractor(s) creation of and review and approval of shop drawings, erection drawings, requests for substitutions, samples, manufacturer's specifications and catalog cuts submitted by the contractors as required by the contract documents. Reviews shall be completed within two weeks of the submission.

10.2 Consultation

Throughout the construction phase, the key members of the Design Team shall provide consultation to the contractor's project manager on a continuing basis.

10.3 Attend construction meetings

The Design Team's project manager, project architect or other key members shall attend regularly scheduled construction meetings during the construction period.

10.4 Requests for information

The Design Team shall provide, as needed, investigation of and consultation on anticipated problems or conditions encountered during construction; preparation of supplementary sketches for resolution thereof; review of construction engineering proposals submitted by the contractor; and interpretation of plans and specification requirements. All RFIs shall be requested and answered in writing with a copy forwarded to the Agency.

10.5 Periodic observations

Key members of the Design Team shall visit the site on a regular basis to observe construction activity and to determine if the project is being constructed consistent with the design. They shall promptly advise the Agency of any discrepancies. If anyone within the Design Team becomes aware of any defect in the work or becomes aware of any work that is not being performed in accordance with the construction documents, they shall provide immediate written notification to the Agency and the general contractor.

10.6 Equipment testing and startup

The Design Team shall review selected items of service and maintenance equipment to be installed in the new facility. Manufacturer's specifications and catalog cuts submitted by the contractor and suppliers shall be reviewed for compliance with the specifications. Further, experienced staff members shall provide assistance during testing of specialized service and maintenance equipment and recommend final acceptance.

10.7 Final inspections and certificate of occupancy

A pre-final inspection shall be conducted in conjunction with the Agency to assist in developing a punch list of work items required to complete the project. Upon completion of the punch list items, a final inspection shall be performed. If a final Certificate of Occupancy is received, move-in may occur at the Agency's discretion. If a temporary Certificate of Occupancy is received, then the final inspection by the Design Team shall be postponed until corrective work is completed.

10.8 Optional resident inspection/construction management

Should the Agency determine that onsite construction inspection and construction management need to be a part of the project scope, a construction manager and resident inspector shall be selected to monitor the daily progress of the contractors onsite. The duties of the resident inspector shall include the following:

- Review all the contractor's pay requests, change orders, field orders, claims for additional time and other such data and take appropriate action on behalf of the Agency.
- The construction manager shall recommend the rejection of all work observed by the Design Team personnel during the above site inspections that, in its opinion, does not conform to the contract documents.
- Conduct a punch list walk-through prior to signing off on the Certificate of Substantial Completion for each of the structures. The punch list shall identify all work items that must be corrected or completed.
- Produce field observation reports.
- Maintain a submittal log.
- Maintain a daily progress log, including weather observations.
- Maintain record drawings.

10.9 Optional post-construction services

Facility maintenance plan

The Design Team can prepare a preventive maintenance plan for the new facility that shall identify the maintenance requirements of all building components, systems and equipment that need to be maintained on a regular basis and the frequency of maintenance required. Specifically the work includes the following:

- Identifying all building components, systems and equipment requiring maintenance.
- Reviewing the list of items identified above to determine the availability of resource data for each item.
- Reviewing all available resource data, including the O&M manuals, installation manuals, shop drawings, warrant information, product data and nameplate information.
- Identify all periodic inspection and maintenance requirements for each item.
- Develop detailed facility maintenance standards and procedures, which shall clearly define maintenance personnel responsibilities.
- Develop a work order system to effectively monitor preventive maintenance activities.
- Identify maintenance task intervals to provide a basis for facility maintenance master schedule.
- Provide computer-based facility maintenance program software to automate the work orders and master schedule.
- Provide all of the above described items in an organized facility maintenance system operating manual.
- Provide onsite startup assistance and training to familiarize maintenance personnel with the system.

