# Environmental Assessment


# Maintenance Program

April 2011

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# 1.0 INTRODUCTION

Pursuant to 43 Texas Administrative Code (TAC), Part 1, Chapter 2, Subchapter A, § 218(b), the Texas Department of Transportation's (TxDOT) Maintenance Division (MNT) undertook an environmental review of TxDOT's Maintenance Program. 43 TAC, Part 1, Chapter 2, Subchapter A, § 218(b) requires TxDOT to conduct an environmental review and solicit public input on TxDOT's maintenance programs. TxDOT is required to coordinate each review with appropriate state and federal environmental resource agencies and to collaboratively develop effective environmental protection measures and best management practices (BMPs). The initial step toward compliance with 43 TAC, Part 1, Chapter 2, Subchapter A, § 218(b) included individual reviews of each of TxDOT MNT programs. This Environmental Assessment represents the combination of the results of the individual maintenance program reviews. TxDOT identified several BMPs that, when implemented, will further reduce the environmental impacts of the Maintenance Program. These BMPs in many cases will continue to be implemented by TxDOT to reduce any adverse environmental effects associated with the maintenance program.

Organizationally, TxDOT is comprised of 25 districts, 21 divisions, six offices and four regions. Each district, as well as MNT, maintains a role in the Maintenance Program. In some cases, area offices and/or local maintenance offices within different TxDOT districts also play a role in maintenance, implementing different practices and/or procedures in the field. Each district is responsible for Maintenance Program activities conducted within its jurisdictional area. Generally speaking, maintenance needs vary from district to district. Needs and corresponding practices vary due to differing environments, traffic levels, and the availability of resources. Finally, State funds pay for MNT. Some funding for maintenance is administered through MNT while some funding is allocated through the Regions.

The Maintenance Program maintains TxDOT highways to provide a safe and functional roadway system, ensure clean and aesthetically pleasing highways and facilities, and improve the value and prolong the functional lifespan of TxDOT infrastructure. This program includes several individual maintenance programs. Individual maintenance programs include:

- Bridge;
- Customer Service;
- Debris and Spills;
- Drainage;
- Ferry;
- Enhancement;
- Pavement;
- Roadside Appurtenances; and
- Traffic Pavement Markings.

Starting in **Section 2.3**, each individual maintenance program is described in further detail.

# 2.0 NEED AND PURPOSE

TxDOT's mission is to provide safe, effective, and efficient movement of people and goods. Supporting this mission is TxDOT's vision, which is to be a progressive state transportation agency recognized and respected by the citizens of Texas for:

- Providing comfortable, safe, durable, cost-effective, environmentally sensitive, and aesthetically appealing transportation systems that work together;
- Ensuring a desirable workplace, which creates a diverse team of people and professions;
- Using efficient and cost-effective work methods that encourage innovation and creativity; and
- Promoting a higher quality of life through partnerships with the citizens of Texas and all branches of government by being receptive, responsible, and cooperative.

Consistent with TxDOT's mission and vision, the Maintenance Program adds to TxDOT's ability to maintain a safe, efficient, comfortable, aesthetically appealing, effective, and environmentally sensitive transportation system.

## 2.1 Need for the Maintenance Program

The Bridge Maintenance Program provides TxDOT with an effective means of extending the functional life of bridges which translates into a more efficient, less costly bridge system. Routine bridge inspection and maintenance also provides for a safer more reliable bridge system and virtually eliminates the risk of catastrophic structural failure.

The Customer Service Maintenance program addresses a variety of the travelling public's concerns. TxDOT's rest areas are needed to provide the opportunity for travelers to rest and take much-needed breaks to ensure alertness and safety. TxDOT's care of sites and facilities plays an essential and integral role in the long-term life of information centers, rest areas, picnic areas, roadside parks, pull-outs, and parking areas. Without timely maintenance, more costly treatments would be required to repair these areas. Assisting traffic during extraordinary circumstances allows the highways to remain safe and functional, as well as keeping the traveling public informed and out of harm's way. The Adopt-a-Highway Program gives groups, businesses, or organizations the opportunity to help their communities by collecting litter and keeping Texas roadsides clean and aesthetically appealing. Approximately 90 percent of highway litter is removed by paid contractors, but volunteer efforts reduce litter cleanup costs and save taxpayers money.

Regular road inspections and timely debris removal are critical components of the Debris and Spills Maintenance Program. If debris remains on the highway for a significant amount of time, it is more likely to cause a crash. This maintenance program is needed because by removing debris, litter, illegal dumpsites and signs, and encroachments from TxDOT's highways and right-of-way (ROW), it helps keep the traveling public safe from potentially dangerous obstacles. Removing litter and debris helps to keep TxDOT's highways clean and aesthetically appealing, as well as keeping

roadway drains clear and working properly to prevent flooding. It is TxDOT's responsibility to respond and assist during a release of a hazardous material, whether it is for abandoned hazardous materials of unknown ownership, a leaking storage tank, or a hazardous materials spill, TxDOT's Debris and Spills Maintenance Program is needed in helping to keep the traveling public informed and safe from hazardous materials. TxDOT takes an active role in protecting the traveling public during a hazardous materials release on TxDOT property or ROW. The Debris and Spills Maintenance Program allows the highways to remain safe and functional and keeps the traveling public out of harm's way.

The Drainage Maintenance Program helps TxDOT protect water resources from impacts by completing necessary ditch, culvert, storm drain, or other drainage repair/cleaning work, thereby allowing the storm drain system to function properly and reducing sediment and debris traveling to water resources during periods of inclement weather. This program also maintains the drainage system in order to help prevent localized flooding during storm events. The Drainage Maintenance Program is needed because maintaining drainage structures protects the citizen's investment in the infrastructure by ensuring that these structures do not overflow and cause storm water to pond on roadways or accumulate sediment and debris traveling to water resources during periods of inclement weather, thereby creating safety issues for the traveling public and pavement damage.

Protecting environmental resources from the impacts of the ferry system is one of TxDOT's highest priorities in the Ferry Maintenance Program. TxDOT meets this priority by completing necessary repair and cleaning work, thereby allowing the ferry system to function properly and reducing potential hazards or dangers from occurring. The Ferry Maintenance Program is needed because maintaining ferries and landings protects the citizen's investment in the infrastructure by ensuring that the ferries, landings, and other associated buildings are kept in working condition and that these structures do not malfunction or break during use, thereby creating safety issues for the traveling public.

TxDOT's Maintenance Enhancement Program is responsible for safety features such as shoulders, handicap ramps, sidewalks, and turnouts. These features are needed on the existing TxDOT roadway system to provide safe and functional highways, as well as improve safety, increase usability, and provide efficient and meaningful access for all of the traveling public. Maintenance of boat ramps is needed to ensure the safety of the public while participating in boating activities and to maintain an aesthetically appealing environment. Maintenance of landscaping in medians or islands is needed to correct potential safety issues, such as vegetation obstructing motorist's views. Also, maintenance enhancement inspections are essential for realizing the design lifespan and safety of driveways and utilities in TxDOT ROW. Without timely inspections, costly treatments would be required to repair driveways and utility areas, therefore increasing the impact on the travelling public and the environment.

The Pavement Maintenance Program is needed to complete necessary routine and preventative maintenance to the roadway surface, thereby allowing the roadway to function properly and reducing potential hazards such as potholes or uneven travel lanes, to the traveling public. The Pavement Maintenance Program is also needed because maintaining the pavement system protects the citizen's investment in the infrastructure by ensuring the roadways are inspected and maintained regularly for distressed or failed roadway surfaces, cracks, potholes, or low spots that can occur over time, thereby creating safety and quality issues for the traveling public.

Maintenance of roadside appurtenances is necessary to allow the roadway to function properly and promote safety. The Roadside Appurtenance Maintenance Program is also needed in order to maintain necessary mitigation measures for visual and noise impacts on neighboring properties. By maintaining noise and visual barriers along the roadway, adjacent communities are kept separated from the noise and visual impacts of the highway system.

The Traffic Pavement Markings Maintenance Program is needed to complete necessary maintenance to traffic pavement markings. This program helps to keep the roadway functioning properly and promotes safety.

## 2.2 Purpose of the Maintenance Program

The purpose of TxDOT's Maintenance Program is to maintain the nearly 80,000 centerline miles of highways in Texas in a manner that provides a safe, efficient, comfortable, aesthetically appealing, effective, and environmentally sensitive transportation system. The Bridge Maintenance Program protects the public's investment in bridge infrastructure by maximizing the functional life of existing bridges, and ensures the safety of the traveling public. Through the Customer Service Maintenance Program, facilities and sites are maintained in order to provide a safe, convenient, and aesthetically appealing environment; as well as to assist the traveling public during extraordinary events. TxDOT ensures the safety of the traveling public and preserves and extends the public's investment by maintaining the functional condition and diminishing future deterioration of these facilities.

The Debris and Spills Maintenance Program provides a safe and aesthetically appealing environment, as well as protects the waterways, soils, vegetation, and wildlife from dangerous chemicals and waste. The safety of the traveling public is ensured by removing potentially dangerous debris and encroachments from the highways and ROWs and helps to protect the environment and the traveling public from hazardous materials. Through the Drainage Maintenance Program the drainage system along the highways in Texas are maintained in a manner that provides a safe environment for travelers and protects water resources, while improving the value and prolonging the functional lifespan of TxDOT infrastructure. The Ferry Maintenance Program maintains the ferry systems at Port Aransas and Galveston-Port Bolivar, in a manner that provides a safe environment for travelers, protects environmental resources, and improves the value and prolongs the functional lifespan of TxDOT infrastructure.

Through the Maintenance Enhancement Program TxDOT provides access and ensures the safety of the traveling public by adding features to highways such as shoulders, handicap ramps, sidewalks, and turnouts to the existing TxDOT roadway system. The Maintenance Enhancement Program also inspects driveways and utilities for any violations that may pose a risk to the travelling public or the environment. The Pavement Maintenance Program's purpose is to maintain the pavement system to provide a safe environment for travelers as well as a suitable riding quality. The Pavement Maintenance Program also improves the value and prolongs the functional lifespan of TxDOT infrastructure. The Roadside Appurtenance Maintenance Program allows the highways to remain safe and functional, while also providing noise and visual barriers to adjacent communities. The purpose of the Traffic Pavement Markings Maintenance Program is to maintain the traffic pavement markings system along the highways in Texas, in a way that allows the highways to remain safe, while also providing and promoting an efficient traffic flow.

## 2.3 Objectives of the Maintenance Program

To fulfill the purpose of the Maintenance Program, maintenance activities and practices must address one or more of the following objectives:

- Maintain and improve safety;
- Maintain efficiency and traffic flow;
- Maintain aesthetic appeal;
- Provide access;
- Protect environmental resources;
- Improve the value of TxDOT infrastructure; and
- Prolong the functional lifespan of TxDOT infrastructure.

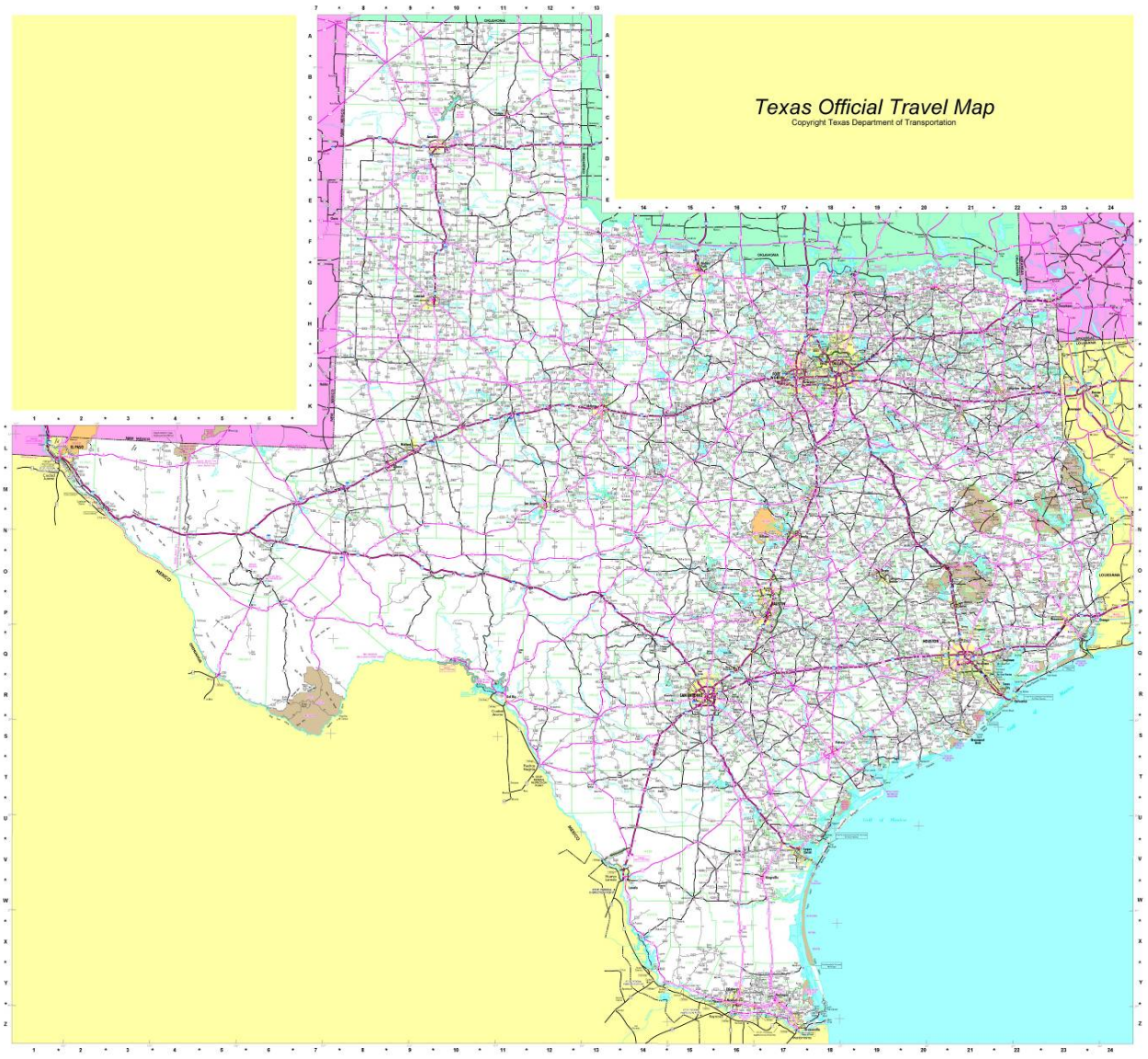
The following sections provide additional details on each of these objectives.

### 2.3.1 Maintain and Improve Safety

A primary objective of the Maintenance Program is to improve the safety of the traveling public. TxDOT maintains more than 80,000 centerline miles of roadway; almost 1,100,000 acres of ROW, which is more than any other state in the nation (see **Figure 2-1** for Travel Map).

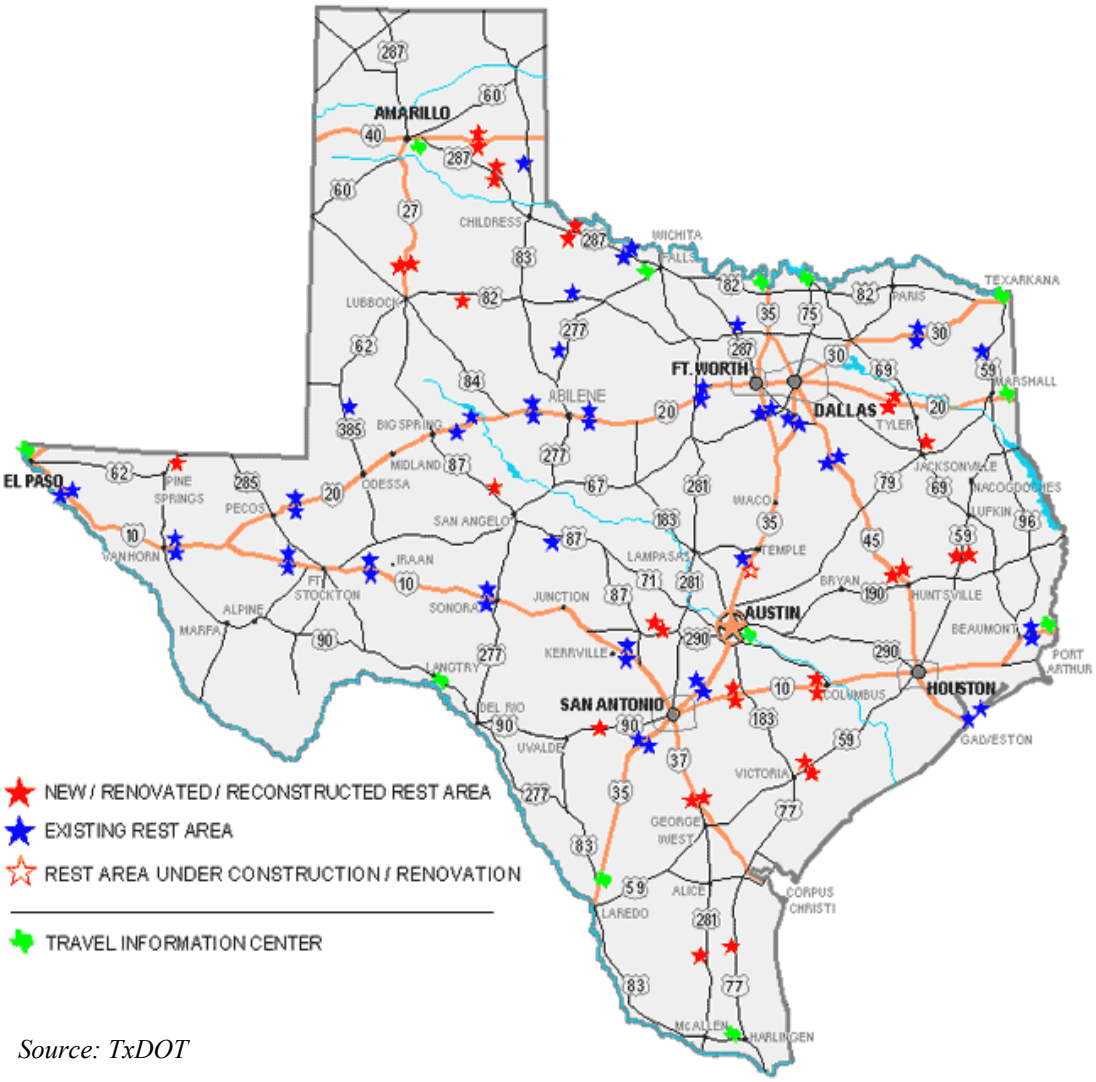
By routinely inspecting and completing needed maintenance to bridge structures, deficiencies can be corrected before compromising the integrity of the structure or one of its components. Bridge deck surfaces need to be clear of debris in order to maintain vehicle traction and traveler safety. During winter storms common in northern Texas and the panhandle region, plowing and salting of bridges to remove snow and ice is a required practice to keep bridges passable and safe. After snow melt, the Bridge Maintenance Program practice of deck sweeping removes ice rock and salt so vehicles' have adequate traction. Routine deck sweeping also removes road debris that can pose a threat to traveler safety.

**FIGURE 2-1**
**TEXAS OFFICIAL TRAVEL MAP**




Having a shortage of rest areas and parking areas can contribute to driver fatigue and drivers parking illegally on ramps and along highways, both of which can cause accidents. Unfocused drivers can be a danger not only to themselves, but to their passengers and other drivers as well. Texas has the most roadways in the country, with nearly 80,000 centerline miles of roadways maintained by TxDOT. Texas also has the most traffic accidents caused by driver fatigue. Rest areas, parking areas, roadside parks, pull-outs, and picnic areas offer an opportunity for drivers to get off the road and rest along highways that otherwise would have no good stopping points. TxDOT currently has 80 Rest Areas, 12 Travel Information Centers, and numerous other pull-outs, parking areas, and picnic areas (see **Figure 2-2**).

**FIGURE 2-2**
**TXDOT REST AREA LOCATIONS**




*Source: TxDOT*

These areas are conveniently located to provide drivers an opportunity to take a much needed break. By inspecting and maintaining these facilities and sites often, these areas can remain open for public use or closed for only a limited amount of time.

Located at or near the Texas state line, Texas Travel Information Centers create a positive first impression of Texas when travelers enter the state. These locations are staffed by professional travel counselors who welcome visitors to Texas, help with route selection, and provide information on points of interest, events, and road conditions. By assisting travelers at information centers, TxDOT promotes travel to and within Texas, therefore increasing revenue for cities, counties, and the state.

Traffic assistance during extraordinary circumstances such as hazardous material spills, special events, accidents and incidents, natural disasters, and snow and ice; is an important service in the

effort to keep the traveling public informed and safe. TxDOT takes an active role in protecting the traveling public during an extraordinary event on TxDOT property or ROW.

The Federal Highway Administration (FHWA) reports that road debris, along with stalled cars, cause as much as 40 percent of the traffic congestion in the United States. Regular road inspections and timely debris removal are critical components of the Debris and Spills Maintenance program. If debris remains on the highway for a significant amount of time, it is more likely to cause traffic accidents and delays. While debris or localized litter may be rare and occur at random, TxDOT proactively addresses these and other hazardous roadway conditions through timely road inspections. This practice is necessary to eliminate an immediate threat to traveler safety by eliminating obstacles and allowing the safe passage of vehicles.

Dumping trash in unauthorized locations is unattractive and can cause major public health and safety concerns. Dumpsites can contain broken glass, exposed metal, hazardous wastes and other dangerous materials; as well as attract pests such as rats, snakes, and mosquitoes. TxDOT patrols the ROW for illegal dumpsites and also relies on the traveling public to report dumpsites. These dumpsites are removed as soon as possible.

Hazardous materials/wastes include, but are not limited to, materials such as:

- explosives
- compressed gas
- flammable liquids
- flammable solids
- combustible liquids
- oxidizers
- poisons
- radioactive materials
- corrosives
- etiological agents
- other materials classified as hazardous by Title 40 Code of Federal Regulations - Part 261 (40 CFR 261) or applicable state and federal regulations.

The term “hazardous materials” refers to a broad category of hazardous wastes, hazardous substances and toxic chemicals that can negatively impact human health or the environment. During a hazardous materials spill or release TxDOT is responsible to notify law enforcement, fire department, or other agency, as well as for restricting public access and providing traffic control. This keeps the traveling public away from any potential harm from the hazardous material.

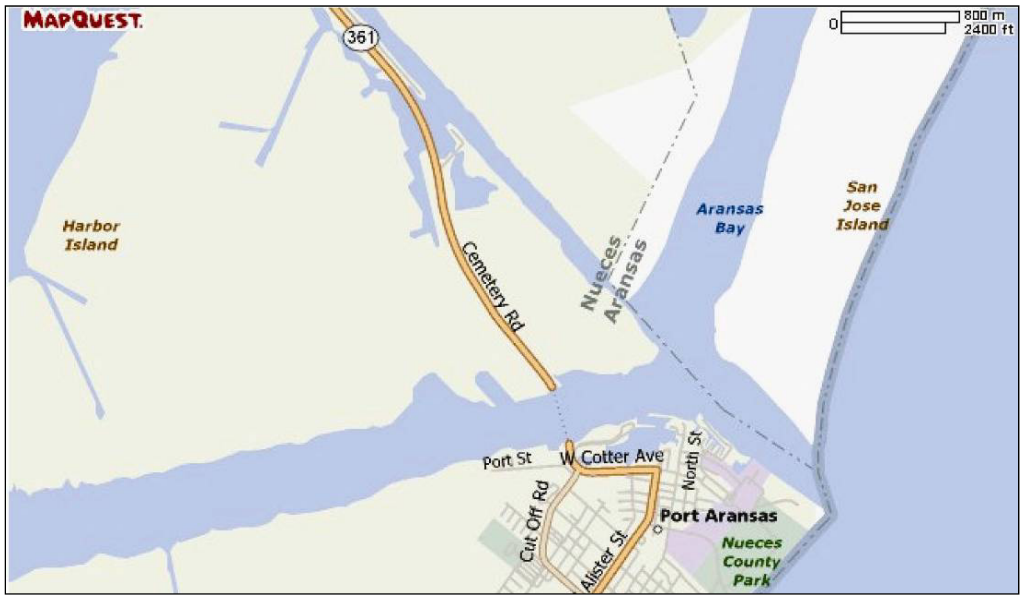
TxDOT maintains ditches, culverts, and storm drains along TxDOT roadways and is also responsible for maintaining and repairing storm water pump stations that are used for drainage along these same roadways. By routinely inspecting and completing needed maintenance to the drainage system, deficiencies can be corrected before compromising the integrity of the system and causing localized flooding of the roadway or pavement damage. Highway drainage is provided to prevent flooding of the highway and to ensure storm water overflowing onto the highway is removed as soon as possible into drainage systems or natural watercourses.

Roadway surfaces need to be clear of water in order to maintain vehicle traction and traveler safety. Standing water on a roadway surface may cause a vehicle to hydroplane. According to Smart Motorist, hydroplaning occurs when water on the roadway accumulates in front of a vehicle's tires faster than the weight of the vehicle can push it out of the way. The water pressure can cause the car to rise up and slide on top of a thin layer of water between the tires and the road. While hydroplaning, the vehicle rides on top of the water and the car can completely lose contact with the road. The resulting loss of friction causes the vehicle to lose braking, steering, and power to the wheels causing a complete loss of control by the driver, which usually happens at higher speeds, over 40 miles per hour. By maintaining the drainage system, storm water overflowing onto the highway is removed as soon as possible to help prevent the accumulation of water on the highway and increase traveler safety.

The Drainage Maintenance Program also removes beaver dams and debris from drainage features to keep the drainage system functioning. Beavers can plug culvert pipes with debris and create dams that impound water against roadbeds, which may flood or wash out roads. Beaver dams and the flooding they cause have resulted in roads being closed, bridges and culverts requiring replacement, and occasional vehicle accidents.

TxDOT maintains the ferries and landings at Port Aransas on Mustang Island in Nueces County and Galveston-Port Bolivar in the city of Galveston, Galveston County. The Port Aransas ferry connects two segments of State Highway 361 (see **Figure 2-3**). The ferry allows motorists to cross the Corpus Christi ship channel between Port Aransas and Harbor Island.

**FIGURE 2-3: PORT ARANSAS LOCATION MAP**




South of Interstate 10, State Highway 87 is the only highway south of East Galveston Bay and the Galveston-Port Bolivar ferry is the connection between two segments of State Highway 87 (see

**Figure 2-4**). The free ferry service provided by TxDOT is the only way motorists can cross the Houston Ship Channel between Bolivar Peninsula and Galveston Island.

**FIGURE 2-4: GALVESTON-PORT BOLIVAR LOCATION MAP**


Deficiencies can be corrected before compromising the integrity of the ferry or landing facilities by routinely inspecting and completing needed maintenance to the ferry system. Keeping the ferry system in a safe and working condition, ensures the safety of travelers and the continued use of the ferries. When a hurricane threatens, the ferry service at Galveston-Port Bolivar is critical to the residents of Bolivar Peninsula for evacuation. The ferries are the primary means of evacuation through Galveston to the causeway and the mainland. Until high winds and tides make it unsafe for the ferries, they cross the channel moving vehicles to the mainland. Once it becomes unsafe for ferries to cross the channel, the ferries are secured in their moorings at the Galveston landing facility.

The Maintenance Enhancement Program ensures the highways remain safe and functional, as well as keeps the traveling public out of harm's way by adding safety features to highways such as shoulders, handicap ramps, sidewalks, and turnouts to the existing TxDOT roadway system. Without the added safety features like shoulders and turnouts, drivers would have nowhere to pull out of the flow of traffic in an emergency and therefore become a hazard to other travelers on the highway, as well as putting themselves at risk. Adding sidewalks and handicap ramps to the existing roadway provides safety for pedestrians and handicap or disabled pedestrians by separating them from the mainstream of automotive traffic.

TxDOT is responsible for inspecting driveways and utilities along TxDOT roadways. Driveways that are not installed correctly can pose a threat to the public. Deficient driveways create roadway hazards when they fail to comply with TxDOT guidelines such as access spacing and corner clearance criteria; using approved driveway material; and constructing the driveway in conformance with all applicable regulations. TxDOT inspects driveways that have a new or existing driveway permit for access to TxDOT roadways. TxDOT has established regulations to govern the construction and maintenance of private, public, and commercial driveways to state highways. These regulations are published in the "Regulations for Access Driveways to State Highways" booklet authored by TxDOT.

Periodic inspection of utilities by TxDOT is essential for public safety and protecting the environment. Utilities need to comply with all applicable TxDOT regulations. Applicable regulations include but are not limited to conformance with the TxDOT Utility Accommodation Rules; TxDOT plan requirements; Roadside Vegetation Management Guidelines; and traffic control in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

Boat ramps and landscaping in medians and islands are also maintained under this program. Boat ramps are necessary for public use of Texas bays, lakes, and rivers. Boat ramps within TxDOT ROW are maintained to ensure the safety of the public while participating in boating activities. This includes activities such as replacing damaged precast concrete launch ramp planks with new ones; adding required footing ballast to ensure proper base and slope; applying crushed rock, ballast, and/or riprap to ensure proper protection from erosion; and removing silt and river gravels from the ramp and in the vicinity of the ramp.

Landscaping in medians and islands is maintained so that any vegetation within these areas does not obstruct motorist's views of other vehicles, traffic markings, or signals which exist on the roadway. Obstructed views pose a safety issue by creating the potential for accidents between drivers who do not have a clear view of each other and the roadway.

A primary objective of the Pavement Maintenance Program is to maintain the safety and suitable riding quality of the traveling public. In most Maintenance Divisions the Maintenance Supervisor and the Assistant Maintenance Supervisor are responsible for reviewing their roadways at least once a month and as often as every day. These inspections help to determine the routine maintenance needs for those roadways, as well emergency maintenance needs. Unless there is a repair that needs immediate attention because it creates a hazard, public input is always taken into consideration when provided and their complaints receive top priority.

Maintenance of roadway pavement includes the restoration and repair of the surface and underlying layers, including the base and sub-grade. There are many types of pavement distress that may cause a safety problem or affect ride quality. Types of distress on flexible or asphaltic surfaces include:

**Alligator cracking** – Generally caused by inadequate base support or brittle asphalt surface. Cracks allow surface water to enter the sub-grade and further destroy the stability of the sub-grade. This type of cracking can also cause rough or low riding quality and may further deteriorate into a pothole.

**Corrugations** – Usually occurs at points where traffic starts and stops. It is a form of plastic movement typified by ripples (corrugation) or an abrupt wave across the pavement surface. The distortion is perpendicular to the traffic direction. As a result of corrugations or unstable pavement grooving, rutting, and shoving can also occur causing issues for motorists.

**Cracks** – This type of distress is typically caused by thermal and moisture changes and can become further deteriorated by heavy loading from vehicles. Water or foreign material may enter the cracks and cause structural damage to the pavement. This damage may cause a rough or low riding quality for motorists.

**Edge cracking** – Frequently happens on narrow pavements. This distress can be started by shrinkage of the asphalt at the edge of the pavement or shrinkage cracks in the base or sub-grade. Allows moisture to infiltrate into base or sub-grade and may cause structural failure and a rough or low riding quality.

**Failures and potholes** – Potholes generally result from excessive alligator cracking. As alligator cracking becomes severe, the interconnected cracks create small chunks of pavement, which can be dislodged as vehicles drive over them. Potholes can rapidly enlarge resulting in considerable pavement loss, as well as cause an objectionable ride quality and/or affect vehicle control.

**Raveling** – Typically caused by weathering and/or traffic abrasion and results from the progressive failure of the binder and loss of aggregate from the surface. Raveling results in loose debris causing rough or low riding quality. Water can also collect in the raveled locations resulting in vehicle hydroplaning and loss of skid resistance.

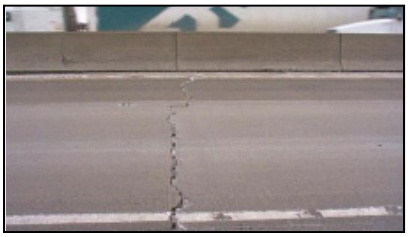
**Rutting** – Generally are surface depressions in the wheel path and may cause pavement uplift. Ruts are particularly evident after a rain when they are filled with water and may make vehicle control difficult resulting in vehicle hydroplaning. They can be hazardous as ruts tend to pull a vehicle towards the rut path as it is steered across the rut.

**Slippery pavement** – The surface texture that results from aging, excessive asphalt, wearing, etc. Usually aggregate extending above the asphalt binder is either very small or there are no rough or angular aggregate particles. It usually creates a shiny, glass-like reflecting surface that can result in a loss of skid resistance and can become quite slippery.

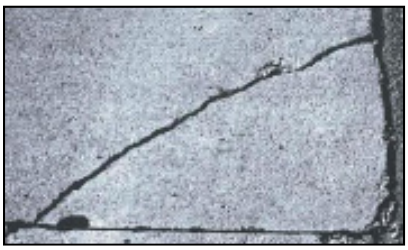
**Waves, sags, and humps** – These are surface defects that often result in poor ride quality and may also make vehicle control difficult. Typical causes are fill settlement, unstable cuts, expansive soils and embankment shear failures. These types of defects may not cause any problems at low speeds, but would be objectionable or intolerable at high speeds.

Types of distress on rigid or concrete surfaces include:

**Blowups** – Typically caused by the expansion of concrete to the point where the stress causes the concrete to be raised. This can result in a problem ranging from a small bump to a shattering of concrete as if an explosion occurred.



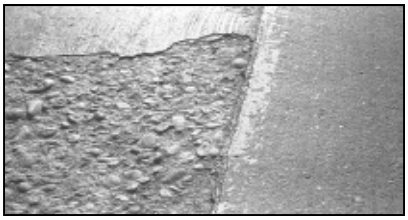
**Cracks** – Transverse cracks on jointed concrete pavement tend to be wider and will allow moisture into the pavement and underlying layers, which can lead to other distress. These types of cracks can have a negative effect on ride quality.



**Failures** – These consist of punchouts, corner breaks and other major distresses than can cause a very uncomfortable ride and severe conditions that could result in vehicle damage. The pavement can become cracked or broken to the extent that ride quality and structural integrity of the pavement is lost.

**Joint failures** – This type of distress occurs on jointed concrete pavements and can cause an unpleasant ride if not properly maintained. Joint failures appear in many forms from minor to major spalling to blowups. Deep spalls and failures may affect vehicle contact with the pavement.

**Settlement, heave, and/or faulting** – This occurs on jointed concrete pavement. Settlement and heave are normally gradual changes and can lead to an uncomfortable ride. Faulting can occur rather suddenly when a slab rises or lowers and severe faulting can affect vehicle control.



**Surface deterioration** – This includes raveling, popouts, joint spalling and other surface type deterioration. These deteriorations allow moisture to penetrate through to the steel reinforcing, causing further distress. Ride quality is also compromised.

The Pavement Maintenance Program routinely inspects and repairs pavement distress along TxDOT roadways. The type of hazard that is created on the roadway surface depends on the type of distress that is present and on the type of pavement (rigid or flexible). Hazards or structural failure of the roadway could occur as a result of any or a combination of pavement distress if the roadways are not routinely and preventatively maintained by the Pavement Maintenance Program.

Maintenance of roadside appurtenances includes the installation and maintenance of safety features such as raised medians, guardrails, barriers, bridge rails, fences, vehicle attenuators, cattle guards, delineators, and lighting. Guardrails, guardrail end treatment systems, bridge rails, and barriers are designed to absorb impact energy and minimize the risk to the occupants of cars, and bystanders. Most guardrails are now anchored to the ground, so that they cannot enter a passenger compartment, and most light poles are designed to break at the base rather than violently stop a car that hits them. Some road fixtures such as road signs, attenuators, and delineators are designed to collapse on impact. The ends of some guard rails are protected with end treatment systems that are designed to gradually absorb the impact of a vehicle and slow it more gently before it can strike the end of the guard rail head on, causing an abrupt deceleration.

Guardrails and barriers help prevent vehicles from veering off the roadway into oncoming traffic, crashing against solid objects, or falling off a steep slope. They also keep the vehicle upright while it is being deflected along the guardrail.

Guardrails are effectively a single strong band that transfers the force of the vehicle to multiple posts beyond the impact area or into a ground anchor at the end of the guardrail. Newer concrete barriers are usually strong enough to withstand direct hits by cars and aid in deflecting heavier vehicles.

Illumination, including continuous lighting, safety lighting, and sign illumination, provides improved visibility at night and thus greatly contributes to traffic safety. Lighting also reduces the effect of headlight glare and provides better visibility during nighttime maintenance activities, both of which improve safety.

The Roadside Appurtenance Maintenance Program maintains and repairs roadside appurtenances along TxDOT roadways. If roadside appurtenances are not routinely maintained by the Roadside Appurtenance Maintenance Program, accidents could occur or be more severe as a result of broken, malfunctioning, or missing roadside appurtenances.

Maintenance of traffic pavement markings includes the installation and maintenance of pavement markings such as lane lines, centerlines and edge lines; specialty pavement markings on medians, turn lanes, crosswalks, railroad crossings, make-ready operations; and raised pavement markers. Pavement markings communicate their messages to the public through a uniform system of colors, patterns, widths, symbols, and words. Uniformity of these features throughout the nation makes it possible for drivers to instantly recognize the meaning of the markings in any given situation and quickly react to them, promoting safe and efficient travel.

Rumble strips are a road safety feature that alerts drivers when they drift from their lane or warn drivers of a stop ahead or nearby danger spot. Research has shown that rumble strips are highly effective at reducing many types of accidents, as they provide a visual, auditory and physical alert to the motorists.

Pavement markings are located on the roadway directly in line with the travel path; therefore pavement markings are more visible than other devices since drivers do not have to take their eyes off the road to view them. Pavement markings can assist drivers to correctly position their vehicle, guide them through many different situations, indicate where passing is allowed, and warn of upcoming conditions. In many instances, pavement markings supplement and enhance the messages of other traffic control devices such as traffic signs and signals. Sometimes pavement markings are the only effective way of providing positive guidance or communicating certain regulations or other messages. If pavement markings are not routinely maintained by the Traffic Pavement Markings Maintenance Program, accidents could occur or be more severe as a result of hard-to-see or missing traffic pavement markings.

### 2.3.2 Maintain Efficiency and Traffic Flow

An objective of the Bridge Maintenance Program is to provide usable structures that require infrequent closures and can consistently carry loads and current traffic volumes. Maintenance

prolongs the life of bridges and therefore reduces traffic delays due to detours when bridges need to be replaced or overhauled. Emergency bridge replacements after bridge failure can create major traffic flow problems and inefficient alternate routes. While some bridge washouts are inevitable, proper bridge maintenance guards against bridge failure and the traffic flow problems that result.

Maintaining the roadside appurtenance system helps to maintain the efficiency of the roadway system and facilitate traffic flow. Maintaining traffic control signs (stop, yield, one way, etc.) is essential for safe and efficient operation. Signs direct motorists by displaying important travel information, such as street names and upcoming exits. Medians and traffic islands provide a visual separation between driving lanes and help direct traffic. Many of the features (i.e. traffic signals, signs, etc.) that are maintained under the Roadside Appurtenance Maintenance Program play a large role in directing traffic and keeping the highway functioning as efficiently as possible.

Maintaining the traffic pavement markings system also helps to maintain the efficiency of the roadway system and facilitate traffic flow. Maintaining traffic pavement markers is essential for safe and efficient operation. Effective pavement markings present the appropriate visual cues far enough in advance of a given situation to allow for suitable reaction time to occur and are visible in the periphery to aid in moment-to-moment lane navigation. Pavement markers aid the driver with visual information in order to maneuver effectively and keep traffic flowing optimally.

### 2.3.3 Maintain Aesthetic Appeal

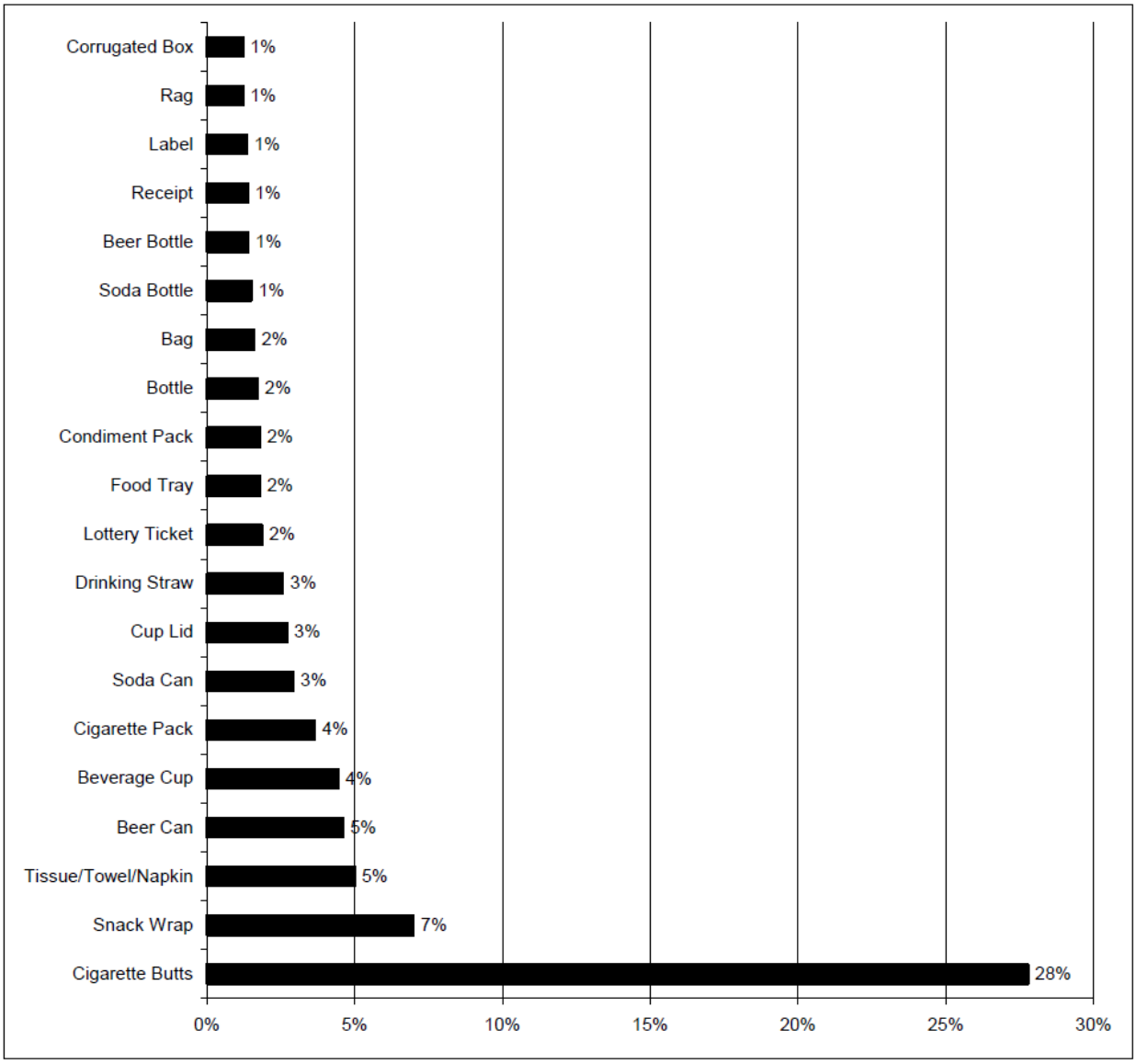
Clean and aesthetically appealing rest area facilities entice travelers to stop and rest. Many of TxDOT's rest areas have restrooms, exhibits pertaining to local features, separate parking for cars and trucks, drinking fountains, vending machines, play areas for children, walking and interpretive trails, traveler information, and even wireless internet access. The standards and upkeep of these facilities vary, but all of these areas need to be kept in a clean and working condition. People are more likely to throw litter on top of existing litter than to be the first to drop trash in neat surroundings, therefore keeping rest areas clean will promote proper disposal of trash by travelers. These areas are a direct reflection of TxDOT and are maintained at a high level of service.

