National Park Service
U.S. Department of the Interior

Alternative Transportation Program
Washington, D.C.

Alternative Transportation Systems – Vehicles and Supporting Infrastructure Guide

Plan Implementation Considerations for National Park Managers

September 2004

John A. Volpe National Transportation Systems Center
Research and Special Programs Administration
U.S. Department of Transportation

Contents

Definitions

The following terms are used in this report:

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASTM	American Society for Testing Materials
ATP	Alternative Transportation Program
ATS	Alternative Transportation System
BAA	Buy America Act
BARB	Buses All Ready to Buy
CARB	California Air Resources Board
CDL	Commercial Driver's License
CE	Categorical Exclusion
CNG	Compressed National Gas
DOE	Department of Energy
DOT	Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPACT	Federal Energy Policy Act
ESF	Environmental Screening Form
EV	Electric Vehicles
FAR	Federal Acquisition Regulations
FC	Fuel Cell
FHWA	Federal Highway Administration
FMCSR	Federal Motor Carrier Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FONSI	Finding of No Significant Impact
FTA	Federal Transit Administration
GVWR	Gross Vehicle Weight Rating
GSA	General Services Administration
HVAC	Heating, Ventilation and Air Conditioning System
ITS	Intelligent Transportation Systems
LCC	Life Cycle of Cost
LPG	Liquefied Petroleum Gas (propane)
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Act
NG	Natural Gas
NOx	Nitrogen Oxides
NPS	National Park Service
OMB	Office of Management and Budget
PM	Particulate Matter
ROD	Record of Decision
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board

Chapter 1: Introduction

This document serves a guide to the basic concepts involved and issues to be addressed by National Park Service (NPS) staff in the of acquisition of vehicles, supporting infrastructure, as well as information on the need for maintenance facilities and specialized staff to operate and maintain transportation system to serve visitors to national parks, recreation areas, historic sites, and monuments. It identifies engineering principles and practices, codes and standards, and lessons learned that are applicable to the NPS. It contains numerous references to other publications and electronic links to websites for more in depth information.

NPS Mission

The National Park Service preserves the natural and cultural resources and values of the national park system for the enjoyment, education and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

ATP Mission

Preserve and Protect resources while providing safe and enjoyable access to and within the national parks by using sustainable, appropriate and integrated transportation solutions.

1.1 Transportation Requirements at Individual Park Units

Individual parks have unique transportation applications. Site-specific requirements set the stage for the proper implementation of unique operations, vehicles, support infrastructure, and personnel. Each park superintendent needs to tailor transportation solutions to accommodate the park's unique characteristics and needs consistent with its geography. For example, transportation at the Washington Monument, an urban park, will have a different set of challenges than the rural Grand Canyon requiring different vehicles and infrastructure.

1.2 Strategic Planning

Understanding and developing realistic estimates of all costs associated with running a transportation system is a critical element of strategic planning. The planning process begins with careful consideration of the goals and objectives to be addressed by a prospective transportation service and clear identification of the needs to be served. Once the preferred characteristics (e.g. mode, route configuration, and schedule) of the transportation services have been broadly defined and potential benefits and impacts have been assessed, infrastructure requirements (vehicle purchase, extended warranties, fuel and maintenance contracts, concession contracts, etc.) can be determined and cost estimates can be developed.

The *National Park Service Transportation Planning Guidebook* outlines the steps to be followed in conceptualizing and developing transportation projects tailored to meet the individual needs of each unique NPS site. It can be referenced at http://www.nps.gov/transportation/alt/nptg.htm. Additional sources of information on transportation planning that may be helpful are technical reports

published by the Transportation Research Board (TRB)[i] (available at: http://www4.trb.org/trb/onlinepubs.nsf/web/TCRP_Reports). Specific references are provided in Table 1 below.

Table 1
Additional Sources of Information on Transportation Planning
Source: Transportation Research Board

TCRP No.	Report Title
3.	Workbook for Estimating Demand for Rural Passenger Transportation
21.	Strategies to Assist Local Transportation Agencies in Becoming Mobility Managers
34.	Assessment of the Economic Impacts of Rural Public Transportation
35.	Economic Impact Analysis of Transit Investments: Guidebook for Practitioners
38.	Guidebook for Evaluating, Selecting, and Implementing Fuel Choices for Transit Bus Operations
41.	New Designs and Operating Experiences with Low-Floor Buses
45.	Passenger Information Services: A Guidebook for Transit Systems
47.	A Handbook for Measuring Customer Satisfaction and Service Quality
54.	Management Toolkit for Rural and Small Urban Transportation Systems
70.	Guidebook for Change and Innovation at Rural and Small Urban Transit Systems
75.	The Role of the Private-for-Hire Vehicle Industry in Public Transit
76.	Guidebook for Selecting Appropriate Technology Systems for Small Urban and Rural Public Transportation Operators
82.	Improving Public Transit Options for Older Persons

[i] TRB is a unit of the National Research Council, a private, nonprofit institution that is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results.

Chapter 2: Vehicles

Given growing concerns over emissions and infrastructure requirements to support the use of private vehicles, many parks are acquiring public transport to provide an alternative. This chapter discusses the issues and concerns when choosing, procuring, and operating vehicles for visitor transportation.

2.1 Vehicle Selection

When selecting a vehicle, decision makers should be aware of the various requirements that affect their choice. They should identify and evaluate the specific features and needs of their park or site. Consideration of the various alternative propulsion systems available in NPS vehicles as well as the financial, operating, environmental, and maintenance implications of those systems should also be taken into account. Managers at parks that transport visitors, particularly those with tours, should consider vehicles that have historical or thematic significance and practical application for their park or site, such as historical trolleys or other rail vehicles or the "Red Bus" as described in Section 2.1.4.

2.1.1. Regulatory Requirements

NPS policies, guidance and Manuals can be found at the web site: http://www.nps.gov/refdesk/policies.html All NPS vehicles must comply with Section 504 of the Rehabilitation Act of 1973, the Federal Energy Policy Act (EPACT) of 1992, Federal "Buy America" requirements, Federal Environmental Protection Agency (EPA) regulations (as well as state environmental requirements), and the Federal Motor Vehicle Safety Standards (FMVSS).

Section 504 of the Rehabilitation Act should be reviewed

Disability Requirements

A requirement that warrants particular consideration in transportation planning is accessibility for persons with disabilities. Section 504 of the Rehabilitation Act of 1973 primarily governs disability rights requirements for the NPS. In certain cases the Architectural Barriers Act of 1968 and the Americans with Disabilities Act of 1990 (ADA) may also be applicable. Park transportation systems must have a "*sufficient percentage of fully accessible vehicles or watercraft to provide effective services to persons with disabilities*." Existing transportation services available to the general public must be made accessible "*to the greatest extent reasonable,*" although separate, specialized services for the disabled may be provided to meet accessibility requirements if the need *"is clearly demonstrated."* All new transportation services and replacement vehicles must be fully accessible to persons with disabilities. [1]

Public transportation vehicles must meet minimum standards and requirements for mobility, accessibility, and information conveyance for people with mobility, auditory, or visual impairment. When specifying vehicles, the NPS must incorporate these requirements in its procurements (refer to section 2.1.1). There are several technologies that address these needs, including wheelchair lifts and ramps, in-vehicle signs, and in-vehicle enunciators. The NPS has published a comprehensive guide for Accessible Transportation Systems, which can be referenced at:

[1] Director's Order #42: *Accessibility for Visitors with Disabilities in National Park Service Programs and Services.* The procedures in the Director's Order give detailed guidance based on the requirements set forth in laws, rules, and regulations.

http://inside.nps.gov/programs/functioncustommenu.cfm?menuid=1594&div=41&prog=151&fun=454.[1]

Energy Policy Act (EPACT) of 1992
The federal government requires that a percentage of a federal agency's light-duty (vehicles less than or equal to 8,500 GVWR) fleet be alternative fuel vehicles. Current legislation states that the vehicles can be bi-fuel. Under current EPACT legislation only alternative fuels (biodiesel, ethanol, methanol, propane, natural gas, and hydrogen) or electric power qualify. Parks should remain cognizant of any additions or changes in this legislation.