Warranty review

Eleven months after substantial completion (and one month before the end of the one-year warranty period expires), the Design Team shall conduct a warranty inspection for the purpose of identifying any items of work that need to be corrected under the warranty. The Design Team shall work with the Agency as required to ensure that the work is corrected in a timely manner.

10.10 Optional sustainability commissioning services

If the facility is proposed for sustainability certification, a third-party contractor shall need to be employed to assemble all sustainability documentation and supporting data; provide the necessary certification documentations with the U.S. Green Building Council, Green Globes, Energy Star, or other appropriate agency; and provide necessary additional supporting documents as required to achieve the desired certification level. The commissioning agent shall also test the building systems and provide and compile the data supporting the design and certification. The firm shall prepare and execute the submission documentation for the Agency. The firm shall submit of the data to the sustainability certification agency as required and manage the submittal process.

TASK 10 DELIVERABLES:

- Shop drawing review log
- RFI response log
- Construction meeting minutes
- Field observation reports
- Preliminary and final punch lists
- Certificate of occupancy

Appendix A: Bus facility design criteria survey

The information requested in this survey is intended to give transit agencies' consultant project teams the basic information they will need to begin developing a project program for a facility. The list is intended to be generic and is not considered to be all-inclusive. The consultant will want more detailed information on some of the items and may ask more specific questions than those contained in the survey.

This information sheet is to be completed to assist the design team to determine the size and type of facility required for your service requirements.

System characteristics

This section is to define the agency system size, needs and growth potential. Enter the current and projected number of vehicles or service hours of each type. An organizational chart (by department) should be provided with this section if available.

Fixed-route fleet:	**Current**	**Projected**
Standard buses (40 ft)		
Articulated buses (60 ft)		
Commuter coaches (40-45 ft)		
Smaller buses (30-35 ft)		
Double-decker buses		
Other:		
Paratransit fleet:	**Current**	**Projected**
Body on chassis		
Vans		
Other:		
Nonrevenue fleet:	**Current**	**Projected**
Type:		
Type:		
Type:		
Contingency fleet:	**Current**	**Projected**
Standard buses (40 ft)		
Articulated buses (60 ft)		
Commuter coaches (40-45 ft)		
Smaller buses (30-35 ft)		
Double-decker buses		
Other:		

Average fleet age (in years):

Fuel types (check all that apply):

- ☐ Diesel
- ☐ CNG
- ☐ LNG
- ☐ Gasoline
- ☐ Other

Propulsion types (check all that apply):

- ☐ Hybrid
- ☐ Electric
- ☐ Fuel cell
- ☐ Other

Route service profile	Current	Projected
Hours of operation		
Morning peak period		
Evening peak period		
Peak pull-out (number of buses)		
Average annual mileage		
Number of employees		

Check all transit types used in the facility:

- ☐ Bus
- ☐ Rail
- ☐ Paratransit
- ☐ Other:

Facility needs assessment

This section is used to determine the type of facility that will be needed. The facility types are defined below and in the Facility Space Needs Calculator (Appendix C) as the following:

- **Level I:** A primary service facility providing running maintenance and storage. Activities include fueling, washing, fare collection, light bulb replacement, wiper-blade replacement, fuel level checks, etc.
- **Level II:** A secondary maintenance facility, sometimes called an inspection garage for light maintenance, i.e., engine tune-ups, lubrications, inspections, tire changing, brake repair, and minor body work, as well as unit change out. Level I activities are also included in this facility.
- **Level III:** A tertiary maintenance facility, one that provides all vehicle maintenance. Activities include engine and transmission rebuilding, testing, major body repairs, painting, etc. Level I and II activities are included in this facility.

Function	Onsite	Off-Site
Administration		
Operations		
Building maintenance services		
Vehicle maintenance		
Other:		
Other:		
Other:		

Sustainable design

This section is intended to explore whether the agency wishes to design to sustainability criteria and possibly seek a sustainability certification for the new (or existing) facility.

Does the agency or local jurisdiction require sustainable design guidelines (e.g. LEED, Green Globes, Energy Star, etc.)?	Yes	No
If yes, what guideline and rating?		