**Aesthetic Appeal:** pertaining to a sense of the beautiful or to the science of aesthetics. Having to do with beauty; pertaining to beautiful appearances.

**Litter:** Any discarded, used, or unconsumed substance or waste. Litter may include, but is not limited to, any garbage, trash, refuse, debris, rubbish, grass clippings, or other lawn or garden waste; newspaper, magazines, glass, metal, plastic or paper containers; or other packaging construction material.

In 2005, TxDOT sponsored a statewide Visible Litter Study (VLS), which was conducted by NuStats under subcontract to Tuerff-Davis EnviroMedia Inc. Approximately 827 million pieces of litter accumulate on Texas roadways each year. The study found that cigarette butts are the most common form of litter on TxDOT roadways, as shown in **Figure 2-5**.

**FIGURE 2-5**
**TOP 20 MOST COMMON LITTER ITEMS IN TEXAS**




*Source: NUSTATS, 2005*

The 2005 VLS study suggests a correlation between litter amounts and the proximity of convenience stores, shopping malls and fast food restaurants to highways. The study also indicates a direct correlation between the volume of traffic and quantity of litter. Facilities with higher traffic volumes generally have greater quantities of litter present within the adjacent ROW. Tobacco products, food-related and non-alcohol items comprised nearly 75 percent of all litter found within the ROW. The tobacco products included cigarette butts, cigarette packs, chewing tobacco cans, chewing tobacco pouches, etc. Food related and non-alcohol items range from fast food items (beverage cups, food napkins, condiment packs, and fast food wraps all from specific fast food establishments) to candy wrappers.

The study also indicated that the overall quantity of litter within the ROW decreased 33 percent since 2001 on TxDOT roadways. Based on the results of this study, TxDOT's Debris and Spills Maintenance Program yields positive results for users of TxDOT's roadway facilities.

In an attempt to reduce the amount of litter and preserve the splendor of Texas Highways, TxDOT actively promotes several litter prevention programs that complement the Debris and Spills Maintenance Program. For example, the Adopt-a-Highway program, first conceived in the TxDOT Tyler District in 1985, began when a civic group "adopted" a two-mile stretch of roadway. The Adopt-a-Highway Program helps keep the highways and ROW clean and free of litter. Adopt-a-Highway groups volunteer their time to help their communities by collecting litter and keeping roadsides clean and aesthetically appealing. This program is further discussed in the Customer Service Maintenance Program Environmental Assessment.

Sponsored by TxDOT, the "Don't Mess with Texas" public education campaign also began in 1985. This program is known for its use of well-known spokespersons and for its tough stance on litter. The "Don't Mess with Texas" campaign has a history of success in promoting public awareness. Recent survey findings suggest that this campaign is successful in reducing the percentage of Texans that admit to littering.

With approximately 23 million people living in Texas and still growing, a surging population means more cars on the roadways and based on the VLS 2005 study, more trash. Approximately 90 percent of highway litter is removed by paid contractors, but volunteer efforts reduce litter cleanup costs and save taxpayers money. Illegally dumped waste ranges from a bag of trash thrown into a borrow ditch to a pile of hundreds or thousands of discarded tires. Illegal dumpsites that are not cleaned up can leave the traveling public with a negative image of the roadway, and studies have shown that people are much more likely to dump on property where a dumpsite already exists. Highways with visible litter and debris within the ROW seem to encourage users to contribute additional unwanted material. Clean highways can be a source of pride for Texans and leave a lasting positive impression with visitors.

The Maintenance Enhancement Program ensures aesthetically pleasing boat ramp areas and landscaping within medians and islands. Since the traveling public views these areas regularly, it is important for them to be properly maintained. TxDOT is responsible for planting, maintenance, and replacement of plant material, as well as constructing, maintaining, and replacing plant containers such as walls, borders, and watering systems in landscaped areas like medians and islands.

TxDOT is also responsible for litter removal and maintenance of paved and unpaved areas on boat ramps. These areas are a direct reflection of TxDOT and are maintained frequently.

The Roadside Appurtenance Maintenance Program ensures aesthetically pleasing appurtenances, including barriers, noise walls, lighting, signs, signals, and paved medians. Since the traveling public views these features regularly, it is important for them to be properly maintained. A well-lighted structure or design element along the highway can do a lot to improve the overall perception of a highway corridor. Noise walls are strong vertical elements that can dominate the field of view. The color, texture, and pattern of walls have a strong influence on driver perception of the highway landscape. Noise walls need to be maintained so they blend with the natural surroundings. Signs have an impact on the aesthetic character of the roadway. The purpose of a sign is to convey specific information and/or elicit specific driver behaviors, but this is less likely to occur when these signs are in disrepair or the signs are not visually appealing. TxDOT is responsible for maintaining and keeping these roadside features aesthetically appealing.

### 2.3.4 Provide Access

Adding sidewalks and handicap ramps to the existing roadway provides access for pedestrians and handicap or disabled pedestrians. The Americans with Disabilities Act (ADA) ramps were designed to ensure easy access on and off sidewalks. Building new sidewalks and handicap ramps provide pedestrian access to many residential and business developments that did not include sidewalks when first built. TxDOT boat ramps also provide public access to Texas bays, lakes, and rivers.

### 2.3.5 Protect Environmental Resources

The Drainage Maintenance Program helps TxDOT protect water resources from impacts of the road network by completing necessary ditch, culvert, storm drain or other drainage repair/cleaning work, thereby allowing the storm drain system to function properly and reducing sediment and debris traveling to water resources during periods of inclement weather.

When it rains, water washes over highways and can pick up a variety of pollutants, such as oil, pesticides, metals, chemicals, and soil. This polluted storm water drains into the storm system that eventually discharges into our rivers and streams. The pollutants can endanger the water quality of our waterways, making them unhealthy for people, fish, and wildlife. The Drainage Maintenance Program includes maintaining or implementing SW3P in accordance with EPA regulations. The EPA set regulations on construction/ maintenance activities to prevent contamination to water resources through a program known as the National Pollutant Discharge Elimination System (NPDES). The Texas Commission on Environmental Quality (TCEQ) operates this program under the Texas Pollutant Discharge Elimination System (TPDES), which requires storm water to be treated to the maximum extent practicable.

The SW3P states that BMPs must be used during construction and maintenance. These practices are intended to reduce the amount of pollutants contaminating surface water bodies. BMPs include erosion and sediment controls and storm water management controls. The erosion and sediment controls are measures used to prevent or reduce erosion and redirect storm water flow during

construction/maintenance activities. The storm water management controls are used after construction/maintenance is completed to prevent pollution due to storm water runoff.

Protecting environmental resources from the impacts of the ferry systems is one of TxDOT's highest priorities. The Ferry Maintenance Program helps TxDOT meet this priority by completing necessary repair and/or cleaning work and following environmental guidelines; thereby allowing the ferry system to function properly and reduces the possibility of hazards entering into water or other environmental resources. The Ferry Maintenance Program includes maintaining or implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with EPA regulations contained in 40 CFR 112. This plan presents site-specific operating procedures to prevent an oil spill, control measures to prevent a spill from entering navigable water resources, and countermeasures to contain, cleanup and mitigate the effects of any oil spill that may impact navigable waters. TxDOT has a five year Oil Spill Prevention and Response Discharge Prevention and Response Certificate from the General Land Office. This Certificate indicates that the regulatory requirements of the Oil Spill Prevention and Response Act of 1991 (OSPRA) have been met.

### 2.3.6 Improve the Value of TxDOT Infrastructure

A well-maintained highway system including bridges, drainage, ferry, pavement, and roadside appurtenances, yields a higher return on the investment for the State of Texas, the traveling public, and for taxpayers. Bridge, drainage, ferry, pavement, and roadside appurtenance maintenance results in safer, longer-lasting, environmentally responsible roadway systems that are usable over the duration of their design life or beyond, reducing infrastructure costs, and improving the overall quality and value of the Texas roadway system.

By keeping drainage structures in working condition, the public's investment in the infrastructure is protected by ensuring that these structures do not overflow and cause storm water to pond on roadways causing pavement damage. Additionally, beavers can plug culvert pipes with debris and create dams that impound water against roadbeds, which may flood or wash out roads and damage pavement creating potholes. Removing beaver dams or discouraging beaver dam establishment in drainage features helps prevent this type of damage from occurring on TxDOT highways. By keeping infrastructure such as bridges, ferries, and ferry landings in working condition, the public's investment in the infrastructure is protected by ensuring that the system is functioning properly and therefore improves safety and value for the traveling public.

### 2.3.7 Prolong the Functional Lifespan of TxDOT Infrastructure

By completing inspections and maintenance, TxDOT infrastructure last longer, therefore reducing costs and environmental impacts associated with infrastructure replacements. Infrastructure includes bridges, drainage systems (i.e. culverts, ditches, storm drains), ferries, boat ramps, rest areas, pavement sections, and roadside appurtenances. The Maintenance Program strives to be as efficient as possible with available transportation funds.

The Maintenance Program corrects problems before they become a threat to structural integrity, or before the cost of repairs exceeds that of replacement. Maintenance allows for a longer lasting infrastructure which results in lower costs to the taxpayer. Longer lasting infrastructure translates into fewer impacts to the natural and human environment as infrastructure replacements occur less frequently. Replacing infrastructure often involves impacts to streams, wetlands, and other natural environments, as well as detours and other impacts to the human environment. Maintaining existing infrastructure allows it to last the duration of its design life resulting in less environmental impacts and lower costs. This maintenance results in longer lasting and safer infrastructure. TxDOT preserves and extends the public's investment, by maintaining the functional condition and diminishing future deterioration.

## 2.4 Bridge Maintenance Program

TxDOT's Bridge Maintenance Program maintains the state's bridges in order to ensure uninterrupted, safe traffic flow and to prolong the useful life of TxDOT's investment in bridge infrastructure.

**Bridge**: A structure including supports erected over a depression or an obstruction, such as water, highway or railway, and having a track or passageway for carrying traffic or other moving loads and having an opening measured along the center of the roadway, track or passageway of 20 feet or more between undercopings of abutments, backwalls, spring lines of arches or extreme ends of openings for multiple boxes or having an inside diameter of 20 feet or greater, in the case of pipes (TxDOT, 2005).

Currently, TxDOT maintains bridges on an "as needed" basis as inspections dictate. Routine inspections usually occur every 2 years with interim inspections occurring every 6 months, or immediately following any significant event such as a permit overload, flood, or impact damage that could alter the conditions of the structure.

The inspection process focuses on identifying or determining:

- Structural damage;
- Damage to bridge railing or approach guard fence;
- Quality of riding surface;
- Performance and condition of the channel and bank protection measures; and
- Adequacy of deck drainage.

In addition to correcting problems identified during inspections, the Bridge Maintenance Program also focuses on cleaning the roadway; restoration and signing; cleaning and servicing of joints and bearings; and removal of drift from around substructures.

Activities conducted under the Bridge Maintenance Program range from sweeping the deck surface to patching cracked or pitted concrete. Bridge maintenance program activities include the following practices.

### 2.4.1 Deck Sweeping

Deck sweeping involves the use of a street sweeper to collect debris on the deck surface of the bridge. The street sweeper collects the debris, which is eventually disposed of in a TxDOT-approved landfill.

### 2.4.2 Joint and Bearing Cleaning

Joint and bearing cleaning involves removing debris with the use of vacuums, air blowers, or pressure washing. Debris that is cleared would either be collected and disposed of, or allowed to remain on site.

### 2.4.3 Paint Removal

Paint removal is not a routine operation, occurs infrequently, and is usually completed as a special project. Several different methods of paint removal are used depending on specific needs. These include:

- Power washing;
- Sand blasting;
- Scraping or brushing (hand removal); and
- Application of chemicals (the use of paint strippers).

### 2.4.4 Paint Application

Like paint removal, paint application is not a routine operation, occurs infrequently, and is usually completed as a special project. Paint is applied by spraying, rolling and/or brushing.

### 2.4.5 Debris Removal and Channel Clearing

Debris removal and channel clearing involves removing drift usually consisting of logs, branches, vegetation, and other objects that wash down during flood events and collect at the base of bridges. Methods of drift removal include mechanical and manual, in which debris is either removed by hand or through the use of equipment (backhoe, bulldozer, etc.).

### 2.4.6 Power Washing and Sand Blasting

Power washing and sand blasting involve the cleaning of bridge structures with the use of either pressurized water or sand.

### 2.4.7 Channel Stabilization

Channel stabilization involves adding rip-rap, seeding or sod along a channel, and/or using mats to prevent erosion and silting. Very rarely are such practices considered maintenance and are most commonly performed immediately following construction of a new structure. Nevertheless,

additional bank and channel stabilization and/or re-vegetation activities are implemented as a bridge maintenance practice, particularly after a flood event.

### 2.4.8 Pest Control

Pest control is an infrequent practice that includes the removal of casts or nests from the substructure of bridges. Also, burrowing animals sometimes create burrows around approach slabs and backwalls of bridges requiring removal or filling.

### 2.4.9 Structural and Other Repairs

Structural and other repairs include maintenance of bridge rail, posts and post connections to deck, bridge deck repairs, and maintenance of the concrete components of the bridge superstructure, including bearings, concrete diaphragms, and beams. Structural repairs also include fixing steel components of the bridge superstructure, maintenance of the steel or timber components of the bridge substructure, and repairs to steel diaphragms and beams. Structural repairs also include patching or replacing pitted concrete components of the bridge substructure, including caps, columns, abutments, wingwalls, pilings, etc. Fender repair and/or replacement are also considered as structural repairs for purposes of this review.

## 2.5 Customer Service Maintenance Program

The Customer Service Maintenance Program generally includes maintenance activities geared towards directly serving the traveling public (i.e., TxDOT's customers). As part of the Customer Service Maintenance Program TxDOT maintains:

- Driveway entrances within the highway ROW;
- Sewer treatment plants and storm water systems located at rest areas;
- Rest areas;
- Picnic areas;
- Roadside parks;
- Access to historical markers and sites;
- Vehicle pull outs and parking areas;
- Restrooms at ferry landings;
- Adopt-a-Highway Program; and
- Providing traffic assistance.

TxDOT's Customer Service Maintenance Program provides safety, comfort, and convenience for the users of TxDOT's facilities. The Customer Service Maintenance Program insures clean and aesthetically pleasing facilities and that all facilities and sites operate properly. Since the traveling public uses TxDOT facilities regularly, it is important for the information centers, rest areas, picnic

area, and other areas included in the Customer Service Maintenance Program to be properly maintained. This program also assists the traveling public on TxDOT highways during extraordinary circumstances such as hazardous material spills, special events, accidents and incidents, floodwater removal, natural disasters, and snow and ice. Many of the maintenance activities are contracted out and supplemented by TxDOT personnel when necessary.

Activities conducted under the Customer Service Maintenance Program are associated with maintaining TxDOT information centers, rest areas, picnic areas, pull-outs, and parking areas. The limits of maintenance in these areas begin at the beginning of the ramp entering the area and end at the end of the ramp leaving the area. This program does not include the construction of new information centers, rest areas, picnic areas, pull-outs and parking areas, it only includes maintenance of these facilities and areas once they are constructed.

The Customer Service Maintenance Program also maintains restrooms at ferry landings, as well as provides assistance to traffic during extraordinary circumstances and assists with the Adopt-a-Highway Program. Customer Service Maintenance Program activities include the following practices.

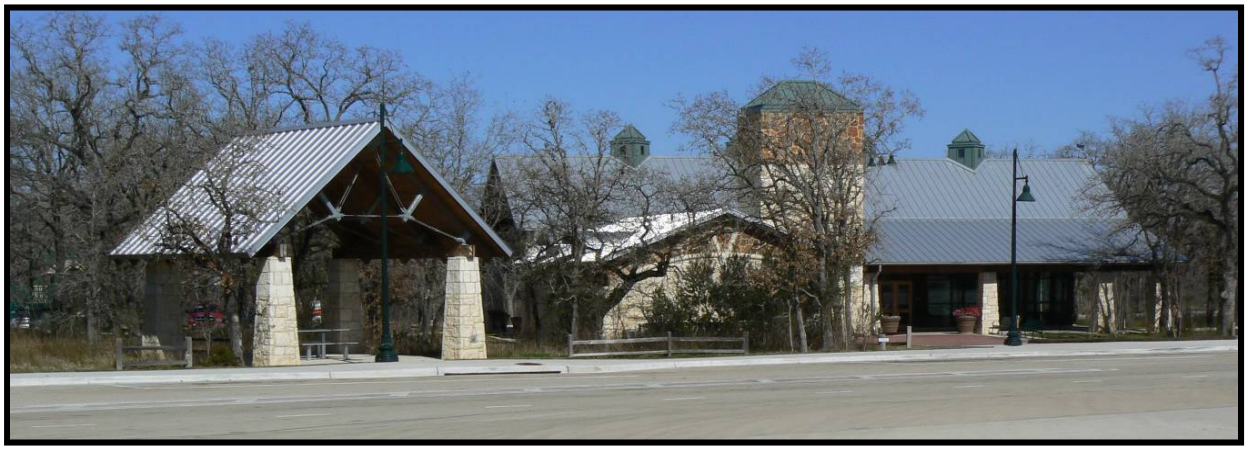
### 2.5.1 Maintaining Travel Information Centers, Rest Areas, and Roadside Parks

Maintenance activities include all necessary repairs to ensure the proper operation of information centers, rest areas, and roadside parks. Work performed consists of janitorial and grounds maintenance, including mowing, litter removal, emptying litter barrels, maintenance of plantings, cleaning restrooms, cleaning arbors, removal of graffiti, and minor painting. The program also includes practices involving the repair of items such as buildings (including vending building), arbors, picnic tables, fixtures, electrical, litter barrels, flags, flag poles, irrigation system, and playground equipment, as well as maintenance of water and wastewater treatment systems. This particular practice also includes special maintenance required to repair paved areas and pavement markings, such as sweeping, patching, full depth repairs, striping, resurfacing, and crack sealing.

Other items could include repairs to sidewalks, repairs to curb and gutter, application of herbicide and fertilizer, drainage, fencing, lighting; and all restroom facility maintenance such as plumbing, painting, cleaning, and repairs made to the roof, walls, and floor of the facilities. TxDOT also ensures that the restrooms are sufficiently stocked with toilet tissue, air freshener, and hand-soap at all times.

Removal of graffiti consists of removing graffiti from steel, rock, and concrete fixtures. Work items could include chemical or mechanical removal such as applying solvents, sand blasting, water blasting, scraping, or covering the graffiti with fresh paint.

Travel Information Centers also need maintenance of their wireless Internet access, security surveillance, and video theaters.



*Modern TxDOT Safety Rest Area* *Source: Baker Team*

### 2.5.2 Maintaining Picnic Areas

In terms of maintaining picnic areas, the maintenance work performed consists primarily of janitorial and grounds maintenance, including mowing, litter removal, emptying litter barrels, maintenance of plantings, cleaning arbors, graffiti removal, and minor painting. Picnic area maintenance includes operating, maintaining and/or repairing items such as picnic area buildings, arbors, picnic tables, fixtures, litter barrels, pavement, and pavement markings; such as sweeping, patching, full depth repairs, striping, resurfacing, and crack sealing.

*TxDOT Picnic Area* *Source: Baker Team*

Picnic area maintenance could also include repairs to sidewalks, repairs to curb and gutter, application of herbicides, drainage, fencing, and lighting. In most cases, TxDOT outsources picnic area maintenance to private contractors. TxDOT's contracts usually require cleaning the picnic areas two times per week, usually every Monday and Thursday. Local TxDOT personnel also assist with

picnic area maintenance when needed. TxDOT's district area offices inspect picnic areas two times per week to make sure the picnic areas are clean, functional, and appealing to the traveling public.

### 2.5.3 Maintaining Vehicle Pull Outs and Parking Areas

The limits of maintenance in the vehicle pull out and parking areas begin at the beginning of the ramp entering the area and end at the end of the ramp leaving the area. Work performed consists of grounds maintenance, including mowing, litter removal, emptying and repairing litter barrels, and graffiti removal. Maintenance of vehicle pull-outs and parking areas can also include special maintenance required to repair paved areas and pavement markings, such as sweeping, patching, full depth repairs, striping, resurfacing, and crack sealing. Other items could include repairs to curb and gutter, application of herbicide, drainage, fencing, and lighting or the placement of gravel and minor grading when the pull-outs or parking areas are not paved.

### 2.5.4 Maintaining Access to Historical Markers and Sites

TxDOT District staff maintains the grounds around historical markers located within the TxDOT ROW. Historical markers are used to interpret, promote, and protect historic and cultural resources. TxDOT strives to cooperate with the Texas Historical Commission's (THC) historical marker program by creating accessible locations for the markers to be placed, such as roadside parks, existing turnouts, or at a specially prepared turnout. Access to these areas is maintained to allow the public a safe area to view the historical marker or site.

If the historical marker is located within an existing rest area, picnic area, pull-out or parking area, the maintenance would be the same as previously discussed for these areas. However, TxDOT is not responsible to maintain or repair the historical marker itself if it is damaged or vandalized. The THC is responsible for the coordination for cleaning, repair, or providing a new replacement marker if necessary. TxDOT should contact the THC if maintenance or replacement is needed. THC then works directly with the local county historical commission, who is responsible for cleaning or replacing the marker.

### 2.5.5 Maintaining Restrooms at Ferry Landings

Maintaining restrooms are ferry landings consists of performing janitorial services and all necessary repairs to ensure the proper operation of the restrooms. TxDOT strives to keep the restrooms clean, pleasant smelling, and free of dirt, trash, and insects. TxDOT removes graffiti and other markings immediately upon detection. Litter is removed on a regular cycle, the frequency of which depends on the frequency of use of the specific restroom facility. TxDOT also operates, maintains, and repairs items such as, but not limited to, electrical and plumbing systems, utilities, lavatory fixtures, toilets, signs, and restroom structural elements. As part of the Customer Service Maintenance Program, TxDOT ensures that the ferry landing restrooms are sufficiently stocked with toilet tissue, air freshener, and hand-soap at all times.

## 2.5.6 Maintenance of Entrances to TxDOT ROW

TxDOT has put into place rules and regulations that facilitate the safe movement of the traveling public. Entrances to properties along TxDOT roadways can be physical obstructions and can negatively influence the flow of traffic if not properly maintained. TxDOT has established regulations to govern the construction and maintenance of private, public, and commercial driveways to state highways. These regulations are published in the "Regulations for Access Driveways to State Highways" booklet authored by TxDOT. Driveway accesses to state highways are located to provide maximum safety for highway traffic and for users of the access driveways.

Under the Customer Service Maintenance Program driveway accesses to state highways are maintained to allow the traveling public to safely access these driveways. Work could include pavement repairs, vegetation removal, and maintaining transitions to driveways. All work occurs within the TxDOT ROW. Maintenance beyond the ROW line is the responsibility of the owner of the entrance/access.

## 2.5.7 Traffic Assistance

### *2.5.7.1 Special Events*

During special events such as games, parades, bicycle races, etc., TxDOT provides traffic control, sets up detours, and keeps traffic moving.

### *2.5.7.2 Hazardous Material Spills*

Most hazardous materials spills are a result of a traffic accident. TxDOT is usually notified and called to the scene by law enforcement. TxDOT takes an active role in protecting themselves and the traveling public when a hazardous material spills or releases on TxDOT property and ROW. The first concern is safety.

During a hazardous material spill, TxDOT provides support to other agencies, such as the Department of Public Safety (DPS), TCEQ, or the local fire marshal during the containment and cleanup of the spill or release. TxDOT is responsible for restricting public access, providing traffic control until relieved by DPS or another on-site coordinator, and reporting all pertinent information to the site supervisor. The site supervisor reports information to the district hazardous material coordinator. The district engineer/hazardous materials coordinator notifies appropriate governmental agencies such as TCEQ, DPS, and the local fire department.

All TxDOT personnel who may encounter a hazardous material spill or release require Hazardous Materials Awareness Training. Department personnel are specifically prohibited from handling, cleaning up, or otherwise coming in contact with toxic or hazardous materials at accident scenes or abandonment sites on the department's ROW. Vehicle fluid cleanup of less than 25 gallons is the only exception in terms of TxDOT handling or cleaning up hazardous materials at accident scenes or abandonment sites.

#### 2.5.7.3 Accidents and Incidents

TxDOT provides traffic assistance for accidents and incidents on highways by directing traffic around accident sites, which includes providing traffic control, setting up detours, keeping traffic moving, and clearing the roadway as appropriate. Depending upon the incident, such as traffic accidents, vehicle breakdowns, spilled cargo, adverse weather conditions, rubbernecking, etc., law enforcement, fire and rescue, local public works department, TCEQ, Department of Health, or other agencies may respond. The type of incident and location determines who is in charge of the incident. For prolonged incidents, changeable message boards are used to provide information to motorists.

#### 2.5.7.4 Flood Water Removal

During or after a flood event, TxDOT provides assistance to traffic by removing and disposing of floodwater. Typical activities performed include pumping and/or diverting water off the inundated roadways.

#### 2.5.7.5 Natural Disasters

TxDOT's role during or after natural disasters is to provide assistance to traffic as needed. Typical activities include closing state maintained roadways, detouring traffic, and initial clean-up (e.g., blading mud and debris off of the roadway surface) resulting from events such as floods, wildfires, tornados, hurricanes, or landslides. Given the availability of TxDOT personnel, resources and equipment TxDOT is frequently asked to support wildfire control operations. The department participates in activities such as blading fire breaks and providing water and fuel trucks. Activities do not include actual firefighting.

#### 2.5.7.6 Snow and Ice

The objective of removing snow and ice is to provide assistance to traffic as needed during or after a snow and ice event on all highways. Typical activities include displaying of snow and ice warning signs; plowing snow; application of ice control material such as sand and/or aggregate, liquid de-icers, or other approved materials; closing roadways; and assisting stranded motorists.

The first priority of snow and ice removal is to maintain known trouble spots, such as bridge decks, steep grades, sharp curves, intersections, and approaches to railroad crossings. Attending to heavier traveled section of streets and highways is the next priority, followed by the lighter traveled sections.

When a section of a road needs to be closed because of snow or ice, DPS or local law enforcement asks to officially close the road. Signs are erected to advise the public of the closure and news media and appropriate officials are given notice. For all highways crossing district or state lines, closures are coordinated with the adjoining district or state officials. Once road closure signs are in place, closed areas are driven to ascertain if anyone is stranded within the closed section.

### 2.5.8 Adopt-a-Highway Program

The Adopt-a-Highway Program originated in Texas and it gives various groups the opportunity to help their communities by collecting litter and keeping roadsides clean. This program remains one of the state's most successful public-private initiatives. TxDOT provides the personnel and equipment used for the Adopt-a-Highway Program. Activities associated with supporting Adopt-a-Highway groups include installing and maintaining signs, providing materials for litter collection and removal of debris and litter bags collected by Adopt-a-Highway groups, meeting with existing Adopt-a-Highway groups or recruiting new groups.


## 2.6 Debris and Spills Maintenance Program

**Debris:** The remains of something broken down or destroyed; an accumulation of fragments of rock; or something discarded.

**Spill:** A hazardous material spill in which there is a significant amount of a hazardous material released or a spill in which the release of the substance cannot be controlled.

The Debris and Spills Maintenance Program maintains TxDOT highways for debris, including litter, as well as responds to hazardous material spills. As part of the Debris and Spills Maintenance Program TxDOT:

- Patrols for debris;
- Conducts spot litter pick-up and disposal;
- Removes and disposes of litter;
- Conducts hand sweeping;
- Conducts street sweeping;
- Sweeps ice rock;
- Removes and disposes of illegal dumpsites;
- Removes illegal signs on ROW;
- Removes encroachments (other than signs); and
- Manages hazardous material cleanup for spills, abandoned materials, and leaking storage tanks owned by the Department.

TxDOT's Debris and Spills Maintenance Program provides safety and an aesthetically appealing environment for the users of TxDOT's roadways. The Debris and Spills Maintenance Program

insures safe, clean and aesthetically pleasing highways and that all hazardous material spills or releases on TxDOT roadways or ROW are handled properly. Debris and Spills Maintenance Program activities keep TxDOT's roadways free from obstructions and other dangers that could pose a threat to the safety of the traveling public.

Activities conducted under the Debris and Spills Maintenance Program are associated with maintaining TxDOT roadways and ROWs for litter and debris and remove illegal signs and other encroachments within the ROW. The Debris and Spills Maintenance Program also assists with hazardous material cleanup, spills, and leaking storage tanks, as well as hazardous material cleanup for abandoned materials. The following sections provide additional details of the specific practices included as part of Debris and Spills Maintenance Program activities.

### 2.6.1 Patrolling for Debris

Patrolling for debris includes routine patrolling and inspection of TxDOT rights-of-way to identify, collect and dispose of debris that has been deposited on the ROW. TxDOT tracks this practice based on actual miles patrolled.

### 2.6.2 Spot Litter Pick-Up and Disposal

Spot litter pick-up and disposal includes the spot removal and disposal of litter, including dead animals, from the ROW. This consists of litter removal and disposal from specific or isolated sites and litter barrels not in picnic or rest areas within the ROW. This practice consists of clearance, removal, and/or disposal of items such as trees, ladders, lumber, tire tread, personal property, etc. from the ROW. This work is necessary to eliminate an immediate threat to traveler safety by eliminating obstacles, thereby allowing the safe passage of vehicles.

Remains of animals are also removed as soon as possible from the roadway and disposed of in a proper location. If a dead animal is located in a rural area, they are sometimes buried on the roadside within the ROW away from any homes or development. If the animal is large (such as a cow or horse), a by-products or rendering company is sometimes called to remove the animal for disposal.

Dead animals in urban areas are taken to an approved sanitary landfill or municipal solid waste facility at a cost of $35 per animal. This fee comes out of the general maintenance fund. If this method is not practical, the animals are moved to a rural section of ROW and disposed of properly through burial. TxDOT employees are sensitive to pet owners and seek to contact owners of animals when possible (i.e. if animal is collared with owner identification tags).

When picking up debris on the roadway, TxDOT personnel considers their personal safety and safety of the traveling public in all situations. When conditions permit, TxDOT staff and contractors keep themselves and their equipment well clear of open traffic lanes and position themselves to allow maximum sight distance to oncoming motorists.

Debris is left in place if TxDOT staff or contractor safety is compromised due to high-speed traffic, heavy traffic volume, multiple lanes of travel, or insufficient site distance. In such cases TxDOT requests assistance from local police, Department of Public Safety or other TxDOT traffic management units. Once assistance is rendered traffic conditions are managed so TxDOT or contractor personnel can safely remove the debris. Effective traffic management prevents oncoming traffic from having to slow down suddenly or make sudden stops and this lessens the chance of accidental collisions.

TxDOT patrols for debris everyday and removes debris upon discovery and when conditions are safe for its removal. TxDOT's district maintenance staff or TxDOT's maintenance contractors remove debris.

### 2.6.3 Removal and Disposal of Litter

The practice of removing a disposing of litter consists of removing and disposing of litter from the entire ROW, excluding paved areas, as well as picnic and rest areas. Picnic and rest area litter removal and disposal practices were addressed in the Customer Service Maintenance Environmental Assessment. Activities associated with the removal and disposal of litter from the entire ROW within a section of roadway includes driving to the work location, picking up litter, and disposing of litter items at an approved site. This function includes picking up litter from roadway drains, and from any floodplain, wetland or surface water located within TxDOT ROW.

The frequency of litter removal and disposal depends on the roadway and the average daily traffic (ADT) volume. High volume areas are done weekly, major or secondary roads with less volume and lower ADTs are done every two weeks, and some Farm to Market (FM) roads are rarely cleaned. TxDOT's removal and disposal of litter policy is based on the need to provide a safe and attractive ROW for the traveling public. All litter within the ROW is removed as soon as possible. If any items are found that are of value, they are brought to the district warehouse for recycling and/or disposal via appropriate procedures.

Issues of concern associated with roadside litter include biological (e.g. bacteria, viruses, etc.), physical (e.g. sharp objects like glass, needles, etc.), and chemical (e.g. gasoline, oil, acids, heavy metals, and other potentially hazardous chemical substances). Illegal dumping is further discussed in

**Section 2.6.7** and hazardous material cleanup for spills and abandoned materials is discussed in **Section 2.6.10**.

Litter is generally brought to landfills for disposal. Litter becomes property of contractors as soon as it is picked up and the contract states that is must be disposed of at appropriate places, which are generally only landfills. Most litter and debris is currently not sorted for recycling, with the exception of tire rubber, due to high costs and labor requirements associated with the sorting.

If a designated state highway lies within a city's limits, the city is generally responsible for litter removal and disposal. The only exception is on controlled access highways. TxDOT is responsible for litter removal and disposal on these facilities regardless of where they are located. The city may request assistance from TxDOT if state resources are available.

### 2.6.4 Hand Sweeping

Hand sweeping includes using hand brooms or blowers to clean riprap, islands, medians, curb and gutter, driveways, etc. Activities could include hand-loosening of dirt in curb and gutter sections except when performed in conjunction with routine street sweeping.

### 2.6.5 Street Sweeping

The practice of street sweeping consists of sweeping the road surfaces with a rotary broom or street sweeper to remove loose aggregate and debris on the roadway surface, sweeping along median barriers, sweeping along concrete bridge rails, and sweeping curb and gutters. The frequency of street sweeping depends on the type of roadway. Toll roads are swept weekly, major roads like interstates every two weeks, while other major roads are swept once a month. Street sweeping is generally performed at night. Materials collected during sweeping are disposed of at approved landfills.

Sweeping provides two primary benefits. The more obvious benefit is the collection and removal of visible debris that collect on the paved surfaces of TxDOT's roadway facilities. In addition to being unsightly, this debris can accumulate and block catch basins and other storm water drainage and management facilities, causing localized flooding during heavy rains. A less visible, but equally important benefit is the removal of particulate matter (PM) such as metal particles and other hazardous waste products deposited by passing vehicles. Although they are virtually invisible, these small particles can be toxic to fish and other wildlife. Street sweeping is an effective method of removing both the large and microscopic pollutants that collect on roadways. Contaminant concentrations in sweepings are usually lower than those found in catch basins, sumps and storm sewer lines waste (vactor waste), but even relatively clean sweepings can contain toxins and require careful management. Wastewater collected when wet roads are swept has many of the same concerns as vactor waste.

The practice of sweeping also includes the collection of road sand applied for traction control during snow or ice events. Once the event is over and snow and ice are gone, the sand is collected for reuse. In some cases the collected sand must be cleaned to remove other materials like litter. The collected and recycled sand reduces the quantity of new product that TxDOT must purchase and results in less waste to manage.

### 2.6.6 Sweeping Ice Rock

The practice of sweeping ice rock includes the removal of ice rock from bridge decks and/or intersections after treatment for a winter storm event. This does not include cleaning or repairing bridge joints even if the debris in the bridge joints is from ice control activities. See the Bridge Maintenance Environmental Assessment for more detail on bridge maintenance.

**Ice Rock:** Aggregates used for snow and ice control. Includes anti-icing and de-icing agents such as sodium chloride crystals; magnesium chloride; calcium chloride; and sand.

Aggregate used for snow and ice control creates an undesirable condition on the roadways after a storm event due to decreased traction and dust; therefore, use of aggregate is kept to a minimum. Aggregate used for a winter storm event is removed as soon as practical. Sweepers are utilized continuously by TxDOT or contractors, until cleanup is complete. All equipment used during a storm event is thoroughly washed and inspected to determine if any repairs are required. Repairs are completed as soon as possible to ensure equipment is ready for the next storm event.

### 2.6.7 Illegal Dumpsite Removal and Disposal

Illegally dumped waste ranges from a bag of trash thrown into a borrow ditch to a pile of hundreds or thousands of discarded tires. Illegal dumpsites that are not cleaned can lead to a number of health and safety concerns, as well as leave a negative image of the roadway with the traveling public. This practice includes the removal and disposal of debris discarded or deposited in an unauthorized area in the ROW such as under a bridge, overpass, culvert, etc. This does not include the removal of abandoned hazardous materials. The removal of abandoned hazardous materials is further discussed in **Section 2.6.10**.

### 2.6.8 Removal of Illegal Signs on ROW

Removal of illegal signs on the ROW includes the disposal and written notice to the owners of the sign. Activities associated with the removal and disposal of permanent or temporary signs include the time involved to inspect the ROW, driving to the location of the sign, using equipment to remove the sign, disposing of the sign, storing the sign for the owner to pick up, and all costs associated with the notification of the owner of the sign.

Texas Transportation Code 392.034 states that TxDOT should give written notice of encroachment to the owner of a sign that is on property other than a state highway ROW; is maintained under a written permit or agreement; and encroaches on the state highway ROW. If the owner of the sign does not correct the encroachment before the 31st day after the date of receipt of the notice, the department may remove the sign under Section 392.033. Section 392.033 states that TxDOT, without prior notice to the owner of the sign, may remove a sign that is placed or maintained in violation of ROW encroachment. If the owner's identity and mailing address are displayed on the sign or are otherwise reasonably ascertainable, the department notifies the owner in writing that the sign has been removed and may be disposed of unless the owner claims the sign on or before the 10th day after the sign was removed. If the owner of the sign does not claim it on or before the 10th day after the removal date, the department may dispose of the sign.

## 2.6.9 Removal of Encroachments

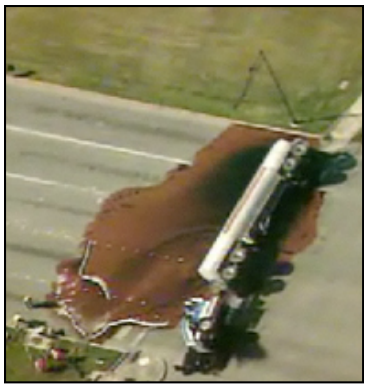
This practice includes the removal of illegal encroachments (other than signs) on the ROW, including disposal and written notice to owners. This includes encroachments such as roadside vendors, dumpsters, and vehicles. Activities associated with this function include driving to the location, notifying the owner, and removing, storing or disposing of the encroachment.


## 2.6.10 Hazardous Material Cleanup for Spills, Abandoned Materials, and Leaking Storage Tanks

Activities for hazardous material cleanup for spills, abandoned materials, and leaking storage tanks include investigations, testing, cleanup, removal, disposal and restoration work associated with hazardous materials spill, abandoned hazardous materials of unknown ownership, or leaking storage tanks located on TxDOT property. This function requires coordination with the district hazardous materials coordinator and must comply with departmental policy and district guidelines.

### *2.6.10.1 Hazardous Material Spills*

As discussed in the Customer Service Maintenance Program Environmental Assessment, most hazardous materials spills are a result of a traffic accident. TxDOT is usually notified and called to the scene by law enforcement. TxDOT takes an active role in protecting themselves and the traveling public when a hazardous material spills or releases on TxDOT property and ROW. The first concern is safety.



TxDOT provides support to other agencies, such as the DPS, TCEQ, and/or the local fire marshal during the containment and cleanup of a hazardous material spill or release. TxDOT is responsible for restricting public access, providing traffic control until relieved by DPS or another on-site coordinator, and reporting all pertinent information to the site supervisor. The site supervisor reports information to the district hazardous material coordinator. The district engineer/hazardous materials coordinator notifies appropriate governmental agencies such as TCEQ, DPS, and the local fire department.

### *2.6.10.2 Abandoned Materials*

If hazardous materials are abandoned on TxDOT's ROW, and the responsible party cannot be identified, it becomes TxDOT's responsibility to ensure proper disposal.

As stated in AASHTO's Compendium of Environmental Stewardship Practices in Construction and Maintenance, many chemical pollutants can be detected by odd colors, stains, discoloration, or chemical smells. Other times pollutants can only be detected through chemical testing, or in the case of knowing oil or grease is present, it may still take laboratory testing to determine if levels are toxic. Heavy metals detection requires laboratory testing. If waste is full of trash, smells of oil and gasoline, it has a high toxic risk and reuse options are limited; hauling waste to a high-risk waste dump can be the quickest option. Trash may be able to be screened from medium risk waste and stored in an appropriate spot while toxic hydrocarbons (present from gasoline or oil contamination) break down. Later, such material may be appropriate for shoulder repair or patching holes under proper circumstances.

TxDOT personnel follow standard safety procedures and report pertinent information to their supervisors immediately. TxDOT supervisors contact the district hazardous materials coordinator and local law enforcement officials if needed. Hazardous materials coordinators oversee removal and disposal when the responsible party cannot be identified. The following process is followed when hazardous waste is discovered or reported to TxDOT:

- Access to material is restricted. The public is kept away from any hazard, and traffic control is provided.
- The scene is surveyed from a safe distance and the integrity of the container(s) is assessed;
    - the existence or possibility of runoff is determined
    - the scene is surveyed for the presence of distressed vegetation and/or dead animals

  - any markings on containers are read and evaluated
  - the physical characteristics of the materials are assessed
- If determined an emergency, due to location, material characteristics, etc., TxDOT personnel proceed directly to their contractors for containment, material identification and material disposal.
- The responsible party is determined.
  - labeling on container(s) are observed from a safe distance to determine whether a potential responsible party can be identified
  - TxDOT will then contact the responsible party to pick up the container(s)
  - If the responsible party cannot be identified, TxDOT then contacts the TCEQ regional office for assistance in identifying the responsible party
  - All unidentifiable materials are assumed to be hazardous until proven otherwise and TCEQ is contacted for material identification (and disposal, if appropriate).
- Material Disposal
  - Recovered spill materials will be recycled when possible.
  - Only transporters and recycling/disposal facilities licensed for such activities within the State of Texas will be utilized.
  - Materials not eligible for recycling will be disposed of at a licensed landfill following proper profiling and manifesting practices.
  - All TxDOT personnel who may encounter a hazardous material spill or release require Hazardous Materials Awareness Training. Department personnel are specifically prohibited from handling, cleaning up, or otherwise coming in contact with toxic or hazardous materials at accident scenes or abandonment sites on the department's ROW. Vehicle fluid cleanup of less than 25 gallons is the only exception in terms of TxDOT handling or cleaning up hazardous materials at accident scenes or abandonment sites.

#### *2.6.10.3 Storage Tanks*

TxDOT stores fuel in above ground and underground storage tanks at many of the Maintenance Facilities and District Headquarters. These tanks store diesel, gasoline, propane, or other fuels for use in Maintenance Division or other TxDOT vehicles. The tanks range in capacity from 200-12,000 gallons, but the majority of tanks holds between 1,000 and 4,000 gallons.

Some of the tanks have replacement dates as old as 1947, with the majority of tanks having replacements dates from the 1990s to present. **Table 2-1** shows the number of facilities in each district that have fuel stations, the number of underground and above ground storage tanks, and the total number of tanks per district. As of March 26, 2009 there were 1,046 storage tanks at TxDOT facilities.

**TABLE 2-1**
**TXDOT MAINTENANCE DIVISION FUEL STATIONS**

| District | Facilities with Fuel Stations | Underground Tanks | Above Ground tanks | Total Tanks |
|---|---|---|---|---|
| Abilene | 14 | 0 | 53 | 53 |
| Amarillo | 19 | 10 | 50 | 60 |
| Atlanta | 10 | 13 | 18 | 31 |
| Austin | 17 | 20 | 48 | 68 |
| Beaumont | 10 | 2 | 27 | 29 |
| Brownwood | 9 | 4 | 37 | 41 |
| Bryan | 11 | 15 | 25 | 40 |
| Childress | 13 | 7 | 30 | 37 |
| Corpus Christi | 13 | 16 | 25 | 41 |
| Dallas | 7 | 0 | 15 | 15 |
| DHQ headquarters | 1 | 0 | 6 | 6 |
| El Paso | 14 | 0 | 52 | 52 |
| Fort Worth | 11 | 4 | 26 | 30 |
| Houston | 13 | 19 | 20 | 39 |
| Laredo | 9 | 8 | 16 | 24 |
| Lubbock | 19 | 14 | 44 | 58 |
| Lufkin | 13 | 23 | 26 | 49 |
| Odessa | 13 | 11 | 37 | 48 |
| Paris | 9 | 10 | 26 | 36 |
| Pharr | 11 | 6 | 24 | 30 |
| San Angelo | 13 | 7 | 42 | 49 |
| San Antonio | 14 | 20 | 39 | 59 |
| Tyler | 9 | 10 | 20 | 30 |
| Waco | 9 | 14 | 10 | 34 |
| Wichita Falls | 14 | 0 | 44 | 44 |
| Yoakum | 12 | 6 | 36 | 43 |
| **Total** | **307** | **239** | **796** | **1,046** |

*TxDOT March 2009f*

All above ground or underground storage tanks have the potential risk for leakage or other unintended discharges, which, if realized, can cause environmental problems, especially if the fuel reaches a waterway or aquatic environment. As seen in **Table 2-2**, approximately 237

TxDOT facilities have reported at least one unauthorized discharge of fuel from the storage tanks on premises. The report does not indicate the specific cause of each discharge.