Buy America
The Federal Buy America Act (BAA) provisions in the Federal Acquisition Regulation (FAR; Part 25) require federal agencies to procure products manufactured in the United States with domestically produced components accounting for more than 50 percent of the component costs. Vehicles acquired through the General Services Administration (GSA) are subject to the BAA under the FAR.

For vehicles acquired in partnership with the Federal Transit Administration (FTA) or public transit agencies using FTA funds, additional regulations (49 CFR 661) apply (http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr661_00.html). Generally, the FTA requirements do not apply to procurement of buses and other rolling stock if the cost of components (excluding labor costs involved in final assembly) produced in the United States is more than 60 percent of the cost of all components and final assembly that takes place in the United States.

If working with transportation agency partners under the FTA regulations, a plan must be developed to conduct both a pre-award review and a post-delivery material audit of vehicles procured to ensure compliance with "Buy America" regulatory provisions. A series of "Dear Colleague" letters from the FTA Administrator provide guidance to public transportation agencies using FTA Capital Grant funds (http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr661_00.html).

EPA and State Environmental Requirements

Environmental compliance

Any vehicle that is purchased or has a propulsion system overhaul will need to meet the applicable EPA (40 CFR 59), and state requirements. This is particularly true in California, where the individual parks should coordinate with the regional air quality management district. Particulate matter (PM) and nitrogen oxides (NOx) are the two commonly regulated emissions. EPA does not regulate carbon dioxide emissions or many of the other air toxins. Relevant requirements of the National Environmental Policy Act (NEPA) for supporting infrastructure are discussed in Section 3.1. These extend beyond those for vehicle emissions and cover additional criteria including ozone and CO.

Federal Motor Vehicle Safety Standards (FMVSS)

Vehicle safety standards

All vehicles must be tested or certified to conform to the applicable Federal Motor Vehicle Safety Standards, 49 CFR 571, which are posted on the following website: http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr571_00.html. Modifications to a vehicle shall not take the vehicle out of compliance with any and all FMVSS for which the vehicle was initially certified.

[1] See 2001 NPS Management Policies, Physical Access for Persons with Disabilities 5.3.2; Accessibility for Persons with Disabilities 8.2.4; 9.1.2 Park Facilities: Accessibility for Persons with Disabilities; Accessibility of Commercial Services 10.2.6.2. Also see Director's Order #42: Accessibility for Visitors with Disabilities

Federal Motor Carrier Safety Regulations (FMCSR)

Vehicles used in commerce and in specific passenger transport and livery operations may also be subject to operational regulations defined under 49 CFR 390: http://www.fmcsa.dot.gov/rulesregs/fmcsr/fmcsrguide.htm. These regulations provide for the operational safety, maintenance, and inspection of vehicles and components.

Vehicle Insurance

It is common for concession owned vehicles to carry jurisdictional (State) insurance requirements. The Federal Government requires all vehicles purchased with Federal funds be insured and that all operating entities carry liability insurance. The Department of Interior legal council should review requirements for vehicle insurance coverage including liability. Rates may vary according to vehicle type, fuel, use, and location. Insurance rates for vehicles used at monuments and sites in urban areas are likely to be higher than those deployed in rural areas. Liability rates for high-capacity transport vehicles are likely to be very expensive. These rates may affect vehicle choice or even the extent of visitor transportation offered.

2.1.2 Park-Specific Performance Criteria

In addition to understanding the constraints of various Federal requirements relevant to vehicles, parks should also evaluate the vehicles' compatibility with the locations where it will be operated.

First, park staff should survey the needs and characteristics of their park or site and the available resources. Appendix A contains a Park Criteria Sample List. Park staff should evaluate vehicles in terms of emissions, noise levels, reliability, intended duty cycle, interior design (to include capacity and stowage capability), and maintenance requirements. As part of these evaluations, consulting the Society of Automotive Engineers (SAE) recommended practices on vehicle structural safety may be helpful; see http://www.sae.org/servlets/index. An examination of the design guidelines published by FTA, available at http://transit-safety.volpe.dot.gov/Publications/Default.asp could also be beneficial.

Vehicles should be compatible with park characteristics

Emissions

The air quality of the park's region and the distance and frequency of vehicle trips will help determine acceptable emission levels. Major determinants of emissions levels are the vehicle's propulsion and fuel systems, and proper maintenance. Emerging and existing technology alternatives to gasoline and diesel fuels are discussed in Section 2.1.3. The EPA sets Federal emissions criteria regulations. State environmental and other regulatory agencies may also set local or regional air quality standards. A fleet operator should be cognizant of air quality issues and standards that may affect their fleet operations.

Noise

Vehicle noise may affect not only park visitors and others in or near a park but wildlife as well. It is commonly accepted that man-made noise may be a distraction and interfere with the enjoyment and experience of a park. It is often desirable to require more stringent noise emission profiles than what is commonly available on transit vehicles. Noise measurements and monitoring in the park are useful for determining the desired noise profile of the vehicles operating in the park, including both absolute level and frequency content of vehicles' noise signature. Noise measurements should include sites at varying distances from existing roadways and other places where vehicles are known to operate. Concurrent to

measurements and continuous observations of the audible noise source should be made and documented according to an established hierarchy of noise sources. These measurements should include periods of time when no vehicles are operating in the vicinity. Noise impacts are highly localized to specific sites. To facilitate noise management, the Volpe National Transportations Systems Center has drafted a measurement protocol that has been employed in several national parks for measuring ambient noise. The *Draft Guidelines for the Measurement and Assessment of Low Level Ambient Noise* (DTS-34-FA865-LR1)[1] may be more rigorous than needed but provides a significant amount of guidance and relevant information.

Many of the alternative technologies (discussed in Section 2.1.3) are quieter than conventional engines. For instance, battery electric vehicles and hybrids that use substantially smaller engines or turbines generate substantially less noise than conventional vehicles. All vehicle models purchased with Federal funds are tested at the Altoona Bus Research and Testing Center in Altoona, Pennsylvania. Information on the test results of vehicle noise emissions is available at http://www.vss.psu.edu/fta/altoona_facility.htm.

Other factors that affect vehicle noise are:

- Heating, Ventilation and Air-conditioning (HVAC) system
- Brakes and suspension system
- Air compressions
- Amount of sound insulation on board the vehicle

A general rule of thumb is that the quieter the vehicle, the more it will cost.

Reliability

The mean-distance-between-failures, the rollout rate, and the amount of scheduled and non-scheduled maintenance should be considered in the equations or models that evaluate reliability. Basic reliability test information is available for any vehicle that has completed Altoona testing (discussed in Section 2.1.1). Current users such as other parks or public transportation organizations also provide valuable insight. The vehicle's reliability is a direct function of the environment, duty cycle, design, and maintenance practices.

Duty Cycle

The American Public Transportation Association (APTA) defines several basic duty cycles that represent the prevalent conditions in the United States. However, park sites may need to define their own duty cycle. The cycle for a specific site can be measured directly using an on-board data logger. Understanding the duty cycle may allow an entity to tailor the vehicle design, specifically the propulsion system, to optimize fuel economy and lower emissions. This is particularly important with many of the emerging technologies, such as battery or hybrid electric. If the vehicle is not suited for the given duty cycle, there may be severe performance and reliability problems. The emissions and fuel economy tests are also based on the duty cycle (see SAE J1711 and 2711). When the duty cycle is properly understood and defined, it can be incorporated into the procurement performance specifications. This may lead to improved performance and a less costly vehicle or a more expensive vehicle with greater reliability.

Americans with Disabilities Act requirements for emergency evacuation should be reviewed

Interior Vehicle Design

[1] Fleming, Gregg G., et al. *Draft Guidelines for the Measurement and Assessment of Low Level Ambient Noise*. John A. Volpe National Transportation Systems Center Acoustics Facility: Cambridge, MA. March 9, 1998.

Management should assess the number of anticipated passengers, the length and nature of the trips to determine capacity, the demand for storage space, and the type of seats used. Tour vehicles will most likely have high passenger numbers but require little storage area. Vehicles that transport passengers to recreation areas will need sufficient space to accommodate gear, depending on the type of recreation. The length of the trips and types of passengers will determine the type of seats. Vehicles used for short rides can have hard, inexpensive seats. A comfortable seat for longer rides leads to higher costs. The costs of cleaning the seats, as well as the entire interior, should be considered (i.e., plastic vs. upholstered).