Funding sources

This section is to identify all funding sources This will help determine the budget and funding regulation requirements. List all funding sources, and provide additional information as required.

Current	**Projected**

Site selection

See Appendix B, **Site selection criteria**, for development of information that relates to the selection of a suitable site or evaluate an existing site or a site that may become available.

Facility configuration (programming)

This section will assist the consultant in evaluating the current and future needs for the size and type of building or buildings and develop the type of operations or functions required.

Vehicle bays:	**Current**	**Projected**	**Size requirements**
Lift bays			
Pit bays			
Flat bays (portable lift)			
Vehicle inspection bays:	**Current**	**Projected**	**Size requirements**
Underbody			
Rooftop			
CNG tanks			
Tank removal			
DOT			
Emissions			
Other:			
Average fleet age (in years):			

Parking (check type preferred):

Indoor	☐ Inline	☐ Angled	☐ Individual	☐ Multiple
Outdoor	☐ Inline	☐ Angled	☐ Individual	☐ Multiple
Canopy	☐ Inline	☐ Angled	☐ Individual	☐ Multiple

Block heaters preferred?

Fluids (list all types and quantities stored for all vehicles)

Motor oils:
Automatic transmission fluids:
Hydraulic oils:
Gear oils:
Grease:
Antifreeze/coolant (specify whether premixed):
Other:

Fuels (list quantities stored in gallons)

Diesel:
Unleaded:
Biodiesel:
CNG:
LNG:
Ethanol:
Other:

Requirements for fuel storage:	
AST (above ground):	UST (below ground):

Vehicle cleaning

Type of wash (or washer) preferred:

Check all items that apply to current operation:

- ☐ Interior
- ☐ Automated
- ☐ Manual
- ☐ Exterior
- ☐ Queuing
- ☐ Reclamation
- ☐ Air curtains
- ☐ Other

Chassis wash requirements (list type preferred):

Maximum number of buses washed per day:	
Wash schedule (number of washes per week)	

Administrative activities (check all that apply):

- ☐ Senior management
- ☐ Accounting/finance
- ☐ IT
- ☐ Marketing
- ☐ Capital projects
- ☐ Legal
- ☐ Procurement
- ☐ Human resources
- ☐ Risk management
- ☐ Security
- ☐ Other:
- ☐ Other:
- ☐ Other:
- ☐ Other:

Conference rooms:

☐	Large	List maximum occupancy:	
☐	Small	Suggested number of rooms:	
☐	Training		

Operational activities:

Offices (check all that apply):

- ☐ Supervisor
- ☐ Centralized cubicles
- ☐ Managers
- ☐ Administration
- ☐ Record storage
- ☐ Media storage (i.e. passes, smartcards)
- ☐ Other:
- ☐ Other:
- ☐ Other:
- ☐ Other:

Dispatch (check all that apply)

- ☐ Ideal view of bus parking
- ☐ Ease of operator access
- ☐ Pick room
- ☐ Mail room
- ☐ Drug and alcohol testing
- ☐ Radio room
- ☐ Supervisor office
- ☐ Road supervisor office
- ☐ Record storage
- ☐ Other:

Maintenance activities

Vehicle bodywork (check all that apply):

☐	Painting		
☐	Prep bays		
☐	Sanding bays		
☐	Paint mix and storage		
☐	Paint booth	List type preferred:	

Metalwork (check all that apply):

- ☐ Sheet metal shop
- ☐ Welding shop
- ☐ Frame straightening
- ☐ Trim work
- ☐ Glazing

☐	Upholstery

Storage (check all that apply)	Special size requirements
☐ Components storage	
☐ Parts storage	
☐ Storage racks	
☐ Hazmat storage	
☐ Records storage	
☐ Material lift	
☐ Shipping and receiving	
☐ Truck docks (dock levelers?)	
☐ Other:	
☐ Other:	
☐ Other:	

Component repair (check all that apply):