**TABLE 2-2**
**NUMBER OF FACILITIES WITH AT LEAST ONE UNAUTHORIZED DISCHARGE**

| District* | Number of facilities |
|---|---|
| Abilene | 11 |
| Amarillo | 17 |
| Atlanta | 6 |
| Austin | 16 |
| Beaumont | 7 |
| Brownwood | 8 |
| Bryan | 11 |
| Childress | 16 |
| Corpus Christi | 8 |
| Dallas | 7 |
| El Paso | 8 |
| Fort Worth | 8 |
| Houston | 13 |
| Laredo | 7 |
| Lubbock | 17 |
| Lufkin | 9 |
| Odessa | 8 |
| Paris | 1 |
| Pharr | 8 |
| San Angelo | 8 |
| San Antonio | 13 |
| Tyler | 9 |
| Waco | 13 |
| Wichita Falls | 5 |
| Yoakum | 3 |
| **Total** | **237** |

**As of May 22, 2001 with 18 out of 25 districts verified.*

In addition, a search on the TCEQ's Leaking Petroleum Storage Tank Database Query returned 500 results with the responsible party as TxDOT. Some of these were listed as TxDOT Maintenance Facilities, some within TxDOT ROW, and others on parcels of property said to be owned by TxDOT.

When an underground storage tank or piping lies within either the recharge or the transition zone of the Edwards Aquifer, an underground storage tank facility plan is required. Also, storage tank (aboveground or underground) facilities that will store 500 gallons or more of static hydrocarbons or

hazardous substances are regulated. Double-walled tanks and product delivery piping are required and continuous leak detection is in place that will alert the owner at all times, even when the facility is not occupied. Containment sumps beneath piping sumps are also required elements of the plan. Above ground storage tanks are situated on a foundation, if site appropriate.

## 2.7 Drainage Maintenance Program

The Drainage Maintenance Program maintains TxDOT highways for drainage, including storm water. As part of the Drainage Maintenance Program, TxDOT:

**Drainage:** draining; a gradual flowing off any liquid; also, that which flows out of a drain; the mode in which streams or rivers pass off water; the system of drains and their operation, by which superfluous water is removed.

- Maintains ditches;
- Reshapes ditches;
- Repairs or stabilizes slopes;
- Maintains culverts and storm drains;
- Maintains storm water pump stations;
- Repair and installs riprap; and
- Maintains or implements storm water pollution protection plans (SW3P).

The Drainage Maintenance Program ensures safe highways through a fully functioning drainage system. Drainage Maintenance Program activities keep TxDOT's roadways free from hazards, such as localized flooding, and other dangers that could pose a threat to the safety of the traveling public.

The Texas Condition Assessment Program (TxCAP) combines data from three different reports compiled by three different divisions, the Texas Maintenance Assessment Program, the Pavement Management Information System (CST), and the Texas Traffic Assessment Program (TRF). The scoring calculations are from 0-100 percent and are based on inspections of randomly selected one-mile sections totaling 10 percent of interstate highway systems and 5 percent of all other highways. **Table 2-3** shows the 2007 TxCAP drainage assessment scores for each TxDOT district.

TxDOT's drainage system is inspected twice a month through an informal process by district maintenance offices. Additional maintenance is performed when noticed on an as needed basis. Some maintenance is performed in response to public complaints.

Activities conducted under the Drainage Maintenance Program are associated with maintaining the drainage system along TxDOT roadways and ROWs. The Drainage Maintenance Program also maintains storm water pump stations and maintains or implements SW3P. The following sections provide additional details of the specific practices included as part of Drainage Maintenance Program activities.

**TABLE 2-3**
**2007 TXCAP DRAINAGE ASSESSMENT SCORES**

| District Number | District Name | Overall Drainage Assessment Score (%) | Interstate Assessment Score | Non-Interstate Assessment Score |
|---|---|---|---|---|
| 1 | Paris | 92.32 | 100.00 | 91.97 |
| 2 | Fort Worth | 90.31 | 87.78 | 90.64 |
| 3 | Wichita Falls | 90.15 | 90.00 | 90.15 |
| 4 | Amarillo | 94.27 | 98.75 | 93.85 |
| 5 | Lubbock | 85.67 | 97.78 | 85.19 |
| 6 | Odessa | 96.81 | 100.00 | 96.23 |
| 7 | San Angelo | 93.77 | 96.00 | 93.55 |
| 8 | Abilene | 85.45 | 90.00 | 85.03 |
| 9 | Waco | 88.79 | 96.36 | 88.27 |
| 10 | Tyler | 92.21 | 97.78 | 91.90 |
| 11 | Lufkin | 80.00 | N/A | N/A |
| 12 | Houston | 94.67 | 100.00 | 93.66 |
| 13 | Yoakum | 86.79 | 90.00 | 86.58 |
| 14 | Austin | 93.72 | 93.33 | 93.74 |
| 15 | San Antonio | 96.17 | 98.13 | 95.78 |
| 16 | Corpus Christi | 93.64 | 100.00 | 93.28 |
| 17 | Bryan | 94.58 | 100.00 | 94.14 |
| 18 | Dallas | 91.80 | 97.86 | 90.53 |
| 19 | Atlanta | 92.38 | 100.00 | 92.77 |
| 20 | Beaumont | 79.21 | 88.00 | 78.75 |
| 21 | Pharr | 87.16 | N/A | N/A |
| 22 | Laredo | 92.25 | 100.00 | 91.65 |
| 23 | Brownwood | 98.24 | 100.00 | 98.20 |
| 24 | El Paso | 83.44 | 88.24 | 82.37 |
| 25 | Childress | 92.46 | 100.00 | 92.27 |
| **Statewide** | | **90.85** | **96.18** | **90.40** |

*Source: Texas Condition Assessment Program 2007.*

## 2.7.1 Maintain Ditches

**Ditch:** A long narrow trench or furrow dug in the ground, as for irrigation, drainage, or a boundary line.

Maintaining ditches includes removal and hauling of silt, drift, and/or filling eroded areas. This practice consists of activities associated with ditch cleaning projects that include hauling and disposing of the silt, sand, dirt, or other materials removed from the ditch. It also includes cleaning ditches because of a rock slide. A rock slide is a type of landslide in which the slope of a ditch fails and causes rocks or debris to slide into the bottom of the ditch.

Maintaining ditches includes removal of materials in order to restore the ditch to its original design and restore drainage capacity. Work items could include using a motor grader to roll out dirt to be hauled, using a loader to load trucks, using trucks to haul and dispose of removed material, and the final reshaping of the ditch that was cleaned.

Completing necessary ditch maintenance on TxDOT ROW reduces the amount of sediment and debris traveling to surface water resources during periods of inclement weather. Keeping ditches free of debris also helps to ensure that these structures do not overflow and cause storm water to pond on roadways causing safety issues and pavement damage. Material is removed above the bank line, while avoiding any waterway or wetland. Materials removed from the ditch are then taken to an approved site. Excavated material is recycled to fill in other areas when needed and feasible.

Maintenance ditch cleaning is only done in areas where the ditch's function is impaired. The ditch length, width, and height are dredged back to its original dimensions. Mowing drainage ditches to control vegetation, rather than mechanically cleaning ditches with heavy equipment, causes less erosion of exposed soil and can result in improved water quality.

In general, ditches are cleaned and repaired only during periods of low water flow and not during intense rainfall events. All efforts are made to retain existing vegetation, especially along the ditch slopes to maintain slope stability. Excavating only the first three quarters of the ditch and retaining vegetation in the remaining quarter also reduces the amount of pollutants traveling in the water.

Adequate siltation control measures are generally put into place before cleaning operations begin. Erosion control devices such as check dams, silt fences, and other acceptable techniques are used when the potential exists for sediment or other materials to enter a Water of the State. Check dams may be necessary on steep slopes to slow water velocity, reduce erosion, and sedimentation. Cleaned ditches are seeded and mulched at the end of each work day and monitored for subsequent erosion until the cleaned area is stable.

Highway drainage ditches originally constructed in upland areas are not considered Waters of the U.S., including wetlands, and are not subject to Section 404 jurisdiction; therefore maintenance cleaning of these ditches is not regulated and requires no coordination with the U.S. Army Corps of Engineers (USACE). However, if highway drainage ditches were originally constructed in wetlands or a stream channel, connect two or more wetlands, or are draining a wetland, then these ditches are subject to Section 404 jurisdiction. In this situation, these ditches can be cleaned to the original alignment and dimensions under Nationwide Permit 3 (NWP3) without notification to the USACE. Incidental fallback from the equipment bucket is not regulated; however no material may be side-cast

or disposed of in Waters of the U.S., including wetlands, and all Section 404 general and regional conditions must be complied with in full. If there is to be a modification to a jurisdictional highway ditch from its original alignment or dimension, then it is regulated under Section 404 and will require notification under NWP3 to the USACE. The district environmental quality coordinator will be contacted for assistance in determining when SW3P or USACE permits are required.

### 2.7.2 Reshape Ditches

Reshaping ditches involves using a maintainer and/or gradall, etc., but does not include work at culverts or bridges. This practice is used for activities that restore ditches to their original design and capacity, which is intended for ditch maintenance activities that involve the entire ditch area and could include unpaved shoulders. This practice also includes blading fire guards. Work items could include using a motor grader, gradall, backhoe, loader, drag blade, or tractor mounted blade to reshape the ditch.

Adequate siltation control measures are generally put into place before operations begin. Erosion control devices such as check dams, silt fences, and other acceptable techniques are used when the potential exists to have sediment or other materials enter a Water of the State. Check dams may be necessary on steep slopes to slow water velocity, reduce erosion, and sedimentation. Reshaped ditches are seeded and mulched at the end of each work day and monitored for subsequent erosion until the reshaped ditch is stable. Excavating only the first three quarters of the ditch and retaining vegetation in the remainder is considered. Studies by Washington State Department of Transportation (WSDOT) have found the greatest water quality benefits occur when the first three quarters of the ditch were excavated and vegetation was retained in the remainder.

Material is removed above the bank line, while avoiding any waterway or wetland. Materials removed from the ditch are then taken to an approved site. Excavated material is recycled when feasible. The ditch length, width, and height are dredged back to their original dimensions. In general, ditches are reshaped only during periods of low water flow and not during intense rainfall events. The district environmental quality coordinator is contacted for assistance in determining when SW3P or USACE permits are required.

### 2.7.3 Repair or Stabilize Slopes

The practice of repairing or stabilizing slopes consists of reshaping or repairing eroded areas on slopes, which includes all activities involved with the stabilization of slopes that could be subject to erosion, the repair of slopes that have failed due to erosion, or along a slip plane.

Work items could also include removal of loose rock from the face and bench area of rock cuts. This practice is intended for use in mechanical repair and stabilization projects. Work items could include the reshaping of eroded areas on slopes, rebuilding slopes that have failed, installing geo-grid materials to stabilize soils, adding stabilizing materials such as cement, lime, etc., installing baffle dams, installing vertical pilings and columns, and final reshaping of the slope.

Where feasible and appropriate, existing ditch slopes are evaluated and modified to trap sediments and support development of vegetation. Completing necessary slope repairs can reduce erosion and the amount of sediment and debris traveling to surface water resources during periods of inclement weather. Material is removed above the bank line, while avoiding any waterway or wetland. Materials removed from the ditch are then taken to an approved site. In general, debris removed from slope repair or stabilization is stockpiled and later used to fill in other areas where it is needed and feasible.

Slope repair is only done in areas where the ditch's function is impaired. In general, slope repair or stabilization is completed only during periods of low water flow and not during intense rainfall events. Changes or increases in the material profile are avoided whenever possible. Erosion repair activities (response to and cleanup of erosion problems, not the erosive action itself), which cause significant changes in the topography or vegetation within the riparian management area are coordinated with TxDOT environmental staff and/or other regulating agencies.

Erosion control methods are used in a timely manner, including seeding and mulching specific areas with non-invasive species, installing silt fences, and installing other devices as appropriate. Also, precautionary measures (chicken wire, chain link, rock matting) are taken on erodible areas where eroding areas are identified and where precautionary measures can be successfully and safely applied.

### 2.7.4 Maintain Culverts and Storm Drains

**Culvert:** A drain or pipe that crosses under a road, embankment, or railway.

**Storm Drain:** A catch basin or storm sewer for carrying off rainfall drained from paved surfaces, roofs, etc.

The practice of maintaining culverts and storm drains includes the installation, repair, and maintenance of culverts up to bridge classification (twenty feet measured along the centerline of the roadway). This work includes silt and debris removal from inlets, storm drains, retention ponds, and culverts, as well as all activities associated with the installation and maintenance of culverts, including safety end treatments. This practice should also include all items associated with the installation and maintenance of storm drains.

Work items could include cleaning culvert ends with a backhoe, loader or gradall, repairing bent culvert ends to restore drainage, installing or repairing sloped safety ends, installing new culverts, setting forms and pouring concrete headwalls, replacing or repairing grates on slope ends or drop inlets, removing silt and debris from culvert pipe or storm drain, repairing pavement cuts for new culvert installations, and cleaning of easements.

Drift removal is an aspect of culvert maintenance that involves either using boats to maneuver the drift, hydraulic tongs to reach over the side of the structure and dislodge the material, or pulling the drift from the side of the bank and cutting it into pieces. Environmental stewardship practices for drift removal include cutting and turning drift to allow it to flow through and under the structure, only where doing so would not endanger any other crossing structures downstream and repairing and restoring riparian areas temporarily impacted by machinery during drift removal.

Removal of sediment from Waters of the U.S., including streams and wetlands, during culvert cleaning activities is not subject to Section 404 jurisdiction and therefore is not regulated if the work is accomplished by reaching from above with a gradall, back hoe, excavator, etc., and the activity does not result in the discharge of dredge or fill material or placement of equipment in Waters of the U.S, including wetlands. Incidental fallback of small amounts of sediment from the equipment bucket is not regulated; however sediment removed from the stream must not be side-cast or disposed of in Waters of the U.S., including wetlands.

If equipment is placed or operated within Waters of the U.S., including streams or adjacent wetlands, the work is jurisdictional under Section 404; however the work can be done under NWP3 without notification to the USACE if:

- All work is limited to within 50 feet in any direction from the structure;
- Excavation is limited to the original cross section or design, sediment removed from the stream is not pushed up onto the banks or side-cast into adjacent floodplains or wetlands;
- Work is accomplished, to the extent practicable, during low flow conditions;
- There are no adverse impacts to federally-listed endangered or threatened species or to historic properties; and
- All other Section 404 general and regional conditions are complied with in full.

If equipment is placed or operated within Waters of the U.S., including streams or adjacent wetlands, and the work limits extend beyond 50 feet in any direction from the structure, the USACE must be

notified in accordance with Section 404. The district environmental quality coordinator is contacted for assistance in determining when SW3P or USACE permits are required.

### 2.7.5 Repair and Install Riprap

Riprap works by absorbing and deflecting the impact of a wave before the wave reaches the structure or slope. The size and mass of the riprap material absorbs the impact energy of waves, while the gaps between the riprap traps and slows the flow of water, lessening its ability to erode soil or structures. The mass of riprap also provides protection against impact damage by ice or debris.

**Riprap:** is rock or other material used to armor shorelines, streambeds, bridge abutments, pilings, and other shoreline structures against scour, water, or ice erosion. It is used to protect coastlines and structures from erosion by the sea, rivers, or streams. It is used on any waterways or water containment where there is potential for water erosion.

Riprap installation and repair includes the installation and maintenance of ditch liners, retards, down drains, riprap, flumes, concrete mowing strips, gabions, retaining walls, and other erosion protection. Riprap is placed during in-water work periods (compliant with seasonal habitat restrictions) in non-emergency situations. TxDOT environmental staff and/or other regulating agencies are coordinated with when riprap is placed, in addition to existing conditions, and within the two-year floodplain of Waters of the State.

Placement of riprap (minor deviations) above the ordinary high water mark (OHWM) is not jurisdictional under Section 404 and is not regulated; therefore it does not require notification to the USACE. Replacement of riprap to the original footprint below the OHWM is jurisdictional under Section 404; however it is allowed under NWP3 without notification to the USACE, provided that all Section 404 general and regional conditions are complied with in full. The district environmental quality coordinator is contacted for assistance in determining when SW3P or USACE permits are required.

### 2.7.6 Maintain Storm Water Pump Stations

Maintaining storm water pump stations include repairing and maintaining motors, pumps, generators, wet wells, dry wells, debris screening baskets, etc., including costs of utility services. This work also includes building maintenance, cleaning in and around the pump station, testing system operations, and hauling fuel to pump station site. Storm water pumps are most prevalent in San Antonio, Houston, and Beaumont Districts.

### 2.7.7 Removal of Beaver Dams

Damage to roads by beavers is a serious problem for TxDOT. Drainage ditches on the edge of roadways offer good habitat for the beaver. As outlined in **Section 2.1.1**, beavers can plug culvert

pipes with debris and create dams that impound water against roadbeds, which may flood or wash out roads and damage pavement creating potholes. Beaver dams and the flooding they cause have resulted in roads being closed, bridges and culverts requiring replacement, and occasional vehicle accidents.

During routine inspections, if a beaver dam is noted or if a landowner reports a beaver dam that needs to be removed, a contracted trapper is notified. In general, the removal process consists of breaking down the beaver dam and setting traps for beavers that are present. Currently, there is one contractor for the entire state of Texas that is notified when there is a beaver dam that needs to be removed. Beaver dam removal occurs most frequently in districts in east Texas.


### 2.7.8 Maintain or Implement Storm Water Pollution Protection Plan (SW3P)

This practice includes maintaining or implementing SW3P in accordance with EPA regulations on projects designated by area engineers, which includes all activities associated with implementing and maintaining a SW3P, usually on large projects that disturb more than one acre of soil during construction or maintenance activities. SW3P is required on these projects if the maintenance or construction activity changes the ROW from its original cross section or design. Original cross section or design is understood to mean the normal flow line, shape, and capacity of the ditch.

The construction plans may be consulted to determine the normal flow line, shape, and capacity of the ditch if maintenance section personnel cannot make that determination. Maintenance activities that restore the ditch to its original cross section, shape, and capacity are exempt from SW3P requirements, but may require USACE permits if Waters of the U.S. are involved (i.e., waterways, playas, designated wetlands, etc.). The district environmental quality coordinator should be contacted for assistance in determining when SW3P or USACE permits are required. Work items could include the installation and maintenance of silt fence, rock filter dams, or hay bales. This work also includes removing trapped silt, sand, dirt or other pollutants during the maintenance of the SW3P devices, and removing and disposing of the SW3P devices after re-vegetation is complete.

The TCEQ is responsible for administering the state's storm water management program. The Texas storm water program is closely modeled after the federal NPDES program, which requires storm water to be treated to the maximum extent practicable. Texas has established permitting requirements for construction/maintenance sites disturbing more than one acre. Each permitted project will be responsible for establishing a SW3P.

## 2.8 Ferry Maintenance Program

**Ferry:** transport from one place to another; a boat that transports people or vehicles across a body of water and operates on a regular schedule.

The Ferry Maintenance Program maintains ferries and landings at Port Aransas and Galveston-Port Bolivar (see **Figure 2-6**). Port Aransas lies within the Corpus Christi District and Galveston-Port Bolivar lies within the Houston District. South of Interstate 10, State Highway 87 is the only highway south of East Galveston Bay and the Galveston-Port Bolivar ferry is the connection between its two segments. The free ferry service provided by TxDOT is the only way motorists can cross the Houston Ship Channel between Bolivar Peninsula and Galveston Island. The Port Aransas ferry connects two segments of State Highway 361. The ferry allows motorists to cross the Corpus Christi Ship Channel between Port Aransas and Harbor Island.

As part of the Ferry Maintenance Program, TxDOT is responsible for maintaining the ferries and also the ferry landings at Port Aransas and Galveston-Port Bolivar. This maintenance includes on site activities, as well as off site dry dock activities that are typically performed by a contracted party.

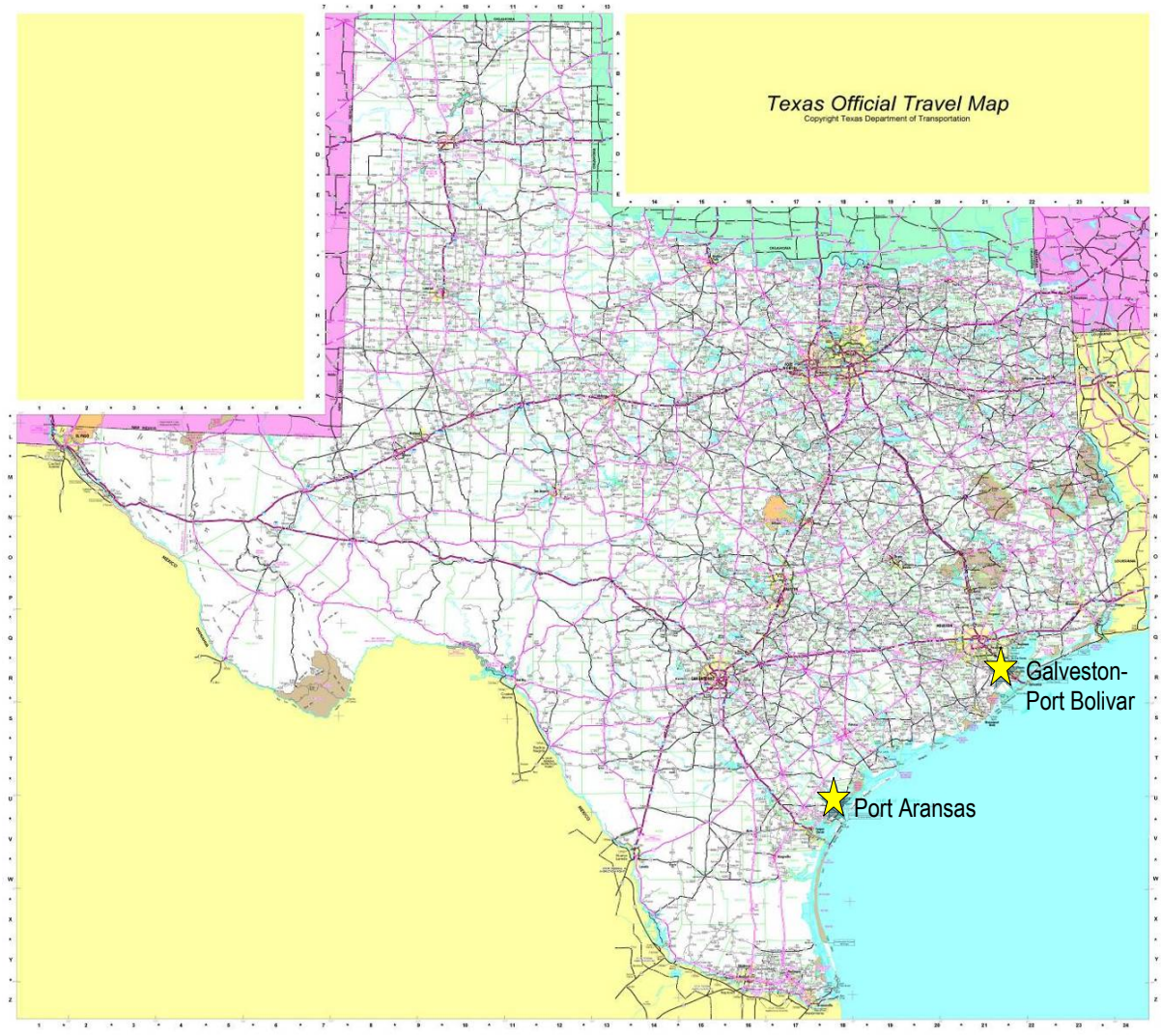
More than 8 million people use the TxDOT ferry system throughout the year and peak ferry use occurs during the summer months of June, July and August. The ferries at Port Aransas run 24-hours a day, 365 days a year on an "as needed" basis. Typically, a ferry will depart from each terminal every 10-20 minutes, but the schedule may vary depending upon the traffic load, weather conditions and ship channel traffic.

The Galveston-Port Bolivar ferry operation is currently operating one ferry 24 hours per day. A second ferry is placed in service at 5:30 a.m. and after the 7 a.m. departure, the two ferries operate based on traffic volumes, and space themselves to carry traffic as efficiently and safely as possible. A third ferry is placed in service during the afternoon period as ferries and crews are available. During the summer months, TxDOT's Galveston-Port Bolivar operation maintains base ferry service with two ferries. A third, fourth or fifth ferry is placed into service as crews and ferries are available.

TxDOT's Ferry Maintenance Program maintains the state's ferry system in order to ensure safe, convenient, and efficient traffic flow and to prolong the useful life of TxDOT's investment in the ferry infrastructure. The Ferry Maintenance Program ensures safe travel through a fully functioning ferry system. Ferry Maintenance Program activities keep TxDOT's ferries and landings in working condition and free from hazards and other dangers that could pose a threat to the safety of the traveling public and the environment.

Activities conducted under the Ferry Maintenance Program are associated with maintaining the ferry systems at Port Aransas and Galveston-Port Bolivar. The following sections provide additional details of the specific practices included as part of Ferry Maintenance Program activities.

**FIGURE 2-6**
**TXDOT FERRY PORT LOCATION MAP**




## 2.8.1 Dredging

**Dredging:** The removal of rock, sand, gravel, mud and clay from the bottom of waterways to create or maintain sufficient depth for navigation or other purposes. The material, which appears as wet soil. The sediment is scraped, scooped or pumped by dredging vessels which transfer it to barges, hoppers or on-shore facilities for placement.

Dredging is the process of removing silt and sand that has accumulated due to wave action and ship traffic. Dredging is required due to shoaling in and around ferry landings and to maintain a safe depth for the ferry vessels to operate and dock in. This is necessary for passenger and crew safety as well as to prevent damage to hulls and propulsion systems.

Dredging is done on an as-needed basis; a frequency of once a year for dredging has been the norm, but is currently moving to two times per year. Tropical storms and other natural phenomenon may result in the need for more frequent dredging. All dredging activities are contracted to a third party contractor, and permitted through the United States Army Corps of Engineers (USACE). TxDOT and the dredging contractor are required to follow all regulations set forth in the USACE permit.

The USACE is responsible for dredging the Houston Ship Channel, which the Bolivar-Galveston Ferry Crosses, at a depth of 45 feet and width of 530 feet. However, TxDOT is responsible for maintaining the appropriate depth at ferry landings to allow for safe access by the ferry vessels. Due to currents and location, the Bolivar landing of the Galveston-Bolivar Ferry experiences the heaviest shoaling, and therefore requires more frequent dredging than other sites.

A reoccurring 10 year permit is required from the USACE to perform dredging activities at the Galveston-Bolivar Ferry. The existing permit identifies four sites where dredged material may be deposited, however the USACE must be notified prior to deposition at a site, and approval must be acquired. TxDOT is currently looking into the possibility of using dredge material at a beneficial use site, where the dredge material would be used to create or improve coastal habitat. The cost of dredging is high at approximately 5 million per occurrence and possibly higher, depending on the amount of dredge material to be removed and the distance the dredged material must be transported to deposit at a site pre-approved by the USACE.

### 2.8.2 Oil and Fuel Storage and Transfer

Maintenance activities include the storage, transfer, and disposal of oil and fuel required for ferry operations. The Galveston-Bolivar Ferry Maintenance Office (GMFO) receives fuel by common carrier tank truck which is offloaded into underground storage tanks and into one 1,000 gallon, above ground steel tank (diesel). Two 13,000 gallon, above ground, steel tanks are also used to contain oily bilge water. Other smaller tanks above ground are used to contain oil and waste oil. New and used oils are stored in the mechanic's shop in drums that are further staged on spill containment pallets.

Used oil is stored according to federal regulation and the SPCC) plan in a dedicated tank or drum labeled as "used oil". Containers are closed when not being filled, and containers and storage

containers are in good condition with no leaks. The tank system is inspected monthly and during fuel transfers for signs of deterioration and/or discharge, including visual inspection of tank, valves, pipes, supports, and foundations. In addition, there is a secondary containment berm with a drain pipe and lockable valve as required for facilities with a SPCC plan and container capacity of 55 gallons or greater. Onsite maintenance includes the replacement of oil filters, which are drained before storage, and stored in labeled filter storage drums.

Oily-bilge waste water is transferred into an oil water separator system. After separation the water then flows into the city sewer system, and the oil is stored in a used oil container.

Oil is transferred regularly from the storage tanks to the ship tank according to GLO oil transfer procedures. These procedures include having an Officer in Charge of Engineering supervise activities, making sure the proper valves are aligned, determining the quantity of oil needed, monitoring the oil tank level indicator, and signing for the oil. An oil record book is maintained for each ship which details information about the quantity and types of oil, oil residue, and bilge water transferred as well as the date, time, location, and method of disposal.

Port Aransas has two 8,000 gallon diesel tanks and one 4,000 gallon unleaded fuel tank. There is also one underground tank for used oil, but currently it is not in use because Port Aransas does not have an oily-bilge water separator. Instead the bilge is pumped out directly from the ferry vessel and taken offsite by a contractor. Port Aransas ferries have two 1,000 gallon tanks. There are existing coffer dams on the ferries in case of an oil spill, the oil would spill into the engine room not in the water. Port Aransas also has an SPCC plan. On shore facilities at Port Aransas include a hazmat building that holds used filters and no more than five 55 gallon containers. Also, Port Aransas allows passengers to carry less than 12 gallons of unleaded fuel on board.

### 2.8.3 Re-fueling

Re-fueling takes place on an as needed basis following fueling procedures that outline the duties of the captain, chief engineer, oiler/wiper, number one deckhand, and deckhand. The procedures include insuring alignment of valves, proper connection of hoses, monitoring of fuel gauges, and proper communication among crewmembers. Fuels are dispensed via underground and above ground piping, and over water to fuel dispenser manifolds on each boat dock ramp.

### 2.8.4 Other Chemical Storage

Batteries are also stored onsite, on wooden pallets outside (or inside in a large open area). Used batteries are stored in a covered area to minimize the mixing of rainwater and battery acid. Batteries are considered a hazardous waste and are collected by a battery recycler registered with the Texas Commission on Environmental Quality (TCEQ).

## 2.8.5 Grey Water Disposal

**Grey Water:** Grey water includes wastewater from baths, showers, bathroom wash basins, clothes washing machines, sinks and laundry tubs.

Grey water disposal is the transfer of water from the ferry vessel's restrooms and sinks off board. Grey water is transferred and stored onboard in the vessels grey water system. Currently, as per applicable regulations, grey water from restrooms is discharged while vessels are under power and away from landings. This practice is soon to change, and all grey water will soon be stored on board and transferred into the black water system at Galveston landing to be discharged into the City of Galveston wastewater system. Modifications to all the vessels grey water systems are underway to allow for pumping of the grey water tanks at the Galveston landing. Once all necessary modifications have been made to the grey water systems, the new grey water transfer process will be implemented. Port Aransas does not have any restrooms on their ferry vessels and therefore do not have any grey water.

## 2.8.6 Public Area Maintenance

The Galveston Ferry Facility contains a public restroom and parking lot, both of which require regular maintenance such as trash collection, bathroom cleaning, and parking lot sweeping. Trash collection is contracted and trash becomes property of the contractor. Trash collection, parking lot maintenance, and public restrooms maintenance were covered under the Customer Service Maintenance Program Environmental Assessment.

Port Aransas does not have any permanent restroom facilities located at the ferry landing. There are portable restrooms that are maintained by contractors.

## 2.8.7 Deck Sweeping

Deck sweeping is completed on an as-needed basis, and varies due to the amount of vehicle traffic and debris that collects on the ferry decks. A small scale street sweeper is used to collect debris on the ferry decks and is emptied and maintained on shore in the maintenance yard at the Galveston Landing. Trash barrels and anti-litter signage are stationed throughout the public areas of the ferries to contain trash and debris, to prevent debris on deck, and to prevent trash from blowing over board during operation. Also, a deckhand checks for any stray litter that might be blown into water between each trip.

### 2.8.8 Minor Routine Ship Maintenance

As discussed below, most major vessel maintenance is contracted out and performed offsite at a dry-dock facility. Some minor repairs and maintenance such as replacement of filters, valves, hoses, and sensors are done onsite.

### 2.8.9 Maintaining Facility Equipment

In addition to the routine maintenance of the ferries, equipment used to perform these tasks must be maintained. Small vehicles such as deck sweepers and life boats, as well as maintenance tools may have parts that require replacement of filters, valves, oil changes, etc. This maintenance is done onsite in the warehouse and shop building.

### 2.8.10 Contracted Maintenance

Contracted maintenance activities are those activities that require special equipment, special technical experience, or are cost prohibitive to perform on site or with TxDOT labor. These activities can further be categorized into on-site and off-site.

Off-site contracted maintenance activities include any maintenance to a ferry vessel that requires dry-docking service. Such maintenance activities that are done during off-site dry dock include but are not limited to, any work to the hull, such as hull repair, hull scraping and painting, as well as maintenance and repairs to the propulsion or steering system. Each ferry is generally dry-docked every two years. The U.S. Coast Guard inspects the hull and structure of the ferries and recertifies the ferry for two more years. Dry docking at Port Aransas consists of alternating between the six ferries each winter. First three ferries are done one winter and then the other three ferries the next winter.

On-site contracted maintenance activities would include any maintenance to the ferry, ferry landing, or associated structure(s) requiring contracted work. Such maintenance activities would include re-painting and repairs to the landing structures and equipment, such as loading gates and dolphins. Dolphins are a group of piers used as a fender at a dock.

All contractors hired to complete maintenance or repair procedures are required to follow all applicable environmental and safety regulations, which would include proper handling and disposal of fluids, wastes, and hazardous substances, as well as prevention and clean-up of spills of such substances. Although TxDOT contracts maintenance activities out, responsibility is assumed for waste materials associated with ferry vessel and infrastructure maintenance in a “cradle to grave” approach.

## 2.9 Maintenance Enhancement Program

The Maintenance Enhancement Program generally includes maintenance activities geared towards increasing safety, maintaining aesthetic appeal, and providing access to the traveling public. As part of the Maintenance Enhancement Program, TxDOT responsibilities include:

**Enhancement:** To make greater, as in value, beauty, or effectiveness; augment. To provide with improved, advanced, or sophisticated features.

- Adding a shoulder;
- Adding handicap ramps;
- Adding sidewalks after construction;
- Adding turnouts;
- Inspecting driveways;
- Inspecting utilities;
- Maintaining landscapes; and
- Maintaining boat ramps.

TxDOT's Maintenance Enhancement Program provides safety and convenience for the users of TxDOT's facilities. The Maintenance Enhancement Program ensures safe highways by adding safety features such as shoulders, handicap ramps, sidewalks, and turnouts to the existing TxDOT roadway system where they are needed. Activities include repairing pavement drop-offs with material from the shoulder, embankment, or adding asphalt or other material when on-site material is less than adequate; and clearing and paving new handicap ramps, sidewalk areas, and highway turnouts within the ROW.

Under the Maintenance Enhancement Program driveways and utilities are inspected regularly for any violations that may cause a safety issue or are not in compliance with all applicable regulations. Also, TxDOT boat ramps and landscaping in medians and islands are maintained for safety and aesthetics under this program. This includes litter removal and the maintenance of paved and unpaved areas associated with the boat ramps; and planting, maintenance and replacement of plant material, as well as constructing, maintaining, and replacing plant containers such as walls, borders, and watering systems in landscaped areas of medians and islands.

Maintenance Enhancement Program activities help keep TxDOT's roadways safe for the traveling public. TxDOT performs most Enhancement program activities in-house. However, some of the activities are completed via contractors.

Activities conducted under the Maintenance Enhancement Program generally include maintenance activities geared towards safety of the traveling public. The Maintenance Enhancement Program adds safety features such as shoulders, handicap ramps, sidewalks, and turnouts to the existing TxDOT roadway system where they are needed.

Under the Maintenance Enhancement Program driveways and utilities are inspected regularly for any violations that may cause a safety issue. Also, TxDOT boat ramps and landscaping in medians and islands are maintained for safety and aesthetics under this program. The following sections provide

additional details of the specific practices included as part of Maintenance Enhancement Program activities.

### 2.9.1 Adding a Shoulder

Pavement edge drop-offs frequently occur on narrow pavement or pavement without paved shoulders. A drop-off exists when the edge of pavement in the travel lane is higher than the surface of the shoulder. The drop-off condition can create a safety hazard because the wheels of a vehicle can run off the pavement causing the driver to lose control of the vehicle. New overlays can also create a drop-off as additional pavement is added to the travel lane increasing the distance between the travel lane and the surface of the shoulder.

According to the 2009 TxDOT Design Manual, if the drop-off is greater than two inches, it can cause some vehicles to have control issues. For example, where the depth of the drop off is greater than 2 inches, and up to 24 inches, different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control issues when the drop off is greater than 2 inches, and up to 5 inches. Trucks, particularly those with high loads, have more steering control issues when the drop off is greater than 5 inches, and up to 24 inches. As the depth of the drop off zone exceeds 24 inches, the possibility of a rollover is greater for most vehicles. When drop-offs get deep enough to cause potential vehicle control hazards, repairs are made as soon as possible.

Repairs can include the construction of new shoulders up to four feet in width where shoulders did not previously exist. Adding shoulders or making pavement edge repairs are accomplished by one of two accepted methods. One method is to raise the surface of the shoulder or area located adjacent to the edge of the travel lane pavement, by bringing the existing natural material from the shoulder and/or the embankment up to the same level as the travel lane pavement surface. The second method involves placing new asphalt or other material beside the edge of the pavement to remove the drop-off. Work items could include preparation of sub-grade, constructing base courses, and the first course of surfacing.

### 2.9.2 Adding Handicap Ramps

In 1990, the Americans with Disabilities Act (ADA) introduced legal requirements for ADA Ramps for physically handicapped and visually impaired individuals. ADA ramps were designed to ensure easy access on and off sidewalks. ADA code of standards requires communities and public spaces to build safe street access for all members of society, taking into consideration those with

disabilities or impairments. The code outlines the minimum design and construction standards to which TxDOT adheres

Adding handicap ramps involves the new construction of a handicap ramp where none had previously existed or replacing handicap ramps where they do not meet current codes. Work items could include preparation of sub-grade, constructing base courses, and pavement of the new ramp as well as repairing or replacing adjoining sidewalks.

### 2.9.3 Adding and Repairing Sidewalks after Construction

The practice of adding or repairing sidewalks consists of constructing a new sidewalk where none had previously existed, or repair or replacement of existing sidewalks after the roadway has already been constructed. Work items could include preparation of the sub-grade, adding base courses, constructing concrete forms, pouring and finishing concrete, removing forms, and work site clean-up.

### 2.9.4 Adding Turnouts

Highway turnouts provide drivers an opportunity to pull over out of the flow of traffic. Adding a turnout includes all activities associated with the installation of a new roadside turnout where none had previously existed. The work items could include sub-grade and base preparation for new installations. These new turnouts may be paved or unpaved. Work items are typically limited to the area within the actual side road turnout and usually do not extend into the adjoining pavement.

### 2.9.5 Inspecting Driveways

The presence and use of entrances to properties along TxDOT roadways can be physical obstructions and can negatively influence the flow of traffic and compromise safety. TxDOT has established regulations to govern the construction and maintenance of private, public, and commercial driveways to state highways. These regulations are published in the "Regulations for Access Driveways to State Highways" booklet authored by TxDOT.

Inspecting driveways includes all activities associated with the inspection of the installation, removal or repairs to driveways performed by adjacent landowners and their contractors. Inspection activities are normally associated with a new or existing driveway permit.

### 2.9.6 Inspecting Utilities

This practice includes all activities associated with the inspection of the installation, removal, or repairs to utilities performed by utility companies and their contractors. Inspection activities are normally associated with a new or existing utility permit.

As stated in the 2009 Roadside Vegetation Maintenance Manual (TxDOT, 2009d), trees are one of the major causes of power outages in areas served by overhead utility lines due to direct tree contact with lines, or trees or tree limbs falling on the nearby lines. Trees can conduct electricity when they make contact with live wires from overhead utilities. This can cause power outages or create dangerous situations for anyone coming into contact with these trees. It is TxDOT's responsibility to inspect utilities regularly to make sure that utility companies are following the regulations regarding tree trimming, as well as following other guidelines set forth by TxDOT.

### 2.9.7 Maintaining Landscapes

The practice of maintaining landscapes consists of the installation or maintenance of landscape plantings and their facilities including planter walls, borders, sprinkler systems, etc. (excluding picnic and rest areas). This practice includes all activities that establish or maintain plants and their containers. Work items include the planting, maintenance and replacement of plant material, as well as constructing, maintaining, and replacing plant containers such as walls, borders, and watering systems. These activities would normally take place in areas such as landscaped medians and/or islands.

Incorporated municipalities may request a Landscape Agreement to be used in areas within the jurisdiction of cities under a Municipal Maintenance Agreement. The purpose of the Landscape Agreement is to establish the responsibility for maintenance of various landscape features within the ROW, including median or island plantings and any cost sharing or beautification plantings. The Landscape Maintenance Agreement is a separate agreement with a city that is added by resolution to become a supplement to the Municipal Maintenance Agreement. Historic landscapes can occur within the ROW and caution should be exercised during all work performed at such a site. All landscaping performed within the ROW is done in compliance with the Presidential Executive Memorandum on Beneficial Landscaping and Presidential Executive Order 13112 on Invasive Species.

### 2.9.8 Maintaining Boat Ramps

Maintaining boat ramps includes mowing and removing litter; removing existing ramp planks; replacing damaged precast concrete launch ramp planks; adding required footing ballast to ensure proper base and slope; applying crushed rock, ballast, and/or riprap to ensure proper protection from erosion; removing silt and river gravels from a ramp and in the vicinity of the ramp (dredging) (except in TPWD operated facilities); using cabled together precast concrete blocks for erosion protection where riprap or ballast rock are not effective; repairing cracks/ crack sealing; resealing/seal coating; and maintaining boat ramp signage outside TPWD parks.

Work activities for TPWD operated boat ramp facilities within TxDOT ROW could include providing vegetation management, mowing, and trimming; providing litter pick-up and disposal; providing appropriate directional and regulatory signs; maintaining paved surfaces; maintaining unpaved surfaces by blading as necessary; performing periodic inspections of facilities; and submitting to TPWD an annual report of the list of ramps that require major rehabilitation. These practices are only done when requested by TPWD.

## 2.10 Pavement Maintenance Program

**Pavement:** A hard smooth surface, especially of a public area or thoroughfare that will bear travel; the material with which such a surface is made or the surface of a road.

The Pavement Maintenance Program maintains TxDOT highways to provide a safe roadway surface and to maintain a riding quality satisfactory to the traveling public. Maintenance of roadway pavement includes the restoration and repair of both surface and underlying layers. Maintenance of the shoulder and approaches can also effect the pavement. As part of the Pavement Maintenance Program, TxDOT:

- Maintains base and sub-grade of travel lanes and shoulders;
- Maintains flexible (asphaltic) surfaces of travel lanes and shoulders;
- Maintains rigid (concrete) pavement of travel lanes and shoulders;
- Stores pavement materials; and
- Cleans up work site and maintenance equipment.

TxDOT's Pavement Maintenance Program maintains the state's pavement system in order to ensure uninterrupted, safe traffic flow and to prolong the useful life of TxDOT's investment in roadway infrastructure. The Pavement Maintenance Program ensures safe highways through a fully functioning pavement system.