Fire safety and egress issues, including evacuation of disabled passengers, should be considered.
The flammability ratings for floors and various types of seats should be ascertained. CFR Title 49, 571.302 is a flammability of interior materials standard that applies to passenger cars, multipurpose vehicles, trucks, and buses. This standard specifies burn resistance requirements for materials used in the occupant compartments of motor vehicles. FTA has published guidelines on fire safety, egress, and evacuation of disabled passengers.[1]

The design of egress features should be designed so that people threatened by a fire are able to reach a place of safety before hazardous conditions develop. CFR Title 49, 571.217 is a standard for emergency exits and window retention and release on buses. It contains requirements for the retention of windows other than windshields in buses, establishes operating forces, opening dimensions, and markings for bus emergency exits. The purpose of this standard is to minimize the likelihood of occupants being thrown from the bus in case of a collision and to provide a means of readily accessible emergency egress.

Maintenance Requirements
The maintenance needs of the types of vehicles being considered should be determined, preferably by a certified mechanic who has prior knowledge of the type of vehicle being considered, and should not rely entirely on the manufacturer's suggested maintenance procedures. Vehicles that use the alternative fuel and power sources discussed in Section 2.1.3 may require maintenance skills and training not possessed by the park's mechanics. Qualified mechanics may not be available within a reasonable distance of some parks, particularly those in isolated areas. Maintenance needs and costs as well as the logistical implications of meeting those needs must be carefully assessed before vehicles are selected. Vehicle manufacturers or dealers may be good sources of information.

2.1.3 Propulsion Options[2]
As a steward and champion of environmental preservation and leadership, the NPS mission includes protection of resources by reducing the local and global emissions and of transportation systems. There are numerous current and emerging propulsion/fuel technologies that may produce fewer emissions and reduce environmental impact compared to conventional gasoline and diesel fuels: Electric, Hybrid electric, Biodiesel, Ethanol, Methanol, Liquefied petroleum gas (propane), Natural gas, and Hydrogen.

---

[1] Evacuation and Rescue of Elderly and Disabled Passengers from Paratransit Vans and Buses can be obtained by contacting: Alison Thompson, Volpe National Transportation Systems Center, Infrastructure Protection and Operations Division, DTS-78, 55 Broadway, Kendall Square, Cambridge, MA 02142
[2] Information is abridged from the NPS Vehicle Primer Additional propulsion system found available at: http://www.nps.gov/transportation/alt/vehicletech.htm

The availability of electricity in a given location depends on the on-site power distribution

Executive Order 13149 on Federal Fleet and Transportation Efficiency requires agencies to report progress in acquisition of alternative fuel vehicles, use of alternative fuels, and acquisition of higher economy vehicles. EO 13149, Sec. 201. Reduced Petroleum Fuel Consumption states, "Each agency operating 20 or more motor vehicles within the United States shall reduce its entire vehicle fleet's annual petroleum consumption by at least 20 percent by the end of FY 2005, compared with FY 1999 petroleum consumption levels." These alternative fuel vehicles may be appropriate for use in certain parks or sites, particularly those concerned with air quality. The factors discussed in Section 2.1.2 (emissions, noise, and vehicle performance characteristics) must not be forgotten. More in depth information on any of these alternative propulsion/fuel systems can be found at http://www.afdc.doe.gov/ and in the NPS publication *Transit Vehicles for the National Parks: Factors and Technologies for Vehicle Selection*. This document also provides expanded guidance on evaluating the appropriateness and value for an alternative fuel in a specific park application

Electric

Electricity is either stored energy (in a battery) or generated as needed. Most electric vehicles (EVs) have limited on board energy storage capacity and therefore a shorter range than comparable conventionally fueled vehicles. Small vehicles have proven most suited to using this energy source. Some amenities, such as air conditioning, are either not available or may function differently or in a very limited capacity in pure EVs. The electric drive system has zero tailpipe emissions and is typically quieter than conventional systems.

By 2005, all major auto manufacturers are expected to offer a hybrid vehicle

Hybrid Electric

Hybrid electric is an increasingly popular propulsion system that combines on-board electric storage with an on-board power unit that may be fueled from any of the conventional or alternative fuels. Hybrid electric vehicles have lower emissions, use less fuel, and are quieter than conventional vehicles, yet have greater range than pure EVs.

Hybrids exist in several configurations that can be tailored to or optimized for their given use. These are series, parallel, series-parallel, mild/light (engine dominant), strong/heavy (battery dominant), charge sustaining, charge depleting, and grid or non-grid connected. On-board power is typically generated from an internal combustion engine (reciprocating or microturbine). Fuel cells are another option. Some hybrid vehicles offer the option of sustained off-grid distributed power generation.

Biodiesel

Biodiesel is a cleaner burning diesel fuel produced from domestic, renewable resources such as soybean oil or recycled restaurant-cooking products. It is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics. It can be used in compression-ignition (diesel) engines with few or no modifications. Many fleet managers have determined biodiesel is their least-cost strategy in complying with state and Federal regulations.

Biodiesel is not compatible with natural rubber hoses and gaskets found in pre-1993 vehicles

Biodiesel may be blended in any proportion with petroleum diesel. B20 (20 percent biodiesel/80 percent petroleum diesel) is the most common blend, and has demonstrated significant environmental benefits with a minimum increase in cost for fleet operations. The FTA is currently funding a comprehensive emissions testing program to evaluate biodiesel.

Biodiesel is an EPA registered as a fuel and fuel additive. It meets clean diesel standards established by the California Air Resources Board (CARB). The Department of Energy (DOE) and the U.S. Department of Transportation (DOT) have designated biodiesel as an alternative fuel. The national biodiesel fuel specification issued by ASTM is D-6751.

Infrastructure for ethanol is similar to that for gasoline or diesel

Ethanol

Ethanol is a renewable, domestically produced resource derived primarily from corn, although it can be produced from any resource containing starch, sugar, or cellulose based material. The fuel can be blended with gasoline, diesel, or used as pure fuel. Ethanol has a lower energy density that gasoline or diesel, but can achieve comparable range with a larger fuel tank. The common form is E85, an 85-percent blend with 15 percent gasoline. E95, a 95-percent ethanol 5-percent diesel blend, can be used as a substitute for diesel fuel. Ethanol is also used as an additive to gasoline (approximately 10 percent), and is currently being tested as a diesel fuel additive.

Special precautions must be taken, as methanol flame is virtually invisible.

Methanol

Methanol is a domestically produced fuel and is readily available in the western hemisphere. The fuel was used as a feedstock for MTBE (an oxygenate for gasoline). M85, an 85-percent blend of methanol with 15 percent gasoline, can be used with internal combustion engines. Currently, M100 (pure methanol) is being used as a fuel for on-board reforming for fuel cells. Methanol is primarily produced from methane, although it can be made from coal and renewable feedstocks including wood, sewage, and agricultural products. Methanol offers significantly higher fuel energy density than pure hydrogen stored on-board. Since the storage volume of the fuel is reasonable, methanol fuel cell vehicles can meet the range requirements of most identified drive cycles.

Liquefied Petroleum Gas (LPG)

Also known as propane, LPG consists primarily of propane and butane, and it is a plentiful domestic, North American energy source. It has been used as a vehicle fuel since the 1920s. The terms "LPG" and "propane" often are often used interchangeably. LPG, when used as an alternative transportation fuel, is typically a mixture of at least 90 percent propane and 2.5 percent butane and higher hydrocarbons with the balance being ethane and propylene. A special blend of propane called HD-5 has been developed for vehicular use. "HD" stands for heavy duty, and "5" represents the maximum allowable percentage of propylene content. HD-5 propane is distinguished from the "commercial" propane blend used for residential, commercial, and industrial heating purposes. Most commercial propane, however, in the United States meets the HD-5 specification and has been found to be a satisfactory vehicular fuel.