- ☐ Major component rebuild
- ☐ Engine and transmission
- ☐ Dynamometers
- ☐ Small component rebuild
- ☐ Brake shop
- ☐ Component teardown and parts clean
- ☐ Material handling
- ☐ Equipment cleaning
- ☐ Air conditioning
- ☐ Multiple stations
- ☐ Battery room
- ☐ Other:

Electrical/electronic repair (check all that apply):

- ☐ Electronic shop (radio/AVL)
- ☐ Fare box
- ☐ Electronic signs
- ☐ Electric shop (alternator/generator/starter
- ☐ Other

Material handling equipment (check all that apply):

- ☐ Jib cranes
- ☐ Bridge cranes
- ☐ Monorails
- ☐ Material lifts

Vehicle exhaust collections/protection (check all that apply):

- ☐ Vehicle exhaust collection systems
- ☐ Alt. fuels rated hoses

- [ ] Emissions testing
- [ ] Other

Fare collection (check all that apply):

- [ ] Vaulting
- [ ] Money counting room
- [ ] Data collection
- [ ] Armored pickups
- [ ] Wireless collection
- [ ] Other:

Tire maintenance (check all that apply):

- [ ] Servicing
- [ ] Mounting
- [ ] Tire storage (new/used)
- [ ] Rim maintenance
- [ ] Contract maintenance
- [ ] Other:

Employee/visitor parking (check all that apply):

- [ ] Secured/card accessible
- [ ] Alternate fuel parking
- [ ] Bike parking
- [ ] Motorcycle parking
- [ ] Other:

Employee training (check all that apply):

- [ ] Maintenance
- [ ] Accessibility for large components
- [ ] Operations
- [ ] CDL training
- [ ] Other

Equipment storage (check all that apply):

- [ ] Toolboxes
- [ ] Portable equipment
- [ ] Large/small tools storage
- [ ] Other:
- [ ] Other:

Facility maintenance (check all that apply):

- [ ] Shop space
- [ ] Storage space
- [ ] Miscellaneous equipment storage
- [ ] Other:

Security (check all that apply):

- ☐ Visual monitoring room
- ☐ Cameras (CCTV)
- ☐ Guardhouse
- ☐ Card accessibility (admin, ops and maintenance)
- ☐ Emergency evacuations
- ☐ Other:

Waste water/storm water management:

Does agency currently have waste water and/or storm water permits (provide copies)?	Yes	No

Water recovery storage and pickup:

Landscaping (check all that apply):

- ☐ Snow storage and removal
- ☐ Irrigation
- ☐ Shade canopies
- ☐ Bicycle lockers
- ☐ Other:

Employee facilities (check all that apply):

- ☐ Washrooms (may be separate from lockers/showers)
- ☐ Lockers
- ☐ Showers
- ☐ Quiet room
- ☐ Wellness center
- ☐ Kitchen
- ☐ Break room
- ☐ Uniform storage
- ☐ Other:

IT criteria (check all that apply):

- ☐ Security
- ☐ Storage
- ☐ Auxiliary (deliveries, queuing lines, etc.)
- ☐ Plant services (electrical closets, communications closets, HVAC units, etc.)
- ☐ Server room
- ☐ Fire/life safety-alternative fire suppression
- ☐ Other:

Environmental considerations

This section will assist the consultant in determining the environmental impacts or considerations needed for the facility.

Waste/refuse/recycling

List all types of recycling:

Hazmat (check all that apply):

- ☐ Storage
- ☐ Pickup
- ☐ Data collection
- ☐ Electronic
- ☐ Hard copy

Waste oil management (check all that apply):

- ☐ Monitoring
- ☐ Testing
- ☐ Collection

Other items to consider

Vehicles (check all that apply):

- ☐ Delivery
- ☐ Towing recovery

Pedestrian (check all that apply):

- ☐ Maintenance
- ☐ Operation
- ☐ Management

Material storage configurations (check all that apply):

- ☐ Components
- ☐ Distribution
- ☐ Inventory control
- ☐ Consumables
- ☐ Other:

Vehicle fueling (list related requirements):

Fuel type separation:

Coordination with other functions at fuel lane:
Variable fuel port locations:
Fire suppression:
Ventilation:
Other:

Vehicle daily fluid servicing (list related requirements):

Distribution:
Scheduled changes:
Daily topping:

Project schedule

This section is intended to identify project schedule requirements or other items that may delay the project.