The Pavement Management Information System or PMIS is an automated system that TxDOT uses for storing, retrieving, analyzing, and reporting pavement condition information. This program can be used to retrieve and analyze pavement information to compare maintenance and rehabilitation treatment alternatives, monitor current pavement conditions, and estimate total pavement needs. A detailed description and explanation of the PMIS is located in TxDOT's Pavement Management Information System User's Manual. Surveying the condition of the pavement helps predict the occurrence of distress, select appropriate maintenance, and schedule maintenance activities before further deterioration occurs. The PMIS helps TxDOT prioritize improvements and document the cost-effectiveness of preventative maintenance. The PMIS provides a systematic, objective evaluation of pavement condition for identification of maintenance and rehabilitation needs and projects, and then prioritization of those projects. The tool can help TxDOT track progress toward reducing total pavement needs to specified target levels as well as in improving pavement conditions overall.

Pavement Maintenance Program activities keep TxDOT's roadways free from hazards, such as potholes or uneven travel lanes, and other dangers that could pose a threat to the safety of the traveling public. Activities conducted under the Pavement Maintenance Program are associated with preventively maintaining the roadway system, which includes the base, sub-grade, and roadway surface along the 80,000 centerline miles of TxDOT roadways. As stated by AASHTO, "preventive maintenance is a program strategy intended to arrest light deterioration, retard progressive failures, and reduce the need for corrective maintenance and service activities... [Preventative maintenance] treatments reduce the amount of water that may infiltrate the pavement, slow the rate of deterioration, or correct surface roughness. Timely application of maintenance treatments can maintain or extend a pavements service life five to ten years or longer before significant maintenance effort is required." In urban areas, pavement maintenance activities are often contracted out and the contractor is responsible for environmentally appropriate storage, transport, use, and clean-up of asphalt and related materials, while in more rural areas the majority of the pavement repair is done by the District. The following sections provide additional details of the specific practices included as part of Pavement Maintenance Program activities.

### 2.10.1 Maintain Base and Sub-grade of Travel Lanes and Shoulders

Maintaining base and sub-grade of the roadway consists of removal and replacement; in place repair; installation or maintenance of underdrains; and unpaved road maintenance.

**Removal and replacement** is the removal of base and/or sub-grade materials from distressed or failed areas and replacing it with suitable materials. This activity includes using a backhoe or gradall to remove the existing surfacing, base and sub-base material; using lime, concrete, or fly ash to stabilize base and sub-base material; using a loader, motor grader or other equipment to place new material in excavated area; watering, compacting, and the application of the surface course.

**Base:** The sub-layer material of a roadway and is placed directly on top of the soil so as to provide a foundation to support the top layer(s) of the pavement. Generally consisting of a specific type of construction aggregate, providing the stable foundation needed to support either additional layers of aggregates or the placement of asphalt concrete.

**Sub-grade:** The level layer of rock or earth upon which the foundation of a road is laid. The soil prepared and compacted to support a structure or a pavement system; the base portion of any surfaced area.

**In place repair** is the repair of base and/or sub-grade material, including resurfacing, and may or may not include additional stabilizing materials. This activity is associated with the repair of pavement failures when existing materials are reused rather than discarded. For example, a reclaimer machine would pulverize the existing surface and the material would be placed back on the road bed. This can also include the addition of materials such as lime, cement, asphalt or fly ash as a stabilizer. Work items could include using a reclaimer, roto-tiller, scarifiers or other equipment to recycle existing pavement, base and sub-base material; using a loader, motor grader or other equipment to place recycled material, water, shape and compact the base courses, and apply the surface.

Recyclers cut into existing bituminous surface to a 12-in. depth, pulverizing it with the sub-grade, mixing cement into the soil, and providing a homogeneous material. Recyclers are often used to correct base failures.

**Installing and/or maintaining underdrains** consists of the installation, repair, and maintenance of underdrains. Underdrains can be anything that allows water to pass through and drain to a predetermined area. This could include trenching, the placement of pipe and filter material, and backfilling the excavation.

**Unpaved road maintenance** is the repair of gravel or dirt roads, including blading, addition of base, etc. This includes only repair of gravel or dirt roadways within State Parks that are being maintained by TxDOT. TxDOT does not have unpaved roadways on the state system.

## 2.10.2 Maintain Flexible (Asphaltic) Surfaces of Travel Lanes and Shoulders

**Asphaltic:** A brownish-black solid or semisolid mixture of bitumen obtained from native deposits or as a petroleum byproduct, used in paving; mixed asphalt and crushed stone, gravel, or sand, used for paving.

The 1993 AASHTO Guide for the Design of Pavement Structures describes the factors that are taken into consideration when selecting a pavement type. Some factors taken into consideration include traffic, soils characteristics, weather, construction considerations, recycling, and cost comparison. Other factors include performance of similar pavements in the area, adjacent existing pavements, conservation of materials and energy, and availability of local materials, among other issues.

The type of asphalt depends on the process used to bind the aggregate (crushed stone, gravel, sand, etc.) with the asphalt. Hot mix asphalt (HMA) is produced at 160$^{o}$ C. This high temperature decreases viscosity and moisture during the manufacturing process, which results in a very durable material and is most commonly used for high-traffic areas.

Warm mix asphalt (WMA) adds asphalt emulsions, waxes, or zeolites to the mix, thereby decreasing the temperature required to produce this type of asphalt. This results in less fossil fuel consumption and reduced emission of fumes which benefits both the environment and the workers.

Cold mix asphalt eliminates the need for high temperatures because the asphalt is emulsified in soapy water before mixing it with the aggregate. However, the asphalt produced is not as durable as HMA or WMA, and therefore cold mix asphalt is typically used for low traffic areas or to patch damaged HMA.

Cutback asphalt is produced by blending petroleum solvents with asphalt. Cutback asphalt may be used as prime coats to prepare surfaces for construction or to provide tack between the old pavement and the new pavement being laid down, to prevent slippage of the layers. In addition, cutback asphalt serves as a moisture barrier. TxDOT uses very little cutback asphalt. Prime coats of flexible base are the most common place for TxDOT to use cutback asphalt Medium Curing 30 (MC-30) asphalt. .TCEQ regulations limit the amount of cutback asphalt that can be used statewide (7%) and in non-attainment areas (6%). There are exemptions for the use of MC-30 to prime base material and other cutbacks to manufacture stockpile patching materials. Cutback asphalts, other than MC-30 and in commercially made patching mixes, are not used in significant quantities. Statewide use is approximately less than 2% and in non-attainment areas it is approximately 0.2%.

Maintaining flexible surfaces of the roadway consists of leveling or overlaying with a laydown machine, maintainer, dragbox, or by hand; sealing cracks; applying a seal coat; strip or spot seal coat; fog seal; microsurfacing; repairing potholes; milling or planing; spot milling; and treat bleeding pavement. The need for these types of repairs is determined based on the condition of the roadway and monies available to address the issue.

**Leveling or overlaying** is the application of asphaltic tack coat and placing of asphaltic concrete materials to improve the ride qualities or level up low spots of the roadway. Work items associated with leveling or overlaying of pavement could include the application of a tack coat; adding hot mix; hot mix cold laid to the repair area; placement and leveling with a laydown machine, maintainer, dragbox, or by hand; and rolling the repaired area. Leveling by hand only is done on project that is less than 500 square yards and is used as a bridge from pothole repair to overlay.

**Sealing cracks** consists of cleaning, filling, and sealing cracks in the pavement using asphaltic rubber or other sealants. This includes all types of cracks. Work items include routing cracks; using compressed air to remove debris from cracks to be sealed; sandblasting cracks; applying sealant material; and squeegee the repaired crack to smooth out excess sealant. The material used to seal the cracks could include crumb rubber sealant, cold pour, emulsions modified with latex rubber additive, and various commercially prepared crack and joint sealing materials.

**Applying a seal coat** is the application of a single layer of asphaltic material followed by the application of a single layer of aggregate over the full width of the lane or a shoulder (greater than 6 ft in width) for a minimum of 1,000 continuous feet. TxDOT's goal is to apply seal coats every seven years. This activity consists of a full width seal coat and work items include sweeping immediately prior to application of asphalt or emulsion; application of asphalt or emulsion using an asphalt distributor (truck or trailer mounted); application of aggregate using a chip spreader (tail gate or self propelled); laying paper for joints; rolling the finished mat; and first sweeping of excess aggregate from the new surface.

**Strip or spot seal coat** is the application of a single layer of asphaltic material followed by the application of a single layer of aggregate over areas less than the full width of the lane or shoulder (6 ft or less in width), or the full width of the lane or shoulder but less than 1,000 feet in length. Work items include the same as when applying a seal coat to the full width of the lane or shoulder as described in the previous paragraph. When applying a strip or spot seal coat there is no limit on the length as long as the area sealed is less than the full width of the lane or shoulder.

**Fog seal** consists of retaining aggregate; enlivening surface and/or sealing hairline cracks by the application of a thin layer of asphaltic material. Actions under this activity are for full width or spot fog sealing. Fog seal is typically used to retain aggregate on seal coat projects that continue to lose surface aggregate; to temporarily seal hairline cracks until a more permanent solution can be made; and to rejuvenate dry, oxidized hot mix pavements. This activity could also include applying a narrow strip or ribbon of raw emulsion to pavement edges.

**Microsurfacing** is the application of a polymer modified high performance emulsion coupled with fine graded aggregate, mineral fillers and special additives in a slurry, to fill ruts or to provide a new wearing surface. This is not used to seal cracked pavements.

**Potholes** can be repaired using a semi-permanent repair or a square cut permanent repair. A square cut permanent repair of a pothole consists of permanently repairing a hole with an area of less than or equal to one square yard and squaring the sides. Work items could include using an axe or pavement saw to square cut the hole; using hand tools to remove loose pavement; sweeping debris from the hole; applying a tack coat; backfilling the hole with patching material, using hand tools to level the patch; and using hand tools or power equipment to compact the patch.

A semi-permanent repair is a temporary corrective measure and consists of repairing a hole with an area less than or equal to one square yard. Work items associated with this activity include using hand tools to remove loose pavement from the hole; sweeping debris from the hole; applying a tack coat; backfilling the hole with patching material; using hand tools to level the patch and using hand tools or power equipment to compact the patch.

**Milling or planing** is the removal of pavement surface by milling or planing. Milling is the process where the old existing road surface is removed by machine to expose the road base. The old material is ground into small chunks by the machine and stockpiled to be used later at various locations. This material is used when needed as road base material. This activity also includes using special cutting edges to add texture to the pavement surface to restore skid resistance on flushed pavement. Work items include the operation of the milling or texturing equipment; trucks hauling reclaimed asphalt pavement; sweeping; and other support items directly related to the milling operation.

**Spot milling** is the removal of the pavement surface by milling using a small milling machine (4 ft or less drum width), such as a bobcat. Work items for this activity are the same as the activities described under the milling and planing in the previous paragraph, but with a small milling machine.

**Treat bleeding pavement** involves removing excess asphalt on the pavement surface. This could include spreading aggregate or aggregate screenings; rolling aggregate into affected area; or applying lime slurry to the affected area.

## 2.10.3 Maintain Rigid (Concrete) Pavement of Travel Lanes and Shoulders

**Concrete:** A hard, strong construction material consisting of sand, conglomerate gravel, pebbles, broken stone, or slag in a mortar or cement matrix.

Maintaining rigid surfaces of the roadway consists of slab stabilization/jacking; cleaning and sealing joints and cracks; blowouts and stress relief; repair spalling; and full depth removal and replacement.

**Slab stabilization / jacking** consists of leveling concrete pavement through the use of hydraulically placed material. This includes repairing concrete slabs by pumping material (usually flowable concrete backfill material) under settled areas to raise the slab back to its original elevation by drilling or jack hammering an opening in the slab and pressure injection of backfill material.

**Cleaning and sealing joints and cracks** is the cleaning, filling, and sealing of joints and cracks in concrete pavement. This is accomplished by using compressed air to blow loose dirt and debris from joints; routing or sandblasting joints; installing backer rod; filling joints with sealant; and then removing excess sealant.

**Blowouts and stress relief** consist of repairing blowouts and cutting pavement to relieve stress and reduce further pavement damage from additional blowouts.

**Repair spalling** consists of cleaning and repairing spalled areas of concrete pavement (not to the full depth of the concrete slab). Work items could include removal of loose material and cleaning and patching the defect using materials designed for shallow repairs on concrete. This could also include activities to expose the top reinforcing bar to ensure adequate bonding.

**Full depth removal and replacement** is the removal and replacement of failed areas for the full depth of the concrete slab. This could include saw cutting the full depth of the concrete slab to remove the failed area; removal and replacement of reinforcing bar; pouring concrete into repair area; and finishing the new concrete and applying curing compound. This also includes the removal and replacement of base, sub-grade, or other foundation materials under the concrete pavement.

## 2.10.4 Storage of Pavement Materials

There are several types of materials that are stored for the Pavement Maintenance Program, which includes recyclable materials. Stored materials include fuel; aggregate such as crushed stone, gravel, or sand; base material that consists of a mixture of crushed stone, gravel, sand, soil, and/or other approved similar material; Recycled Asphalt Pavement (RAP); Portland cement; lime; and fly ash. Materials such as RAP, base materials, and aggregates are stockpiled within the ROW or at maintenance yards throughout the state and asphalt is typically kept in above ground storage tanks or silos. Materials such as lime, fuel, and Portland cement are stored in a covered facility, such as a warehouse.

TxDOT has eliminated unnecessary requirements for virgin materials in its construction and maintenance specifications. Additionally, TxDOT has approved specifications that specifically call for or allow for the use of recycled materials, such as RAP, fly ash, and crushed concrete. Some specifications require their use, while others allow their use if noted in the plans. **Table 2-4** shows what the recycled materials can be used for in sub-base and base specifications and **Table 2-5** shows their use for surface courses or pavement specifications.

**TABLE 2-4**
**SUB-BASE AND BASE COURSES**

| Specification | Recycled Materials | Applications |
|---|---|---|
| Flexible Base | Crushed concrete, Recycled Asphalt Pavement (RAP), or other (such as glass cullet) | Coarse aggregate |
| Lime Treatment (Road-Mixed) | | |
| Lime Treatment (Plant-Mixed) | | |
| Fly Ash or Lime-Fly Ash Treatment (Road-Mixed) | Fly ash | Sub-grade or base stabilizer |
| Cement Treatment (Road-Mixed) | Crushed concrete, RAP, or other (such as glass cullet | Coarse aggregate |
| Cement Treatment (Road-Mixed) | | |
| Asphalt Treatment (Plant-Mixed) | | |

*Source: TxDOT, 2009e*

**TABLE 2-5**
**SURFACE COURSES OR PAVEMENT**

| Specification | Recycled Materials | Applications |
|---|---|---|
| Asphalts, Oils, and Emulsions | Tire rubber | Asphalt modifier for pavements |
| | | Asphalt modifier for crack sealer |
| Aggregates for Surface Treatments | Crushed slag, glass cullet | Coarse aggregate |
| Surface Treatments | Tire rubber | Asphalt modifier |
| Hot Asphalt-Rubber Surface Treatments | Tire rubber | Asphalt modifier |
| Hot-Mix Cold-Laid Asphalt | Fly ash | Mineral filler |
| Dense-Graded Hot-Mix Asphalt (Method) | Fly ash | Mineral filler |
| | RAP | Coarse aggregate |
| Dense-Graded Hot-Mix Asphalt (QC/QA) | Fly ash | Mineral filler |
| | RAP | Coarse aggregate |
| Permeable Friction Course (PFC) | Cellulose or mineral fiber | Fiber additive |
| | Tire rubber | Asphalt modifier |
| Performance-Designed Mixtures | Fly ash | Mineral filler |
| RAP | Coarse aggregate | Coarse aggregate |
| Stone-Matrix Asphalt | Cellulose or mineral fiber | Fiber additive |

| Specification | Recycled Materials | Applications |
|---|---|---|
| | Fly ash | Mineral filler |
| | Manufactured sand | Fine aggregate |
| | RAP | Coarse aggregate |
| | Tire rubber | Asphalt modifier |
| Asphalt Concrete Surface Rehabilitation | Asphalt pavement, in place | Pavement |
| Concrete Pavement | Crushed blast furnace slag, crushed concrete | Coarse aggregate |
| | Fly ash, ground granulated blast-furnace slag, silica fume | Supplementary Cementing Material (SCM) |
| | Manufactured sands | Fine aggregate |
| Full-Depth Repair of Concrete Pavement | Crushed blast furnace slag, crushed concrete | Coarse aggregate |
| | Fly ash, ground granulated blast-furnace slag, silica fume | SCM |
| | Manufactured sands | Fine aggregate |
| Concrete Pavement Terminals | Crushed blast furnace slag, crushed concrete | Coarse aggregate |
| | Fly ash, ground granulated blast-furnace slag, silica fume | SCM |
| | Manufactured sands | Fine aggregate |

*Source: TxDOT, 2009e*

### 2.10.5 Clean-up of Work Site and Maintenance Equipment

Surplus liquid asphalts not utilized by TxDOT maintenance are returned to the maintenance yard and mixed with base material to be utilized in future projects. Surplus mixed asphaltic pavement material is returned to the maintenance yard and stockpiled. Damaged asphalt that has been removed from roadways during maintenance activities is also reclaimed and returned to the maintenance yard for stockpiling.

Most hot mix asphalt (HMA) haul truck beds are sprayed with an asphalt release agent to prevent the HMA from sticking. TxDOT asphalt trucks are cleaned at the maintenance yards. Waste products from cleaning of trucks is mixed with base material and utilized in maintenance procedures.

## 2.11 Roadside Appurtenance Maintenance Program

**Roadside Appurtenance:** An accessory or adjunct that is attached and incidental to a roadway. This includes, but is not limited to guardrails, signs, delineators, and fences.

The Roadside Appurtenance Maintenance Program maintains TxDOT highways to provide a safe roadway system. This program includes the maintenance and installation of various roadside appurtenances. As part of the Roadside Appurtenance Maintenance Program, TxDOT maintains and installs the following:

- Concrete appurtenances;
- Barriers;
- Guardrails and guardrail end treatment systems;
- Mailboxes;
- Cattle guards;
- Bridge rails;
- Roadway access controls;
- Delineators;
- Vehicle attenuators;
- Small and large signs;
- Flashing beacons;
- Illumination systems;
- Coordinated and isolated traffic signals;
- Traffic management systems; and
- Traffic control plans.

TxDOT's Roadside Appurtenance Maintenance Program maintains the state's roadside appurtenance system in order to ensure a safe environment, facilitate traffic flow, and to maintain mitigation for visual and noise impacts. The Roadside Appurtenance Maintenance Program ensures safe highways through a fully functioning roadside appurtenance system. Roadside Appurtenance Maintenance Program activities keep TxDOT's roadside appurtenances, including fences, noise attenuators, and barriers in functioning order as necessary to promote safety and to mitigate visual and noise impacts on neighboring properties.

Activities conducted under the Roadside Appurtenance Maintenance Program are associated with maintaining roadside appurtenances, which includes guardrails, barriers, fences, signs, and signals along the 80,000 centerline miles of TxDOT roadways. Roadside appurtenances are designed and placed in accordance with the current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. Traffic, vandalism, animals, and atmospheric conditions cause most of the damage to these elements. The following sections provide additional details of the specific practices included as part of Roadside Appurtenance Maintenance Program activities.

### 2.11.1 Install and Maintain Concrete Appurtenances

Maintaining concrete appurtenances includes maintaining, installing, repairing, or removing curbs and/or gutters, raised medians, sidewalks, and sound barriers. Work items could include sawing and removing sections of curb and gutter, replacing damaged sidewalks, or installing new raised medians. This also includes the base and sub-grade preparation for the installation of the new appurtenances.

In response to the demand of the public living adjacent to highways, the use of sound walls has increased significantly in recent years. The maintenance requirements include repairs and replacement due to damage by vehicles, atmospheric action, and vandalism. Sometimes a

separate concrete barrier is placed in front of the sound wall to protect motorists and to improve maintainability.

### 2.11.2 Install and Maintain Barriers

There are two main types of barriers, cable median barriers and concrete barriers. Barriers are provided for the purpose of protecting vehicles from crashing into the opposing traffic and other hazardous objects such as piers, abutments, signs, light poles, and falling rocks. They also protect vehicles from entering areas with steep slopes and other hazardous conditions. Barriers are designed to reduce the severity of accidents.

Maintaining cable median barriers includes the installation and maintenance of high tension cable median barrier systems, including the cable, posts, and end treatments. Work items could include the installation of posts, cable, or end treatments, and any repair or maintenance item on the wire rope barrier system such as the removal and replacement of damaged posts.

Concrete median barriers are often used in narrow medians. The curved face of the barrier is designed such that vehicles hitting it at a narrow angle are redirected parallel to the roadway. Barriers cause less damage to these vehicles and, in turn, require minimum maintenance. Maintaining concrete barriers consist of the installation, removal, and maintenance of permanent concrete barrier, including attached headlight barrier fence. Work items could include the forming and pouring of concrete barrier in-place, installing pre-cast concrete barrier, installing headlight barrier fence, and any repair or maintenance item on the concrete barrier or headlight fence.

### 2.11.3 Install and Maintain Guardrails and End Treatment Systems

Guardrails are also designed to reduce the severity of accidents and are provided for the purpose of protecting vehicles from crashing into the opposing traffic and other hazardous objects or entering areas with steep slopes and other hazardous conditions. Guardrails are often used in areas that are subject to snow or sand accumulation rather than using concrete or cable median barriers.

Maintaining guardrails and guardrail end treatment systems include the installation, removal, and maintenance of metal beam guard fence (MBGF), including attached headlight barrier, and guardrail end treatment systems (GETS). Work items could include the installation of posts, MBGF, terminal anchors, headlight barrier fence, and any repair

or maintenance item on the guard fence or headlight barrier fence such as the removal and replacement of damaged sections. Work items also include installation, removal, or any repair on the GETS.

### 2.11.4 Install and Maintain Mailboxes

This activity consists of the installation and maintenance of USPS approved mailboxes (provided by the postal patron) placed on single or multiple supports provided by TxDOT, or the removal of non-approved supports placed illegally on the ROW. Work items could include setting the post or support including the object marker or reflective tape and installing all necessary hardware to attach the mailbox.

### 2.11.5 Repair, Replace, and Remove Cattle Guards

This activity consists of the repair, installation, and removal of cattle guards within TxDOT ROW. Cattle guard maintenance occurs when a problem is identified through routine inspection by TxDOT or when reported by a landowner. If the cattle guard is still needed, TxDOT will either repair or replace it. If the cattle guard is on property no longer being used for ranching, the cattle guard will be removed and the space filled in with concrete.

### 2.11.6 Install and Maintain Bridge Rails

Maintaining bridge rails consists of the maintenance of bridge rail, posts, and post connections to the deck of the bridge. Work is limited to the metal beam or concrete bridge rail that is directly over the bridge deck. Work items could include removing and replacing damaged sections of metal beam bridge rail and damaged bridge rail posts; repairing post support hardware such as base plates; repairing or replacing anchor points for posts, removing damaged sections of concrete bridge rail; setting concrete bridge rail forms; replacing corroded reinforcing steel; and pouring/finishing concrete bridge rail. Bridge maintenance was covered under the *Bridge Program Draft Environmental Assessment* and will not be directly addressed in the environmental impacts section of this document.

### 2.11.7 Install and Maintain Roadway Access Controls

Installation and maintenance of barriers designed to control access on highways, including post and cable fences, and ROW fences. These types of barriers are provided to keep people and animals out of the highway ROW. Maintenance includes repairs or replacement because of damage by vehicular accidents, deterioration, vandalism, livestock, erosion, rockslides, and heavy snow loads.

## 2.11.8 Install and Maintain Vehicle Attenuators and Crash Cushions

Vehicle attenuators and crash cushions are used in places where hazardous fixed objects such as bridge abutments or piers, bridge rails, sign posts, and bridge ramp gore areas cannot be avoided. This does not include the end treatment devices on guardrails.

TxDOT has developed a low-maintenance attenuator. It is durable and can be easily and quickly brought back to its original condition and position with inexpensive and available replacement parts. It is mainly made of rubber and, following a collision, can be pulled back out and re-anchored to its original position.

The major maintenance requirement is quick repair or replacement after a collision. Work items could include pouring concrete slabs and footings, installing attenuators, installing crash cushions, and replacing broken, missing, or damaged components. In addition, attenuators must be cleaned of debris regularly in order to ensure that they will function properly in the event of a crash.

## 2.11.9 Install and Maintain Delineators

**Delineator:** A reflecting device that has reflective markers mounted on posts and located at the outside edges of shoulders, in series, to indicate the alignment of the roadway.

Maintenance requirements include cleaning, repair, and replacement due to damage by vehicles, snowplows, vandalism, and atmospheric conditions. Work items could include removing damaged posts and bases, straightening bent or leaning posts, installing new bases, installing new posts, installing or reinstalling reflectors, installing object markers, cleaning reflectors, and installing reflective tape on posts.

Flexible delineator posts cause little or no damage to a vehicle striking the post. Delineators are used to enhance visibility of a feature of the highway system. They are installed in accordance with standards maintained by the Traffic Operations Division. **Table 2-1** lists the minimum standards that should be used for installation and maintenance of delineators.

**TABLE 2-6**
**MINIMUM STANDARDS FOR DELINEATORS**

| Delineators | Location |
|---|---|
| Single | Curves on freeways |
| | Outside curves of interchange ramps |
| | Guardrail, bridge rail, barriers |
| | Narrow bridge approaches |
| Double | Acceleration and deceleration lanes |
| | Crossover for official or emergency use |

*Source: TxDOT, 2010*

## 2.11.10 Install and Maintain Small and Large Signs

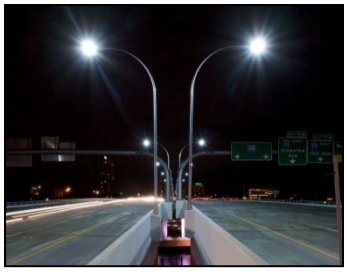
Signs are generally mounted on single or double posts or on large overhead structures. Sign maintenance includes maintaining breakaway features of sign supports to ensure they function as designed (no silt or debris at the slip base, no signs attached below hinge points); assuring that the sign message is clearly visible at all times (clear of vegetation or other obstructions); reporting damaged signs; replacing signs and posts as needed; straightening posts and sign assemblies; completing records of all sign installations (stop signs and regulation); cleaning as necessary; tightening sign fasteners; proper torquing of slip base plate and fuse plate connecting bolts or breakaway sign posts; tightening anchor bolt nuts on overhead sign supports; and performance of scheduled inspections by trained personnel in accordance with the Traffic Operations Manual. Vandalism, especially graffiti in urban areas and bullet holes in rural areas, is a serious problem and demands a significant maintenance effort. Routine sign maintenance includes graffiti removal, power washing, bleaching, and scrubbing.

Signs are designed to yield on impact, thereby preventing sudden vehicle decelerations and occupant injuries. Small signs typically yield by bending or fracturing, while larger ones give way through a slip-base and hinge combination. Cantilevered and overhead signs, which cannot be redesigned to enhance safety, are usually shielded. Breakaway posts can be easily repaired or replaced and causes less damage to vehicles.

## 2.11.11 Install and Maintain Flashing Beacons


Maintaining flashing beacons consists of the installation and maintenance of overhead flashing beacons, pedestal or sign mounted flashing beacons, etc. Work items could include trenching, placing electrical conduit, pulling wire, terminating electrical connections, pouring concrete base, setting signal pole and mast arm, installing signal head, installing and programming signal controllers and monitors, trouble shooting signal malfunctions, replacing controller components, replacing bulbs, installing guy wires, and site restoration and cleanup.

## 2.11.12 Install and Maintain Illumination Systems



Each district has a plan to inspect, report and maintain illumination features to ensure they function as designed. Illumination features are maintained so that all illumination is clearly visible at all times; routine illumination repair or maintenance is performed as soon as practical; and all damage that poses a safety hazard is repaired as soon as possible. Maintaining illumination systems, including continuous

lighting, safety lighting, and sign illumination, consists of trenching, placing electrical conduit, pulling electric wire, terminating electrical connections, pouring concrete base, setting pole and mast arm, installing lighting head, installing controller, replacing bulbs, trouble shooting illumination system malfunctions, and site restoration and cleanup.

### 2.11.13 Install and Maintain Coordinated and Isolated Traffic Signals

Traffic signals are maintained in their originally built condition. Traffic signal malfunctions are repaired as soon as possible and only trained maintenance personnel perform traffic signal maintenance. However, all department personnel immediately report any malfunctioning traffic signal and notify law enforcement if traffic control is needed until the signal is repaired.

All maintenance work performed at signal locations complies with the requirements of the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and the Traffic Engineering Standard Sheets. Records are kept on all traffic signal maintenance or repair and include the time and date of the maintenance at each traffic signal location.

This activity involves the installation, maintenance, and operation of all isolated or coordinated traffic signals. This includes diamond interchange signals, closed loop type systems, centrally controlled, hardwired interconnect, and time based coordinated systems and all associated equipment. Work items could include trenching, placing electrical conduit, pulling electric wire, terminating electrical connections, sawing pavement to install vehicle detection loops, pouring concrete base, setting signal pole and mast arm, installing signal head, installing and programming signal controllers and monitors, trouble shooting signal malfunctions, replacing controller components, replacing bulbs, installing guy wires, and site restoration and cleanup.

### 2.11.14 Install and Maintain Traffic Management Systems


Maintenance of traffic management systems include the maintenance and operation of systems on freeways or non-freeways, entrance/exit ramps, motorist information (e.g. changeable message signs, highway advisory radio, etc.), bridge warning systems, and surveillance and related communications equipment.

### 2.11.15 Install and Maintain Traffic Control Plans


This activity includes the placement, maintenance, and removal of barricades, signs, cones, lights, and other such devices used to handle traffic maintenance operations. This also includes flaggers. Work items may include placing or removing barricades, signs, traffic

control devices, flagging, and shadow vehicles (truck mounted attenuators and arrow boards, pilot car operations, detour set-up).

## 2.12 Traffic Pavement Markings Maintenance Program

**Traffic Pavement Markings:** Communicates a message to drivers through a uniform system of colors, patterns, widths, symbols, and words that are on the pavement. Pavement markings supplement and enhance the messages of other traffic control devices.

The Traffic Pavement Markings Maintenance Program maintains TxDOT highways to provide a safe roadway system. This program includes the maintenance and installation of various traffic pavement markings. As part of the Traffic Pavement Markings Maintenance Program, TxDOT maintains:

- Paint and Bead Striping;
- High Performance Striping;
- Specialty Markings;
- Raised and Reflective Pavement Markers; and
- Removal of Pavement Markers.

TxDOT's Traffic Pavement Markings Maintenance Program maintains the state's traffic pavement markings system in order to ensure a safe environment and facilitate traffic flow. The Traffic Pavement Markings Maintenance Program ensures safe highways through a fully functioning traffic pavement markings system. These maintenance activities keep TxDOT's traffic pavement markings, including striping, specialty markings, and raised pavement markers in functioning order as necessary to promote safety and traffic flow.

According to the FHWA and the Manual on Uniform Traffic Control Devices (MUTCD) there are four basic types of pavement markings.

- Longitudinal lines;
- Transverse lines;
- Arrows, words, and symbol markings; and
- Special markings.

Longitudinal lines delineate vehicular paths of travel along the roadway by marking the center of the road, lanes of travel, edges of pavement, etc. The color of a longitudinal line tells drivers whether they are on a one-way road or whether there may be opposing traffic to the left of the line. The pattern and/or width of a longitudinal line indicate whether it is permissible, discouraged, or prohibited to cross the line. The three main types of longitudinal lines are centerlines, edgelines, and lane lines.

- Centerlines delineate the center of an undivided roadway and separates traffic flowing in opposite directions. These lines are always yellow and they regulate whether passing and overtaking is allowed or prohibited depending on their pattern.
- Edgelines are solid lines that delineate the edge of the pavement or separate a travel lane from an adjacent shoulder. Edgelines on the outer edge or right side of a travel lane are always white. Edgelines on the left side of a travel lane indicate whether the roadway is one-way or two-way depending on the color. The width of an edgeline indicates special emphasis in discouraging crossing the line.
- Lane lines are white lines that separate lanes going in the same direction, such as on a highway with two or more lanes in each direction. Lane lines indicate whether crossing the line is permitted, discouraged, or prohibited depending on the pattern of the line. The pattern of the lane line may also indicate special messages regarding travel in a lane, such as when a travel lane is changing to an "Exit Only" lane.

Transverse lines go across one or more lanes or across the whole roadway and inform drivers where to stop or yield and show pedestrians where to cross the road. A stop line is a wide solid white line across a lane or lanes that indicates where to stop your vehicle in compliance with a stop sign, a traffic signal, or a railroad grade crossing. A yield line is a series of solid white isosceles triangles, pointing toward approaching vehicles, and extending across a lane or lanes that indicates where to yield to other vehicles or to pedestrians. Crosswalk markings show pedestrians where to safely cross the road and also supplement signs to warn drivers of the possibility that pedestrians may be crossing.

Arrows on the pavement convey directional or lane usage requirements. Arrows are used to warn drivers that a lane is ending ahead and traffic should move out of the lane into an adjacent lane that continues, as well as to show the direction of traffic flow on a one-way roadway or ramp. Arrow markings on the pavement also inform drivers what movements (straight, left, right) are allowed from a specific lane.

Words and symbols marked on the pavement supplement signs in conveying important regulatory, warning, or guidance information, such as regulations pertaining to a lane or an approach to an intersection, messages warning of conditions to watch out for ahead, or guidance on what lane to use to reach certain destinations, routes, or directions.

Special markings are used for special conditions or to communicate special messages that can't be communicated by other types of markings. Special markings consists of cross hatching, dotted lines, reversible lane markings, two-way left turn lane markings, speed hump markings, and parking space markings. TxDOT may also stripe in city or county-owned general aviation airports.

Raised pavement markers (reflectors mounted on or in the pavement) are usually either white (supplement white lines) or yellow (supplement yellow lines). Special color raised reflectors are used to communicate special messages. Red raised reflectors inform drivers not to enter a one-way roadway or ramp and blue raised reflectors mark locations of fire hydrants adjacent to the road, for quicker recognition by emergency service providers.

As previously discussed, activities conducted under the Traffic Pavement Markings Maintenance Program are associated with maintaining traffic pavement markings, which includes paint and bead striping, high performance striping, specialty markings, and raised and reflective pavement markers along the 80,000 centerline miles of TxDOT roadways. In August of 2004, TxDOT created a Pavement Markings Handbook for engineering and field personnel. This handbook provides information on material selection, installation, and inspection guidelines for pavement markings. The following sections provide additional details of the specific practices included as part of Traffic Pavement Markings Maintenance Program activities.

### 2.12.1 Paint and Bead Striping


Maintenance of paint and bead striping consists of striping or re-striping lane lines, centerlines and edge lines using paint and beads. Work items could include removal of old stripe, preparing and operating striping equipment and support vehicles such as the supply truck and shadow vehicle, if the shadow truck is also serving as a supply truck. This activity also includes using paint and beads at spot locations such as level-up, spot seal coat, etc.

Water-based traffic paints are the oldest and most widely used pavement marking materials in existence. Water-based paints are environmentally friendly, are much easier to handle than solvent based paints, and greatly decrease the safety hazards to workers. Water-based paints also become track-free much quicker than solvent-based paints.

Paint is a common pavement marking material used by TxDOT and is the most inexpensive of all pavement marking materials. For maintenance projects, paint is almost exclusively used for longline applications. Most of the water-based paint placed for longline applications is applied by spraying the paint onto the surface using a striping truck. To achieve proper bonding with the pavement, the

pavement surface must be free of dirt, dust, and other contaminants; free of poorly adhered existing markings, glass beads, and curing compound; free of moisture; and pavement and air temperatures (including wind chill) must be at least 40°F.

Several external factors affect water-based paint performance including traffic volume, pavement surface roughness, and environmental wear. Under normal conditions paint usually lasts approximately 6 to 12 months. However, on low-volume roadways paints have been known to last up to 2 years, but only 3 months on roads that have a very high ADT. Because of their relatively short service lives, most water-based paints are only used on low-volume highways.

Epoxy-resin paints are durable, sprayable materials that provide exceptional adhesion to both asphalt and concrete surfaces with good abrasion resistance. To achieve the best bond, epoxies require the pavement surface to be clean. However, unlike water-based paints, epoxies can be applied at surface temperatures as low as 35°F and when pavement surfaces are slightly wet. On low to mid volume roadways, epoxies have been known to last in excess of four years. One drawback associated with epoxies is that they often take much longer to dry than other materials. Some formulations take over 40 minutes to dry, although newer formulations exist that provide no-track drying times as low as 30 seconds depending on weather conditions. Other drawbacks of epoxies are that they fade due to color instability under ultraviolet lighting and epoxies cannot be placed over markings made from other materials, limiting their use as a restripe material.

Pavement-marking retroreflectorization is accomplished through the use of glass beads partially embedded on the surface of the marking binder material. Glass beads play the most important role in pavement-marking retroreflectivity. The bead returns light from a headlamp back to a driver. Markings without beads are virtually useless at night.

**Retroreflectorization:** Sometimes called retroflection, is used on road surfaces, road signs, vehicles, and clothing. When the headlights of a car illuminate a retroreflective surface, the reflected light is directed towards the car and its driver (rather than in all directions).

### 2.12.2 High Performance Striping

High performance striping maintenance includes striping or re-striping lane lines, centerlines and edge lines using thermoplastic or other high performance materials. Work items might include removal of old stripe and installation of sealer. Work items will also include inspection of contract striping work.

Thermoplastics have been used as a pavement marking material since the late 1950s and have been the most common pavement marking material used in Texas for years. Thermoplastic is solid at room temperature, but when heated it becomes liquid. The advantages of thermoplastic material include its readiness for immediate use; high durability; good retroreflectivity; and relatively low cost.

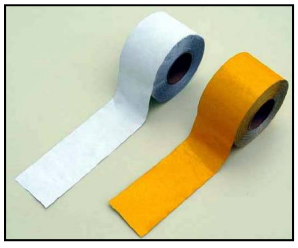
Suitable application temperatures range from 400–450°F, with 420°F as the recommended temperature for most applications. For proper bonding the pavement surface must be free of dirt, dust, and other contaminants; free of poorly adhered existing markings, glass beads, and curing compound; free of moisture; and pavement and air temperatures must be at least 50°F and 55°F, respectively.

Thermoplastic pavement markings have been known to last from 5 to 8 years depending on traffic volumes, but usually last from 2 to 3 years. Thermoplastic application warrants strict quality control because it is very sensitive to variables governing application, including material composition; application procedure; roadway surface; traffic volumes; and environment.

Most of the thermoplastic longlines placed on TxDOT roadways are applied by spraying the hot thermoplastic onto the surface. The primary advantage to sprayed application is that striping can occur at higher speeds (2–8 mph) and markings are ready for traffic in one minute, lessening the time the road is blocked to traffic. However, there are other methods of applying thermoplastic markings to the roadway surface, such as gravity extrusion and ribbon application which are well suited for applying markings thicker than 100 mils. Extrusion, a relatively slow process (3 mph), occurs by pouring hot thermoplastic into a trough or shoe, which has a gate set to produce a desired thickness. Ribbon application uses a pressurized gun to apply thermoplastic in the same manner as the gravity extrusion method.

### 2.12.3 Specialty Markings

Maintenance of specialty markings consists of maintaining medians, islands and other pavement markings not covered under the other activities (including make-ready operations for all stripe alignment, such as spotting tabs, temporary tape, etc.) This activity includes placing specialty pavement markings on medians, turn lanes, crosswalks, railroad crossings, make-ready operations, etc. This also includes the removal of the temporary markings and the installation of rumble strips.

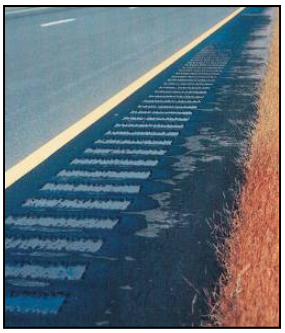


Preformed tapes are cold-applied and are supplied in continuous rolls of various lengths and widths. Preformed tapes have the advantage over sprayed or extruded materials because they do not require expensive application equipment or experienced operators to place, and they require no drying or curing times. Preformed plastic tapes are most commonly used for crosswalks, stop bars, and words and symbols. However, their use as a longline application is increasing. While tapes have a significantly higher initial cost than most other materials, the service lives are usually superior to most other materials, including thermoplastics, often making them a cost effective choice in locations with high traffic volumes that require frequent replacement of standard pavement markings.

A clean pavement surface is very important for tapes to achieve a good bond. Preformed tapes may be inlaid or overlaid. The inlay method is preferred on newly constructed or resurfaced asphalt pavement. The asphalt is still warm, approximately 130°F and application usually follows the pavement breakdown roller. The tape is then rolled into the pavement surface with a steel drum roller during the final rolling of the pavement. The roller fuses the plastic into the hot asphalt surface creating an excellent bond and sealing out moisture.

On existing pavement and concrete pavement, the overlay method is used. The tape is applied directly on and bonded to the surface with an adhesive. Contact cement is used when installing the tape on concrete or over older markings. This is also true for all surfaces with heavy turning or weaving movements over the markings. Markings are initially bonded with a light hand roller or vehicle tire and permanently bonded by traffic wear.

Temporary preformed tapes are used in construction or maintenance jobs requiring temporary delineation or altered travel lanes. Temporary preformed tapes require little or no equipment to apply and the roadway is open almost immediately after installation. Most of the temporary tapes that are in use are easily removed by hand or by a mechanical roller with no special equipment required.



Rumble strips cause a tactile vibration and audible rumbling that is transmitted through the wheels into the car body. A rumble strip is either applied in the direction of travel along an edgeline or centerline to alert drivers when they drift from their lane; or in a series of three or more across the direction of travel to warn drivers of a stop ahead or nearby danger spot. Rumble strips can be created by scalloping a section out of the roadway in a regular pattern or by adding thermoplastics or cold-applied plastic round or rectangular bumps to the roadway.

### 2.12.4 Raised and Reflective Pavement Markers

Maintaining raised and reflective pavement markers includes the installation, maintenance and removal of raised pavement markers. Work items could include cleaning and/or priming pavement surface, applying adhesive, placing raised pavement markers (RPMs), placing and removing protective covers during seal coat operations, mechanically removing existing raised pavement markers and repairing the pavement after RPMs have been removed.

Raised pavement markers are high-impact plastic markers approximately 4 inches square and 3/4 inch high with one or two retroreflective faces. RPMs are used to provide retroreflectivity, delineation, and guidance and to enhance the reflectivity of pavement markings.

RPMs may serve as a positioning guide or a supplement to pavement markings. The TxDOT standard is to install RPMs using position guidance on all roadways with centerlines. Position guidance placement is used to show the driver where the centerline or lane lines of the roadway are located. Supplemental markings are installed along the outside of the solid centerline. The spacing and location of the markings are intended to inform the driver if passing is allowed and also mark the lane line location. The RPMs are maintained and replaced periodically to ensure that the driver is getting the expected benefits of the markers. Routine maintenance of the markers is performed when fewer than two markers are visible when spaced at 80 feet or fewer than three markers are visible when spaced at 40 feet.

RPMs are applied to the roadway surface using either bitumen or epoxy adhesives. Bitumen adhesives are normally used on asphalt surfaces, and epoxy is normally used on concrete roadways. Any adhesives used meet TxDOT DMS specifications for epoxy or bitumen and are installed in accordance with the manufacturer's recommendations. Some raised pavement markings have to be replaced every year due to removal by snow plows. Above the "snow line", districts are not required to use raised pavement markings.

### 2.12.5 Removal of Pavement Markers

Removal of pavement markers includes the removal or obliteration of pavement stripes when the stripe is not going to be replaced. Work items could include grinding, burning, scraping or covering existing pavement stripes by applying an asphaltic material. Existing markings should be removed if they are: too thick, losing adhesion to the pavement surface, of an incompatible material, or if the marking layout must be reconfigured.

Existing pavement markings on both concrete and asphaltic surfaces are removed so that color and/or texture contrast of the pavement surface is minimum. When thermoplastic pavement markings or prefabricated pavement markings are removed, the application of heat is used to remove the bulk of the marking material prior to blast cleaning. A burner is used for complete removal of pavement markings and broom removal or light blast cleaning may be used for removal of minor residue.