Propane is significantly heavier than the ambient air—safety precautions must be taken

Propane offers the potential for significant cost savings and price stability

LPG has a higher octane rating than gasoline but less energy content. Vehicles that use it average approximately 12 to 15 percent fewer miles per gallon than those that use gasoline. LPG has a higher energy density in terms of BTUs per gallon than other alternative fuels. It is stored as a liquid at pressures in the range of 125 to 175 psi. When released from pressure, it expands and enters the engine compartment as a vapor.

Natural Gas

Natural gas (NG) is a domestic North American energy source consisting primarily of methane (CH_4). When used as a transportation fuel, NG must be at least 88 percent methane, with the balance being higher weight hydrocarbons. NG has a lower energy density than conventional fuels, but achieves comparable range in

A consideration of CNG vehicles is the fueling options

most vehicles with large fuel storage devices, these add weight and reduce cargo and/or passenger capacity. Properly tuned and maintained NG propulsion systems offer emissions benefits greater than those of conventional technologies. About 20 percent of all transit buses currently manufactured in the United States use NG.

NG bus fuels are available in two forms: compressed natural gas (CNG) and liquefied natural gas (LNG). The safety and storage implications are different for the two forms. CNG is stored in cylinders under very high pressure, typically 3,000 or 3,600 psi. LNG is a cryogenic liquid fuel.

Hydrogen

Hydrogen is one of the most common elements found on earth and in the atmosphere. Because hydrogen is chemically bound with other elements, such as water (H_2O), hydrogen atoms need to be freed from the bond to be used as a fuel. Hydrogen is used extensively and safely by the food and chemical industry, but a high level of purity (99.9 percent) is necessary for use as a fuel in many fuel cell (FC) applications. This level of purity requires additional or different processing techniques. Some manufacturers are also promoting the use of hydrogen to fuel internal combustion engines.

Hydrogen vehicles are currently available only as prototypes

Hydrogen is a domestic fuel/energy source, and can be produced using renewable energy, or derived from hydrogen-rich feed stocks including fossil fuels. The energy density varies depending on the form in which it is stored. Hydrogen and its on-board storage have a lower energy density than natural gas and conventional liquid fuels. Range is achieved in most cases with large fuel storage devices. These add weight, and reduce cargo or passenger capacity. High compression of hydrogen gas (in the range of 5,000 to 10,000 psi) or liquefaction helps address this issue. On board reforming of liquid fuels is also an option.

2.1.4 Special Vehicles Particularly Suitable for Visitor Transportation

Some parks use historical vehicles that have been refurbished and have thematic significance and/or features for transporting visitors in a park. These vehicles are especially useful for tours. Examples include a mid-20th century steam locomotive used in Steam Town National Historic Park (Scranton, PA), early 20th century trolley cars used in Lowell National Historic Park (Massachusetts), and the circa 1940 "Red Bus" used in Glacier National Park (Montana).

The Red Bus has been a successful means of visitor transport in Glacier National Park; it is being considered for use in Rocky Mountain National Park

The Red Bus is a passenger vehicle that was used in Glacier Park before World War II and has been rebuilt by Ford Motor Company using modern propulsion technology. It is used in Glacier Park to transport visitors through the vast park to view its spectacular scenery. Keys to the vehicle's success include its retro design, historical significance, and canvas rollback top. The canvas top can be pulled back to provide panoramic views when temperatures are at least 50° F and when it is not raining. Blankets are provided on cool days, and the driver assists people with disabilities in boarding and leaving the vehicle. The Red Bus has a dual-fuel engine that uses gasoline or propane.

There are emerging technologies that also seem promising for visitor transport at NPS entities.

Figure 1
Examples of Refurbished Park Vehicles

2.2 Procuring Vehicles

After choosing the appropriate vehicle, several decisions must be made concerning procurement of the vehicle(s). Entity officials must decide where to obtain the vehicle(s), perform a cost comparison, decide whether to purchase or lease the vehicle(s), have the candidate vehicle(s) inspected, and determine the lead-time for the procurement.

2.2.1 Procurement Source

Federal agencies procure vehicles through GSA. In special circumstances a waiver is required to procure vehicles directly as noted below regarding direct procurement. Government surplus is also an option for certain types of vehicles.

AutoChoice allows agencies to compare vehicles and prices and to place orders

GSA

GSA has a program called Buses All Ready to Buy (BARB). This program allows the agencies to view various types of buses and available options, while allowing buyers to configure the buses. Standard school buses (adult and passenger), shuttle buses, transit buses, and motor coaches can be acquired through the BARB program.

The preferred method for ordering vehicles is through GSA's electronic ordering process. Ordering electronically expedites orders and provides the ordering agency with an immediate order receipt acknowledgement. There are two ways to order electronically:

(1) AutoChoice, GSA's online vehicle ordering system accessible via the Internet at http://www.fss.gsa.gov/vehicles/roads/roads.cfm. The web site allows agencies to choose vehicle models, compare contract prices and equipment options, place vehicle orders, and check order status.

(2) Electronic file format – Orders can be sent to GSA, as an e-mail attachment to electronic.requisition@gsa.gov, in three different file formats: Excel (.xls), text file (.txt), and database file (.dbf). Orders can also be submitted via overnight mail on a

compact disk or 3.5-inch floppy disk. For more information about the template for electronic file format orders, contact Mike Couveau, (703) 308-0789, michael.couveau@gsa.gov.

Paper requisitions are being phased out. Fiscal Year 2004 will be the last year GSA will accept the GSA Form 1781 in paper form covering vehicles that can be purchased through the on-line AutoChoice program. If the NPS is unable to submit their requisitions electronically, they may send it by mail or fax on either the GSA Form 1781 (Motor Vehicle Requisition) or the Standard Form 344 (Multiuse Standard Requisitioning/Issue System Document).

Mail to:
General Services Administration
Federal Supply Service
GSA Automotive (FFA)
1941 Jefferson Davis Highway, Room 600
Arlington, VA 22202
Fax (703) 305-3034

GSA also offers an "Express Desk" to handle "urgent requirements" – those that are needed on an "Unusual and Compelling Urgency" basis, in accordance with FAR 6.302(c)(2). Urgent requisitions must include a justification for other than full and open competition. For further information, call the Light Vehicles Division at (703) 308-4576.

Direct Procurement

When a special vehicle, configuration, or technology is needed, NPS may wish to effect its own procurement if the required vehicle characteristics are not available from GSA. In such circumstances, a written waiver request must be submitted to GSA. GSA waivers for procurement authority are awarded on a case-by-case basis. GSA's Multiple Award Schedule offers many benefits, including the ability to choose among various suppliers and to order directly from the vendor.

Government surplus is often an inexpensive source for quality utility vehicles

Government Surplus

Several national parks and recreation areas, including Cape Cod National Seashore, use vehicles purchased from Government surplus for purposes other than visitor transportation. These vehicles are commonly decommissioned military utility vehicles (plows, tow trucks, water trucks, etc.). The availability of these vehicles is decreasing. Parks that already use these vehicles may serve as a valuable reference on their utility.

2.2.2 Federal Requirement for Cost Comparison

Ordering agencies must compare prices for each contractor that can meet the agency's minimum vehicle order in accordance with FAR 16.505 (a) and (b), and must document the contract file with the rationale for order placement and price. Each order submitted to GSA for placement must provide a statement affirming that all contractors were provided a fair opportunity to compete in accordance with FAR 16.505(b).

As a minimum the following criteria should be used when comparing costs:

(1) Price
(2) Optional equipment
(3) Delivery time
(4) Fuel economy

(5) Life cycle cost
(6) Past performance
(7) Dealer/maintenance location

AutoChoice (http://www.fss.gsa.gov/vehicles/roads/roads.cfm), the online vehicle ordering system described in Section 2.2.1, will calculate the prices for the selected vehicles and give a price summary, including the 1-percent GSA surcharge. AutoChoice allows comparison of base prices and equipment options and comparison of fuel consumption in miles per gallons.

2.2.3 Purchase or Lease

When the appropriate vehicle has been located, the park must decide whether to purchase or to lease the vehicle(s). The central concern is that the acquisition of the use of a capital asset is carried out in the way that is least expensive for the Federal Government. The Office of Management and Budget (OMB) guidelines can be found in OMB Circular A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," (Revised 01/22/2002): http://www.whitehouse.gov/omb/circulars/a094/a094.html.