Do you have the land identified?	Yes	No
Has the site received environmental clearances?	Yes	No
Do you have sufficient funding?	Yes	No
Do you have personnel identified to manage the project?	Yes	No
Do you have a schedule or timeline defined to meet your needs?	Yes	No

Deliverables to aid the consultant team's project initiation

1. Staffing plan/organizational chart
2. Fleet composition/inventory (revenue and nonrevenue)
3. Existing site plan
4. Existing building floor plan
5. Local sustainability requirements
6. Regional master plan
7. Local zoning regulations
8. Storm water permit
9. Waste water permit
10. Hazmat list

11. Furniture, fixtures and equipment inventory lists by department

Appendix B: Site selection criteria

This table will assist the agency in evaluating existing and proposed sites by providing a preliminary checklist of factors to be considered in selecting a site for a transit maintenance and operations facility.

Proposed Site Evaluation

Program elements/size (from Facility Space Needs Calculator)		
Building size (square feet)		
Recommended site size (acres)		
Proposed site size (acres)		
Regional master plan		
Indicate if the regional master plan is available and attach it to this document	Yes	No
Zoning		
Determine the zoning requirements for the operation type.	Zone(s):	
Locality		
Determine optimal location for facility.		
Indicate site seismic restrictions/parameters.		
Aerial restrictions		
Transit-oriented development	Yes	No
Shape		
Does the shape of the land affect its use for transit?	Yes	No
Easements		
Are there any easements that affect the development of the site?	Yes	No
Surrounding neighborhood		
Are there traffic or noise restrictions that make site an incompatible land use?	Yes	No
Displacements		
Will any business or homes be displaced as a result of the project?	Yes	No
Wetlands		
Are there wetlands or floodplains on the site?	Yes	No
Ecologically sensitive areas		
Are there other sensitive areas in the vicinity of the site	Yes	No
Historic properties		
Are there any historic properties in the vicinity of the site?	Yes	No
Parklands		
Are there any parklands adjacent and/or affected by the facility?	Yes	No
Utilities		
Are all utilities required for operations available in area?	Yes	No
Vehicle storage		
Interior/exterior/desired configuration		
Drainage features		
Storm sewer/detention pond/swales/drainage ditch		
Service area/deadhead		
Decrease/increase/no change		
Construction phasing		

Will construction phasing be required?	Yes	No

Expansion

Is there a need for future expansion?	Yes	No
Is area available for expansion?	Yes	No

Business and legal terms of deal

Provide terms and conditions.

Site access

Arterials/secondary streets/signals/RR crossings	

Ingress/egress

Are multiple points of ingress/egress available?	Yes	No

Service queuing lanes

Is there sufficient space to queue on site?	Yes	No

Down line (defects) storage

Is sufficient space available to dedicate space for down line?	Yes	No

Bridge/tunnels/ROW

Are there any other transportation facilities impacting the site?	Yes	No
Are there any transportation structures required to access the site?	Yes	No

Regulatory restrictions

Provide regulations.

Radio signal propagation

Evaluate the signal propagation of any radio dispatch.

Geotechnical site analysis/foundation condition

Has a soils analysis been performed on the site?	Yes	No

Local, state and federal regulations/codes

Determine any regulation that will apply during the construction of a facility and make a list of contact numbers.

Disaster/emergency service needs

Consider how the location of this site affects emergency preparedness and disaster planning.