Damage to asphaltic surfaces, such as spalling, shelling, etc., that is greater than ¼ inch in depth and is caused by the removal of pavement markers is repaired by the application of a two foot wide surface treatment for longitudinal markers with no directional change or a minimum of one lane width surface treatment in areas where directional changes of traffic are involved. Equipment utilizing special milling flails removes markings on asphalt and Portland cement concrete surfaces. A vacuum truck is used to collect the dust generated.

# 3.0 DESCRIPTION OF ALTERNATIVES

As part of the environmental review of the Maintenance Program, TxDOT is required to analyze program alternatives. As such, three Maintenance Program alternatives, including No Action, Current Practices, and Optimal Maintenance, were evaluated. In order for a program alternative to be considered reasonable, it must meet the following criteria:

- Maximizes lifespan and maintains highways infrastructure and ROW in a safe, operable, and aesthetically pleasing condition;
- Preserves the traveling public's safety;
- Supports the Adopt-a-Highway Program;
- Protects the integrity of cultural resources that are within or adjacent to the ROW;
- Achieves results in a cost effective and timely manner; and
- Is environmentally sensitive.

## 3.1 No Action Alternative

The No Action Alternative consists of taking no action to maintain TxDOT's roadways, ROW, infrastructure, or facilities. This alternative does not meet the previously described criteria to be considered reasonable and is dismissed as not feasible since the system must be maintained.

## 3.2 Current Action Alternative

TxDOT's current Maintenance Program meets these criteria to the extent practical, given fiscal limitations. The Current Practices alternative includes taking no actions to change the Maintenance Program. TxDOT would continue to conduct maintenance practices and activities as planned and programmed given current funding levels. The Current Practices alternative would propose no changes to the existing Maintenance Program. Highway ROWs would continue to be maintained according to need and available funding. TxDOT would continue to keep highways safe for the traveling public. TxDOT would continue to complete environmental reviews of specific activities in its maintenance programs when those activities are beyond the scope of this programmatic evaluation or if site-specific conditions warrant environmental analysis of the activity. This alternative serves as a baseline for comparison in terms of environmental impacts.

## 3.3 Optimal Action Alternative

An Optimal Action alternative would include an optimal level of maintenance activities without fiscal limitations. The Optimal Action alternative would provide the highest level of maintenance achievable while still protecting the environment, but would require additional funding. Under the Optimal Action alternative, TxDOT would develop and implement a standardized approach across all districts for conducting inspections, prioritizing needs, and implementing maintenance for highway ROWs, facilities and sites, assisting the traveling public during extraordinary events, and supporting the Adopt-a-Highway Program. TxDOT would also develop and implement a standardized approach

at Port Aransas and Galveston-Port Bolivar for implementing maintenance for ferries and landings. As part of the Optimal Action alternative, more work would be done by TxDOT staff and less work would be contracted, resulting in more control over performance and end results. The Optimal Action alternative would also include a robust tracking system which would capture all phases of the bridge maintenance program from inspection through the completion of bridge maintenance activities. The Optimal Action alternative would strive to improve environmental performance and promote the use of sustainable practices, resource conservation, and recycling. For example, litter and debris collected along the roadside could be sorted for recycling; dead animals could be composted; and leaking underground storage tanks could be replaced with above ground storage tanks.

# 4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Maintenance Program activities and practices occur almost exclusively within TxDOT ROW. For purposes of the environmental review of the Maintenance Program, the affected environment includes the area immediately adjacent to or within the ROW. Furthermore, bridge maintenance occurs primarily on or under bridges and overpasses. A typical bridge section includes a deck spanning, or supported by pilings, with approaches, backwalls, and guard rails. Bridges generally cross water features, wetlands, floodplains, depressions, or other transportation features like roadways, rail road tracks or in some cases ship channels. The environment surrounding a typical bridge structure usually includes a slope to the backwall, a riparian area, channel, or other crossing feature located between the backwalls and below the bridge deck. For purposes of the environmental review of the Bridge Maintenance Program, the affected environment includes the area immediately surrounding a bridge as well as any feature that a bridge crosses. Also, the affected environment for the Ferry Maintenance Program includes the landing area; which includes the docking/loading area, TxDOT office and maintenance warehouse, storage tanks, public restroom, and parking lot. In addition to the ferry landing and associated "on land" infrastructure, the affected environment also includes the waters and associated aquatic environment that the ferries travel through.

The following sections of this document discuss specific aspects or resources that make up the affected environment, provide the regulatory context for each resource as appropriate, and discuss the environmental impacts, if any, that Maintenance Program activities and practices have on the resource.

## 4.1 Geology, Soils, and Farmlands

Texas is geographically diverse ranging from the Coastal Plains in the Rio Grande Valley to the Guadalupe Mountains in west Texas. According to the Bureau of Economic Geology:

> *Texas is a microcosm of the American south, plains, Gulf, and Rockies. The Llano Uplift in the center of Texas, exposing ancient rocks of Precambrian age, is an outlier of the Appalachian*

*Mountains. The great exposures of Paleozoic and Mesozoic strata, covering the middle of the state, were laid down in the same gentle sea that extended from New York to Montana for many millions of years.*

*The vast thicknesses of recent sediments in the Texas coastal plain are riddled with salt domes and petroleum deposits, just like Mexico to the south and the Deep South states to the east. Their weight pushed the crust downward along the Gulf of Mexico throughout the Cenozoic Era, tipping their landward edges up in gentle cuestas that march inland in ever-older succession.*

*At the same time, Texas was undergoing mountain building, including continental rifting with attendant volcanism, in its far west. Great sheets of sand and gravel washed down over the northern plains from the rising Rockies to be reworked by winds as the climate grew colder and drier. And the most recent period has built the world-class barrier islands and lagoons along the Texas Gulf Coast.*

**Soil order**: the highest level of classification in soil taxonomy. There are 12 total soil orders, classified by their unique physical, chemical, and biological properties.

Texas geology plays a vital role in the formation of soils and ultimately the vegetation present within different regions of the state. In terms of soils, seven soil orders are found in Texas, ranging in texture from sand to clay (see **Table 4-1**). Native vegetation reflects variations in soil composition. As previously indicated, the geology and soils unique to a particular region strongly influence the development of farmlands, agricultural practices, and crop selection. For example, in the coastal plains of the Rio Grande Valley fruits and vegetables are crops of choice while in the Panhandle cotton is commonly grown.

**TABLE 4-1**
**DESCRIPTIONS OF SEVEN DOMINANT SOIL ORDERS IN TEXAS**

| Order | Defining Characteristic | Description | Vegetation Region Occurrence |
|---|---|---|---|
| Alfisols | High aluminum and iron content | Well-developed B horizon from leaching of clays in the A horizon; moderate age has not resulted in leaching of nutrients; relatively high base content (Mg2+, Ca2+, NH4+, Na+), although surface horizon may be strongly acidic; little buildup and shallow penetration of organic matter (less than 1% in A horizon) | Extensive in Pineywoods, Post Oak Savannah, and High Plains |
| Aridisols | Found in arid environments | Low plant-available water for extended periods; low in organic matter; high salt content (calcium carbonate or sulfate common) but often fertile; high base content; may have clay horizons | Dominant in Trans-Pecos |
| Entisols | Recent alluvial deposits | Soil profiles usually not developed; low in organic matter; texture and chemical properties vary considerably | Relatively small area of Trans-Pecos and High Plains |

| Order | Defining Characteristic | Description | Vegetation Region Occurrence |
|---|---|---|---|
| Inceptisols | Young soils with weakly developed profiles | Poorly developed; horizons show little weathering; found in any type of environment and are commonly found forming in alluvium on floodplains and delta deposits | Localized areas of South Texas Plains and Rolling Plains |
| Mollisols | Soft, organic | Deep, dark fertile A horizons; high in organic matter; rich in bases; formed under grasslands (semi-humid conditions) | Extensive in Cross Timbers and Prairies, Edwards Plateau, Rolling Plains, and northern High Plains; Lesser extent in Gulf Prairies and Marshes and South Texas Plains |
| Ultisols | Ultimate profile development | Older soils with very strong profile development; intensely leached, resulting in substantial clay translocation from A to B horizon; low base content | Pineywoods and Post Oak Savannah |
| Vertisols | High clay content | Soils with high content of swelling clays and wide, deep cracks in some seasons | Extensive in Gulf Prairies and Marshes, Blackland Prairie, and South Texas Plains |

*Source: Brady, 1974*

Ferry maintenance activities under either alternative occur within previously disturbed TxDOT property and the waters and associated aquatic environment that the ferries travel through. The Houston and Corpus Christi Districts are largely underlain by the Pleistocene Beaumont Formation consisting of unconsolidated clay, silt, sand, and gravel deposited by ancient streams. The dominant soil orders in these districts are vertisols, mollisols, and alfisols.

At least 9,500 caves, sinkholes and springs are known in Texas, distributed in karst regions covering about 20% of the state. Karst is a terrain formed by the dissolution of bedrock, and generally is characterized by sinkholes and caves that channel water underground. Texas caves and karst aquifers are important economic, scientific, and recreational resources (Elliott, 2010). Karst features are located within and adjacent to TxDOT ROW. Important functions of karst features include recharge pathways for aquifers and critical habitat for federally listed threatened and endangered species. Karst formations are known to exist within and adjacent to TxDOT ROW.

### 4.1.1 Environmental Consequences

Within the TxDOT ROW, few undisturbed soil profiles exist. The initial construction process disturbs the vast majority of soils within the ROW. In some cases bridge construction requires blasting or cutting of rock outcrops which disturbs local geologic features. Bridge maintenance activities under either alternative would not result in direct or indirect impacts to geology, soils, or farmlands since such activities occur within previously disturbed TxDOT right of way and usually

pertain to the structure itself. In rare cases where erosion control measures are implemented as part of the bridge maintenance program, bridge maintenance activities prevent impacts to geologic features including karst, soils, and nearby farmlands when erosion is prevented from affecting adjacent properties or sensitive karst features.

**Erosion:** The gradual wearing away of land surface materials, especially rocks, sediments, and soils, by the action of water, wind, or a gravity. Usually erosion also involves the transport of eroded material from one place to another, as from the upstream portion of a river to the downstream portion. **Scour:** The result of the erosive action of flowing water excavating and carrying away material from the bed and banks of streams.

Minimizing erosion is a very important aspect in terms of maintaining bridges. Following construction activities, disturbed areas are re-vegetated in order to minimize soil erosion. Establishing, managing, and maintaining vegetation within transportation corridors slows the process of erosion and protects topsoil.

If left untreated, soil erosion can be a serious threat to the integrity of a bridge substructure (see **Figure 4-1**). Typically erosion occurs via scouring triggered by heavy precipitation events. Scouring can expose pilings, and erode soil from behind bridge headwalls.

**FIGURE 4-1**
**EROSION AND SCOUR TO STREAM CHANNEL AND BRIDGE PILINGS**

Bridge inspection and maintenance is important in the early identification and corrective action of scour to bridge pilings and abutments. Without regular inspection and maintenance, erosion and scour continue over time, and can eventually compromise the integrity of the structure. Bridge maintenance practices minimize erosion and help protect the integrity of soils under bridges, preventing accelerated soil movement.

Minimizing erosion is a very important aspect in terms of maintaining roadway systems. In order to minimize soil erosion, measures such as silt fences or check dams are applied to ensure proper protection from erosion and to trap sediment on-site. Establishing, managing, and maintaining erosion control measures around exposed soils slows the process of erosion and protects topsoil.

Customer Service Maintenance Program activities and practices include a limited amount of grading and blading for wildfire control and preventative maintenance on unpaved pull-outs and parking areas. Under either alternative, impacts associated with grading and blading would occur within

previously disturbed TxDOT ROW or property minimizing direct and indirect impacts to karst features, soils, geology, and farmlands. Some of the Customer Service Maintenance Program activities like establishing fire breaks for wildfire control serve to protect farmlands located adjacent to the TxDOT ROW.

TxDOT is responsible for assisting other agencies, such as DPS, TCEQ, or the local fire marshal during the containment and cleanup of hazardous material. The extent and magnitude of soil contamination from a hazardous materials spill or release, abandoned materials, leaking storage tank, or illegal dumpsite is assessed and cleaned up as soon as possible by the responsible party, TCEQ, or other lead agency. By removing the contamination from the soil as soon as possible, hazardous material is prevented from spreading deeper into the soil.

Additionally, sweeping ice-rock from roadways can decrease the levels of salinity in soils within and directly adjacent to the right-of-way. Under the Optimal Action alternative, TxDOT would have more resources available for the Customer Service Maintenance Program. More available resources could mean greater effects, both adverse and beneficial, as TxDOT could increase the volume of its Debris and Spills Maintenance Program activities and practices. Also, under the Optimal Alternative technologically advanced equipment could be used for sweeping and street sweeping could occur more frequently, therefore increasing the amount of de-icers and sediments removed from the roadways and reducing the amount available for dispersion into soils, adjacent waterways, and karst features.

Storage tank facility plans are set in place for all underground storage tanks or piping that lies within either the recharge or the transition zone of the Edwards Aquifer. Also, any storage tank (aboveground or underground) facilities that will store 500 gallons or more of static hydrocarbons or hazardous substances require a storage tank facility plan. Having a storage tank facility plan in place, reduces the amount of hazardous waste spreading throughout the soil in the event of a leak.

Drainage maintenance activities occur within previously disturbed TxDOT ROW. Where erosion control measures are implemented as part of the Drainage Maintenance Program, drainage maintenance activities prevent impacts to geologic features including karst features, soils, and adjacent land when erosion is prevented from spreading. Minimizing erosion is a very important aspect in terms of maintaining drainage systems. Following construction activities, disturbed areas are re-vegetated in order to minimize soil erosion. Establishing, managing, and maintaining vegetation within transportation corridors slows the process of erosion and protects topsoil and sensitive habitat within and adjacent to TxDOT ROW.

Adequate erosion control measures are generally put into place before drainage maintenance operations begin. Erosion control devices such as check dams, silt fences, and other acceptable techniques are used. Cleaned ditches are seeded and mulched at the end of each work day and monitored for subsequent erosion until the cleaned area is stable. Installing or repairing riprap also

helps to minimize erosion. The size and mass of the riprap material absorbs the impact energy of waves, while the gaps between the riprap traps and slows the flow of water, lessening its ability to erode soil. Additionally, completing necessary slope repairs can reduce erosion during periods of inclement weather. When repairing a slope, erosion control methods are used in a timely manner, including seeding and mulching specific areas with non-invasive species, installing silt fences and installing other devices as appropriate. Also, precautionary measures (chicken wire, chain link, rock matting) are taken on identified erodible areas and where these precautionary measures can be successfully and safely applied.

Minimizing erosion is a very important aspect in terms of maintaining boat ramp systems. In order to minimize soil erosion, crushed rock, ballast, and/or riprap are applied to ensure proper protection from erosion. Cabled together precast concrete blocks are used for erosion protection where riprap or ballast rock are not effective. Establishing, managing, and maintaining erosion control measures around boat ramps slows the process of erosion and protects topsoil. Indirect impacts, including increased levels of total suspended solids and turbidity to downstream water quality from specific boat ramp maintenance activities would generally be local and temporary.

Dredging removes silt and sand that has accumulated due to wave action and ship traffic. Dredging is required due to shoaling in and around ferry landings and to maintain a safe depth for the ferry vessels to operate and dock in. Dredging is done on an as-needed basis, at the Galveston-Port Bolivar ferry; a frequency of once a year for dredging has been the norm, but is currently moving to twice a year. Tropical storms and other environmental factors may result in the need for more frequent dredging. Dredging activities are permitted through the USACE and all regulations set forth in the USACE permit are followed.

TxDOT is responsible for maintaining the appropriate depth at ferry landings to allow for safe access by the ferry vessels. However, the USACE is responsible for dredging the Houston Ship Channel, which the Galveston-Port Bolivar ferry crosses, at a depth of 45 feet and width of 530 feet. Due to currents and location, the Bolivar landing of the Galveston-Port Bolivar ferry experiences the heaviest shoaling, and therefore requires more frequent dredging than other sites. Under either alternative dredged material is deposited at predetermined spoil areas as determined by USACE through permit. The locations of the dredged material placement areas (PAs) vary. PA 41 is located on Goat Island near its eastern terminus and north of the Bolivar Peninsula. PA 43 is located parallel to Goat Island near its western terminus at Galveston Bay. Placement Area A is located in open water, just south of the Bolivar Ferry landing. The existing permit authorizes the maintenance dredging; however, a special condition to the permit requires that future beneficial use dredged material placement areas be identified within two years of issuance of the permit. TxDOT has identified two beneficial use sites which include beach and/or habitat creation and submitted a permit request to the USACE in August of 2010. Beneficial Use Site No. 1 (BU 1) is located immediately southeast of the Bolivar Ferry Landing facility and extends east to the western boundary of Fort Travis Seaside Park. The BU 2 is located east of Fort Travis Seaside Park.

In terms of regulations that address impacts to geology, soils or farmlands, only farmlands are afforded protection. The Farmland Protection Policy Act (FPPA) requires that federal agencies identify and take into account the adverse effects of their programs on the preservation of farmlands; consider alternative actions, as appropriate, that could lessen adverse effects; and ensure that the project is compatible with state and local programs and policies to protect farmlands (7 CFR Part 658). Since Maintenance Program activities and practices occur almost exclusively within TxDOT right-of-way or property, and no new right-of-way or property is required or affected by Maintenance practices, no coordination with the Natural Resource Conservation Service (NRCS) as mandated through FPPA is required. Soils and geology are afforded regulatory protection in the sense that erosion control is required by TCEQ under the Texas Pollutant Discharge Elimination System (TPDES) process. TxDOT's Current Action alternative complies with all applicable regulatory requirements related to soils, geology, and farmlands. Under the Optimal Action alternative, TxDOT would have more resources available for the Maintenance Program. More available resources could mean greater effects, both adverse and beneficial, as TxDOT could increase the volume of its Maintenance Program activities and practices.

## 4.2 Water Quality

Within Texas, there are approximately 191,228 river and stream miles of which 40,194 miles are perennial (flowing throughout the year). There are also nine major aquifers and 20 minor aquifers (see **Figure 4-2**). Water quality can be divided into two classes: surface water and groundwater. Surface water quality is often discussed and managed by river basin, and more specifically, as a stream segment or water body. Groundwater is most often divided by major and minor aquifers.

The federal Safe Drinking Water Act Amendments of 1996 protects public health by regulating the nation's public drinking water supply. The law requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, and groundwater.

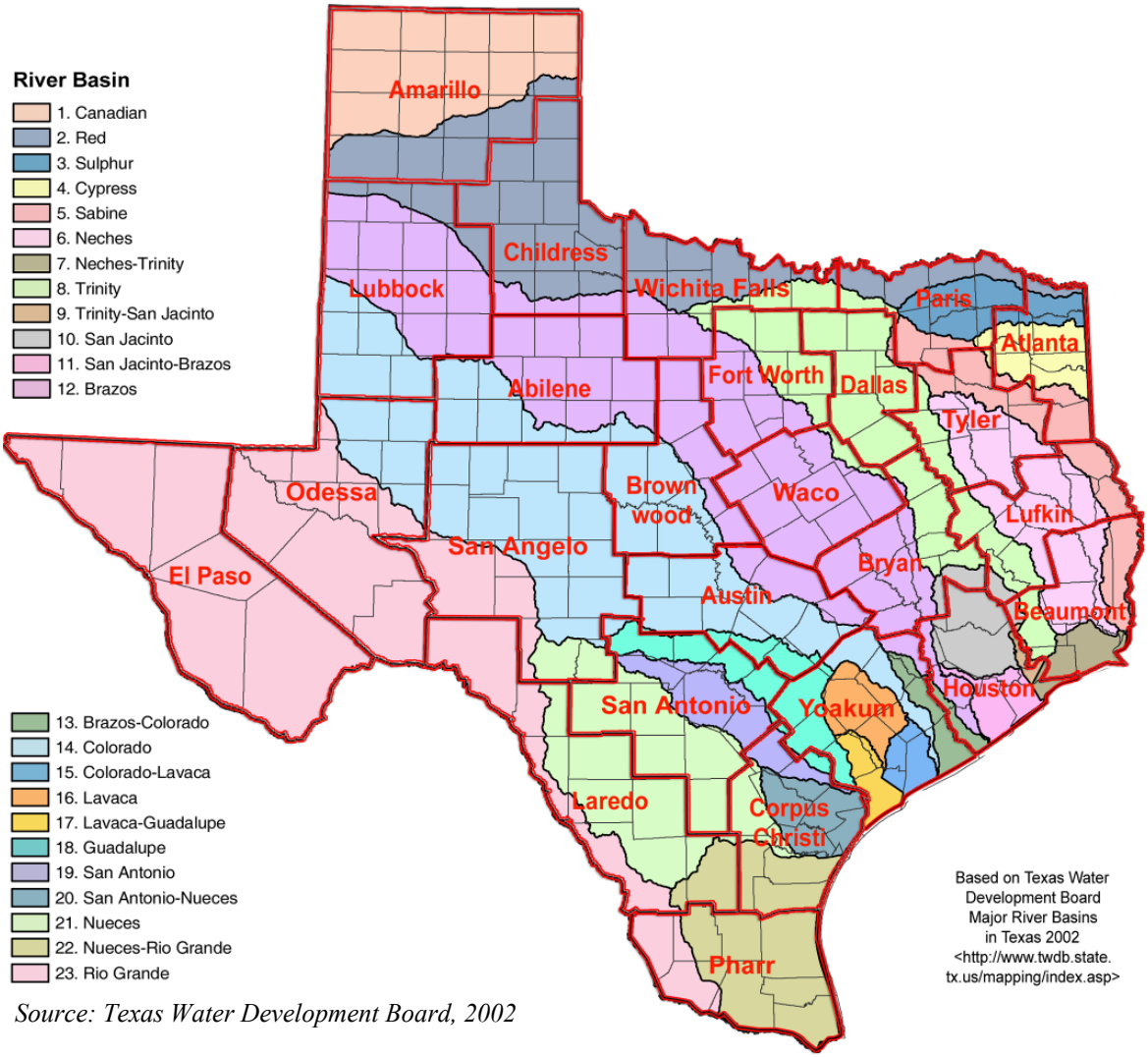
The EPA has defined a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

Two segments of the Edwards Balcones Fault Zone (BFZ) Aquifer have been designated sole source aquifers by the EPA and the Edwards BFZ Aquifer is the primary source of water for San Antonio. The location of these in relation to the appropriate TxDOT districts is shown in **Figure 4-3**.

Thickness of the Edwards BFZ Aquifer ranges from 200 feet to 600 feet and is highly permeable. This aquifer responds quickly to changes and extremes of stress placed on the system due to its highly permeable nature in the fresh-water zone.

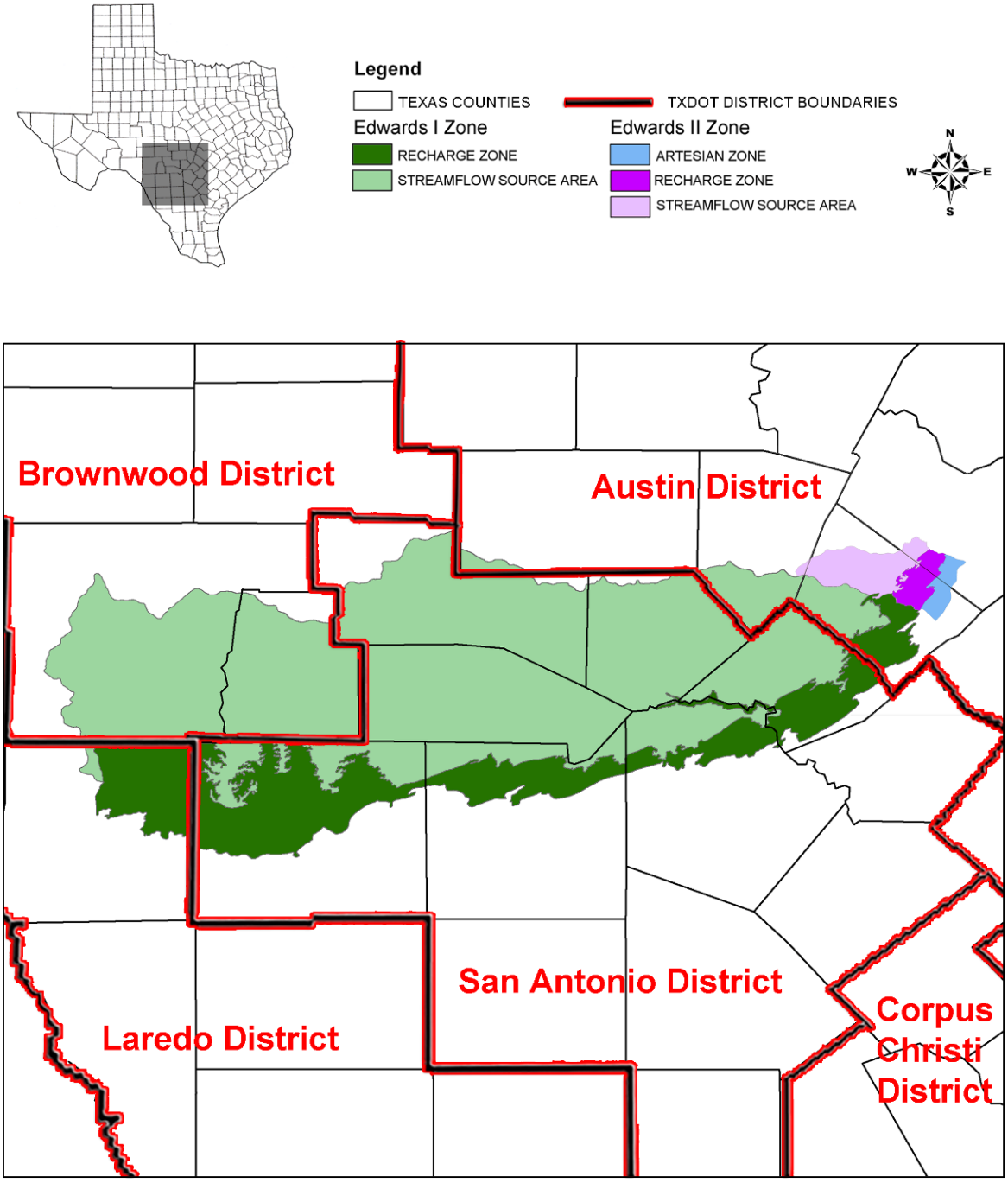
The Sole Source Aquifer designation heightens awareness of the sensitivity of the resource and provides for a review of certain federal financially assisted projects to ensure they pose a minimal threat to groundwater. The federal Clean Water Act (CWA) governs most aspects of water quality and establishes the basic structure for regulating discharges of pollutants into the Waters of the U.S. The CWA gave the EPA the authority to set water quality standards for all contaminants in surface waters. The act made it unlawful for any person to discharge any pollutant from a point source into navigable waters without a permit. The Texas Water Code is the body of state law pertaining to the use, regulation, and protection of surface water and groundwater within the state.

**FIGURE 4-2**
**MAJOR RIVER BASINS IN RELATION TO TXDOT DISTRICT BOUNDARIES**




*Source: Texas Water Development Board, 2002*

**FIGURE 4-3**
**EDWARDS SOLE SOURCE AQUIFERS LOCATION**

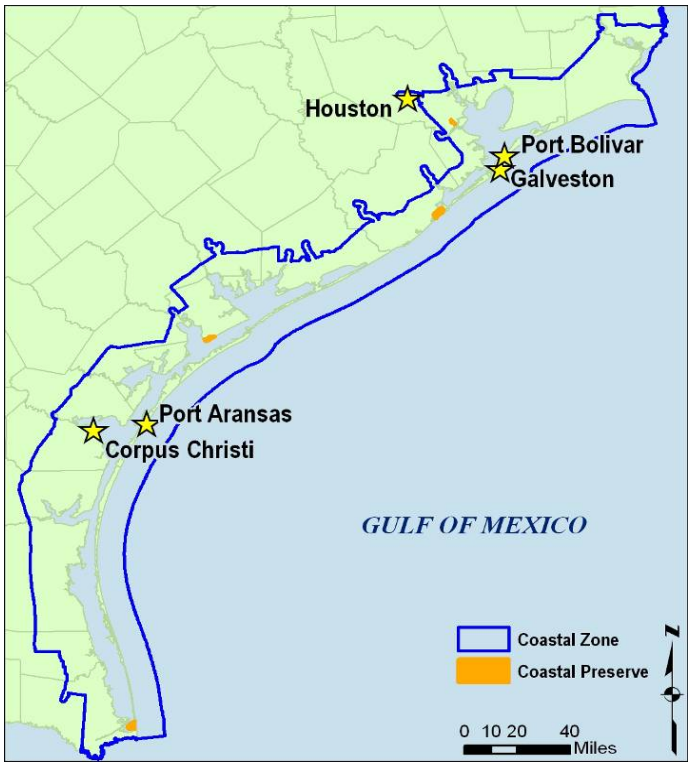



*Source: EPA, 2005*

Specific storm water treatment requirements must be met for all projects conducted in the Edwards Aquifer recharge zone. This area encompasses a number of counties and four TxDOT districts. All projects in this region must comply with the Edwards Aquifer Technical Guidance Manual. Water quality BMPs are required to remove 80 percent of the Total Suspended Solids (TSS) load and meet

specific volume requirements. In Austin, BMPs must also be designed to remove 80 percent of the TSS load. The City of Houston has established specific requirements for storm water treatment as well. To ensure compliance with all regulations, the municipality where the project is to take place is contacted.

**FIGURE 4-4**
**TEXAS COASTAL ZONE**




The Galveston-Port Bolivar ferry system lies within the San Jacinto-Brazos River Basin and the Port Aransas ferry system lies within the San Antonio-Nueces River Basin. Port Aransas ferries cross the Corpus Christi Ship Channel. This water channel connects the Gulf of Mexico with Corpus Christi Bay and the Port of Corpus Christi. Galveston-Port Bolivar ferries cross the Houston Ship Channel, which connects Galveston Bay and the Port of Houston to the Gulf of Mexico. The Gulf of Mexico is a major body of water bordered and nearly landlocked by North America. The total area of the Gulf of Mexico is approximately 615,000 square miles.

Ferry Maintenance Program activities and practices also occur within the Coastal Zone as defined by the Texas Coastal Management Program (CMP). State coastal preserves are designated by the Texas General Land Office and the Texas Parks and Wildlife Department. Since 1988 five areas have been designated Texas Coastal Preserves, including South Bay, a 3,420-acre estuary in Cameron County; two areas comprise Welder Flats Coastal Preserve, 1,480 acres in San Antonio Bay, Calhoun County; Armand Bayou Coastal Preserve, 290 acres in Armand Bayou, a tidal tributary of the western shore of Galveston Bay; and Christmas Bay Coastal Preserve is a 4,831-acre bay adjacent of West Bay below San Luis Pass.

TCEQ is required by Section 303(d) of the CWA to develop a list of water bodies that do not meet water quality standards and to submit updated lists every two years. The 303(d) Lists and Inventory Report describe the status of Texas waters based on historical data on surface-water and groundwater quality, and identify water bodies that are not meeting standards set for their use. The latest 2008 section 303(d) list identified 399 water bodies that do not meet applicable water quality standards or are threatened for one or more designated uses by one or more pollutants.

### 4.2.1 Environmental Consequences

Prior to beginning any Maintenance Program activity, sensitive habitat areas, including watercourses such as streams, lakes, and other marine foreshores that could be found within the work area, are identified. Under either alternative, Maintenance Program activities and practices would sometimes occur near or over listed segments and impaired water bodies. In cases where a segment or water body is listed for elevated levels of total suspended solids, certain maintenance activities like sanding and de-icing roadways; sweeping rock salt and debris off of roadways and bridges; could add additional pollutants to a listed water body. However, such impacts would occur infrequently and would be temporary in nature.

Ferry cleaning is undertaken at the ferry landings and on the ferries to prevent the accumulation of dirt and debris. The landings and ferries are swept clean and all material swept loose is disposed of away from the watercourse and where it cannot be returned to the watercourse. Trash barrels are located on the ferries and signs are posted to help prevent litter and debris from being thrown or blown into the water. An adequate supply of absorbent materials is kept on board the ferries to absorb minor leaks from vehicles. A separate fully stocked oil spill response station is maintained on the ferry or in the storage shed on shore in case of an oil spill. In the event of a spill, personnel follow standard safety procedures and report pertinent information to their supervisors immediately. Ferry personnel contact the General Land Office, Coast Guard, district hazardous materials coordinator and local law enforcement officials as necessary. In case of an oil spill on board a ferry, Port Aransas ferries contain a coffer dam which allows oil to spill into the engine room and prevents any oil getting into the water. **Table 4-2** lists the impaired water bodies within 5 miles of Port Aransas and Galveston-Port Bolivar.

**TABLE 4-2**
**2008 303(D) LISTED WATERBODIES WITHIN 5 MILES OF TXDOT FERRY OPERATIONS**

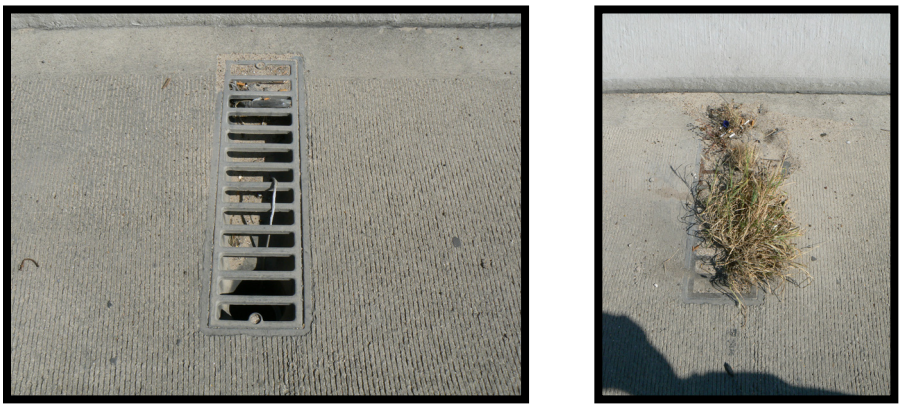
| Segment ID | Segment Name | Parameter |
|---|---|---|
| 2439 | Lower Galveston Bay | bacteria (oyster waters) |
| 2501 | Gulf of Mexico (From the Gulf shoreline to the limit of Texas jurisdiction between Sabine Pass and the Rio Grande) | mercury in edible tissue |
| 2483 | Redfish Bay | bacteria (oyster waters) |

*Source: TCEQ 2008 Texas 303(d) List (March 19, 2008)*

During precipitation events, rainfall accumulates on impermeable surfaces like bridge decks and then runs down hill via gravity. Water can drain off of a bridge as sheet flow over the edge of the bridge or it can drain from the crown to the margin of a bridge where it is then channeled to the bridge approaches via a drain system. Overpasses and some bridges have grate and drain systems (see **Figure 4-5**), in which run-off is collected by grates on the roadway surface and transported through a network of pipes to the ground or a nearby water body. Litter and debris can clog these drains and prevent them from functioning properly. TxDOT is responsible for removing litter and debris from

roadway drains under the Debris and Spills Maintenance Program and by doing so, allows the drains to function properly.

**FIGURE 4-5**
**GRATE/DRAIN SYSTEM AND DEBRIS CLOGGING DRAIN**



Bridge paint removal is not considered a routine maintenance procedure and is generally contracted rather than being performed by TxDOT personnel. Contractors are required to test existing paint on bridges to check for lead or asbestos content. If these materials are found, remediation practices, such as removal and containment, are implemented prior to any further work. Extra care is taken to protect the environment, particularly water quality, and workers when lead or asbestos containing substances are encountered. Contractors are required to catch paint flakes and debris when removing old paint prior to re-painting. Current best management practices use filter mats that catch paint particles while allowing wash water to pass through. A study done by Kentucky Transportation Center, University of Kentucky examines the effectiveness of filtration systems for removing paint particles as well as suspended fine particles from wash water.

Some parts of swing bridges and draw bridges maintained as part of the State's bridge system require periodic lubrication and greasing. Excess lubrication/grease would drop off of these types of bridges entering into the aquatic environment beneath the structures. Few of these bridges exist within the State of Texas therefore impacts associated with this Bridge Maintenance activity would be isolated and infrequent.

Removal of snow and ice from roadways and bridges may introduce sediment or other substances in to a watercourse. Much of the salt that is placed on a road during snow and ice control operations enters watercourses via roadway runoff and drainage. Chloride based compounds sometimes used to treat icy roads and bridges can cause increases in salinity to nearby surface waters when they accumulate in runoff. These compounds can also facilitate the movement of trace metals from soils into groundwater - an indirect effect to water quality. Under the Debris and Spills Maintenance Program, sweeping ice rock from bridge decks and roadways reduces the amount of salt compounds entering nearby surface waters through runoff.

Sand is also used to treat icy roads and bridges. Sand can be applied many times during winter, which can create debris deposits on roadways that require road sweeping and subsequent disposal as solid waste. Roadway sand contributes to sedimentation in streams and can impact fish and other aquatic resources. Sand has a negative effect on water quality because of the increased turbidity caused by the presence of sand particles in water. Street sweeping regularly on bridge decks and roadways removes sand and sediment accumulations and reduces the amount that enters nearby surface waters through runoff.

The varying winter storm conditions around the state require different snow and ice control plans, and therefore each district uses different amounts of de-icing agents, including salt and sand on the facilities and roadways in their district. Depending on the quantities of salt and sand that are used in a given district and the specific locations where salt and sand are applied, varying degrees of environmental effects on water quality can be expected. When applied directly to bridges that span surface waters, de-icing agents can enter surface water directly causing increased levels of salinity or total suspended solids depending on the specific agent used. The effect of de-icing agents on a particular water body's water quality depends on flow, current water quality, and a number of other variables. Effects on water quality associated with de-icing are generally short in duration and vary in intensity depending on a number of factors, including size of the receiving water body, substrate, existing levels of pollutants, etc.

Regular street sweeping of roadways can reduce the amounts of de-icers and sediments on the road, thereby reducing the impacts of these materials on water quality. The effectiveness of the sweeping equipment, the technology used, and the frequency of sweeping have a direct influence on the amount of de-icers and sediments collected. The more efficient the collection of de-icers and sediments, particularly the finer fractions, the less these materials are available for dispersion into nearby surface water resources.

The Customer Service Maintenance Program includes maintenance of on-site sewer and storm water management systems located at TxDOT's safety rest areas, picnic areas, etc. These systems are designed, constructed, operated, and maintained in a manner that minimizes adverse environmental effects to water quality. Nevertheless, effects to water quality could occur if these systems malfunction and untreated storm water or sewer enter nearby surface water bodies or percolate into groundwater.

When hazardous waste is discovered by TxDOT personnel or is reported to TxDOT, the proper authorities are contacted within 24 hours of notice to clean up and dispose of the spill or abandoned waste. By responding quickly and notifying agencies of a hazardous waste incident, the spill or abandoned waste can be taken care of quickly, which reduces the possibility of the hazardous waste spreading to surface water or groundwater.

Storage tank facility plans are required for an underground storage tank or piping that lies within either the recharge or the transition zone of the Edwards Aquifer. Also, any storage tank (aboveground or underground) facilities that will store 500 gallons or more of static hydrocarbons or hazardous substances require a storage tank facility plan. As part of that plan, double-walled tanks and product delivery piping are required, continuous leak detection is required that will alert the owner at all times, and containment sumps beneath piping sumps are also required. Having a storage tank facility plan in place, reduces the possibility of the hazardous waste spreading to surface water or groundwater if there is a leak.

The activities under the Maintenance Program are designed, constructed, operated, and maintained in a manner that minimizes adverse environmental effects to water quality. Nevertheless, those activities that involve the disturbance of soils (e.g., sub-grade and base preparation, grading and blading for wild fire control and management, drainage and boat ramp maintenance, etc.) can indirectly affect water quality as some of the disturbed soils may enter nearby surface water bodies or percolate into groundwater. Garbage and litter deposited at rest areas and other roadside facilities can enter nearby surface waters via runoff if these areas are not properly maintained.

On large projects that disturb more than one acre of soil during construction or maintenance activities, a SW3P is required if the activity is changing the original cross section or design, which means the normal flow line, shape, and capacity of the ditch. Drainage maintenance activities that restore the ditch to its original cross section, shape and capacity are exempt from SW3P requirements, but may require USACE permits if Waters of the U.S. are involved (i.e., waterways, playas, designated wetlands, etc.). The district environmental quality coordinator should be contacted for assistance in determining when SW3P or USACE permits are required.

Maintenance activities also occur within the Coastal Zone as defined by the Texas CMP. The Maintenance Program does not have a direct or significant adverse impact on the coastal natural resource areas, and therefore is in accordance with the CMP. All activities, including the disposing and placing of dredged material, complies with the requirements under the CMP. For dredging and dredged material disposal and placement, the CMP requires that dredging and the disposal and placement of dredged material avoids and minimizes adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. Dredging and dredged material disposal and placement will not cause or contribute to violation of any applicable surface water quality standards established under the CMP.

Adverse effects on water quality from dredging and dredged material disposal and placement, such as increased sediment, can be minimized by controlling the location and dimensions of the activity; by complying with applicable standards for sediment toxicity; by controlling the manner in which material is dispersed; and by adapting technology to the needs of each site.

TxDOT's Maintenance Program practices and activities have a low potential to directly affect water quality. As previously stated some maintenance activities may inadvertently add additional pollutants into adjacent or underlying water bodies causing temporary increases in turbidity and suspended solids. Overspray, dust, debris, spills and leaks may create pollutants. Pollutants may include paint, sediment, fuel, hydraulic fluid and oil. However, such impacts would be infrequent and temporary in nature, and control measures would be put into place to prevent pollutants from entering a nearby water body or segment. Also, water used during pre-sweeping operations is controlled to prevent unpermitted non-stormwater discharges.

Under the Optimal Action alternative, TxDOT would have more resources available for the Maintenance Program. More available resources could mean additional effects to water quality, both adverse and beneficial, as TxDOT could increase the volume of its Maintenance Program activities and practices. Under the Optimal Alternative, technologically advanced equipment could be used for sweeping and street sweeping could occur more frequently, therefore increasing the amount of de-icers and sediments removed from the roadways and reducing the amount available for dispersion into nearby surface waters. Also, the Optimal Alternative could include using alternative drainage cleaning methods. For example, WSDOT assessed routine highway ditch cleaning alternatives for water quality benefits by surveying biofiltration swales to evaluate conditions promoting water quality benefits. Of the options explored, the study found the greatest water quality benefits when the first three quarters of the ditch were excavated and vegetation was retained in the remainder. The ditch treated in this manner was capable of reducing TSS by approximately 40 percent, total phosphorus by about 50 percent, and total and dissolved Cu and Zn each by roughly 20 to 25 percent.

From a regulatory perspective, water quality and water resources are governed by a number of laws with the most prominent being the CWA. The CWA regulates the discharge of pollutants into jurisdictional Waters of the U.S. Other applicable laws include the Safe Drinking Water Act and the Sole Source Aquifer Protection Program. In specific areas of Central Texas, TCEQ regulates water quality through the Edward's Aquifer Rules in addition to those other regulations mentioned. Traffic Pavement Markings Maintenance Program activities and practices comply with regulations governing water quality.

## 4.3 Wetlands

Wetlands are transitional areas between terrestrial and aquatic habitats and include elements of both systems. Hydrology is the dominant factor determining the characteristics of wetlands, since the timing, quantity, and duration of water flow strongly influences both abiotic and biotic factors within a wetland (Texas Parks and Wildlife Department [TPWD], 2005). Saturation often determines the nature of soil development and the types of plant and

animal communities living in the soil and on its surface (Cowardin et al., 1979). Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance.

Within Texas, there are several types of wetlands. Typical wetlands include freshwater marshes, brackish and saltwater marshes, deepwater swamps, bogs, riparian and forested wetlands, and playa lakes. Many of these wetlands are often associated with streams, rivers, lakes, and primary and secondary bays. Other wetlands such as playas occur in depression areas surrounded by uplands. In general, wetlands become more common as one travels eastward across the state, which corresponds with increasing precipitation.