The burden of proof lies with the advocates of leasing

According to Circular A-94, the burden of proof lies with the advocates of leasing: "All leases of capital assets must be justified as preferable to direct government purchase and ownership." There are three ways to justify leasing:

(1) **Conducting a lease-purchase analysis** – This is the only acceptable way to justify major acquisitions. An acquisition is major if it represents a separate line item in the agency's budget, the agency or OMB determines that the acquisition is so, or the total purchase price of the asset or group of assets to be leased exceeds $500 million.

(2) **Conducting a periodic lease-purchase analysis of recurrent decisions to lease similar assets used for the same general purpose** – It is permitted for any non-major capital asset.

(3) **Developing a formal policy and submitting the policy to OMB for approval** - The policy, intended for smaller leases, should demonstrate that the leases would result in substantial savings to the Government that could not be realized through purchase. In these cases the leases are so short as to make separate lease-purchase analysis impractical. The leases of different types are scored consistently with the instructions in Appendices B and C of OMB Circular A-11, "Preparation and Submission of Annual Budget Estimates."

The purpose of lease-purchase analysis is to compare the net discounted present value of the life cycle cost (LCC) of leasing with the full costs of buying or constructing an identical asset. The duration of the life cycle begins with the acquisition of the asset and ends when the asset is retired from service. It is typically not the same duration as useful life estimates specified for tax purposes.

When comparing the LCC of leasing with the LCC of purchasing the asset outright, it is critical to include all items included in the lease. These may include:

- Improvement costs (if included in lease payments)
- Operation and maintenance costs (if included in lease payments)
- "Imputed property taxes" that approximate the costs of providing municipal services such as road repair and police and fire protection
- "Imputed insurance premiums"

The present value of the cost of obtaining these services separately should be added to the purchase price. OMB presumes that lease-purchase analyses will be conducted with cost estimates that reflect inflation. Costs that reflect anticipated inflation are referred to as "nominal" costs, as opposed to inflation-adjusted costs, which are referred to as "real" costs. The analyst conducting LCC analysis must make assumptions about how costs will behave over the useful life of the asset in question.

2.2.4 Vehicle Inspections

When as purchases requires multiple unit fabrication or consists of unique or costly items, a representative from the NPS[1] should visit the plant facility before manufacturing begins. This helps to answer any questions and allows the buyer to be involved in the process from the start of manufacture. A site visit also allows the buyer to meet the appropriate the contact person. The person(s) performing the site visit should be knowledgeable of the procurement activity, including the statement of work and other articles (i.e., specifications). A checklist is useful to make sure the vehicle is in compliance with the stated needs and specifications. In most cases, a general checklist can be generated from pre-procurement activities such as the statement of work or vehicle/deployment environment description.

A good understanding of the production plan may be advantageous to help alleviate initial and recurring costs. Common items include:

Vehicle inspectors should obtain and review the manufacturer's Quality Assurance Plan

- Production Plan or milestone chart (especially if multiple vehicles are to be purchased)
- Quality Assurance Plan
- Complete understanding of the vehicle's warranty
- Technical Manuals including:
- Operator's manuals
- Spare parts list (which may include consumable items such as filters, hoses, brake pads, etc.)
- Maintenance documents
- Parts list to include subcomponent manufacturer's catalog numbers
- Identification of applicable FMVSS requirements, under 49 CFR 571: http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr571_00.html

If the *Buy America* clause has been drawn into the contract, the purchaser should refer to FTA's Bus Handbook for appropriate certificates and to 49 CFR Part 661 for definitions, procedures, and waivers.
http://www.fta.dot.gov/library/legal/bushandbook/toc.html
http://www.access.gpo.gov/nara/cfr/waisidx_00/49cfr661_00.html

The purchaser should witness any final acceptance testing

During the final inspection, purchasers should walk around the vehicle and look for anything out of the ordinary (loose body panels, wrong mirror type, etc.). A valuable resource for how to conduct a vehicle inspection is the New York State Department of Transportation Bus & Passenger Regulations: Title 17, Official Compilation of Codes, Rules and Regulations, Parts 720, 721, 722 and 723. It is available at http://www.dot.state.ny.us/ts/files/busregs.pdf. The New York State inspection regulations include:

[1] The NPS Alternative Transportation Program (ATP) has an arrangement with the U.S. DOT Volpe Center to conduct pre-delivery manufacturer plant inspections of vehicles acquired under the ATP. Barry Mickela is the Volpe Center point of contact, and can be reached via phone at (617) 494-3589 and email at mickela@volpe.dot.gov.

Universal Disabled Symbol - The universal disabled symbol shall be conspicuously displayed on the rear of every vehicle that transports persons with disabilities and is equipped with a wheelchair lift.

Power Assist Doors - Every power-assisted door shall have an easily accessible emergency release located in the passenger entrance/exit area. This device shall be identified and instructions for its use shall be posted thereon or adjacent thereto. The device shall be have a positive stop design, and must allow the door closing mechanism to release with the absence of electrical, pneumatic, or hydraulic power.

The New York State list of subcomponents to be tested is recommended to NPS entities, but inspections need not be limited to those items

Lettering of Capacity - The maximum seating and standing capacities of a bus shall be lettered near the floor line of the vehicle adjacent to the entrance door in easily discernable figures not less than 1½ inches high depicting adult capacity.

Grab Handles –All grab handles the must comply with Altoona testing standards (mentioned in Section 2.1.1).

A good reference list can be found in Appendix B, Vehicle Subcomponents.

2.2.5 Lead Time

When purchasing new vehicles directly from the manufacturer, the NPS entity should consider the manufacturer's availability to begin work on the production of new vehicles following execution of the contract. It is not uncommon for this period, called "lead time", to exceed 9 months.

2.3 Operating Vehicles

After vehicles are procured, fire safety on board must be ensured, and the vehicles must be maintained. Electronic technologies to help manage transportation operations and traffic are discussed in Section 3.5.

2.3.1 On-Board Fire Safety

Every vehicle should have at least one portable fire extinguisher on board and in working order at all times. The person responsible for selecting portable fire extinguishers should determine what class of fire or fires is anticipated (generally A, B, or C). These answers along with evaluation of the code requirements for the type and quantity needed on board the vehicle will determine the selection. NFPA 10, *Portable Fire Extinguishers*, published by the National Fire Protection Association (NFPA) recommends extinguishers be inspected every 30-days and serviced annually.

Title 49 CFR Part 571.301-305 are the standards for post-crash vehicle safety and fuel system integrity. These standards reduce deaths and injuries from fires caused by fuel spills or leaks during and after crashes.

The alternative fuel systems discussed in Section 2.1.3 may have different fire suppression procedures than for conventional fuel systems. Recommended procedures and equipment must be identified for the system used.

2.3.2 Vehicle Maintenance

All vehicles must be inspected periodically and must be repaired according to the manufacturer's specifications. Warranty requirements typically require adherence to a prescribed schedule for preventative maintenance. The requirements for vehicle mechanics that perform the inspections and repairs are discussed in Section 4.2.2. It is also advised that the vehicles meet the operational requirements

of the FMCSRs (Section 2.1.1), and any other state or regional requirements. This may be obligatory if the vehicles operate on non-park land.

The vehicles used for visitor transport must be cleaned periodically, if not daily. Procedures for cleaning floors and seats will vary according to the material and fabric used. The manufacturer's specifications should be consulted and followed. Facilities are an integral part of maintenance, and are covered in section 3.2.

Chapter 3: Supporting Transportation Infrastructure

In addition to the purchasing and operations concerns, decisions makers at the NPS entity must consider the infrastructure needed to store, repair, clean, and fuel vehicles; the surface parking lots needed to accommodate the visitors' vehicles, as well as NPS vehicles, and the park's roadways. All of these facilities must conform to the requirements of the National Environmental Policy Act (NEPA). The decision makers must also consider the infrastructure needed to manage transportation services and traffic within the park or site, such as intelligent transportation systems (ITS).