Existing Site Evaluation

Program elements/size (from Facility Space Needs Calculator)		
Building size (square feet)		
Recommended site size (acres)		
Proposed site size (acres)		

Regional master plan

Indicate if the regional master plan is available and attach it to this document	Yes	No

Zoning

Determine the zoning requirements for the operation type.	Zone(s):

Locality

Determine optimal location for facility.
Indicate site seismic restrictions/parameters.

Aerial restrictions

Transit-oriented development	Yes	No

Shape

Does the shape of the land affect its use for transit?	Yes	No

Easements

Are there any easements that affect the development of the site?	Yes	No

Surrounding neighborhood

Are there traffic or noise restrictions that make site an incompatible land use?	Yes	No

Displacements

Will any business or homes be displaced as a result of the project?	Yes	No

Wetlands

Are there wetlands or floodplains on the site?	Yes	No

Ecologically sensitive areas

Are there other sensitive areas in the vicinity of the site	Yes	No

Historic properties

Are there any historic properties in the vicinity of the site?	Yes	No

Parklands

Are there any parklands adjacent and/or affected by the facility?	Yes	No

Utilities

Are all utilities required for operations available in area?	Yes	No

Vehicle storage

Interior/exterior/desired configuration	

Drainage features

Storm sewer/detention pond/swales/drainage ditch	

Service area/deadhead

Decrease/increase/no change	

Construction phasing

Will construction phasing be required?	Yes	No

Expansion

Is there a need for future expansion?	Yes	No
Is area available for expansion?	Yes	No

Business and legal terms of deal

Provide terms and conditions.

Site access

Arterials/secondary streets/signals/RR crossings	

Ingress/egress

Are multiple points of ingress/egress available?	Yes	No

Service queuing lanes

Is there sufficient space to queue on site?	Yes	No

Down line (defects) storage

Is sufficient space available to dedicate space for down line?	Yes	No

Bridge/tunnels/ROW

Are there any other transportation facilities impacting the site?	Yes	No
Are there any transportation structures required to access the site?	Yes	No

Regulatory restrictions

Provide regulations.

Radio signal propagation

Evaluate the signal propagation of any radio dispatch.

Geotechnical site analysis/foundation condition

Has a soils analysis been performed on the site?	Yes	No

Local, state and federal regulations/codes

Determine any regulation that will apply during the construction of a facility and make a list of contact numbers.

Disaster/emergency service needs

Consider how the location of this site affects emergency preparedness and disaster planning.

Appendix C: Using the Facility Space Needs Calculator

The Facility Space Needs Calculator (Reference: Facility Space Needs Calculator APTA-BT-MF-CALC-001-10) is an Excel file that has been designed to allow users to quantify rough square footages needed to accommodate the design for a bus maintenance facility. Fields highlighted in yellow allow data entries.

Instructions

1. Type in numbers for current or anticipated fleet quantities in the highlighted Fleet Information boxes, including potential visitors' spaces.

   NOTE: If you do not enter any numbers in a highlighted field, space for that item will not be allocated. You can calculate square footages for a standalone administration building, operations offices or a maintenance-only facility without any administration or operations staff on site.

2. The numbers will be totaled in the GSF (nearest 100 square feet) column.
3. Go over to the Staffing Information blocks and enter current or anticipated numbers for staffing. Note that the drivers or operators are entered just below.
4. The numbers will be totaled in the Total Staff and Total Operators area.
5. In the Program Calculator section, click on the correct button for either **interior** or **exterior** bus storage parking. For this calculator, you must consider the buses as all parked inside or all parked outside at night.
6. At the top right of the calculator, choose one selection from each pull-down menu: Facility Circulation Pattern, Bus Parking Pattern and Facility Type. Refer to the Glossary for detailed explanations of each term.
7. All levels of transit bus maintenance facilities can be generated by selecting Level I, II or III Facility in the pull-down menu.
8. The Total Building Area is a very general design "ballpark" number and should be considered as a beginning point for more detailed discussions.
9. The Site Square Footage is a general design number and purposely includes a range for other unexpected or unforeseen circumstances but does *not* include expansion space, easements, wetlands, irregularities with regards to the shape of the property, and site topography.