Wetlands perform many ecologically important functions. These functions vary from wetland to wetland, but include providing water quality protection and nutrient cycling, flood control, shoreline and sediment stabilization, contributions to groundwater and stream flow, and wildlife and fisheries habitat. Wetlands also are valued as natural areas providing aesthetic, recreational, and educational opportunities. Wetland values are a measurement of the benefit these wetland functions provide to society. For example, wetlands are valued in different degrees for their ability to improve water quality, provide economic benefits for wetland-dependent businesses, help in stabilizing global levels of carbon dioxide, reduce flood damage, and provide recreation opportunities.

The USACE has primary responsibility for regulation of wetlands and jurisdictional waters under the CWA. For many years, wetlands have been regarded as wastelands or idle lands and substantial areas of wetlands have been developed for other purposes such as agriculture and building construction. Impact of highway development and maintenance is likely to be small because permanent wetland areas often occur on terrain or substrate insufficient for highways. In some cases, highways may actually promote wetland development where roadbed surfaces are elevated and constructed traffic pavement markings patterns serve as a source of water.

The increased awareness in recent years of the importance of wetlands has led to efforts at all levels of government to protect wetland habitats throughout the United States. A variety of federal, state, and local regulations affect construction and other activities in wetlands and adjacent areas, but the final criterion is "no net loss."

For regulatory purposes under the CWA, the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The principal federal laws that regulate activities in wetlands are Sections 404 and 401 of the CWA and Section 10 of the River and Harbor Act. Other federal laws include the National Environmental Policy Act of 1969 (NEPA), the Coastal Zone Management Act (CZMA), and a provision of the 1985 Food Security Act known as "Swampbuster." Many of these provisions

have defined parameters not only for vegetation management in sensitive areas, but also for the more fundamental issues of highway construction.

The Supreme Court handed down a ruling on January 9, 2001 in Solid Waste Agency of Northern Cook County (SWANCC) v. USACE that is pertinent to TxDOT. SWANCC held that the USACE's use of the "migratory bird rule," adopted by the USACE to interpret the extent of its Section 404 authority over "isolated waters" (including isolated wetlands), exceeded the authority granted by law. Wetlands not connected to the network of Waters of the U.S. directly by a surface connection (channel) or within the 100-year floodplain are not subject to Section 404 of the CWA.

### 4.3.1 Environmental Consequences

TxDOT's Maintenance Program practices and activities would have a minimal affect on adjacent wetlands. The potential impacts to wetlands resulting from Maintenance Program activities could be indirectly related to the water quality effects discussed in **Section 4.2.1** as any adverse effects to water quality could degrade wetland environments receiving degraded waters. Likewise, any beneficial effects to water quality could improve wetland function and value by increasing the level of water quality entering into the wetland system.

Bridge maintenance activities, such as deck sweeping, drain cleaning, power washing, and joint cleaning have the potential to knock dirt and debris into underlying wetland vegetation. These occurrences would be infrequent and temporary in nature and wetland vegetation and wetland functions would not be permanently affected by such practices.

Customer Service Maintenance Program activities and practices include removing snow from roadways and parking areas and the application of de-icing agents, which have the potential to add sediment and chemicals to wetland areas directly adjacent to TxDOT ROW. Such occurrences would be infrequent and temporary in nature.

The Ferry, Customer Service and Debris and Spills Maintenance Programs provides benefits to wetlands by ensuring the trash and litter are removed from TxDOT facilities, ferries, ferry landings, and ROW and thus does not find its way into nearby wetland environments via runoff. Also, the Debris and Spills Maintenance Program removes litter and debris within a wetland if it lies within the ROW.

TxDOT's Maintenance Program complies with all applicable regulatory requirements related to wetlands and Waters of the U.S. Under the Maintenance Program, Section 404 of the CWA would be followed and no unauthorized dredge or fill material would be discharged into a wetland or jurisdictional water. Dredging and placement of dredged materials have the potential to add sediment to wetland areas in the vicinity. Such occurrences would be infrequent and temporary in nature. Dredging materials would be re-used in other areas when possible where dredged material is needed or disposed of at an approved site.

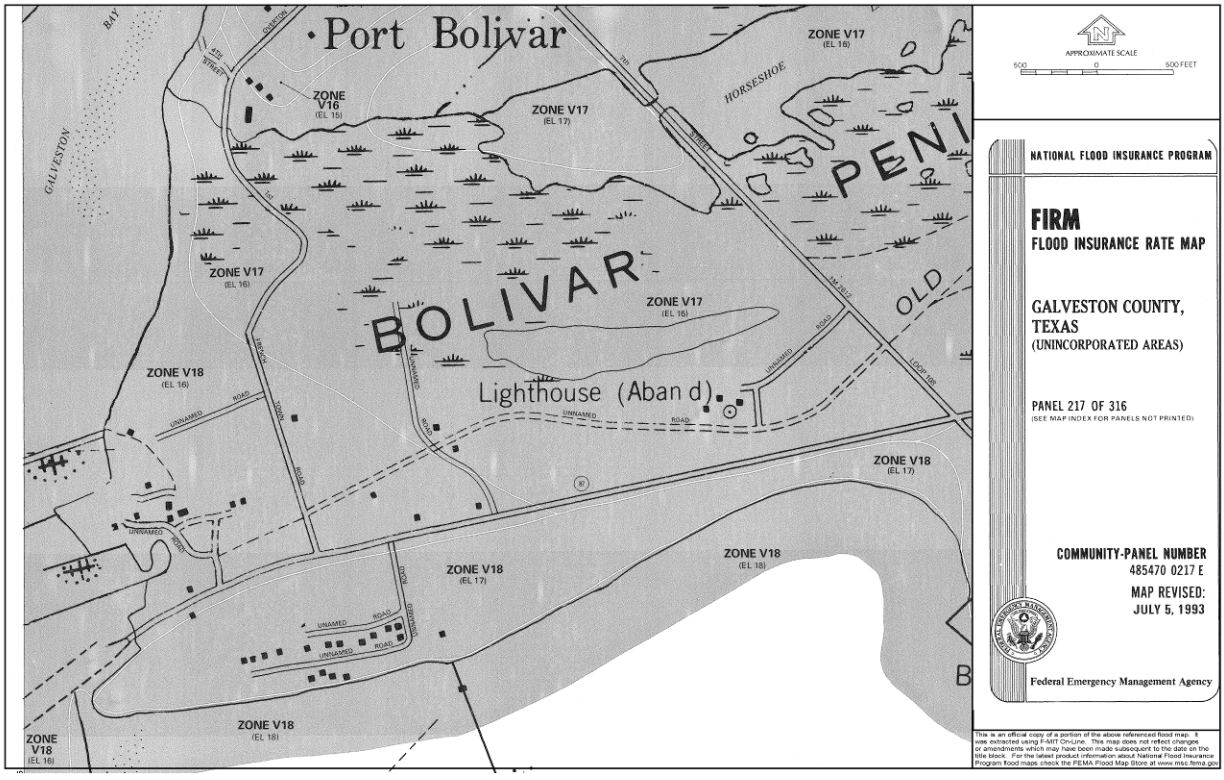
The Ferry Maintenance Program includes maintaining or implementing a SPCC Plan in accordance with EPA. This plan presents site-specific operating procedures to prevent an oil spill, control measures to prevent a spill from entering water resources, and countermeasures to contain, cleanup and mitigate the effects of any oil spill that may impact water or an associated wetland environment. Currently there are no known wetland areas at Port Aransas or Galveston-Port Bolivar.

As indicated earlier in this document, under the Optimal Action alternative TxDOT would have more resources available for the Maintenance Program. More available resources could mean additional effects to wetlands, both adverse and beneficial, as TxDOT could increase the volume of its Maintenance Program activities and practices. Activities such as street sweeping and removing litter and debris could occur more frequently, therefore increasing the amount of de-icers, sediments, and garbage removed from the roadways and reducing the amount available for dispersion into nearby wetlands.

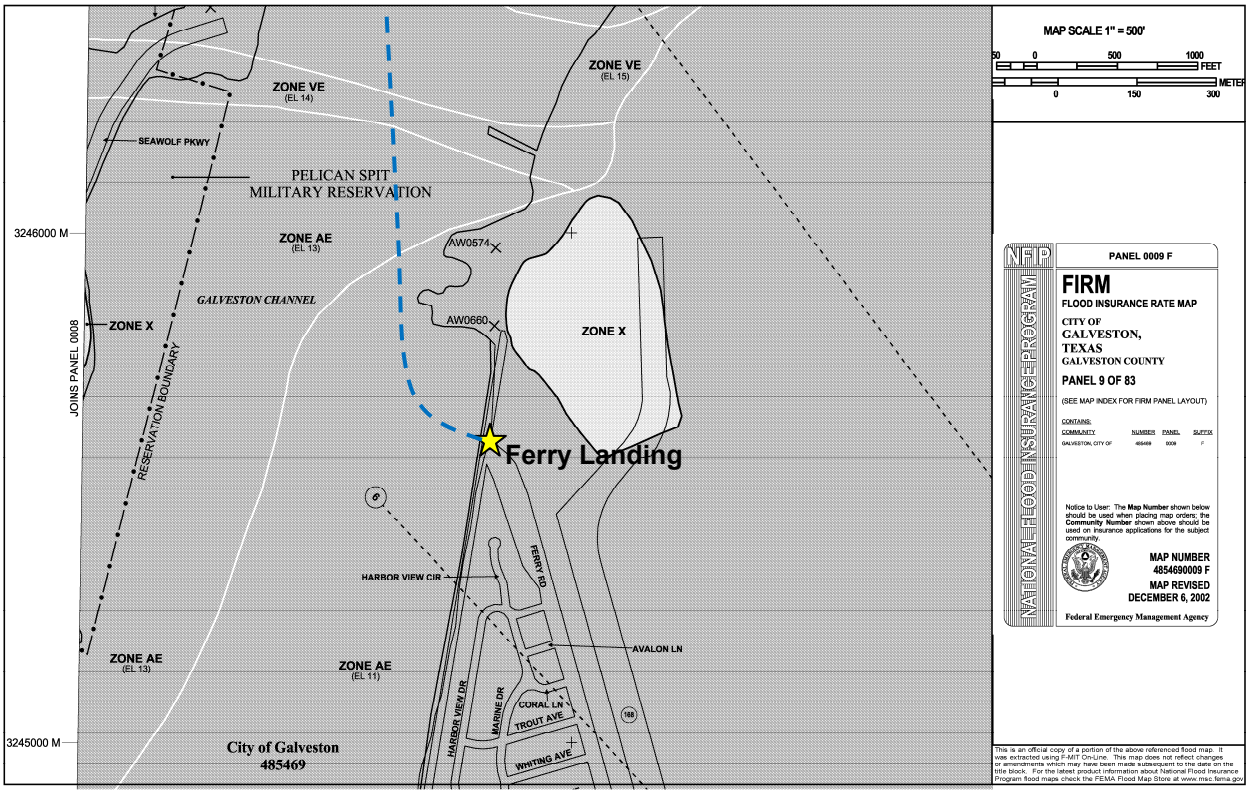
## 4.4 Floodplains

Floodplains include any land area susceptible to being inundated by floodwaters. Approximately 12 percent of the state's land area consists of mapped floodplains (Texas Floodplain Management Association [TFMA], 2002). **Figures 4-6** and **Figure 4-7** show the floodplain maps for the Galveston-Port Bolivar ferry landings. **Figure 4-8** show the floodplain map for Port Aransas ferry landings.

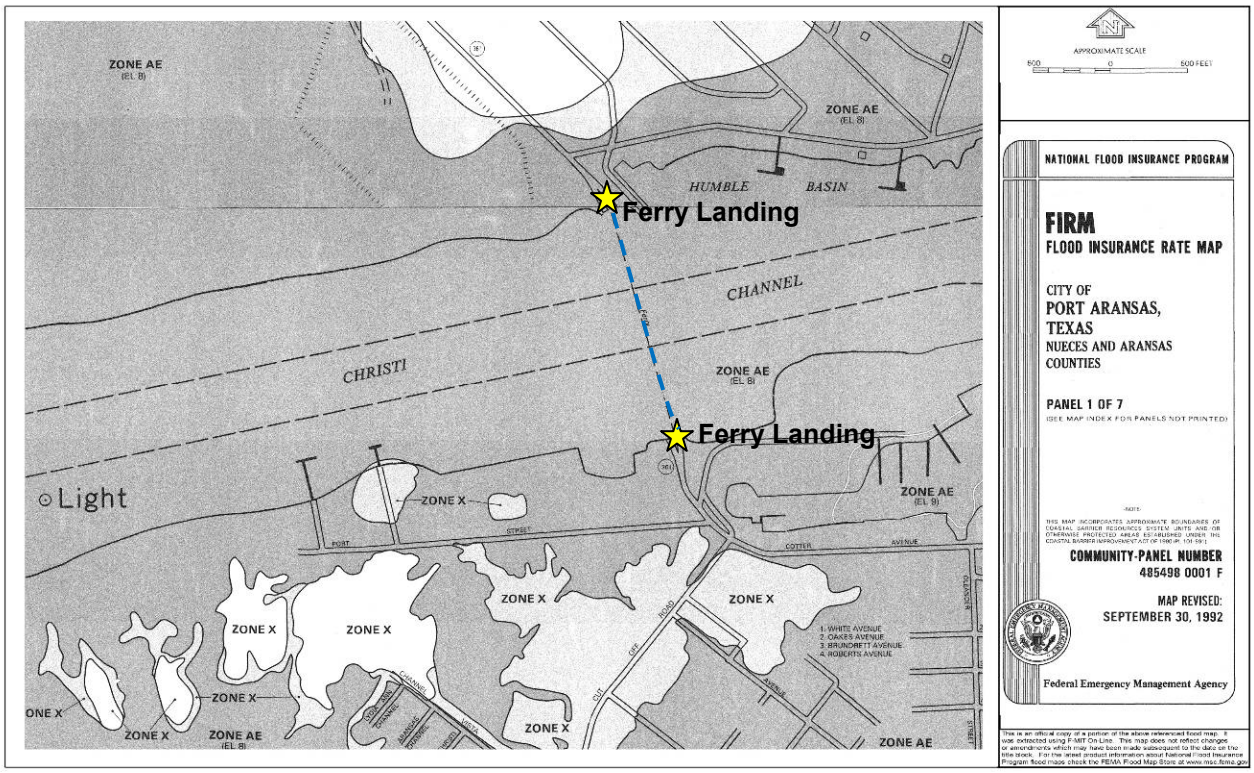
**FIGURE 4-6**
**PORT BOLIVAR FLOODPLAIN MAP**



## FIGURE 4-7
## GALVESTON FLOODPLAIN MAP




## FIGURE 4-8
## PORT ARANSAS FLOODPLAIN MAP



### 4.4.1 Environmental Consequences

All Maintenance Programs, besides the Ferry Maintenance Program, do not involve any construction that would displace floodwaters. The Maintenance Program puts into place erosion protection measures during maintenance when necessary and this helps to control erosion and runoff. Therefore, no adverse impacts to floodplains or floodplain development are anticipated under these programs.

Under the Bridge Maintenance Program, maintenance activities would help to control erosion, ensure free flow conditions beneath bridge structures, and therefore would not adversely impact floodplains. By regularly disposing of litter and garbage collected at TxDOT's roadside facilities under the Customer Service Maintenance Program and disposing of litter and garbage collected on TxDOT's ROWs under the Debris and Spills Maintenance Program, less of these materials would enter floodplains where they can accumulate and eventually constrict the flow of water through floodplain areas. Debris and litter are removed regularly from roadway drains to prevent these drains from becoming clogged and creating localized flooding.

The Drainage Maintenance Program activities would help to control erosion and ensure free flow conditions. Highway drainage is provided to prevent the flooding of the highway and to ensure water falling onto the highway is removed as soon as possible into drainage systems or natural watercourses. The Maintenance Enhancement Program boat ramp maintenance activities would help to control erosion and would not adversely impact floodplains.

The Ferry Maintenance Program would not increase the base flood elevation to a level that would violate applicable floodplain regulations and ordinances. The proposed dredging and dredge disposal would be located within the 100-year floodplain. The ferry landing at Galveston and both ferry landings at Port Aransas are located in Zone AE, which is the 100 year floodplain with base flood elevations determined. The ferry landing at Port Bolivar is located in Zone V18, which is areas of 100-year coastal flood with velocity (wave action) and base flood elevations and flood hazard factors have been determined. Consistent with Executive Order (EO) 11988 on floodplain management, dredging and dredge disposal in these areas are considered to be a repetitive action in the floodplain and would not adversely impact flooding or floodplain values. Therefore, no adverse impacts to floodplains or floodplain development are anticipated. Galveston and Nueces Counties are both participants in the National Flood Insurance Program (NFIP).

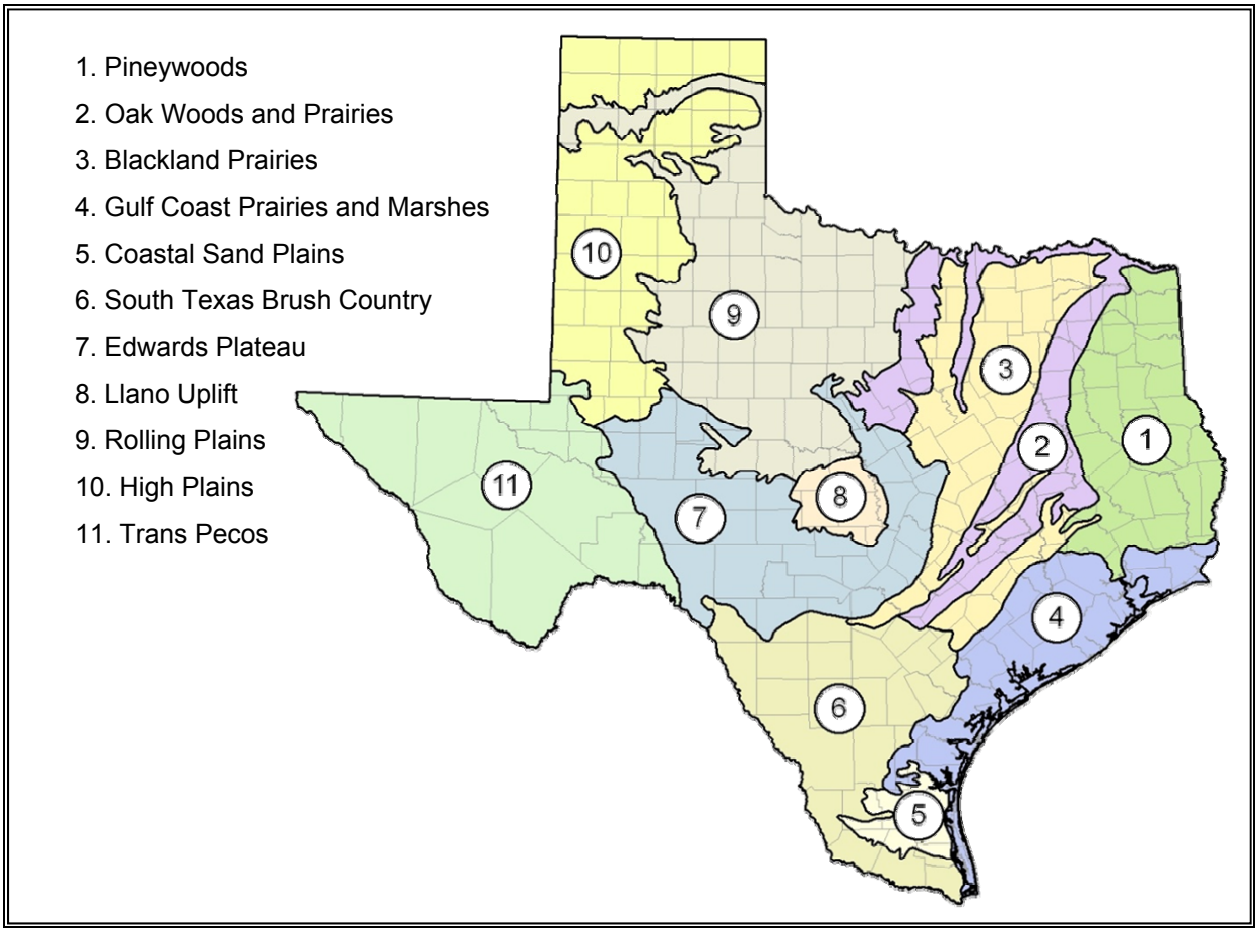
Under the Optimal Action alternative TxDOT would have more resources available for the Maintenance Program and would have more staff to patrol roadways and facilities and pick up debris, litter, and illegal dumpsites and maintain TxDOT's drainage system.

## 4.5 Vegetation

The native flora of Texas consists of more than 5,000 species. Plant groupings reflect differences in amount and frequency of rainfall, in physical and chemical constituents of soils, and the extremes in temperature. Plant species change continuously from the coastal marshes to the prairies, from the

thorny brushlands of South Texas to the grassy plains of North Texas and from the forests of East Texas to the desert shrublands of West Texas. Texas can be divided into eleven distinct ecological regions. These ecological regions of the state represent differences in soils, topography, geology, rainfall, and plant and animal communities (see **Figure 4-9**).

**FIGURE 4-9**
**ELEVEN ECOREGIONS OF TEXAS**




*Source: TPWD, 2009*

The Galveston-Port Bolivar and Port Aransas ferries are located within the Gulf Prairies and Marshes habitat type. The Gulf Prairies and Marshes habitat is a nearly level, poorly drained region bordering the Gulf of Mexico that ranges in elevation from sea level to 250 feet above sea level. The Gulf Marshes occupy the low-lying coastal areas frequently covered with saline water and vary from sea level to a few feet in elevation. The Gulf Prairies are nearly level, largely undissected plains extending from sea level to an elevation of 250 feet.

Executive Order (EO) 13112 requires federal agencies to combat the introduction or spread of invasive species. The Texas Administrative Code, Title 4, Part 1, Chapter 19, identifies noxious and invasive plants that have the serious potential to cause economic or ecological harm to the state. Noxious weeds can be defined as those plant species that would be highly destructive, competitive,

or difficult to control by cultural or mechanical practices. The United State Department of Agriculture (USDA) and the Texas State Department of Agriculture are responsible for officially designating noxious weeds. Noxious weeds and invasive species are species that by federal and state law must be controlled. The USDA lists 31 species that are officially designated as noxious.

The TPWD also defines some aquatic vegetation as "nuisance" vegetation. According to TPWD, if aquatic plants grow unchecked they can limit recreational access, restrict flow rates in canals and rivers, interfere with industrial water uses, and harm fish and wildlife. Species such as hydrilla, waterhyacinth, and giant salvinia have invaded many Texas waterways. These plants often grow rapidly, displacing more beneficial native species. TPWD focuses on stands of plants that directly affect the health and recreational use of those resources and works with other organizations to develop treatment measures that minimize harm to the environment.

### 4.5.1 Environmental Consequences

The goal of vegetation management is to maintain highway ROW vegetation in an environmentally sensitive and uniform manner consistent with the special conditions presented by local climate, topography vegetation, and level of urbanization. Vegetation management is considered an independent program (Roadside Pest Management Program) within the maintenance division. The environmental effects of this program were addressed through an Environmental Impact Statement (EIS) and Supplemental Environmental Impact Statement (SEIS) completed in 2007. Very little vegetation management work is considered under the Maintenance Program.

The primary vegetation management practice under the Bridge Maintenance Program is clearing and trimming of vegetation on and around bridge structures. Disturbance to vegetation under most individual Maintenance Programs includes crushing of roadside vegetation by vehicles driving on ROW to complete necessary maintenance.

The Customer Service Maintenance Program does include a limited amount of clearing, trimming, and mowing at rest areas, picnic areas, roadside parks, pull-outs, and parking areas; as well as the application of herbicides to noxious weeds found at these locations. The program also includes trimming vegetation along access driveways that inhibits the traveling public from seeing clearly. While these activities are part of the Customer Service Maintenance Program, TxDOT's 2007 SEIS addresses the environmental effects of all of these activities so additional discussion is not provided in this document.

Vegetation may be directly disturbed or damaged through the side casting of accumulated sediment and de-icing agents or from over spraying of de-icing agents. Indirect effects to vegetation could occur as salinity levels increase over time from the repeated application of salt containing compounds for snow and ice removal. Effects would depend on a particular plant species tolerance to salt, soil type, etc. When TxDOT creates fire breaks via grading and blading, all vegetation is removed. The removal of vegetation within the ROW for wildfire control and management

minimizes the spread of fire on to adjacent land thereby minimizing the potential for vegetation on these lands to be burned.

Indirect effects to vegetation could occur as salinity levels increase over time from the repeated application of salt containing compounds for snow and ice removal. By sweeping ice-rock from bridge decks and roadways, through the Debris and Spills Maintenance Program, it reduces the amount of salt that could be deposited on vegetation through runoff. Under the Optimal Alternative technologically advanced equipment could be used for sweeping and street sweeping could occur more frequently, therefore increasing the amount of ice-rock removed from the roadways.

Under the Drainage Maintenance Program activities such as repairing slopes and cleaning or reshaping ditches, disturbs and/or removes vegetation. These areas are re-vegetated after work is completed. This activity is covered under vegetation management, which is covered in the Roadside Pest Management Program.

The Maintenance Enhancement Program does include a limited amount of disturbance to vegetation including crushing or removing of roadside vegetation during sub-base and base preparation for adding shoulders, sidewalks, turnouts, and handicap ramps. Also, maintaining landscapes within islands or medians includes disturbing, trimming, removing or planting additional vegetation. During utility inspections within TxDOT ROW, TxDOT employees make sure utility companies and their contractors are following applicable guidelines and regulations, as outlined in the 2009 TxDOT Roadside Vegetation Manual, for spraying or trimming vegetation, including trees and bushes that may be coming into contact with overhead utilities. If utility companies or their contractors are violating any regulations, TxDOT can stop their work if necessary.

The Ferry Maintenance Program includes few if any activities or practices that affect vegetation. Dredging disturbs the soil near the ferry landings at Port Aransas and Galveston-Port Bolivar, however there is no aquatic vegetation that exists where dredging occurs. If vegetation does grow in between dredging occurrences, this vegetation is removed with the soil in order to provide adequate depth for the ferries to dock.

**Ballast:** Heavy material that is placed in the hold of a ship, aircraft, or vehicle to give stability. A common type of ballast is water ballast.

The ballast is primarily composed of water and contains stones, sediment, and a variety of living species. Ferries take in a certain amount of water to help stabilize the ferries in the water. The species carried in ballast water are mostly invasive or "nuisance" species; however, ballast water from the ferries is not released into the waters at Port Aransas or Galveston-Port Bolivar. At Galveston-Port Bolivar, ballast water is currently pumped back into the grey water system. All grey water from the Galveston-Port Bolivar ferry will soon be stored on board and transferred into the black water system at Galveston landing to be discharged into the City of Galveston wastewater system. Port Aransas does not use ballast water on a regular basis. Ballast water is used only during hurricanes and the water used in the ballast is fresh

water from the city. Once the ballast water is no longer needed, it is pumped back out into the city's sewer system.

Executive Order (EO) 13112 requires federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. TxDOT's seeding specifications have been approved by FHWA and are in compliance with EO 13112 Invasive Species and the Executive Memorandum on Environmentally and Economically Beneficial Landscape Practices. TxDOT MNT currently utilizes 76% native species in the seed mix and is conducting research projects intended to increase the availability of native species in the commercial seed market.

Transportation Code 201.607 requires TxDOT to adopt a Memorandum of Understanding (MOU) with each state agency that has responsibility for the protection of the natural environment. The memoranda adopted in 1999 (43 TAC 2.22) is still in effect today to ensure continued effective coordination of the review of the environmental effects of highway projects between TPWD and TxDOT. The MOU between TxDOT and TPWD requires TxDOT to coordinate with TPWD regarding potential effects to natural resources and measures to minimize and/or compensate for unavoidable losses of unregulated but sensitive habitats. Generally, TxDOT will interact with TPWD under the MOU through the Wildlife Habitat Assessment Program of TPWD. Due to the infrequent and isolated nature of vegetation management practices completed under the Maintenance Program, no adverse environmental effects are expected to vegetation. However, this document provides such information at the programmatic level and coordination with TPWD will occur in the future on an individual project basis.

## 4.6 Wildlife

The state of Texas is located in one of the most diverse regions of North America in terms of physiography, vegetation, climate, and wildlife habitats. The state includes a variety of terrestrial and aquatic wildlife habitats and communities ranging from dense forests in the eastern portion of the state, to sparse desert scrub in drier western regions, to grasslands in the northern portions, thornshrub in the south, and extensive marshes and prairies along the Gulf Coast. The term "wildlife" refers collectively to mammals, birds, fish, amphibians, and reptiles. According to Wild Texas, over 165 species of mammals are native to the state of Texas, as well as 213 species of reptiles and amphibians. Texas also hosts the greatest diversity of bird life in the United States with 590 native species.

Beavers (Castor canadensis) create ponds and wetlands used by waterfowl, shorebirds, muskrats, otters, fish, amphibians, aquatic plants and other living species. Beaver ponds generally slow the flow of water from drainage areas and alter silt deposition, thus altering habitat. During drought conditions, beaver ponds create water holes for livestock and wildlife, particularly waterfowl. However, their dams cause problems when they flood roads or dam canals, drainages, and culvert pipes, which inhibit water control.

From a wildlife perspective, the affected environment under either alternative of the Maintenance Program includes the area immediately adjacent to or within TxDOT's ROW or property, including rest areas, picnic areas, etc. and also ferry landing areas; which consists of the docking/loading area, TxDOT office and maintenance warehouse, storage tanks, public restroom, and parking lot. In addition to the ferry landing and associated on-land infrastructure, the affected environment also includes the waters and associated aquatic environment that the ferries travel through. Wildlife present in these areas varies by region and also according to localized habitat conditions.

### 4.6.1 Environmental Consequences

Birds often use bridges as nesting and roosting sites. Specifically barn and cliff swallows are known to construct casts on the underside of bridges during the spring. These casts generally do not pose a maintenance issue, and only bridge washing or re-painting requires removal of casts or nests.

Bats are also known to use the substructure of bridges as roosting sites. Maintenance activities can result in temporary increases in noise and also require the presence of workers and equipment to perform maintenance which may cause any roosting bats to leave the area temporarily. However, bats typically return after maintenance activities are completed and workers and equipment vacate the area.

In some cases, animal burrows may need to be removed or filled when they are located in close proximity to bridge, roadway, drainage, or other maintenance areas. Such activities would impact individuals of a particular species but would not constitute population level effects. Animals such as ants, mice, rats, snakes, and birds may nest in habitat created by concrete barriers, control boxes, bases of signal polls, and light poles. Pest management is covered under the Roadside Pest Management Final Environmental Impact Statement.

Under either alternative, maintenance activities can result in temporary increases in noise due to the presence of workers and equipment needed to perform maintenance. Maintenance activities conducted at night can also result in temporary increases in lights from the equipment that is required to perform the maintenance. Increase in noise and presence of workers may cause any wildlife, such as roosting bats or nesting birds, to leave the area temporarily. Lights from maintenance vehicles can also disturb nocturnal animals. Typically, wildlife will return after maintenance activities are completed and the heavy equipment vacates the area. However, areas where maintenance activities are performed are within the existing highway ROW and traffic noise is prevalent in these areas.

Rest areas and other roadside facilities frequently have people present as well as vehicles. Wildlife present in these areas are more accustomed to people and noise and can actually be attracted to these facilities if garbage and wastes are not managed properly. Some of the new safety rest areas and travel information centers have nature trails and areas where natural habitats are preserved to encourage wildlife use. Grading and blading fire breaks for controlling and managing wildfires

could adversely affect any ground nesting species of birds and could also affect other types of animals that cannot vacate the areas prior to the work.

Rats, snakes, mosquitoes and other pests are attracted to and populate around dumpsites, litter, and debris. Also, some wildlife can be attracted to dead animals and cause a potential for more wildlife being hit by vehicles. By clearing up illegal dumpsites, litter, debris, and roadkill, TxDOT is reducing these attractants to pests and wildlife. Under the Optimal Alternative, animal carcasses could be composted, rather than burying them or paying for disposal at a landfill.

Sodium chloride crystals (i.e., road salt) used to treat icy roads can attract birds and mammals, which can contribute to roadkills. In extreme cases, wildlife may over consume road salt causing elevated sodium levels in their blood. In contrast, magnesium chloride and calcium chloride de-icers do not attract wildlife since they lack the main chemical attractant - sodium. Acute toxicity tests show that there is slight oral toxicity when small mammals ingest chloride-containing de-icing agents. Regular sweeping of roadways and streets can reduce the amounts of de-icers on the road, thereby reducing the impacts to wildlife. The effectiveness of the sweeping equipment, the technology used in the sweeper, and the frequency of sweeping have a direct influence on the amounts of de-icers and sediments collected. The more efficient the collection of these materials, the less will be available to wildlife. Under the Optimal Alternative technologically advanced equipment could be used for sweeping and street sweeping could occur more frequently, therefore increasing the amount of de-icers and sediments removed from the roadways and reducing the amount available to wildlife.

Drainage ditches on the edge of roadways and culvert pipes offer habitat for the beaver. If a beaver dam needs to be removed, a contracted trapper is notified. In general, the removal process consists of breaking down the beaver dam and trapping any beavers that are present. Alternative solutions to beaver control could be considered when feasible, such as repellents or discouraging beaver colonies by reducing the desirability of an area, or undermining dams so they cannot hold water. Beaver ponds also create a breeding habitat for mosquitoes. Clogged drainage ditches along roads can become productive mosquito breeding sites, as well. By keeping the drainage system in working condition and removing problem beaver dams from the drainage system, it helps to eliminate this type of problem.

TxDOT and Bat Conservation International, Inc. (BCI) found that bats will roost in long culverts, such as those found beneath divided highways, especially those containing wall or ceiling cavities. Bats will also roost in covered vertical drain pipes in bridges or culverts. Typically, roosting bats do not impede water flow through the culvert; therefore they do not need to be removed. Maintenance on culverts may cause bats to vacate the area temporarily, but bats will typically return once maintenance has been completed.

Aquatic species such as fish, amphibians, insects, and water dwelling mammals require acceptable aquatic habitat and varying degrees of water quality depending on the specific species. As such,

aquatic dwelling insects, fish, reptiles, amphibians, and mammals and birds that frequent aquatic environments for foraging purposes could be indirectly impacted by any changes in water quality resulting from program activities.

As discussed in **Section 4.2** (Water Quality), by following TxDOT approved practices, impacts to underlying water bodies and fish habitat are and will continue to be minimized under either alternative of the Maintenance Program. Some Maintenance Program activities may result in temporary increases in turbidity, but such impacts would occur very infrequently and at specific isolated locations. Erosion control measures would be put into place to trap sediment within the maintenance area and therefore minimizes the amount of sediment that could find its way into nearby water bodies or segments. Lubrication of moving parts on swing bridges or draw bridges may result in the introduction of grease/lubricants into aquatic environments. Such impacts would be isolated as few of these structures exist within the State of Texas.

Maintenance Program activities may result in the disturbance of soils (e.g., sub-base and base preparation) and can indirectly affect water quality as some of the disturbed soils may enter nearby surface water bodies or percolate into groundwater. These impacts would occur very infrequently and at specific isolated locations.

The Coastal Barrier Resources Act (CBRA, Public Law 97-348) was established to address the many problems associated with coastal barrier development. CBRA designated various undeveloped coastal barriers to be included in the John H. Chafee Coastal Barrier Resources System (CBRS). These designated areas were made ineligible for both direct and indirect federal expenditures and financial assistance. CBRA had three objectives: 1) to minimize the loss of human life by discouraging development in high risk areas vulnerable to storm surges and hurricane winds; 2) to reduce wasteful expenditure of federal resources; and 3) to protect the natural resources associated with undeveloped coastal barriers. The USFWS was named the primary authority in the implementation of this Act and since limiting federally-subsidized development on designated coastal barriers, CBRA has managed to conserve valuable coastal habitat for fish and other wildlife. CBRA does not regulate how individuals develop their land on and around areas of coastal barrier, however it does direct that federal dollars not be spent for roads, wastewater systems, potable water supply, and disaster relief on designated coastal barriers. The full cost of development and rebuilding in these areas is the responsibility of the individuals who choose to live and build there. Therefore, the activities and practices conducted under the Maintenance Program would not have adverse impacts to designated coastal barriers. For projects that fall within the boundaries of the CBRS, CBRA coordination would be conducted on an individual project basis.

The Magnuson-Stevens Fishery Management and Conservation Act requires federal agencies that fund, permit, or carry out activities that may adversely impact Essential Fish Habitat (EFH) to consult with the National Marine Fisheries Service (NMFS) regarding potential impacts of their actions on EFH. TxDOT consults with NMFS for various construction projects located in or near

EFH. In terms of maintenance, the most likely effects to EFH would be from runoff that contains sediment from soil disturbing maintenance activities or runoff that contains de-icing agents. However, de-icing agents are very rarely applied in areas of the state where EFH is located. By employing BMPs during such activities TxDOT minimizes adverse effects to water quality and any associated EFH. Coordination with NMFS would be conducted on an individual project basis if there is a potential for impacts to occur.

According to the NOAA Essential Fish Habitat Mapper, Essential Fish Habitat exists at both TxDOT ferry locations. In the Galveston area, documented managed species include the bull shark (Carcharhinus leucas), bonnethead shark (Sphryna tiburo), finetooth shark (Carcharhinus isodon), blacktip shark (Carcharhinus limbatus), king mackerel (Scomberomorus cavalla), Spanish mackerel (Scomberomorus maculatus), cobia (Rachycentron canadum), 43 species of reef fish, 2 species of stone crab, red drum (Sciaenops ocellatus), and 4 species of shrimp. In the Aransas area document managed species include the lemon shark (Negaprion brevirostris), bull shark, bonnethead shark, finetooth shark, blacktip shark, sharpnose shark (Rhizoprionodon terraenovae), king mackerel, Spanish mackerel, cobia, 43 species of reef fish, 2 species of stone crab, red drum, and 4 species of shrimp.

Aside from the Endangered Species Act (ESA) of 1973 (16 USC 1531-1543) discussed in the next section of this document, other regulations also afford protection to wildlife. For example, the Migratory Bird Treaty Act (MBTA) states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, or egg in part or in whole, without a federal permit issued in accordance within the act's policies and regulations. MBTA provides for the protection of birds classified as migratory by the USFWS. The MBTA prohibits any action or future actions that may harm migratory birds. "Harm" is described as destroying active nests or roosts, or disturbing or interrupting nesting birds. Specific protection for bald and golden eagles is authorized under the Eagle Protection Act (16 USC 668), which provides additional protection to these species from intentional or unintentional harmful conduct.

Activities under the Maintenance Program conducted under either alternative would have minimal effects on migratory birds, their nests, or eggs. Some ground nesting species could be accidentally displaced, injured or killed as a result of shoulder or turnout maintenance activities but TxDOT personnel are trained to avoid disturbing birds and nests when present within a work area. Similarly, birds nesting and/or foraging in landscaped areas could also be disturbed during Maintenance Program activities that involve work in these areas. However, maintenance of these areas occurs on a frequent enough basis that birds generally avoid nesting in them so temporary displacement during the actual maintenance activities is the most likely effect. TxDOT's inspection of utility installations, removal, and repair reduces the potential for adverse effects to migratory birds as TxDOT requires utility contractors to adhere to TxDOT standards for vegetation management.

Maintenance activities under the Maintenance Program are necessary and are not likely to result in the unintentional take of migratory birds. However, in conjunction with the MBTA, TxDOT minimizes and avoids disturbance to migratory birds by:

- Not disturbing, destroying, or removing active nests during the nesting season;
- Avoiding the removal of unoccupied, inactive nests, as practicable;
- Preventing the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures;
- Not collecting, capturing, relocating, or transporting birds, eggs, young, or active nests without a permit; and
- Using non-attractive vegetation for plantings in the ROW.

TxDOT is currently investigating methods to reduce roadkill. TxDOT is evaluating the Roadkill Observation Collection System (ROC) which integrates a PDA and GPS system in order to track roadkill, which could later be used to implement strategies to reduce roadkill. In addition, TxDOT is participating in research done by the Deer-Vehicle Crash Information Clearinghouse (DVCIC) in order to reduce deer-vehicle collision through enhanced road safety practices. Under the Optimal Action Alternative, each TxDOT District would acquire relevant information regarding wildlife presence, roadkill locations, and frequency. Collection and analysis of this information would then be used to identify areas that are prone to vehicle wildlife conflicts and those areas would be targeted for treatments designed to reduce the number of incidents. Under the Optimal Action Alternative fewer conflicts between vehicles and wildlife would be expected to occur than under the Current Action alternative.

## 4.7 Threatened and Endangered Species

ESA declares the intention of Congress to protect federally-listed threatened and endangered species and designated critical habitat of such species. The ESA defines an endangered species as a species that is in danger of becoming extinct throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Species listed as candidate species are currently being reviewed to determine if they should also be protected under the ESA. USFWS is the primary regulatory agency responsible for ESA compliance.

Section 7 of the ESA requires federal agencies to consult with NMFS or the USFWS if a proposed action may affect a listed species or designated habitat of a listed species. "Action" may include funding, permitting and other regulatory actions. Section 10 of the ESA requires a federal permit from either the NMFS or USFWS if a non-federal aid project is likely to result in the "take" of a listed species. Maintenance program activities with the potential to affect federally designated threatened and endangered species are reviewed by District Environmental Coordinators and coordinated with the USFWS as required by ESA.

The Fish and Wildlife Conservation Act (16 USC 2901-2911) encourages states to develop conservation plans for non-game fish and wildlife of ecological, educational, aesthetic, cultural, recreational, economic, or scientific value. In 1973, TPWD established a list of rare and endangered animals in the state. Laws and regulations pertaining to endangered or threatened animal species are contained in Chapters 67 and 68 of the Texas Parks and Wildlife Code and Sections 65.171 - 65.176 of Title 31 of the TAC. In 1988, the department established a list of threatened and endangered plant species for the state. Laws and regulations pertaining to endangered or threatened plant species are contained in Chapter 88 of the Texas Parks and Wildlife Code and Sections 69.01 - 69.9 of the TAC.

TPWD regulations prohibit the taking, possession, transportation, or sale of any endangered or threatened species without the issuance of a permit. Regulations also prohibit commerce and the collection of threatened and endangered plants from public land without a permit issued by TPWD. Some species listed as threatened or endangered by TPWD are also listed under the USFWS federal regulations and provided additional protection.

A variety of federally-listed threatened and endangered species reside within the state of Texas. Based on the 2010 lists of threatened and endangered species from the USFWS and TPWD, there are currently 86 federally-listed threatened or endangered species and no proposed threatened or endangered species in Texas: 28 plants and 58 animals (birds, mammals, reptiles, fish, amphibians, arachnids, and insects). ESA prohibits the taking of protected species as well as the protection of critical habitat. Besides those species currently listed as endangered and threatened, there are 21 species (three plants and 18 animals) in Texas that are candidates for the endangered and threatened lists. There are also 195 (30 plants and 165 animals) state-listed species in Texas.

**Table 4-3** lists all federally and state listed species for the state of Texas. Although some of these species are not protected by the ESA, state law prohibits the taking of listed individuals. TPWD and USFWS lists of threatened and endangered species are constantly being updated based on new scientific information and changes in regulatory status.