3.1 National Environmental Policy Act (NEPA)

Location assessments must be performed in accordance with NEPA requirements when constructing, rehabilitating, or renovating buildings, facilities, parking lots, or roadways

NEPA requires that an environmental review be performed for all federally funded highway and transit projects. NPS activities requiring NEPA review rarely have a pre-determined proposed action. In fact, having a solidified proposal at the beginning of the environmental review should be avoided. The objective of the review is to determine the preferred alternative at the end of the analysis process.[1]

Completion of an Environmental Screening Form (ESF) is required at key points in the process to determine if NEPA applies and what level of effort is necessary to ensure compliance. This should be done as part of the internal planning process, performed by a multi-disciplinary team including the Park and Project Coordinator and consultants. (See footnote.)

Because different NEPA documents can vary in the detail and requirements, the environmental review should be initiated early in the project so that the environmental information becomes a valuable part of the decision-making criteria. The review should be applied when the park is considering its purpose or goals for a specific project.

One of three levels of environmental review must be administered:

Categorical Exclusions (CE) - Most proposed projects do not undergo detailed review because they fall into a category that has a blanket exemption. For example, an exclusion from NEPA exists for basic repairs to existing roads or bus replacement.

Environmental Assessment (EA) - For projects not subject to a categorical exclusion, a scan of effects, called an "environmental assessment," is performed. If there is no significant impact, a "Finding of No Significant Impact" (FONSI) is issued, and the project proceeds. If there is significant impact, an Environmental Impact Statement (EIS) is required.

Environmental Impact Statement (EIS) - Before analysis begins, the sponsor must define the "purpose and need" of the project and look for alternative ways to achieve it. When the analysis is completed, the sponsor releases a draft EIS that identifies one option as the "preferred alternative." The draft EIS is sent to DOT and other Federal agencies and to the public for comment. After comments are received, a full EIS is prepared, and DOT can either approve the project, ask for a rewrite of the EIS to better

[1] www.nps.gov/policy/DOrders/DOrder12.html; www.planning.nps.gov/document/do12handbook.pdf

reflect the impacts, or ask for changes to reduce the impacts. No project can proceed until final Federal approval, called a "Record of Decision" (ROD), is issued.

The following NPS documents include information to help determine which NEPA document is required and to assist in the overall NEPA review:

Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-making (DO-12 Handbook) - lays the groundwork for a necessary evolution in the way NPS approaches environmental analysis, public involvement, and resource-based decisions. It also sets forth a new direction in using interdisciplinary teams, incorporating scientific and technical information, and establishing a solid administrative record for NPS actions. DO-12 can be found from the link in footnote 2.

NPS Transportation Planning Guidebook - explains transportation planning processes and laws that are vital to the success of parks as a guide for park managers. http://www.nps.gov/transportation/alt/nptg.htm

Intermountain Region's Guidance Documents - developed to help staff with environmental reviews and to streamline the NEPA process.

NPS NEPA Planning Process and Pathway Guide - documents the step-by-step process for NEPA in a flowchart format.

The Analysis Process - includes excerpts from DO-12 and concisely explains the steps of the NEPA process.

EA or EIS Checklist - outlines the steps for both an EA and EIS to help project coordinators determine which documentation is needed, and provides a timeline to predict the length of the NEPA review, culminating in either a FONSI for an EA or a ROD for an EIS.

Environmental Compliance: Lessons from NEPA Lawsuits - Offers an overview of several lawsuits from 1999 stemming from violations of NEPA. The suits directed Federal agencies to follow a systematic and scientific approach to assessing environmental impacts when proposing actions that may adversely affect the environment. http://www2.nature.nps.gov/YearInReview/yir/yir99/pages/02challenges/02hoogland_nepa.htm

3.2 Buildings and Other Structures

Most of the transportation-related buildings and structures found at parks are the facilities needed to store, repair, clean, and fuel vehicles. Transportation facilities also include passenger shelters and stations for visitors and parking areas for visitors.

The types and safety features needed for the vehicle storage, repair, and fueling facilities will depend on the type of fuels used to power the vehicles—as discussed in Section 2.1.3. FTA has developed facility design guidelines for bus transit systems using several different alternative fuels: methanol and ethanol, LPG (propane), LNG, CNG, hybrid electric, electric and hydrogen. These publications are available on the FTA Safety and Security website: http://transit-safety.volpe.dot.gov/Publications/Default.asp, under "Clean Air". Facilities that

Annually updated NFPA fire codes are available at http://www.nfpa.org/

dispense and or store the fuel (e.g., diesel, natural gas) or generation equipment for electric power or hydrogen must be designed for those types of fuels including the fuel stored on-board in the vehicles propulsion system. The guidelines present a collection of recommended practices derived from practical operating experience that help to insure the safe, cost-effective, and reliable operation of the vehicles and fueling and maintenance infrastructure. They are also valuable for providing preferred component and standards compliance for procurements.

Due to the complexity and magnitude of fire protection problems that can be encountered, the services of registered professional fire protection engineers can be beneficial in assessing hazards. Issues related to procurement of professional engineers are discussed in Section 4.3.

NFPA annually compiles the codes, standards, recommended practices, and guides prepared by technical committees organized under NFPA Sponsorship in accordance with the published procedures of the Association. These should be consulted when constructing, renovating, and using vehicle facilities. They can be found at http://www.nfpa.org/.

The *International Building Code* should also be consulted. It establishes comprehensive minimum regulations for building systems using prescriptive and performance related-provisions.

NPS Director's Order #58, Structural Fire Management, supplements the fire policy articulated in NPS management policies. It describes the operational policies and procedures necessary to establish and implement structural fire management programs throughout the National Park System. All NPS policies and guidelines concerning fire safety are at http://www.nps.gov/fire/fire/fir_structural.html.

NPS Director's Order #58 is available at http://www.nps.gov/fire/fire/fir_structural.html

Fire emergency response procedures for new or renovated transportation structures should be incorporated in the facility's Fire Safety Plan in cooperation with the entity's Fire Safety Officer and the Fire Marshall and/or local authority This should address what responses will be necessary by the NPS staff and local fire departments and address the procedures for evacuation of visitors and staff in the event of fire. Fire control diagrams and emergency exit route plans should be posted in rooms. Egress exit signs should be installed. Equipment plans should be posted locating emergency equipment for the responders. Plans should be implemented for conducting routine fire drills.

3.3 Parking Areas

Outdoor parking areas should be planned and designed with sensitivity to the natural and cultural resources. Impervious surface coverage should be minimized to reduce possibilities for water contamination, accelerated sedimentation, and soil erosion. Parking areas are often a scar on the landscape and require suitable landscape buffering, ideally through differences in natural terrain elevation. While providing ample parking at convenient locations enhances the quality of the visitor experience, this benefit must be evaluated in relation to potential adverse impacts on the environment. A number of key questions should be raised when addressing parking demand and making the best use of parking facilities:

- Are current parking facilities in the right location?
- How well do existing parking facilities integrate with trail, bicycle, and pedestrian pathway systems?
- Which parking facilities regularly overflow?
- Where does the overflow parking take place?

- What are the resource impacts of overflow parking?
- Are there adequate way-finding and information systems (static and dynamic) in place to convey location and availability of parking to visitors?
- What type of parking is needed? Overlook parking, short-term (less than 2 hours not at an overlook), long-term (more than 2 hours)?
- Are there possibilities for consolidation of parking areas or creation of shared-use parking facilities?
- Are there other management actions to moderate demand for parking (e.g., fee structure change, reservation systems, and management actions to influence spatial and temporal distribution of visitor activity)?
- Are there any intercept parking facilities outside the entity's boundary? Would additional intercept parking be effective in satisfying parking demand?
- Could projected growth in parking demand be accommodated by a visitor transport system?