Facility types

- **Level I:** A primary service facility providing running maintenance and storage. Activities include fueling, washing, fare collection, light bulb replacement, wiper-blade replacement, fuel level checks, etc.
- **Level II:** A secondary maintenance facility, sometimes called an inspection garage for light maintenance, i.e., engine tune-ups, lubrications, inspections, tire changing, brake repair, and minor body work, as well as unit change out. Level I activities are also included in this facility.
- **Level III:** A tertiary maintenance facility, one that provides all vehicle maintenance. Activities include engine and transmission rebuilding, testing, major body repairs, painting, etc. Level I and II activities are included in this facility.

Glossary of terms

angled parking: Typically 45-degree angled bus parking, typically in long rows, which allows independent exiting (single pull-through).

articulated bays: Maintenance bays dedicated to buses from 45 to 60 feet long.

exterior circulation: Includes multiple doors for buses to go in, multiple doors out.

fueling lanes: Drive-through lanes dedicated to fueling and fluids top-off.

herringbone parking: Buses parked generally at 90-degree angles, typically tail to tail, preventing any backward bus movements, minimum of two rows.

in-line parking: Head-to-tail bus parking, typically in groups of three or more, with or without an aisle between rows.

input requirements: Enter numbers from fleet/staff inputs known or expected.

interior circulation: Includes one door for buses to go in, and one door out.

modified circulation: Provides one door for buses to go in, multiple doors out.

nonrevenue vehicles: Service vehicles, i.e., those that do not collect fares or run on established routes.

other staff: Includes other building users not defined as administration, operations or maintenance.

service lanes: Drive-through lanes dedicated to fueling, fluids top-off, and washing (can include bypass lane).

tandem parking: Buses parked generally at 180 degree angles, typically tail to tail, preventing any backward bus movements, minimum of two rows.

usable acres: Land area needed, not including required building setbacks, landscaping, water retention, expansion, easements, irregular or odd shapes of the property, wetlands and other site topography.

work bays: Maintenance, inspection and cleaning bays dedicated to buses less than or equal to 40 feet long.

Assumptions

- This has been designed for <=225 vehicles.
- Surface parking only (peak period).
- One-story building(s), suburban-style design.
- GSF factor includes circulation space, mechanical/electrical/plumbing, walls, etc.
- Two shifts per day.
- Average of 8-year-old fleet.
- Average fleet mileage of 30,000 to 60,000 miles per year. If your mileage is more, then the bus-to-maintenance-bay ratio will be higher.
- Based on bus storage area being rectangular.

References

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U.S. Green Building Council (LEED) home page: www.usgbc.org

Abbreviations and acronyms

ADA	Americans with Disabilities Act
AE	architectural and engineering
APTA	American Public Transportation Association
AVL	automatic vehicle locator
BIM	building information modeling
CADD	computer-aided designing and drafting
CatEx	categorical exclusion
CCTV	closed-circuit television
CDL	commercial driver's license
CO	certificate of occupancy
CSI	Construction Specifications Institute
DBE	disadvantaged business enterprise
DOT	Department of Transportation
EA	environmental assessment
EIS	environmental impact statement
FEMA	Federal Emergency Management Agency
FONSI	finding of no significant impact
FSNC	Facility Space Needs Calculator
FTA	Federal Transit Administration

GSF	gross square feet
HVAC	heating, ventilation and air conditioning
ICE	Independent Cost Estimate
LEED	Leadership in Energy and Environmental Design
MBE	minority business enterprise
MPO	metropolitan planning organization
NOA	notice of availability
NRCS	National Resource Conservation Service
O&M	operations and maintenance
PM	project manager
PMC	project manager consultant
ROW	right of way
RFI	request for information
RFP	request for proposal
SBE	small business enterprise
STIP	State Transportation Improvement Plan
TIP	Transportation Improvement Plan
UL	Underwriters Laboratory
USGBC	U.S. Green Building Council
USGS	United States Geodetic Survey