**TABLE 4-3: FEDERALLY AND STATE LISTED THREATENED AND ENDANGERED SPECIES IN TEXAS**

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| **Mammals** | | | |
| Mexican long-nosed bat | *Leptonycteris nivalis* | E | E |
| Louisiana black bear | *Ursus americanus luteolus* | T | T |
| Gulf Coast jaguarundi | *Herpailurus (=Felis) yagouaroundi cacomitli* | E | E |
| Ocelot | *Leopardus (=Felis) pardalis* | E | E |
| Finback whale | *Balaenoptera physalus* | E | E |
| Humpback whale | *Megaptera novaeangliae* | E | E |
| West Indian manatee | *Trichechus manatus* | E | E |
| Southern yellow bat | *Lasiurus ega* | T | |
| Spotted bat | *Euderma maculatum* | T | |

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | T | |
| Texas kangaroo rat | *Dipodomys elator* | T | |
| Coues' rice rat | *Oryzomys couesi* | T | |
| Palo duro mouse | *Peromyscus truei comanche* | T | |
| Gervais' beaked whale | *Mesoplodon europaeus* | T | |
| Goose-beaked whale | *Ziphius cavirostris* | T | |
| Pygmy sperm whale | *Kogia breviceps* | T | |
| Dwarf sperm whale | *Kogia simus* | T | |
| Atlantic spotted dolphin | *Stenella frontalis* | T | |
| Rough-toothed dolphin | *Steno bredanensis* | T | |
| False killer whale | *Pseudorca crassidens* | T | |
| Short-finned pilot whale | *Globicephala macrorhynchus* | T | |
| Pygmy killer whale | *Feresa attenuate* | T | |
| Red wolf | *Canis rufus* | E | |
| Gray wolf | *Canis lupus* | E | |
| Black bear | *Ursus americanus* | T | |
| White-nosed coati | *Nasua narica* | T | |
| Margay | *Leopardus wiedii* | T | |
| Jaguar | *Panthera onca* | E | |
| **Birds** | | | |
| Whooping Crane | *Grus americana* | E | E, EXPN |
| Northern aplomado falcon | *Falco femoralis septentrionalis* | E | E |
| Southwestern willow flycatcher | *Empidonax traillii extimus* | E | E |
| Mexican spotted owl | *Strix occidentalis lucida* | T | T |
| Piping plover | *Charadrius melodus* | T | T |
| Least interior pop. tern | *Sterna antillarum* | E | E |
| Attwater's greater prairie-chicken | *Tympanuchus cupido attwateri* | E | E |
| Black-capped vireo | *Vireo atricapilla* | E | E |
| Golden-cheeked warbler (=wood) | *Dendroica chrysoparia* | E | E |
| Red-cockaded woodpecker | *Picoides borealis* | E | E |
| Yellow-billed cuckoo (Western US) | *Coccyzus americanus* | | C |
| Lesser prairie-chicken | *Tympanuchus pallidicinctus* | | C |
| Eastern brown pelican | *Pelecanus occidentalis* | E | |
| Reddish egret | *Egretta rufescens* | T | |
| White-faced ibis | *Plegadis chihi* | T | |
| Wood stork | *Mycteria Americana* | T | |
| Swallow-tailed kite | *Elanoides forficatus* | T | |
| Bald eagle | *Haliaeetus leucocephalus* | T | |
| Common black-hawk | *Buteogallus anthracinus* | T | |
| Gray hawk | *Asturina nitidus* | T | |
| White-tailed hawk | *Buteo albicaudatus* | T | |
| Zone-tailed hawk | *Buteo albonotatus* | T | |
| American peregrine falcon | *Falco peregrines anatum* | T | |
| Cactus ferruginous pygmy-owl | *Glaucidium bbrasilianum cactorum* | T | |

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| Eskimo curlew | *Numenius borealis* | E | |
| Sooty tern | *Sterna fuscata* | T | |
| Northern beardless-tyrannulet | *Camptostoma imberbe* | T | |
| Rose-throated becard | *Pachyramphus aglaiae* | T | |
| Tropical parula | *Parula pitiayumi* | T | |
| Bachman's sparrow | *Aimophila aestivalis* | T | |
| Texas Botteri's sparrow | *Aimophila botterii texana* | T | |
| Arizona Botteri's sparrow | *Aimophila botterii arizonae* | T | |
| **Fish** | | | |
| Fountain darter | *Etheostoma fonticola* | E | E |
| Devils River minnow | *Dionda diaboli* | T | T |
| Comanche Springs pupfish | *Cyprinodon elegans* | E | E |
| Leon Springs pupfish | *Cyprinodon bovinus* | E | E |
| Smalltooth sawfish | *Pristis pectinata* | E | E |
| Arkansas River shiner | *Notropis girardi* | T | T |
| Big Bend gambusia | *Gambusia gaigei* | E | E |
| Clear Creek gambusia | *Gambusia heterochir* | E | E |
| Pecos gambusia | *Gambusia nobilis* | E | E |
| San Marcos gambusia | *Gambusia georgei* | E | E |
| Sharpnose shiner | *Notropis oxyrhynchus* | | C |
| Smalleye shiner | *Notropis buccula* | | C |
| Rio Grande cutthroat trout | *Oncorhynchus clarki virginalis* | | C |
| Shovelnose sturgeon | *Scaphirhynchus platorynchus* | T | |
| Paddlefish | *Polyodon spathula* | T | |
| Mexican stoneroller | *Campostoma ornatum* | T | |
| Rio Grande chub | *Gila Pandora* | T | |
| Rio Grande silvery minnow | *Hybognathus amarus* | E | |
| Bluehead shiner | *Pteronotropis hubbsi* | T | |
| Chihuahua shiner | *Notropis Chihuahua* | T | |
| Bluntnose shiner | *Notropis simus* | T | |
| Proserpine shiner | *Cyprinella Proserpina* | T | |
| Blue sucker | *Cycleptus elongates* | T | |
| Creek chubsucker | *Erimyzon oblongus* | T | |
| Toothless blindcat | *Trogloglanis pattersoni* | T | |
| Widemouth blindcat | *Satan eurystomus* | T | |
| Conchos pupfish | *Cyprinodon eximius* | T | |
| Pecos pupfish | *Cyprinodon pecosensis* | T | |
| Blotched gambusia | *Gambusia senilis* | T | |
| San Felipe Gambusia | *Gambusia clarkhubbsi* | T | |
| Rio Grande darter | *Etheostoma graham* | T | |
| Blackside darter | *Percina maculate* | T | |
| Opossum pipefish | *Microphis brachyurus* | T | |
| River goby | *Awaous banana* | T | |
| Mexican goby | *Ctenogobius claytonia* | T | |

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| **Crustaceans** | | | |
| Peck's cave amphipod | *Stygobromus (=Stygonectes) pecki* | E | E |
| Diminutive amphipod | *Gammarus hyalleloides* | | C |
| **Snails/Mollusks** | | | |
| Pecos assiminea snail | *Assiminea pecos* | E | E |
| Diamond Y Spring snail | *Pseudotryonia (=Tryonia) adamantina* | | C |
| Phantom Cave snail | *Cochliopa texana* | | C |
| Phantom springsnail (=Tryonia) | *Tryonia cheatumi* | | C |
| Gonzales springsnail | *Tryonia circumstriata(=stocktonensis)* | | C |
| Texas hornshell | *Popenaias popei* | T | C |
| Texas pigtoe | *Fusconaia askewi* | T | |
| Triangle pigtoe | *Fusconaia lananensis* | T | |
| Texas fatmucket | *Lampsilis bracteata* | T | |
| Sandbank pocketbook | *Lampsilis satura* | T | |
| Southern hickorynut | *Obovaria jacksoniana* | T | |
| Louisiana pigtoe | *Pleurobema riddellii* | T | |
| Texas Heelsplitter | *Potamilus amphichaenus* | T | |
| Salina mucket | *Potamilus metnecktayi* | T | |
| Golden orb | *Quadrula aurea* | T | |
| Smooth pimpleback | *Quadrula houstonensis* | T | |
| Texas pimpleback | *Quadrula petrina* | T | |
| False spike | *Quadrula mitchelli* | T | |
| Mexican fawnsfoot | *Truncilla cognate* | T | |
| Texas fawnsfoot | *Truncilla macrodon* | T | |
| **Reptiles** | | | |
| Green sea turtle | *Chelonia mydas* | T | T, E |
| Hawksbill sea turtle | *Eretmochelys imbricata* | E | E |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | E | E |
| Leatherback sea turtle | *Dermochelys coriacea* | E | E |
| Loggerhead sea turtle | *Caretta caretta* | T | T |
| Concho water snake | *Nerodia paucimaculata* | T | T |
| Louisiana pine snake | *Pituophis ruthveni* | T | C |
| Dunes sagebrush lizard | *Sceloporus arenicolus* | | C |
| Alligator snapping turtle | *Macrochelys temminckii* | T | |
| Cagle's map turtle | *Graptemys caglei* | T | |
| Chihuahuan mud turtle | *Kinosternon hirtipes murrayi* | T | |
| Texas tortoise | *Gopherus berlandieri* | T | |
| Reticulated gecko | *Coleonyx reticulates* | T | |
| Reticulate collared lizard | *Crotaphytus reticulates* | T | |
| Texas horned lizard | *Phrynosoma cornutum* | T | |
| Mountain short-horned lizard | *Phrynosoma hernandesi* | T | |
| Scarlet snake | *Cemophora coccinea* | T | |
| Black-striped snake | *Coniophanes imperialis* | T | |
| Texas Indigo snake | *Drymarchon melanurus erebennus* | T | |

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| Speckled racer | *Drymobius margaritiferus* | T | |
| Northern cat-eyed snake | *Leptodeira septentrionalis* | T | |
| Brazos water snake | *Nerodia harteri* | T | |
| Smooth green snake | *Liochiorophis vernalis* | T | |
| Trans-Pecos black-headed snake | *Tantilla cucullata* | T | |
| Chihuahuan desert lyre snake | *Trimorphodon vilkinsonii* | T | |
| Timber (Canebrake) rattlesnake | *Crotalus horridus* | T | |
| **Amphibians** | | | |
| Barton Springs salamander | *Eurycea sosorum* | E | E |
| San Marcos salamander | *Eurycea nana* | T | T |
| Texas blind salamander | *Typhlomolge rathbuni* | E | E |
| Houston toad | *Bufo houstonensis* | E | E |
| Austin blind salamander | *Eurycea waterlooensis* | | C |
| Georgetown salamander | *Eurycea naufragia* | | C |
| Jollyville plateau salamander | *Eurycea tonkawae* | | C |
| Salado salamander | *Eurycea chisholmensis* | | C |
| Cascade caverns salamander | *Eurycea latitans* | T | |
| Comal blind salamander | *Eurycea tridentifera* | T | |
| Blanco blind salamander | *Eurycea robusta* | T | |
| Black-spotted newt | *Notophthalmus meridonalis* | T | |
| South Texas siren (large form) | Siren sp.1 | T | |
| Mexican treefrog | Smilisca baudinii | T | |
| White-lipped frog | Leptodactylus fragilis | T | |
| Sheep frog | Hypopachus variolosus | T | |
| Mexican burrowing toad | Rhinophrynus dorsalis | T | |
| **Insects** | | | |
| American burying beetle | *Nicrophorus americanus* | | E |
| Coffin cave mold beetle | *Batrisodes texanus* | | E |
| Comal Springs dryopid beetle | *Stygoparnus comalensis* | | E |
| Comal Springs riffle beetle | *Heterelmis comalensis* | | E |
| Helotes mold beetle | *Batrisodes venyivi* | | E |
| Kretschmarr Cave mold beetle | *Texamaurops reddelli* | | E |
| Tooth Cave ground beetle | *Rhadine persephone* | | E |
| Unnamed ground beetle | *Rhadine exilis* | | E |
| Unnamed ground beetle | *Rhadine infernalis* | | E |
| **Arachnids** | | | |
| Bee Creek Cave harvestman | *Texella reddelli* | | E |
| Bone Cave harvestman | *Texella reyesi* | | E |
| Cokendolpher Cave harvestman | *Texella cokendolpheri* | | E |
| Braken bat cave Meshweaver | *Cicurina venii* | | E |
| Government Canyon bat cave meshweaver | *Cicurina vespera* | | E |
| Madla's cave meshweaver | *Cicurina madla* | | E |
| Robber Baron cave meshweaver | *Cicurina baronia* | | E |
| Tooth cave pseudoscorpion | *Tartarocreagris texana* | | E |

| Common Name | Scientific Name | State Listing[1] | Federal Listing[1] |
|---|---|---|---|
| Government Canyon bat cave spider | *Neoleptoneta microps* | | E |
| Tooth cave spider | *Leptoneta myopica* | | E |
| Warton cave meshweaver | *Cicurina wartoni* | | C |
| **Plants** | | | |
| South Texas ambrosia | *Ambrosia cheiranthifolia* | E | E |
| Texas Ayenia | *Ayenia limitaris* | E | E |
| White bladderpod | *Lesquerella pallida* | E | E |
| Zapata bladderpod | *Lesquerella thamnophila* | E | E |
| Black lace cactus | *Echinocereus reichenbachii var. albertii* | E | E |
| Chisos Mountain hedgehog cactus | *Echinocereus chisoensis var. chisoensis* | T | T |
| Lloyd's mariposa cactus | *Echinomastus mariposensis* | T | T |
| Nellie cory catus | *Coryphantha minima* | E | E |
| Sneed pincushion cactus | *Coryphantha sneedii var. sneedii* | E | E |
| Star cactus | *Astrophytum asterias* | E | E |
| Tobusch fishhook cactus | *Ancistrocactus tobuschii* | E | E |
| Terlingua Creek Cat's-eye | *Cryptantha crassipes* | E | E |
| Bunched cory cactus | *Coryphantha ramillosa* | T | T |
| Texas prairie dawn-flower | *Hymenoxys texana* | E | E |
| Ashy dogweed | *Thymophylla tephroleuca* | E | E |
| Johnston's frankenia | *Frankenia johnstonii* | E | E |
| Navasota ladies'-tresses | *Spiranthes parksii* | E | E |
| Walker's manioc | *Manihot walkerae* | E | E |
| Hinckley oak | *Quercus hinckleyi* | T | T |
| Texas trailing phlox | *Phlox nivalis ssp. texensis* | E | E |
| Davis' green pitaya | *Echinocereus viridiflorus var. davisii* | E | E |
| Little Aguja pondweed (=creek) | *Potamogeton clystocarpus* | E | E |
| Texas poppy-mallow | *Callirhoe scabriuscula* | E | E |
| Slender rush-pea | *Hoffmannseggia tenella* | E | E |
| Large-fruited sand-verbana | *Abronia macrocarpa* | E | E |
| Texas snowbells | *Styrax texanus* | E | E |
| Pecos Sunflower (=puzzle, =paradox) | *Helianthus paradoxus* | T | T |
| Texas wild-rice | *Zizania texana* | E | E |
| Guadalupe fescue | *Festuca ligulata* | | C |
| Texas golden gladecress | *Leavenworthia texana* | | C |
| Neches River rose-mallow | *Hibiscus dasycalyx* | | C |
| Earth fruit | *Geocarpon minimum* | T | |

Note: [1] E = Endangered; T = Threatened; C = Candidate; EXPN = Experimental Population, Non-Essential
*Source: USFWS and TPWD, 2010*

In terms of the Maintenance Program, the affected environment for threatened and endangered species and state-listed sensitive species includes the area immediately adjacent to or within TxDOT's ROW or property, including rest areas, picnic areas, etc. and also ferry landing areas; which consists of the docking/loading area, TxDOT office and maintenance warehouse, storage tanks, public restroom, and parking lot. In addition to the ferry landing and associated on-land

infrastructure, the affected environment also includes the waters and associated aquatic environment that the ferries travel through.

### 4.7.1 Environmental Consequences

Maintenance activities conducted under either alternative within TxDOT ROW has the potential to impact federal or state-listed species. TxDOT MNT works closely with TxDOT's Environmental Affairs Division (ENV) and the District Environmental Coordinators to prevent any adverse impacts on federally and state-listed species that occur within TxDOT ROW. **Table 4-4** lists all federally and state-listed threatened and endangered species as well as species of concern known to occur in or near TxDOT ROW for each of the TxDOT districts.

**TABLE 4-4: FEDERALLY AND STATE-LISTED THREATENED AND ENDANGERED SPECIES KNOWN TO OCCUR IN OR NEAR TXDOT ROW**

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| Abilene | Brazos watersnake | *Nerodia harteri* | | T | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas horned lizard | *Phrynnosoma cornutum* | | T | |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Prairie Dog Towns | | | | |
| Amarillo | Arkansas River shiner | *Notropis girardi* | LT | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Mountain Plover | *Charadrius montanus* | PT | | |
| | Palo Duro mouse | *Peromyscus truei comanche* | | T | |
| | Blue Grama-Buffalograss Series | *Bouteloua gracilis-Buchloe dactyloides* | | | S3 |
| | Cottonwood-Tallgrass Series | *Populus deltoides-Andropogon gerardii* | | | S2 |
| | Havard Shin Oak-Tallgrass Series | *Quercus havardii-Schizachyrium scoparium* | | | S3 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Sideoats Grama Series | *Bouteloua curtipendula* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| | Prairie Dog Towns | | | | |
| Atlanta | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Bluehead shiner | *Pteronotropis hubbsi* | | T | |
| | Earth fruit | *Geocarpon minimum* | LE | E | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Neches River rose-mallow | *Hibiscus dasycalyx* | C | | |
| | Northern scarlet snake | *Cemophora coccinea copei* | | T | |
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Southern hickorynut | *Obovaria jacksoniana* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | Bald Cypress-Water Tupelo Series | *Taxodium distichum-Nyssa aquatica* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| **Atlanta** | Colonial Waterbird Rookeries | | | | |
| **Austin** | Auston blind salamander | *Eurycea waterlooensis* | C | | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Barton Springs salamander | *Eurycea sosorum* | LE | E | |
| | Cagle's map turtle | *Graptemys caglei* | | T | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Fountain darter | *Etheostoma fonticola* | LE | E | |
| | Georgetown salamander | *Eurycea naufragia* | C | | |
| | Golden orb | *Quadrula aurea* | | T | |
| | Jolleyville Plateau salamander | *Eurycea tonkaewae* | C | | |
| | Karst invertebrates | | LE | | |
| | San Marcos salamander | *Eurycea nana* | LE | E | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas blind salamander | *Eurycea rathbuni* | LE | E | |
| | Texas fatmucket | *Lampsilis bracteata* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas pimpleback | *Quadrula petrina* | | T | |
| | Timber/Canebrake rattlesnake | *Crotalus horridus* | | T | |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Plateau Live Oak-Little Bluestem Series | *Quercus fusiformis-Schizachyrium scoparium* | | | S3 |
| | Sideoats Grama Series | *Bouteloua curtipendula* | | | |
| | Sphagnum-Beakrush Series | *Sphagnum* spp.-*Rhynchospora* spp. | | | S2 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Bat and Invertebrate Caves | | | | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| Beaumont | Bachman's Sparrow | *Aimophila aestivalis* | | T | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |
| | Louisiana pine snake | *Pituophis ruthveni* | C | T | |
| | Northern scarlet snake | *Cemophora coccinea copei* | | T | |
| | Piping Plover | *Charadrius melodus* | LT | T | |
| | Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | T | |
| | Red-cockaded Woodpecker | *Picoides borealis* | LE | E | |
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Smooth green snake | *Liochlorophis vernalis* | | T | |
| | Southern hickorynut | *Obovaria jacksoniana* | | T | |
| | Swallow-tailed Kite | *Elanoides forficatus* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | American Beech-Southern Magnolia Series | *Fagus grandifolia-Magnolia grandiflora* | | | S2 |
| | Baldcypress-Water Tupelo Series | *Taxodium distichum-Nyssa aquatica* | | | S3 |
| | Bluejack Oak-Longleaf Pine Series | *Quercus incana-Pinus palustris* | | | S2 |
| | Little Bluestem-Brownseed Paspalum Series | *Schizachyrium scoparium-Paspalum plicatulum* | | | S2 |
| | Little Bluestem-Nuttall's Rayless Golden-rod Series | *Schizachyrium scoparium-Bigelowia nuttallii* | | | S3 |
| | Longleaf Pine-Beakrush Series | *Pinus palustris-Rhynchospora* spp. | | | S2 |
| | Longleaf Pine-Little Bluestem Series | *Pinus palustris-Schizachyrium scoparium* | | | S2 |
| | Rush-Sedge Series | *Juncus* spp. | | | S3 |
| | Sea Oats-Bitter Panicum Series | *Uniola paniculata-Panicum amarum* | | | S3 |
| | Seacoast Bluestem-Gulfdune Paspalum Series | *Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum* | | | S3 |
| | Sphagnum-Beakrush Series | *Sphagnum* spp.-*Rhynchospora* spp. | | | S2 |
| | Swamp Chestnut Oak-Willow Oak Series | *Quercus prinus-Quercus phellos* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| | Migratory Songbird Fallout Sites | | | | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| Brownwood | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Concho water snake | *Nerodia paucimaculata* | LT | | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Smalleye shiner | *Notropis buccula* | C | T | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fatmucket | *Lampsilis bracteata* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas pimpleback | *Quadrula petrina* | | T | |
| | Plateau Live Oak-Little Bluestem Series | *Quercus fusiformis-Schizachyrium scoparium* | | | S3 |
| | Sideoats Grama Series | *Bouteloua curtipendula* | | | S3 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| Bryan | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Large-fruited sand verbena | *Abronia macrocarpa* | LE | E | |
| | Louisiana pine snake | *Pituophis ruthveni* | C | T | |
| | Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | T | |
| | Red-cockaded Woodpecker | *Picoides borealis* | LE | E | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | Timber (Canebrake) rattlesnake | *Crotalus horridus* | | T | |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Bat Roosts | | | | |
| | Colonial Waterbird Rookeries | | | | |
| Childress | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Palo Duro mouse | *Peromyscus truei comanche* | | T | |
| | Sharpnose shiner | *Notropis oxyrhynchus* | C | | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas kangaroo rat | *Dipodomys elator* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Blue Grama-Buffalograss Series | *Bouteloua gracilis-Buchloe dactyloides* | | | S3 |
| | Cottonwood-Tallgrass Series | *Populus deltoides-Andropogon gerardii* | | | S2 |
| | Havard Shin Oak-Tallgrass Series | *Quercus havardii-Schizachyrium scoparium* | | | S3 |
| | Sideoats Grama Series | *Bouteloua curtipendula* | | | S3 |
| | Prairie Dog Towns | | | | |
| **Corpus Christi** | Atlantic hawksbill sea turtle | *Eretmochelys imbricata* | LE | E | |
| | Attwater's Greater Prairie-Chicken | *Tympanuchus cupido attwateri* | LE | E | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Black lace cactus | *Echinocereus reichenbachii* var. *albertii* | LE | E | |
| | Black-spotted newt | *Notophthalmus meridionalis* | | T | |
| | Brown Pelican | *Pelecanus occidentalis* | LE, PDL | E | |
| | Golden orb | *Quadrula aurea* | | T | |
| | Green sea turtle | *Chelonia mydas* | LT | T | |
| | Kemp's Ridley sea turtle | *Lepidochelys kempii* | LE | E | |
| | Loggerhead sea turtle | *Caretta caretta* | LT | T | |
| | Peregrine Falcon | *Falco peregrinus* | | T | |
| | Piping Plover | *Charadrius melodus* | LT | T | |
| | Sheep frog | *Hypopachus variolosus* | | T | |
| | South Texas siren (large form) | *Siren* sp. 1 | | T | |
| | Southern yellow bat | *Lasiurus ega* | | T | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas indigo snake | *Drymarchon melanurus erebennus* | | T | |
| | Texas scarlet snake | *Cemophora coccinea lineri* | | T | |
| | Texas tortoise | *Gopherus berlandieri* | | T | |
| | West Indian manatee | *Trichechus manatus* | LE | E | |
| | White-tailed Hawk | *Buteo albicaudatus* | | T | |
| | Whooping Crane | *Grus americana* | LE | E | |
| | Cane Bluestem-False Rhodesgrass Series | *Bothriochloa barbinodis-Chloris pluriflora* | | | S3 |
| | Coastal Live Oak-Pecan Series | *Quercus virginiana-Carya illinoensis* | | | S3 |
| | Coastal Live Oak-Redbay Series | *Quercus virginiana-Persea borbonia* | | | S3 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Sea Oats-Bitter Panicum Series | *Uniola paniculata-Panicum amarum* | | | S3 |
| | Seacoast Bluestem-Gulfdune Paspalum Series | *Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| **Dalllas** | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Gammagrass-Switchgrass Series | *Tripsacum dactyloides-Panicum virgatum* | | | S1 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Colonial Waterbird Rookeries | | | | |
| **El Paso** | American Peregrine Falcon | *Falco peregrinus anatum* | | T | |
| | Big Bend gambusia | *Gambusia gaigei* | LE | E | |
| | Bunched cory cactus | *Coryphantha ramillosa* ssp. *ramillosa* | LT | T | |
| | Chihuahua shiner | *Notropis chihuahua* | | T | |
| | Chihuahuan mud turtle | *Kinosternon hirtipes murrayi* | | T | |
| | Chisos Mountains hedgehog cactus | *Echinocereus chisoensis* var. *chisoensis* | LT | T | |
| | Comanche Springs pupfish | *Cyprinodon elegans* | LE | E | |
| | Common Black-Hawk | *Buteogallus anthracinus* | | T | |
| | Conchos pupfish | *Cyprinodon eximius* | | T | |
| | Davis' green pitaya | *Echinocereus davisii* | LE | E | |
| | Little Aguja pondweed | *Potamogeton clystocarpus* | LE | E | |
| | Mexican long-nosed bat | *Leptonycteris nivalis* | LE | E | |
| | Mexican Spotted Owl | *Strix occidentalis lucida* | LT | T | |
| | Mexican stoneroller | *Campostoma ornatum* | | T | |
| | Mountain Plover | *Charadrius montanus* | PT | | |
| | Mountain short-horned lizard | *Phrynosoma hernandesi* | | T | |
| | Pecos gambusia | *Gambusia nobilis* | LE | E | |
| | Pecos pupfish | *Cyprinodon pecosensis* | | T | |
| | Phantom Cave snail | *Cochliopa texana* | C | | |
| | Phantom Cave snail | *Cochliopa texana* | C | | |
| | Reticulated gecko | *Coleonyx reticulatus* | | T | |
| | Rio Grande chub | *Gila pandora* | | T | |
| | Salina mucket | *Potamilus metnecktayi* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Sneed's pincushion cactus | *Escobaria sneedii* var. *sneedii* | LE | E | |
| | Spotted bat | *Euderma maculatum* | | T | |
| | Terlingua Creek cat's-eye | *Cryptantha crassipes* | LE | E | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas hornshell | *Popenaias popeii* | C | T | |
| | Trans-Pecos black-headed snake | *Tantilla cucullata* | | T | |
| | Zone-tailed Hawk | *Buteo albonotatus* | | T | |
| | Cottonwood-Willow Series | *Populus* spp.-*Salix* spp. | | | S3 |
| | New Mexico Little Bluestem Series | *Schizachyrium scoparium* var. *neomexicanum* | | | S3 |
| | Ponderosa Pine Series | *Pinus ponderosa* | | | S3 |
| | Sideoats Grama-Black Grama Series | *Bouteloua curtipendula-Bouteloua eriopoda* | | | S3 |
| | Velvet Ash-Willow Series | *Fraxinus velutina-Salix* spp. | | | S2 |
| | Bat roost | | | | |
| | Prairie dog town | | | | |
| **Fort Worth** | Brazos water snake | *Nerodia harteri* | | T | |
| | Sharpnose shiner | *Notropis oxyrhynchus* | C | | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Plateau Live Oak-Little Bluestem Series | *Quercus fusiformis-Schizachyrium scoparium* | | | S3 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| **Houston** | Alligator snapping turtle | *Macrochelys temminckii* | | T | |
| | Attwater's Greater Prairie-chicken | *Tympanuchus cupido attwateri* | LE | E | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Green sea turtle | *Chelonia mydas* | LT | T | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |
| | Mountain Plover | *Charadrius montanus* | PT | | |
| | Piping Plover | *Charadrius melodus* | LT | T | |
| | Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | T | |
| | Red-cockaded Woodpecker | *Picoides borealis* | LE | E | |
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Smooth green snake | *Liochlorophis vernalis* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Texas prairie dawn | *Hymenoxys texana* | LE | E | |
| | Whooping Crane | *Grus americana* | LE | E | |
| | Coastal Live Oak-Pecan Series | *Quercus virginiana-Carya illinoensis* | | | S3 |
| | Gammagrass-Switchgrass Series | *Tripsacum dactyloides-Panicum virgatum* | | | S1 |
| | Little Bluestem-Brownseed Paspalum Series | *Schizachyrium scoparium-Paspalum plicatulum* | | | S2 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Sea Oats-Bitter Panicum Series | *Uniola paniculata-Panicum amarum* | | | S3 |
| | Seacoast Bluestem-Gulfdune Paspalum Series | *Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| | Migratory songbird fallout site | | | | |
| **Laredo** | Black lace cactus | *Echinocereus reichenbachii* var. *albertii* | LE | E | |
| | Conchos pupfish | *Cyprinodon eximius* | | T | |
| | Devils River minnow | *Dionda diaboli* | LT | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Johnston's frankenia | *Frankenia johnstonii* | LE, PDL | E | |
| | Mexican fawnsfoot mussel | *Truncilla cognata* | | T | |
| | Northern Aplomado Falcon | *Falco femoralis septentrionalis* | LE | E | |
| | Proserpine shiner | *Cyprinella proserpina* | | T | |
| | Reticulate collared lizard | *Crotaphytus reticulatus* | | T | |
| | Rio Grande darter | *Etheostoma grahami* | | T | |
| | Salina mucket | *Potamilus metnecktayi* | | T | |
| | Sheep frog | *Hypopachus variolosus* | | T | |
| | South Texas siren (large form) | *Siren* sp. 1 | | T | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas hornshell | *Popenaias popeii* | C | T | |
| | Texas indigo snake | *Drymarchon melanurus erebennus* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Texas tortoise | *Gopherus berlandieri* | | T | |
| | Trans-Pecos black-headed snake | *Tantilla cucullata* | | T | |
| | Tropical Parula | *Parula pitiayumi* | | T | |
| | Walker's manioc | *Manihot walkerae* | LE | E | |
| | Zone-tailed Hawk | *Buteo albonotatus* | | T | |
| | Cane Bluestem-False Rhodesgrass Series | *Bothriochloa barbinodis-Chloris pluriflora* | | | S3 |
| | Plateau Live Oak-Curlymesquite Series | *Quercus fusiformis-Hilaria belangeri* | | | S3 |
| | Bat cave | | | | |
| **Lubbock** | Texas horned lizard | *Phrynnosoma cornutum* | | T | |
| | Prairie Dog Towns | | | | |
| **Lufkin** | Bachman's Sparrow | *Aimophila aestivalis* | | T | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |
| | Louisiana pine snake | *Pituophis ruthveni* | C | T | |
| | Neches River rose-mallow | *Hibiscus dasycalyx* | C | | |
| | Northern scarlet snake | *Cemophora coccinea copei* | | T | |
| | Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | T | |
| | Red-cockaded Woodpecker | *Picoides borealis* | LE | E | |
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Southern hickorynut | *Obovaria jacksoniana* | | T | |
| | Texas golden gladecress | *Leavenworthia texana* | C | | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | Texas prairie dawn | *Hymenoxys texana* | LE | E | |
| | Triangle pigtoe | *Fusconaia lananensis* | | T | |
| | White bladderpod | *Physaria pallida* | LE | E | |
| | American Beech-Southern Magnolia Series | *Fagus grandifolia-Magnolia grandiflora* | | | S2 |
| | American Beech-White Oak Series | *Fagus grandifolia-Quercus alba* | | | S2 |
| | Baldcypress-Water Tupelo Series | *Taxodium distichum-Nyssa aquatica* | | | S3 |
| | Bluejack Oak-Longleaf Pine Series | *Quercus incana-Pinus palustris* | | | S2 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Longleaf Pine-Little Bluestem Series | *Pinus palustris-Schizachyrium scoparium* | | | S2 |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Sphagnum-Beakrush Series | *Sphagnum spp.-Rhynchospora* spp. | | | S2 |
| | Swamp Chestnut Oak-Willow Oak Series | *Quercus prinus-Quercus phellos* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| **Odessa** | Bunched cory cactus | *Coryphantha ramillosa* ssp. *ramillosa* | LT | T | |
| | Comanche Springs pupfish | *Cyprinodon elegans* | LE | E | |
| | Diamond Y Spring snail | *Pseudotryonia adamantina* | C | | |
| | Dune sagebrush lizard | *Sceloporus arenicolus* | PE | | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Gonzales Spring snail | *Tryonia circumstriata* | C | | |
| | Leon Springs pupfish | *Cyprinodon bovinus* | LE | E | |
| | Pecos assiminea snail | *Assiminea pecos* | LE | E | |
| | Pecos gambusia | *Gambusia nobilis* | LE | E | |
| | Pecos pupfish | *Cyprinodon pecosensis* | | T | |
| | Pecos sunflower | *Helianthus paradoxus* | LT | T | |
| | Phantom Cave snail | *Cochliopa texana* | C | T | |
| | Phantom Cave Spring tryonia | *Tryonia cheatumi* | C | | |
| | Proserpine shiner | *Cyprinella proserpina* | | T | |
| | Rio Grande darter | *Etheostoma grahami* | | T | |
| | Salina mucket | *Potamilus metnecktayi* | | T | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas hornshell | *Popenaias popeii* | C | T | |
| | Trans-Pecos black-headed snake | *Tantilla cucullata* | | T | |
| | Alkali Sacaton-Four-wing Saltbush Series | *Sporobolus airoides-Atriplex canescens* | | | S3 |
| | Havard Shin Oak-Tallgrass Series | *Quercus havardii-Schizachyrium scoparium* | | | S3 |
| | Saltgrass-Olney Bulrush Series | *Distichlis spicata-Scirpus olneyi* | | | S2 |
| | Prairie Dog Towns | | | | |
| **Paris** | Alligator snapping turtle | *Macrochelys temminckii* | | T | |
| | American burying beetle | *Nicrophorus americanus* | LE | | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Ouachita rock pocketbook | *Arkansia wheeleri* | LE | | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Texas heelsplitter | *Potamilus amphichaenus* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | Gammagrass-Switchgrass Series | *Tripsacum dactyloides-Panicum virgatum* | | | S1 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Silveanus Dropseed Series | *Sporobolus silveanus* | | | S2 |
| | Sphagnum-Beakrush Series | *Sphagnum spp.-Rhynchospora* spp. | | | S2 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| **Pharr** | Black-spotted newt | *Notophthalmus meridionalis* | | T | |
| | Black-striped snake | *Coniophanes imperialis* | | T | |
| | Cactus Ferruginous Pygmy-owl | *Glaucidium brasilianum cactorum* | | T | |
| | Gray Hawk | *Asturina nitida* | | T | |
| | Green sea turtle | *Chelonia mydas* | LT | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Johnston's frankenia | *Frankenia johnstonii* | LE, PDL | E | |
| | Kemp's Ridley sea turtle | *Lepidochelys kempii* | LE | E | |
| | Loggerhead sea turtle | *Caretta caretta* | LT | T | |
| | Mexican burrowing toad | *Rhinophrynus dorsalis* | | T | |
| | Mexican fawnsfoot mussel | *Truncilla cognata* | | T | |
| | Mexican treefrog | *Smilisca baudinii* | | T | |
| | Northern Aplomado Falcon | *Falco femoralis septentrionalis* | LE | E | |
| | Northern cat-eyed snake | *Leptodeira septentrionalis septentrionalis* | | T | |
| | Ocelot | *Leopardus pardalis* | LE | E | |
| | Peregrine Falcon | *Falco peregrinus* | | T | |
| | Piping Plover | *Charadrius melodus* | LT | T | |
| | Reticulate collared lizard | *Crotaphytus reticulatus* | | T | |
| | Rio Grande silvery minnow | *Hybognathus amarus* | LE | E | |
| | River goby | *Awaous banana* | | T | |
| | Rose-throated becard | *Pachyramphus aglaiae* | | T | |
| | Salina mucket | *Potamilus metnecktayi* | | T | |
| | Sheep frog | *Hypopachus variolosus* | | T | |
| | South Texas siren (large form) | *Siren* sp. 1 | | T | |
| | Southern yellow bat | *Lasiurus ega* | | T | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Speckled racer | *Drymobius margaritiferus* | | T | |
| | Star cactus | *Astrophytum asterias* | LE | E | |
| | Texas ayenia | *Ayenia limitaris* | LE | E | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas hornshell | *Popenaias popeii* | C | T | |
| | Texas indigo snake | *Drymarchon melanurus erebennus* | | T | |
| | Texas scarlet snake | *Cemophora coccinea lineri* | | T | |
| | Texas tortoise | *Gopherus berlandieri* | | T | |
| | White-lipped frog | *Leptodactylus fragilis* | | T | |
| | White-nosed coati | *Nasua narica* | | T | |
| | White-tailed Hawk | *Buteo albicaudatus* | | T | |
| | Cane Bluestem-False Rhodesgrass Series | *Bothriochloa barbinodis-Chloris pluriflora* | | | S3 |
| | Sea Oats-Bitter Panicum Series | *Uniola paniculata-Panicum amarum* | | | S3 |
| | Seacoast Bluestem-Gulfdune Paspalum Series | *Schizachyrium scoparium* var. *littoralis-Paspalum monostachyum* | | | S3 |
| | Texas Ebony-Anacua Series | *Pithecellobium ebano-Ehretia anacua* | | | S1 |
| | Texas Ebony-Snake-eyes Series | *Pithecellobium ebano-Phaulothamnus spinescens* | | | S2 |
| | Texas Palmetto Series | *Sabal texana* | | | S1 |
| | Colonial Waterbird Rookeries | | | | |
| **San Angelo** | Clear Creek gambusia | *Gambusia heterochir* | LE | E | |
| | Common Black-Hawk | *Buteogallus anthracinus* | | T | |
| | Concho water snake | *Nerodia paucimaculata* | LT | | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Pecos pupfish | *Cyprinodon pecosensis* | | T | |
| | Proserpine shiner | *Cyprinella proserpina* | | T | |
| | Rio Grande darter | *Etheostoma grahami* | | T | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fatmucket | *Lampsilis bracteata* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas horned lizard | *Phrynosoma cornutum* | | T | |
| | Texas pimpleback | *Quadrula petrina* | | T | |
| | Texas snowbells | *Styrax platanifolius* ssp. *texanus* | LE | E | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Curlymesquite-Sideoats Grama Series | *Hilaria belangeri-Bouteloua curtipendula* | | | S3 |
| | Lacey Oak Series | *Quercus glaucoides* | | | S3 |
| | Sideoats Grama Series | *Bouteloua curtipendula* | | | S3 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| | Prairie dog towns | | | | |
| **San Antonio** | Cagle's map turtle | *Graptemys caglei* | | T | |
| | Cascade Caverns salamander | *Eurycea latitans* complex | | T | |
| | Comal blind salamander | *Eurycea tridentifera* | | T | |
| | Comal Springs riffle beetle | *Heterelmis comalensis* | LE | | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Fountain darter | *Etheostoma fonticola* | LE | E | |
| | Golden orb | *Quadrula aurea* | | T | |
| | Karst invertebrates | | LE | | |
| | Mountain Plover | *Charadrius montanus* | PT | | |
| | Reticulate collared lizard | *Crotaphytus reticulatus* | | T | |
| | Texas fatmucket | *Lampsilis bracteata* | | T | |
| | Texas horned lizard | *Phrymnosoma cornutum* | | T | |
| | Texas indigo snake | *Drymarchon melanurus erebennus* | | T | |
| | Texas pimpleback | *Quadrula petrina* | | T | |
| | Texas snowbells | *Styrax platanifolius* ssp. *texanus* | LE | E | |
| | Texas tortoise | *Gopherus berlandieri* | | T | |
| | Zone-tailed Hawk | *Buteo albonotatus* | | T | |
| | Baldcypress-Sycamore Series | *Taxodium distichum-Platanus occidentalis* | | | S3 |
| | Bigtooth Maple-Oak Series | *Acer grandidentatum-Quercus* spp. | | | S2 |
| | Cane Bluestem-False Rhodesgrass Series | *Bothriochloa barbinodis-Chloris pluriflora* | | | S3 |
| | Curlymesquite-Sideoats Grama Series | *Hilaria belangeri-Bouteloua curtipendula* | | | S3 |
| | Lacey Oak Series | *Quercus glaucoides* | | | S3 |
| | Plateau Live Oak-Little Bluestem Series | *Quercus fusiformis-Schizachyrium scoparium* | | | S3 |
| | Post Oak-Black Hickory Series | *Quercus stellata-Carya texana* | | | S4 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |
| | Bat Caves and Roosts | | | | |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| Tyler | Alligator snapping turtle | *Macrochelys temminckii* | | T | |
| | Bachman's Sparrow | *Aimophila aestivalis* | | T | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Earth fruit | *Geocarpon minimum* | LT | T | |
| | Louisiana pigtoe | *Pleurobema riddellii* | | T | |
| | Louisiana pine snake | *Pituophis ruthveni* | C | T | |
| | Neches River rose-mallow | *Hibiscus dasycalyx* | C | | |
| | Red-cockaded Woodpecker | *Picoides borealis* | LE | E | |
| | Sandbank pocketbook | *Lampsilis satura* | | T | |
| | Southern hickorynut | *Obovaria jacksoniana* | | T | |
| | Texas pigtoe | *Fusconaia askewi* | | T | |
| | Timber (Canebrake) rattlesnake | *Crotalus horridus* | | T | |
| | Baldcypress-Water Tupelo Series | *Taxodium distichum-Nyssa aquatica* | | | S3 |
| | Bluejack Oak-Shortleaf Pine Series | *Quercus incana-Ponus echinata* | | | S2 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Sphagnum-Beakrush Series | *Sphagnum spp.-Rhynchospora* spp. | | | S2 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Bat Roosts | | | | |
| | Colonial Waterbird Rookeries | | | | |
| Waco | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Mountain Plover | *Charadrius montanus* | PT | | |
| | Navasota ladies'-tresses | *Spiranthes parksii* | LE | E | |
| | Salado Springs salamander | *Eurycea chisholmensis* | C | | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Timber (Canebrake) rattlesnake | *Crotalus horridus* | | T | |
| | Bigtooth Maple-Oak Series | *Acer grandidentatum-Quercus* spp. | | | S2 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Texas Oak Series | *Quercus buckleyi* | | | S3 |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| Wichita Falls | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Brazos water snake | *Nerodia harteri* | | T | |
| | Interior Least Tern | *Sterna antillarum athalassos* | LE | E | |
| | Sharpnose shiner | *Notropis oxyrhynchus* | C | | |
| | Smalleye shiner | *Notropis buccula* | C | | |
| | Texas kangaroo rat | *Dipodomys elator* | | T | |
| | Whooping Crane | *Grus americana* | LE | E | |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-sorghastrum nutans* | | | S2 |
| | Colonial Waterbird Rookeries | | | | |
| Yoakum | Atlantic hawksbill sea turtle | *Eretmochelys imbricata* | LE | E | |
| | Attwater's Greater Prairie-chicken | *Tympanuchus cupido attwateri* | LE | E | |
| | Bald Eagle | *Haliaeetus leucocephalus* | | T | |
| | Cagle's map turtle | *Graptemys caglei* | | T | |
| | False spike mussel | *Quadrula mitchelli* | | T | |
| | Golden orb | *Quadrula aurea* | | T | |
| | Green sea turtle | *Chelonia mydas* | LT | T | |
| | Kemp's Ridley sea turtle | *Lepidochelys kempii* | LE | E | |
| | Loggerhead sea turtle | *Caretta caretta* | LT | T | |
| | Peregrine Falcon | *Falco peregrinus* | | T | |
| | Piping Plover | *Charadrius melodus* | LT | T | |
| | Smooth green snake | *Liochlorophis vernalis* | | T | |
| | Smooth pimpleback | *Quadrula houstonensis* | | T | |
| | Texas fatmucket | *Lampsilis bracteata* | | T | |
| | Texas fawnsfoot | *Truncilla macrodon* | | T | |
| | Texas pimpleback | *Quadrula petrina* | | T | |
| | Texas scarlet snake | *Cemophora coccinea lineri* | | T | |
| | White-tailed Hawk | *Buteo albicaudatus* | | T | |
| | Whooping Crane | *Grus americana* | LE | E | |
| | Coastal Live Oak-Pecan Series | *Quercus virginiana-Carya illinoensis* | | | S3 |
| | Gammagrass-Switchgrass Series | *Tripsacum dactyloides-Panicum virgatum* | | | S1 |
| | Little Bluestem-Brownseed Paspalum Series | *Schizachyrium scoparium-Paspalum plicatulum* | | | S2 |
| | Little Bluestem-Indiangrass Series | *Schizachyrium scoparium-Sorghastrum nutans* | | | S2 |
| | Seacoast Bluestem-Gulfdune Paspalum Series | *Schizachyrium scoparium var. littoralis-Paspalum monostachyum* | | | S3 |

| TxDOT District | Common Name | Scientific Name | Federal Status[1] | State Status[2] | Conservation Rank |
|---|---|---|---|---|---|
| | Water Oak-Coastal Live Oak Series | *Quercus nigra-Quercus virginiana* | | | S3 |
| | Water Oak-Willow Oak Series | *Quercus nigra-Quercus phellos* | | | S3 |
| | Colonial Waterbird Rookeries | | | | |
| | Migratory Songbird Fallout Sites | | | | |

Notes: [1] LE= federally listed as an endangered; LT federally listed as a threatened plant; PE proposed to become listed as endangered; PT proposed to become listed as threatened; C candidate for listing PDL proposed to be delisted . [2] E = Endangered; T = Threatened *Source: TxDOT 2010*

Maintenance Program activities are not expected to adversely impact federally or state-listed animal species. However, this environmental review addresses potential impacts at a program level and district environmental personnel will review site-specific Maintenance Program activities within their district's jurisdiction. In some cases, such activities may warrant coordination with TPWD due to potential impacts to unregulated but sensitive habitat. Determinations will be evaluated on an individual project basis and coordination will be conducted as appropriate, in accordance with 43 TAC 2.22 (MOU between TxDOT and TPWD). TxDOT will incorporate best management practices or other measures suggested by TPWD, when practical and reasonable, to avoid or minimize impacts.