3.4 Roadways

NPS's National Park Roads Standard should be reviewed

NPS has a long and distinguished history of ensuring that park roadways and parkways are designed and built to "lie lightly on the land." Context-sensitive design should be the focus of roadway planning and design activity. This concept strives to provide a safe and aesthetic driving environment while respecting the landscape, historic and cultural structures, and artifacts adjacent to the alignment. NPS's *National Park Roads Standard* should be consulted before road design projects are initiated. Other relevant context-sensitive design standards include the Federal Highway Administration's (FHWA) *Flexibility in Highway Design* and Vermont's *Agency of Transportation Road Design Standards*. NPS approaches to roadway design adapt the standards in the American Association of State Highway and Transportation Officials (AASHTO) *Green Book* to reflect goals specific to the parks. Some key planning and design issues and questions include:

- Are the roads in the right location to achieve the objectives of the General Management Plan for visitor access to facilities, the natural and cultural landscape, and operational and maintenance needs of the Park's staff?
- Can existing road and bridge designs accommodate the width and weight of buses and other visitor transport vehicles?
- Has the carrying capacity of park resources and parking facilities been considered in roadway planning and design?
- Have roadway locations and alignments been established in conjunction with a comprehensive transportation plan that considers alternate modes of transportation and the location of parking facilities so as to minimize adverse impacts on the natural environment, cultural resources, and the visitor experience?
- Could some roads be removed and the landscape restored to its original and/or historic condition?
- Are there sufficient overlooks? Are they in the right place?
- Are the aesthetics of view to/from the road maintained?
- Do existing road designs and proposed road rehabilitation projects adequately provide for bicyclists and pedestrians?
- Are pedestrian crossings well-designed and placed in relation to pedestrian desire lines and visibility sight line requirements?
- Are design speeds appropriate for multi-class usage?
- Are habitat migration patterns respected by existing and proposed road alignments? Are mitigation devices in place to accommodate animal crossings?
- Are there adequate way-finding and information systems (e.g., road weather and traffic conditions, both static and dynamic) in place for visitor use?

- Are road surfaces designed to reduce water runoff and pollutant loads to the adjacent roadside and to streams and other water sources? Are the surfaces permeable to allow for bio-filtration?
- Do excessive delays exist on the roadways and to and from parking facilities accessed from the roadway? Are non-structural management actions, including alternative transportation systems (e.g., buses) being considered?

3.5 Intelligent transportation Systems (ITS)

Intelligent transportation systems use a variety of technologies to help manage transportation and traffic. Sample technology includes traffic detectors, weather sensors, computer databases, and toll tags or smart cards.

Many states already use ITS to reduce traffic congestion and improve safety on state and local highways. For example, Maine, New Jersey, and other states are using ITS to electronically collect fees, fares, and tolls reducing waiting times at collection plazas. ITS also is used to provide drivers with navigation information, road and weather conditions, traffic congestion updates, and a wide variety of other real-time information.

Many NPS entities are beginning to use ITS. ITS and alternative transportation systems can be used to improve the visitor experience, manage parking, reduce traffic congestion and protect natural and cultural resources. Strategies have been implemented to showcase an ITS Field Operational Test in Acadia National Park by the NPS in cooperation with FHWA and the Maine DOT.

The ITS test project in Acadia National Park centers around a DOT Advanced Traveler Information System designed to give travelers real-time information on parking availability, bus arrival and departure times, weather information, and other pertinent visitor-related information. The objectives are to enhance the quality of the park experience for those visiting Acadia National Park and to increase DOT's capability for deploying ITS in rural areas. More information about the Acadia test project can be found at http://www.its.dot.gov/itsweb/welcome.htm; more information on ITS can be found in the TCRP reports listed in Section 1.2 and at http://www.nps.gov/transportation/alt/vehicletech.htm.

Chapter 4: Personnel

When decisions have been made about the vehicles needed, the supporting infrastructure and the visitors' transportation needs, park officials must identify their staffing needs. These needs must then be compared to skills and number of current employees, whether park or concessionaire staff. If the needs that cannot be met using the current staff then options for training of existing or hiring additional staff must be examined.

This chapter addresses:

(1) Overall management of the transportation system and its personnel needs, including decisions and strategies concerning contracting with private companies and individuals

(2) Personnel needed for the acquisition, operation, and maintenance of vehicles

(3) Personnel needed for the construction, rehabilitation/renovation, security, and maintenance of buildings and other structures, parking lots, and roadways.

4.1 Transportation Management

The success of the transportation system depends largely on the drivers and other employees, as these employees are the ones with direct public contact. Good communication, training, and working conditions should be the goal of any park superintendent, regardless of the level of transportation needs. Most serious employees will appreciate knowing management is committed to continual improvement and that there is a "method behind the madness".

As with vehicle choices, personnel (NPS staff, concessionaire staff, or contractors) hired to manage and operate alternative transportation systems must be determined within the constraints of regulatory requirements and park-specific criteria. Persons employed by the NPS are subject to the Federal Employee Standards of Conduct. This includes not only those directly employed by NPS, but also those who are employed by contracted companies. A complete list of applicable standards is available from the Office of Personnel Management at www.cpms.osd.mil/vip/per_data/12.htm.

Federal Employee Standards of Conduct

When planning a new transportation system or a major expansion, parks may want to hire consultants—such as diagnosticians, transportation or urban planners, or civil engineers—to help assess the overall transportation needs and system design before decisions are made concerning vehicles and other infrastructure components. Those decisions are discussed in Sections 4.2 and 4.3.

4.1.1 Contracting Decisions and Arrangements

Particular and individual positions can be contracted under supervision of Federal employees, or entire operations (such as vehicle operation, vehicle maintenance, and roadway maintenance and landscaping) can be contracted to a private company, which is then responsible for hiring and supervising the needed personnel. Some functions, such as vehicle maintenance, contracted to private companies may be performed off-site in the contractor's facility. Visitor transport could also be contracted to a company that provides the drivers for NPS vehicles or to a vendor that provides the vehicles the storage, the maintenance and the fuel

all off site. Park officials in this instance will have to review the contractor's vehicles and facilities using some of the criteria in Chapters 2 and 3.

Procedures for choosing, procuring, and monitoring contractors used by the park in other areas can also be applied contracted transportation service providers.

4.1.2 Fire Safety Training

All transportation-related personnel (including temporary employees) should receive the basic fire safety awareness training in accordance with the entity's Fire Safety Plan. The training should cover basic understanding of the classification of fires, fire triangle and basic fire and smoke behavior, the use of the on site passive and active fire suppression systems, the appropriate use of extinguishers, fire hoses, communication systems, and emergency egress procedures. Special training may be needed for operation of systems such as fire detection and alarm systems or gaseous agent systems, especially for employees who work in vehicle storage, repair, or refueling facilities. Training for such employees should include efforts to minimize the hazards/risks of combustible materials storage, e.g., storing class A combustibles at the base of an exit stairway or improper or unnecessary storage of waste oils, etc. Vehicle drivers should be trained in all relevant fire safety and evacuation procedures. All employees should be trained in incident reporting relevant to the duties they perform in accordance with the entity's Fire Safety Plan.

4.2 Vehicle-Related Personnel Needs

During the vehicle-acquisition process, NPS staff must have or acquire the capabilities to address the requirements, issues, and concerns discussed in Sections 2.1 and 2.2. In addition to having employees or consultants who can understand the regulatory requirements and identify and assess the park's specific needs, technical expertise in fuels technology may be needed to determine what is appropriate, and to advise the park management about the maintenance and facilities needs for the various technologies. As mentioned in Section 2.1.3, those needs may influence the vehicle choice. A mechanic will be needed to perform the required vehicle inspections during the procurement phase. If a vehicle with an alternative propulsion system is chosen, the mechanic will have to understand those vehicles.

After the vehicles are acquired, the transportation carrier, either NPS or a contracted provider, must register in the state in which service is operating each year. This requirement is outlined in 49 CFR Part 367. Drivers and mechanics will be needed. Parks with extensive visitor transport system will also be need dispatchers. Dispatchers may also be helpful in a limited visitor transport operation or for assisting with ranger and park maintenance operations. The Transportation Cooperation Research Program (TCRP) has produced a manual to aid in the scheduling of transit vehicles and includes examples of dispatching systems. TCRP Report 30, Transit Scheduling, Basic and Advanced Manuals can be found at http://www4.trb.org/trb/onlinepubs.nsf/web/TCRP_Reports.

Management should be familiar with the types of vehicles on park property, in order to assure that all operating personnel have the current required certifications and training. Several types of fleet management software programs are available. A simple Internet search for "transportation fleet management software" will provide options for the entity's transportation manager.

4.2.1 Drivers

The number and type of drivers needed depends on the size vehicle fleet, the visitor transportation network, the hours and days of operation and other features of the system. Updated in December of 2003, the Federal regulations on Hours of

Service of Drivers can be found in Title 49 CFR Part 395. Part 395.3 details the maximum driving time permitted. In addition to having acceptable driving credentials, operators of visitor transport must be able to project a positive image to the public. Operators may have a responsibility to provide interpretation, educating the public about history and significance of the particular park or monument. Use of an additional on-board employee to give a scripted presentation and answer questions may also be appropriate. An on-board recording may also suffice. Even the recording option will require an employee to create or acquire the message and ensure it functions properly.

Management should perform a driver's license background check on individuals applying for positions as bus drivers for visitors.

Drivers' licenses

The Commercial Motor Vehicle Safety Act of 1986 requires each individual state to comply with certain standards regarding licensing of commercial motor vehicle drivers. Each state's registry of motor vehicles has its own requirements and regulations regarding types and classes of driver licenses. Most states require a commercial driver license for drivers of vehicles of more than 26,000 pounds or with a capacity greater than 16 passengers. Additional endorsement codes may also be required. Title 49 CFR part 391 states that "the operator must obtain medical certification every two years to maintain a current CDL". A commercial driver license can only be issued in the driver's state of legal residence, and precludes any other driver licenses in any other state. Website links for each state's of motor vehicle registry agency information can be found at: http://www.dmv-department-of-motor-vehicles.com/

4.2.2 Mechanics

The number and type of vehicles will also determine the number and experience of mechanics required. Entities with alternatively powered vehicles must ensure their mechanics are licensed to repair vehicles using that specific power source. Mechanics must also be available to repair ranger, other park vehicles and other transportation-related equipment.

Engine manufacturers and other organizations offer training courses and certifications for mechanics. Several colleges and universities around the country offer classes. The National Alternative Fuel Vehicle Training Consortium (http://naftp.nrcce.wvu.edu) is a consortium of 13 schools that offer training courses and degrees. A simple Internet search for "transportation alternative energy training" will identify a number of other available resources. Certificates and licenses must always be current.

Proper training and experience is also needed for the vehicle maintenance personnel. This usually exceeds the minimum amount of training or documentation that a manufacturer provides. A recommended practice is to have mechanics receive substantial instruction in addition to spending time at a facility that is currently operating the same or similar vehicle.

Experience and background should be commensurate with responsibility within the transportation department and maintenance facility. For example, not all shop/garage personnel have to be master mechanics.

4.3 Infrastructure-Related Personnel Needs

Construction and major rehabilitation/renovation of buildings and other structures, parking lots, and roadways are generally contracted to a private

company. Selection, procurement, and monitoring of contractors is addressed in Section 4.1.1.

Prior knowledge of public park operations is preferred for those involved in design of new transportation routes, facilities, maintenance, and operation. Construction or renovation plans should be reviewed and approved by a licensed professional engineer in the state in which the park is located.

After transportation facilities are completed and opened for service, personnel must be assigned to maintain them. Periodic inspections must be performed to determine compliance with applicable codes and to ensure safety. Routine and emergency repairs will be needed. Electricians will be needed to perform inspections and repairs. The credentials and experience of current employees should be reviewed to ensure they are qualified to inspect and repair facilities, per the issues addressed in Section 3.2.

As mentioned in Section 3.2, the services of registered professional fire protection engineers can be beneficial. Most fire protection engineers are employed on a consulting basis, and hold either a Bachelor or Masters Degree in fire protection and are state registered professional engineers (fire protection). Fire protection engineers contribute a high level of technical ability to the engineering and design development process with respect to code compliance, interpretations, engineering equivalency determinations and the plan review process. They also assist in working with the fire marshal and field inspections. They also perform evaluations and provide recommendations.

Appendix A
Park Criteria Sample List

- Vehicle Purpose
- Visitors transport (number of visitors and their needs and belongings)
- Service performance (nature and amount of equipment and materials to be carried in or hauled, and miles of travel by rangers)
- Interface Requirements / Off-Site Interfacing
- Theme of the NPS entity and its image and vision
- Wildlife
- Financial resources
- Physical characteristics of the park or site
- Terrain
- Distances to be traveled
- Altitude
- Weather and climate
- Air quality – Identify the minimum air quality levels that can be tolerated in the area.
- Noise levels – Identify the maximum noise levels that can be tolerated in the area.
- View shed – Assess the impact of the vehicle, when moving and when parked, on the integrity and quality of the view from visitor attractions.
- Road network (size, surface, and configuration of roads) and rail network
- The horizontal curve radius on the most restricted part of the road network (and greatest degree of superelevation of the rail network) where the vehicle(s) would travel
- The most severe, controlling grade (and associated length of grade), and whether or not there are passing lanes at these locations
- Locations of severe combined grade and curvature
- Pavement/rail and bridge load bearing limits, and pavement/rail surface conditions
- Number and width of lanes or tracks
- Availability, type, and width of shoulders and rail right-of-way
- Locations with restricted passing, and stopping sight distances
- Locations of overlooks and potential/actual vehicle pull-outs, and associated condition (including vehicle protection systems, e.g., guardrails or other barriers, natural or manmade)
- Locations with poor or non-existent drainage
- Skid-resistance characteristics and locations with poor friction
- Locations with animal crossings, and potential for mitigation devices
- Other users of the road network--e.g., pedestrians, bicyclists, horseback riders, and other motor vehicles

Appendix B
Vehicle Subcomponents

Air compressor and pneumatic systems
Air conditioning compressor assemblies
Air conditioning evaporator/condenser assemblies
Aluminum extrusions
Aluminum, steel, or fiberglass exterior panels and interior trim
Defrosters
Designation sign assemblies
Door control systems
Drive shaft assemblies
Driver's seat assemblies
Engines
Entrance and exit doors
Exit signage properly displayed
Fare box
Fire Extinguishers
Floor coverings
Flooring
Front/rear air brake assemblies
Front/rear bumper assemblies
Front- and rear-end assemblies
Front axle assemblies
Front suspension assemblies
Generator/alternator
Electrical systems
Heating systems
Interior lighting assemblies
Kneeling capability
Passenger seats
Radio
Rear axle assemblies
Rear suspension assemblies
Seating / standing capacity
Specialty steel (structural steel tubing, etc.)
Steering system assemblies
Transmissions
Wheelchair lifts and ramps
Wheelchair tie-down devices
Window assemblies

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01-09-2004	Planning Report	NA

4. TITLE AND SUBTITLE

ATS Vehicles and Supporting Infrastructure Guide

5a. CONTRACT NUMBER

NA

5b. GRANT NUMBER

NA

5c. PROGRAM ELEMENT NUMBER

NA

6. AUTHOR(S)

Gill, Ross; Chernicoff, William P.; Mickela, Barry; Gentile, Mark; Engblom, Lisa; Lian, Scott; Chang, Kate (E,G&G Services)

5d. PROJECT NUMBER

NA

5e. TASK NUMBER

NPS TIC No. D-1672

5f. WORK UNIT NUMBER

PPA HW1M

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center

8. PERFORMING ORGANIZATION REPORT NUMBER

DOT-VNTSC-NPS-04-05

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

National Park Service
Transportation Management Program
1201 Eye St. NW
Washington, DC 20005

10. SPONSOR/MONITOR'S ACRONYM(S)

WASO/TMP

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

(see 5d. and 5e. above)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Public distribution/availability.

13. SUPPLEMENTARY NOTES

This report addresses alternative transportation decision factors as indicated below (Y/N/NA):
(N/A) Non-construction options; (Y) park carrying capacity; (Y) life-cycle/ops. & maintenance costs; (Y) cost-effectiveness.

14. ABSTRACT

This manual is a guide to the basic concepts involved and issues to be addressed in acquiring and maintaining vehicles, supporting infrastructure, and personnel needed for alternative transportation systems to serve visitors to national parks, recreation areas, historic sites, and monuments. It identifies engineering principles and practices, codes and standards, and lessons learned that are applicable to the NPS. It contains numerous references to other publications and electronic links to websites for more in depth information.

15. SUBJECT TERMS

Alternative Transportation Systems, Clean Fuels, Vehicle Technology, Infrastructure

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Gary T. Ritter
None	None	None	NA	28	19b. TELEPHONE NUMBER *(Include area code)*: 617-494-2716, ritter@volpe.dot.gov

Reset

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS D-1672/ September 2004