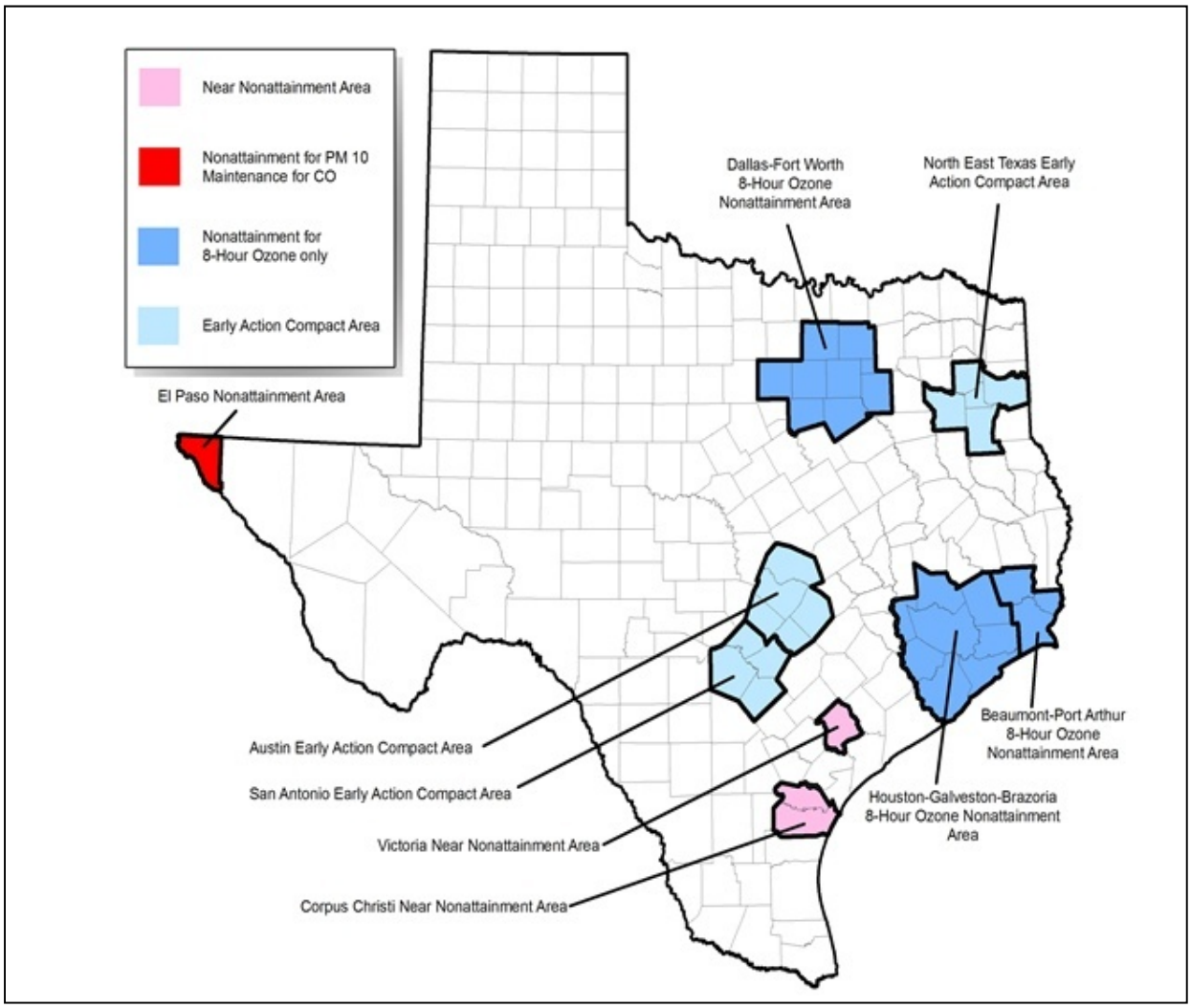
Under the Optimal Action Alternative, the Maintenance staff would conduct biological resource inventorying and monitoring as part of field activities. Inventories of all State and Federally listed species would be completed by county and then populations of identified resources would be monitored by maintenance personnel. Incorporating these practices into maintenance program activities could reduce adverse effects to listed resources although maintenance activities would continue to occur as needed to provide travler safety and preserve TxDOT's investment in infrastructure.

## 4.8 Air Quality

Air quality in Texas varies from region to region. Air pollution is generated from several sources, including industrial processes, motor vehicle emissions (both on and off-road), and area sources (e.g., solvent use, outdoor burning). Substantial levels of air pollution are typically the result of human activities. As a result, poorer air quality is generally correlated with the higher population centers of the state. The federal Clean Air Act of 1970, and its subsequent amendments through 1990, directed the EPA to establish national standards for acceptable levels of outdoor pollutants. The National Ambient Air Quality Standards (NAAQS) were developed for six ambient air pollutants (also known as criteria pollutants): ozone, particulate matter, carbon monoxide (CO), sulfur dioxide, nitrogen dioxide, and lead.

The TCEQ, local air pollution districts, local governments, and private entities all operate continuous air quality monitors in the most populated areas and other rural areas of the state. The data from the majority of these monitors are reported to the EPA. Areas that exceed the NAAQS can be designated as "nonattainment" by the EPA for not complying with the NAAQS. Areas classified as near nonattainment within Texas include the Corpus Christi (San Patricio and Nueces counties) and Victoria (Victoria County) near nonattainment areas. These counties do not currently exceed the EPA pollution levels, but are at risk of violating EPA standards (see **Figure 4-10** for a map depicting NAAQS nonattainment and near-nonattainment areas within the state).

**FIGURE 4-10**
**TEXAS NONATTAINMENT AND NEAR NONATTAINMENT AREAS**




*Source: TCEQ, 2009*

Within the state of Texas, there are three Early Action Compact Areas: Austin (Travis, Williamson, Bastrop, Hays, and Caldwell Counties), San Antonio (Bexar, Comal, Guadalupe, and Wilson Counties), and North East Texas (Rusk, Smith, Upshur, Gregg, and Harrison Counties). These are

areas that have submitted Early Action Compact (EAC) plans which on November 17, 2004 were utilized to develop State Implementation Plan (SIP) strategies to reduce emission standards to meet the eight-hour ozone standard by 2007. All EAC agreements expired Dec. 31, 2007. For areas that needed them, EACs were replaced by an EPA approved "8-Hour Ozone Flex Program" or "O3-Flex Plan." In 2007-2008, TxDOT's Austin and Corpus Christi districts, along with local entities, implemented an O3-Flex Plan, which encompassed these two metropolitan areas. The O3-Flex Plan is a voluntary agreement between the EPA, state, tribal, and local communities that encouraged 8-hour ozone attainment areas nationwide to reduce ozone emissions to remain in attainment. The O3-Flex Plan supports and rewards innovative, voluntary, local strategies to reduce ground-level ozone, and these plans remain active until 2013.

The state of Texas meets federal air quality standards, except for carbon monoxide (CO) and particulate matter 10 microns or less (PM10) in El Paso County and eight hour ground-level ozone in Houston-Galveston-Brazoria, Dallas–Fort Worth and Beaumont–Port Arthur.

Within the Houston-Galveston-Brazoria area, the counties of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller are classified as severe ozone nonattainment areas for 8-hour NAAQS and must be in attainment by June 15, 2019 as required by the EPA. Within the Dallas-Fort Worth area, the counties of Collin, Dallas, Denton, Tarrant, Ellis, Johnson, Kaufman, Parker, and Rockwall are classified as moderate ozone nonattainment areas for 8-hour NAAQS and must be in attainment by June 15, 2010 as required by the EPA. Within the Beaumont-Port Arthur area, the counties of Hardin, Jefferson, and Orange are classified as moderate ozone nonattainment areas for 8-hour NAAQS and must be in attainment by June 15, 2010 as required by the EPA. In March 2008, the EPA lowered the ozone standard; however, in January 2010, the EPA proposed to further lower the ozone standard. The EPA will make a final decision by August 2010 and will designate non-attainment areas by 2011.

On February 9, 2010, the EPA created a new 1-hour primary NAAQS for Nitrogen Oxide (NOx). The EPA will require roadside monitors that are within 50 meters of the edge of the nearest lane to be in place and operational by January 1, 2013. Dallas-Fort Worth and Houston will be required to install two monitors. Austin, San Antonio, El Paso, and McAllen-Edinburg-Mission will require one monitor. The EPA revised the NAAQS for particulate matter 2.5 microns or less (PM2.5) in 2007. All areas in Texas showed attainment for this standard. On December 18, 2007, the Governor of Texas sent a letter to the EPA recommending that all areas of Texas be designated attainment for the PM2.5 standard of less than or equal to 35 micrograms per cubic meter.

Although more rural areas of the state may have better air quality overall than the urban centers, they could still experience air quality impacts. Dust and smoke from agricultural and forestry practices in rural areas reduce air quality on a localized short-term basis. Pollutants generated by these processes include sulfur oxides (SOx), PM, CO, nitrogen oxides (NOx), and volatile organic compounds (VOCs).

In 2003, TxDOT began using an ultra-low sulfur diesel fuel, Texas Low Emission Diesel (TxLED), in all of its diesel engines. No problems were encountered with any of these engines except that all ten propulsion engines used in the ferries operated by TxDOT's Galveston Ferry Operations (GFO) failed within about six months after switching to TxLED. The following is a review of research conducted by the Center of Transportation Research (CTR) at the University of Texas to determine the cause of the engine failures, and develop a solution that allowed continued use of TxLED.

CTR, together with subcontractors Southwest Research Institute and Kibler Technologies, determined that the engine failures were a result of three factors:

- Poor Ring Pack design of these engines, which result in a high oil consumption rate;
- High ash content of the re-refined oil that was used in the ferries; and
- The decreased flame temperature for TxLED relative to 2D on-road diesel.

Once the causes were identified, the research team evaluated nine candidate oils as possible replacements for the re-refined oil that GFO was using. Each oil type was evaluated based on consumption rate, engine wear, and in-cylinder calcium deposits. All of the candidate oils performed much better than the re-refined oil. The research team recommended that Galveston Ferry Operations begin using Exxon Elite 20W50, a type of aviation piston engine oil, in all of its ferries. Aircraft oils are designed to minimize wear due to the danger resulting from an engine failure at altitude. In addition, the Exxon Elite has no ash and had the lowest rate of accumulation of calcium deposits. Exxon Elite also had the second lowest oil consumption rate.

The second aspect of the solution addresses the hardware related causes. Even though a hardware solution was only necessary if none of the candidate oils solved the problem of engine failures, this solution significantly decreased oil consumption. This hardware solution consists of a new and improved ring pack and cylinder liners with an improved finish. In addition to the improved rings and liners, the improved EMD 645 power cylinder assembly includes new and improved flat face valves and new valve rotators and springs.

### 4.8.1 Environmental Consequences

Originating in exhaust from motorized equipment, only very minor amounts of these pollutants (CO, SOx, NOx, VOCs, and PM), would be generated by Maintenance Program activities under either alternative. Air pollution from particles less than 10 microns in size (PM 10) has been documented from winter abrasive use. Vehicle grinding of sand allows fine particulate matter, PM 10 (or PM 2.5), to become airborne when dry. Street sweepers and vacuums, as well as air blowers and sand blasters may cause temporary increases in ambient dust near operations. However, regular sweeping of roadways and streets reduces the amounts of dust and particulate matter that accumulates on the road, thereby reducing the potential for that matter to become airborne. The effectiveness of the sweeping equipment, the technology used, and the frequency of sweeping have a direct influence on

the quantity and size of the matter collected. The more efficient the collection of particulate matter, particularly the finer fractions, the less that will be available for dispersion into the air due to traffic.

All TxDOT ferries use Texas Low Emission Diesel gas to reduce the emissions released into the air. TxDOT also has an existing memorandum of agreement with the EPA, Texas Natural Resource Conservation Commission (TNRCC), and the Houston-Galveston Area Council (HGAC), within the Houston/Galveston Ozone Nonattainment Area for the emissions reduction for TxDOT ferries. In this MOA TxDOT volunteered to implement measures to achieve additional reductions. Examples of measures include, but are not limited to, operating practices and measures, including application of methods to reduce ferries main engine and barge pump engine idling time; modifications to the ferries engine and support equipment, including adjustments to engine timing, early integration of new marine diesel engines or the retrofit of existing marine diesel engines; early use of regulated fuels as they are made available; and/or other maintenance measures consistent with the ferry support operations.

TCEQ regulations limit the amount of cutback asphalt that can be used statewide (7%) and in non-attainment areas (6%). VOC emissions from cutback asphalts result from the evaporation of the petroleum distillate solvent, or diluents, used to liquefy the asphalt cement. There are exemptions for the use of MC-30 to prime base material and other cutbacks to manufacture stockpile patching materials. Cutback asphalts, other than MC-30 and in commercially made patching mixes, are not used in significant quantities. Statewide use is approximately less than 2% and in non-attainment areas it is approximately 0.2%.

Currently, there are no OSHA air quality standards for asphalt fumes. Therefore, air sampling is not required or typically performed during asphalt paving. The Clayton Group Services, an independent research group in Raleigh, North Carolina, conducted an emissions comparison between asphalt plants and other various sources. They found that emissions from an asphalt plant are comparable to those from many consumer-oriented sources, such as residential fireplaces, barbecue grills, lawn mowers, gas stations, fast-food restaurants and bakeries. Since 1997, the asphalt industry has installed engineering controls that vent asphalt fumes away from workers during paving operations on every highway-class paver, thereby reducing worker exposure to asphalt fumes.

Refueling of TxDOT fleet vehicles (Stage I) at motor vehicle fuel dispensing facilities located in non-attainment, near non-attainment, and early action compact areas will comply with TAC, Title 30, §115.221 through §115.239. This states that no person within these areas shall transfer, or allow the transfer of, gasoline from any tank-truck tank into a stationary storage container which is located at a motor vehicle fuel dispensing facility, unless the displaced vapors from the gasoline storage container are controlled by a vapor control system which reduces the emissions of VOC to the atmosphere to not more than 0.8 pound per 1,000 gallons (93 mg/liter) of gasoline transferred; or a vapor balance system which is operated and maintained in accordance with this title.

Also, the control of vehicle refueling emissions (Stage II) at motor vehicle fuel dispensing facilities located in non-attainment, near non-attainment, and early action compact areas will comply with TAC, Title 30, §115.240 through §115.249. This states that no person within these areas shall transfer or allow the transfer of gasoline from any stationary storage container into a motor vehicle fuel tank, unless an approved Stage II vapor recovery system has been installed which is certified to reduce the emissions of volatile organic compound to the atmosphere by at least 95%.

TxDOT has the largest fleet of alternative fuel vehicles (AFVs) in the state of Texas. The shift to AFVs began in 1992 when clean air legislation was passed requiring state agencies to purchase vehicles capable of using alternative fuel. AFVs include hybrid-electric, compressed or liquefied natural gas, hydrogen, or other alternative fuel (propane, methanol, ethanol, or other alcohols, fuel mixtures with at least 85 percent methanol or ethanol, coal derived liquid fuels, and biodiesel) vehicles. AFVs reduce exposure of the citizens living in non-attainment, near non-attainment, and early action compact areas of the state.

TxDOT's Current Action alternative complies with all applicable regulatory requirements related to Air Quality. Effects to air quality from Maintenance Program activities would include dust and exhaust produced by the operation of vehicles and equipment; fine particulate matter from winter abrasive use; emissions from TxDOT ferries; and VOC emissions from cutback asphalts. These impacts would be localized, temporary in nature, and would not make measurable contributions of any pollutants to Texas air quality.

Under the Optimal Alternative, technologically advanced equipment could be used for sweeping and street sweeping could occur more frequently, therefore increasing the amount of particulate matter removed from the roadways and reducing the amount of particles available for dispersion into the air. However, the more often these vehicles and equipment are running, the more exhaust that is produced. Also, under the Optimal Action alternative TxDOT would have more resources available to acquire and put into practice the latest technological advances for reducing affects to air quality.

## 4.9 Noise

Noise may be defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Noise can be intermittent or continuous, steady or impulsive, and can involve a number of sources and frequencies. It can be readily identifiable or generally non-descript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day.

### 4.9.1 Environmental Consequences

Under either alternative, noise associated with Maintenance Program activities is or would be generated by the operation of maintenance equipment. Such noise is temporary and sporadic in

nature and would occur at different locations as maintenance needs dictate. Maintenance Program activities normally occur during daylight hours, though some activities can be conducted at night, such as street sweeping. Any sensitive noise receivers would not be expected to be exposed to elevated noise levels for extended periods of time. As discussed in **Section 4.6**, under either alternative, maintenance activities can result in temporary increases in noise, which may cause any wildlife, such as roosting bats or nesting birds, to leave the area temporarily. Typically, wildlife will return after maintenance activities are completed and the heavy equipment vacates the area. However, maintenance activities occur on roadways where vehicle noise is common and at rest areas and other roadside facilities where people, as well as vehicles, are present. Any wildlife in these areas is more accustomed to people and noise.

Noise would also be generated by the operation of ferries and ferry maintenance equipment. Such noise is common in the waterways the ferries travel and the ferries have been running at Port Aransas and Galveston-Port Bolivar for decades. Ferry Maintenance Program activities occur during daylight and nighttime hours. Galveston ferry operation is currently operating one ferry at night from 10pm to 5am and as many as five ferries during the day. The trip from Galveston to Port Bolivar generally takes less than 20 minutes. The ferries at Port Aransas also run 24-hours a day, but on an "as needed" basis. Typically a ferry leaves the landing every 10 – 20 minutes, depending on traffic load, weather conditions and other ship channel traffic. Overall, the Ferry Maintenance Program activities will not generate any greater noise impacts.

## 4.10 Cultural Resources

The following sections of this document discuss cultural resources which include both historic resources (standing buildings, structures, objects and landscapes) as well as archeological resources within the context of the Maintenance Program.

### 4.10.1 Historic Resources

TxDOT has been given the responsibility for the preservation of historic properties under its control under Sections 106 and 110 of the National Historic Preservation Act (NHPA) (16 USC 470h), as amended. Section 110 established procedures for agencies managing or controlling historic property and the amended Section 110 (1992) requires each agency to establish a historic preservation program. The program must provide for the identification and protection of the agency's historic properties and ensure that such properties are maintained and managed with due consideration for preservation of their historic value. TxDOT has made a commitment to the Texas Historical Commission (THC) to maintain and retain historic resources in its ROW if at all possible. Many historic areas have long associations with communities and there is often strong local sentiment for them to remain open and in good condition.

Efforts to enhance Texas roadways have been underway since the inception of a unified transportation system in the early decades of the twentieth century. These enhancements were multi-

faceted and intended to provide visual relief for drivers and passengers by landscaping the roadsides, physical relief in the form of roadside parks, and by the installation of commemorative markers to inform the traveling public of significant historical events or individuals within the area or a specific site. It was during the 1930s that the majority of the historic resources found within the ROW were constructed or installed. Prior to 1933, many civic and women's organizations had greatly influenced the beautification of the emerging highway system. After that year, the Texas Highway Department (THD) hired a landscape architect to head up the THD Landscape Division. Much of the effort to beautify the highway system and install commemorative markers was in preparation for the upcoming Centennial of Texas Independence in 1936. That effort, in conjunction with the federal work relief programs that provided jobs and added craftsman details to culverts, bridges, drainage features and roadside parks, assisted greatly in the beautification of the nation's largest transportation system.

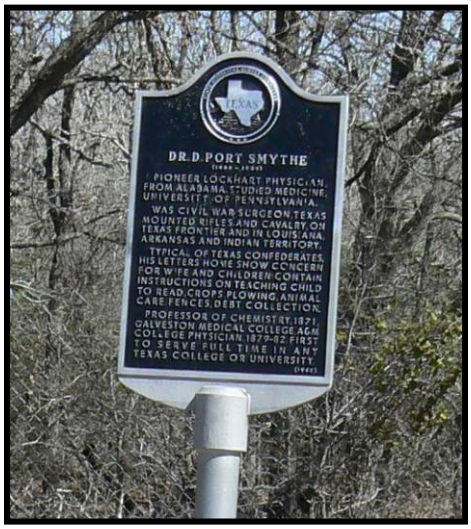
Protection of historic resources along Texas Highways is achieved through provisions set forth in the following state codes and regulations:

- Texas Antiquities Code of 1977, as revised through 1997 (Texas Natural Resources Code: Title 9, Chapter 191);
- Federal guidelines established by Section 106 regulations, 36 CFR Part 800 ("Protection of Historic Properties") of the National Historic Preservation Act of 1966 (PL 89-665), as amended in 1974, 1976, 1980, 1982, 2000, and 2001 preamble of the revised Section 106 regulations, final rule, and the Code of Federal Regulations, Title 36 Parks, Forests, and Public Property, Chapter I National Park Service, Department of the Interior, Part 60 National Register of Historic Places (NRHP);
- National Environmental Policy Act (NEPA) of 1969, as amended (42 USC 4321 and 4331 – 4335); and
- Department of Transportation Act of 1966, as amended (49 USC 303, Section 4(f)).

Some Customer Service Maintenance Program activities are directly concerned with cultural resources (maintaining access to historical markers and sites), but others, such as seemingly routine cleaning, mowing and trash collection have the potential to affect historic resources as well. Routine Drainage Maintenance Program activities include maintaining ditches, slopes, culverts, drains, pump stations and erosion protection devices. As few of these features have historic significance, Drainage Maintenance Program activities have limited potential to affect historic resources. Other individual maintenance programs have the potential to encounter historic resources. The types of historic resources likely to be encountered by the Maintenance Program are wide-ranging and an effort should be made to identify all historic features that are in the TxDOT ROW so that TxDOT's MNT personnel and contractors are aware of their locations and can use proper precautions when dealing with them. The following are examples of historic resources that are currently within the TxDOT ROW and have the potential to be affected by Maintenance Program actions.

***Official State Historical Markers (OSHM).*** These include markers and plaques that the THC awards, approves, or administers and markers the THC's predecessor, the Texas State Historical Survey Committee, awarded.


*OSHM subject marker mounted on granite*




*OSHM Subject Marker mounted on post*

***Centennial Markers***. These include markers awarded by the state in the 1930s to commemorate 100 years of Texas history and Civil War Centennial markers, awarded the 1960s.


*1936 Centennial Marker on stone slab*


*1936 Centennil Marker mounted on rough-cut granite*

***Other Historical Markers.*** Numerous counties installed historical markers (similar in appearance to the OSHM) to commemorate historic events or significant individuals in the county. The DAR, working with the Texas Legislature, arranged for a survey of the Old San Antonio Road from Louisiana to the Rio Grande with granite markers (known as Zively Markers) placed at

approximately five-mile intervals. Distinctive state boundary markers, formed in the shape of the state, were installed on numerous roads at the state line.


*1918 DAR Kings Highway granite marker*


*State boundary marker* *Source: TxDOT*

***Depression Era Structures***. Part of the 1930 to 1943 work relief projects sponsored by the federal government, these culverts, bridges, stone walls, retaining walls, drainage ditches, drop inlets, check dams, and curbing were built by the Works Progress Administration (WPA), Civilian Conservation Corps (CCC), National Youth Administration (NYA), and the Public Works Administration (PWA). Many simple masonry (stone and/or brick) drainage and erosion control structures have survived along the ROW.

*Depression Era stone culvert*

*Stone wall at roadside park and scenic overlook*

TxDOT's Environmental Affairs Division began a survey in the late 1990s to identify all Depression Era features across the state and this document, the Depression Era Inventory, should be consulted to determine the locations of such resources within each district.

***Roadside Rest Areas, Roadside Picnic Areas, Turnouts, and Other Roadside Locations.*** During the 1930s, the Texas Highway Department began building roadside picnic grounds and turnouts along its routes. These areas provided weary travelers with places along highway to rest, prepare food, and

use bathroom facilities, if available. Many of these roadside niches utilized the skills and styles that were common to the Depression Era structures above, but others are stylistically very different.

*TxDOT-maintained 1936 historical marker turnout on a US highway*

*Distinctive Depression Era landscaping and stone work at a roadside picnic area* *Source: TxDOT*

*More modern picnic area with covered tables and benches featuring a walkway to an OSHM*

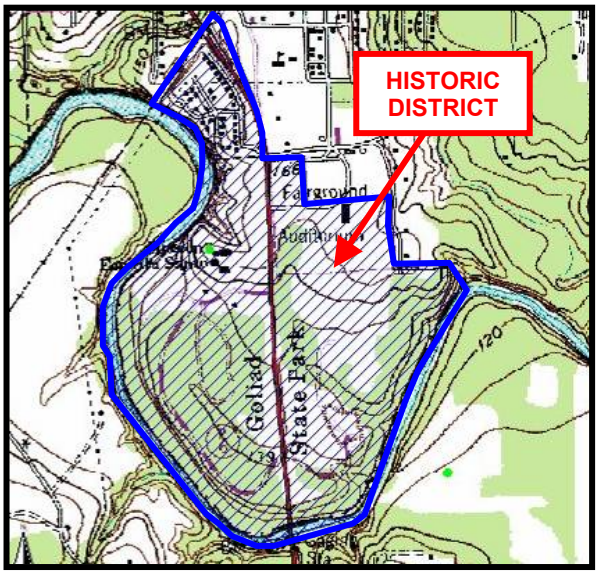
***Bridges.*** TxDOT's Environmental Affairs (ENV), Historical Studies Branch has inventoried and evaluated bridges potentially eligible for the National Register of Historic Places (NRHP), including metal truss, masonry, and concrete bridges, and reached an agreement as to which of those structures are significant or eligible for the NRHP. They have completed two inventories, the 1995 Metal Truss

Inventory and the 1999 Non-Truss Bridge Inventory. A list of those historically significant bridges may be obtained from the TxDOT district environmental coordinator or ENV.

*Pin-connected truss bridge determined NRHP eligible during a TxDOT inventory*

The Historical Studies Branch is currently evaluating bridges constructed prior to 1966 and the list will be available in the near future. Like other structures, when bridges reach 50 years of age they may be evaluated for NRHP listing and listing as a State Archeological Landmark (SAL). The vast majority of Bridge Maintenance Program activities are state funded and Section 106 of the National Historic Preservation Act, 36 CFR Part 800 ("Protection of Historic Properties") would not normally apply except in some rare circumstances where federal permits are required.

Under TAC, Title 43, §2.24 an Antiquities permit issued by the Texas Historical Commission may be needed in order to regulate the preservation, protection, stabilization, conservation, rehabilitation, restoration, reconstruction, or demolition of historic structures and buildings designated as a SAL or listed in the NRHP. SAL permits must be coordinated through the District Environmental Coordinator and TxDOT ENV Historical Studies Branch.




*Example of TxDOT maintained ROW through a historic district. Source: Texas Historic Sites Atlas*

***National Register of Historic Places (NRHP) Historic Districts.*** NRHP historic districts may include sections of TxDOT-maintained ROW and drainage features. The district's nomination may contain references to features in the built environment and landscape that contributes to the district's significance. They can include walls, sidewalks, curbs, culverts, plantings, drainage features, mailboxes, cattle guards, bridge rails, signs, fences and lighting systems that should be treated with the same care as other types of historical resources. Maintenance crews should be aware when performing activities in a Historic District.

***Buildings and Structures Associated with Drainage.*** Because the control of water was often a main factor in the development of a particular community in a specific location at a certain time, drainage features such as pump houses may have historic importance. Typically, these structures are associated with a specific water district and their maintenance is not TxDOT's responsibility, but it is possible that some storm water pump stations are TxDOT controlled, and their presence in each district should be noted. Maintenance crews need to be aware of the sensitivity of masonry culverts particularly Depression Era and those that feature date stamps or other project-funding identifiers such as plaques. Coordination with the District Environmental Coordinator and TxDOT ENV Historical Studies Branch would be necessary for activities that could affect these resources.

***Other Historic Resources.*** TxDOT ROW may contain historically significant features, which do not fit into the above categories, and should be treated with the same care as other types of historic resources. Such resources are not common, but may include signage, designed and commemorative landscaping (including walking trails), bridge abutments and cemeteries or individual gravesites.

*Stone bridge abutment Source: TxDOT*

*A planned landscape within the ROW*

Other historic resources also include historic commercial areas, particularly courthouse squares. Specific resources in these areas include historic sidewalk materials and features, abutting historic building materials such as tiled entries or awning supports, and brick streets. Impacts to these resources may require a SAL permit issued through the Texas Historical Commission (TAC, Title 43, §2.24). Coordination with the District Environmental Coordinator and TxDOT ENV Historical Studies Branch would be necessary for activities that could affect these resources.

### *4.10.1.1 Environmental Consequences*

Bridge Maintenance activities that involve the repair of substructure, superstructure, and railings can impact one or more elements of historic bridges. For these types of activities, the use of similar materials and component design elements is necessary in order to prevent the loss of design and materials integrity. Under either alternative any bridge maintenance activities requiring extensive rehabilitative efforts could result in impacts to historic bridge structures. Major maintenance projects like this would be coordinated with the District environmental personnel and TxDOT Environmental Affairs Division Historical Studies Branch.

Customer Service Maintenance activities and practices conducted under either the Current Action or Optimal Action alternatives that involve mowing, litter and debris removal and trash collection could affect historic resources within the ROW. For example, minor cleaning and graffiti removal of the resource itself could degrade the resource to some extent. Maintaining historic features, such as table and bench sets, stone walls, culverts and fireplaces could be damaged by harsh chemicals and sandblasting. Please note that the TxDOT Customer Service Maintenance Program is not responsible to maintain or repair historical markers if they are damaged or vandalized: THC and the Historical Commission for the county in which they are located are responsible for cleaning, repair, or providing replacement markers, unless the damage is a result of TxDOT activity. The District Environmental Coordinator and TXDOT ENV Historical Studies Branch would be consulted if a historic marker needed to be relocated as a result of TxDOT maintenance activities.

In addition to dealing directly with the maintenance of historic drainage features, Drainage Maintenance activities may mean the difference between protecting and destroying nearby historically-significant resources, may they be TxDOT-owned or otherwise. If the flow is rerouted because of a blockage in the system, it is possible for flooding to occur in historically sensitive areas that would have otherwise have been unharmed. If drainage activities are properly implemented, no historic resources should experience significant direct or indirect impacts.

Maintenance Enhancement Program activities that involve work around historic properties and/or structures are coordinated with District Environmental Coordinators and TxDOT ENV Historical Studies Branch so that effects to these types of resources are minimized. The greatest threat to historic resources would occur during the construction of handicap ramps or sidewalk construction and rehabilitation. Potential impacts to historic commercial areas, particularly courthouse squares, could occur during maintenance activities such as adding handicap ramps and adding or repairing sidewalks. Specific resources in these areas include historic sidewalk materials and features, abutting historic building materials such as tiled entries or awning supports, and brick streets. Many communities across Texas continue to utilize curbs constructed of limestone blocks that are considered contributing to historic properties or districts. The removal of all or a portion of the limestone curbs may create an adverse effect and be considered an impact to the resource. During the construction of ramps, caution should be taken so as not to disturb brick-paved streets adjacent to the project area. The construction or rehabilitation of sidewalks is another area where unintentional impacts to historic resources may occur during the project. Generally the historic property includes not only the buildings but also the lawn and any landscaping that would contribute to the historic character of the property.

Often-unnoticed historic resources where impacts may occur are historic landscape within medians or islands within the ROW. TxDOT's Environmental Affairs Division, Historical Studies Branch should be consulted when projects that affect those types of resources are proposed. The Historical Studies Branch maintains a database of historic properties or can readily obtain the data necessary to inform project managers prior to the proposed activities are commenced.

Pavement and traffic pavement markings maintenance includes limited activities or practices that could affect historic resources adversely. Pavement maintenance activities include preventative roadway maintenance which involves repair, removal and replacement of flexible (asphaltic) surfaces, rigid (concrete) pavement, and base and sub-grade portions (including underdrains) of travel lanes and shoulders for a variety of types of roads in the state. Under either alternative and with proper implementation, the Maintenance Program could prove beneficial to historic roadways, as it does for all roads, by halting progressive damage and keeping them in usable condition.

Because the continued successful functioning of the roadway system relies on pavement and traffic pavement marking features remaining in good condition, they are routinely altered, rendering them unlikely candidates for listing in the NRHP due to their age and lack of integrity. However, exceptions exist, and caution must be exercised when performing maintenance activities in sensitive areas. NRHP-listed roadways in Texas include sections of the Bankhead Highway near Abilene (Abilene District) and US Route 66 in north Texas (Amarillo and Childress Districts). Because parts of these roadways are made from atypical materials (historic-age concrete or brick), maintenance of these resources must be coordinated with District Environmental Coordinator and TxDOT ENV should be consulted to make sure repairs are carried out without undue damage to the existing historic fabric.

Special consideration was made to limit Section 106 obligations to relieve the likely inordinate administrative burden in the case of the Dwight D. Eisenhower National System of Interstate and Defense Highways, parts of which became potentially eligible for NRHP listing when it reached 50 years of age in 2006. In summary, "The Advisory Council on Historic Preservation has approved an exemption that would relieve Federal agencies from the requirement of taking into account the effects of their undertakings on the Interstate Highway System, except with regard to certain individual elements or structures that are part of the system." (Federal Register /Vol. 70, No. 46 /Thursday, March 10, 2005 /Notices). A list of specific non-exempt elements compiled at the time of the exemption can be reviewed at http://www.environment.fhwa.dot.gov/histpres/highways_list.asp. Also non-exempt from Section 106 requirements are any elements that were previously listed in the NRHP, such as portions of the Bankhead Highway and Route 66. Individual districts should be aware of any non-exempt resources present within their jurisdiction and coordinate Pavement Maintenance activities accordingly.

Maintenance Program activities conducted under either the Current Action or Optimal Action alternatives is implemented properly so as not to adversely affect any historic resources present. For minor cleaning of a historic resource itself, the least aggressive methods that prove effective is employed. Maintenance is carried out using sensitive cleaning methods, as many historic features can be damaged by aggressive use of hand tools, harsh chemicals, and power equipment. Guidance for appropriate cleaning methods for historic masonry is provided by TxDOT ENV. If major rehabilitation is required, it is coordinated with the district environmental personnel and TxDOT ENV Historical Studies Branch. When extensive repair and/or replacement are required, the use of

similar materials and component design elements is necessary in order to prevent the loss of the feature's integrity. If historic features are able to be repaired they are not removed. Periodic reviews the list of all eligible (historic) and non-eligible resources, provides maintenance personnel responsible for implementing these program activities, with a list of properties in their respective districts. Maintenance crews are made aware when they are performing activities at a historic property, within a historic district, and involving historic features.

### 4.10.2 Archeological Resources

Archeological resources are material remains such as buildings, graves, tools, and other artifacts typically found underground or just on the surface. Protection of archeological resources along Texas highways, ROW, and within their property is achieved through provisions set forth in the following:

- Texas Antiquities Code of 1977, as revised through 1995 (Texas Natural Resource Code: Title 9, Chapter 191);
- Federal guidelines established by Section 106 regulations, 36 CFR Part 800 ("Protection of Historic Properties") of the National Historic Preservation Act of 1966 (PL 89-665), as amended in 1974, 1976, 1980, 1982, 2000, and 2001 preamble of the revised Section 106 regulations, final rule, and the Code of Federal Regulations, Title 36 Parks, Forests, and Public Property, Chapter I National Park Service, Department of the Interior, Part 60 NRHP;
- 13 TAC 26 and the MOU between TxDOT and THC;
- NEPA, as amended (42 USC 4321 – 4335);
- Department of Transportation Act of 1966, as amended (49 USC 303, Section 4(f)); and
- The First Amended Programmatic Agreement among the Federal Highway Administration, TxDOT, the Texas State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Implementation of Transportation Undertakings (PA-TU). The PA-TU outlines TxDOT's procedures for evaluating project effects and completing associated consultation on behalf of FHWA in compliance with Section 106.

Most activities conducted under the maintenance program meet the criteria of a project that does not have the potential to cause effects to archeological historic properties or to State Archeological Landmarks (PA-TU, Appendix 3 and 43 TAC 2.24(e)(1)). A few projects performed under this program, however, may have the potential to cause effects and potentially require individual coordination with the Texas Historical Commission/Texas State Historic Preservation Officer. The following activities require additional review and coordination as specified under the PA-TU and MOU:

- Any ditch or channel maintenance activity which requires removal of material below the original line and grade requires review and coordination.
- Placement of riprap that requires ground disturbance requires review and coordination.

- Any road improvements which require excavation beyond the flow lines of the associated drainage ditch or excavation below the original line and grade requires review and consultation.
- Finally, work for sidewalks and sidewalk ramps require review and consultation in the following cases: sidewalk installations where the depth of impacts exceeds one foot; projects within the historic districts of the following cities and towns: Goliad, Rio Grande City, Roma, San Antonio, San Elizario, and San Ygnacio; and projects within the city limits of the following cities and towns: Anahuac, San Patricio, and Socorro.

Notice of these activities, including a description and project location map, shall be sent to ENV for review and appropriate coordination. These projects shall not be undertaken until all necessary review and coordination have been completed.

#### *4.10.2.1 Environmental Consequences*

In regard to archeological resources, it is important to note that in the development of new ROW, or the complete restructuring of existing ROW, TxDOT personnel remove all of the topsoil (between six and 12 inches) and either stockpile it (the preferred method) or windrow it (TxDOT, 2004). After completion of ditches and slopes, six inches of topsoil is applied evenly throughout the entire project area. Because of this process, much of the existing ROW in the state of Texas presently has no intact archeological resources within the top six inches of the ground surface, which would be especially true of historic and prehistoric archeological resources located in erosive environments. Any ground-disturbing activities, particularly those involving disturbances deeper than 12 inches below the ground surface, have the potential to affect archaeological resources.

Ground disturbing activities associated with the Maintenance Program includes, but is not limited to grading and blading for fire control, which removes vegetation and involves the disturbance of a minimal amount of the soil profile, usually much less than six inches; burying roadkill at the edge of the ROW in rural areas where other disposal methods are costly, inconvenient, or impracticable; sub-grade and base preparation for new installations of shoulders, turnouts, sidewalks, and handicap ramps; and dredging around the ferry landings. These activities are unlikely to affect archeological resources as they are taking place in previously disturbed areas.

In regard to archeological resources, it is important to note that the greatest danger concerning Drainage Maintenance Program activities is unforeseen erosion due to a poorly maintained system. Long-used and well-maintained culverts, ditches, and slopes are not likely to hold archeological information, as it would have long been exposed or stripped away. In the case of flooding resulting from system blockage, the flow may erode previously undisturbed soil, revealing archeological materials, which then may suffer from exposure or theft. Through activities that minimize erosion some maintenance activities may facilitate the preservation of intact archaeological deposits.

The Maintenance Programs under either alternative deal exclusively with areas that have been previously disturbed. While this does not completely eliminate the potential to discover archaeological relics, it substantially reduces the likelihood, and brings into question the significance of the findings, given their previously disturbed location. However, when any archeological resources (examples include arrowheads, pottery, wells, and human remains) are discovered during the Maintenance Program activities, they are to be left in place, all work ceased, and the District Environmental Coordinator notified immediately.

## 4.11 Hazardous Materials

A hazardous material is a substance capable of posing an unreasonable risk to health, safety, and property. Potentially hazardous materials that may be associated with the Maintenance Program are encountered from a wide range of sources. Traffic pavement markings maintenance may include hazardous materials such as paint, epoxy, fuel, hydraulic fluid and oil, as well as polluted storm water runoff. Water used during pre-sweeping operations is controlled to prevent un-permitted non-stormwater discharges. Polluted storm water runoff may also be associated with drainage, roadside appurtenances, and pavement maintenance activities. Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 storm water management program that is intended to improve the waterways by reducing the quantity of pollutants that storm water picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from treated vegetation, sediment from construction or maintenance sites, and carelessly discarded trash. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways by contaminating drinking water supplies and interfering with the habitat for fish, other aquatic organisms, and wildlife.

Potential hazardous materials associated with TxDOT fleet maintenance and with fixed facilities such as district shops, maintenance offices, warehouses, etc. include items such as diesel fuel, gasoline, parts washer solvent, emulsion, used oil and oil filters, used antifreeze, used batteries and vehicle wash water.

Bridge maintenance activities include lead and asbestos contained in paints on existing bridges or in rare cases lubricants or greases used on swing bridges or draw bridges. Although lead or asbestos containing paints are no longer produced, in the past such paints were used extensively. Epoxies may also be used.

Potentially hazardous materials that may be associated with customer service maintenance activities include cleaners, paints, herbicides, and fertilizers. These products contain materials that could harm the environment and people if improperly handled. By using environmentally safe products, this can reduce the exposure to hazardous chemicals. If hazardous chemicals are used, employees need to be trained on what to use and how much to use. Employees need to be encouraged to not overuse

chemicals. Facilities need to be ventilated and fans should be used to create a cross draft. Also, personal protective equipment should be worn whenever handling a hazardous chemical to reduce exposure, which could cause acute or chronic effects. Training is conducted for employees before handling hazardous chemicals.

TxDOT is usually notified and called to the scene by law enforcement when there is a hazardous materials spill on TxDOT roadways. During a hazardous material spill, TxDOT provides support to the lead agency, such as DPS, TCEQ, or the local fire marshal during the containment and cleanup of the spill or release. TxDOT is responsible for restricting public access, providing traffic control until relieved by DPS or other on-site coordinator. All TxDOT personnel who may encounter a hazardous material spill or release require Hazardous Materials Awareness Training. Department personnel are specifically prohibited from handling, cleaning up or otherwise coming in contact with toxic or hazardous materials at accident scenes or abandonment sites on the department's ROW. Vehicle fluid cleanup of less than 25 gallons is the only exception to handling or cleaning up hazardous materials at accident scenes or abandonment sites.

Through debris and spills maintenance activities employees may encounter abandoned hazardous waste from debris or illegal dumpsites; a hazardous materials spill; or contaminants in materials removed from paved surfaces during sweeping. Contaminant concentrations in sweepings are usually lower than those found in catch basins, sumps and storm sewer line waste (vactor waste), but even relatively clean sweepings can contain toxins and require careful management.

Uncovering or disturbing contaminated soil during enhancement maintenance activities could expose humans and other ecological receptors to hazardous materials which could potentially cause adverse health effects. As stated in AASHTO's Compendium of Environmental Stewardship Practices in Construction and Maintenance, many chemical pollutants can be detected because of odd colors, stains, discoloration, or chemical smells. Other times pollutants can only be detected through chemical testing, or in the case of knowing oil or grease is present, it may still take laboratory testing to determine if levels are toxic.

Ferry maintenance includes hazardous waste such as oily bilge water, oil and waste oil, fuel, batteries, paint, and other fluids or hazardous substances required for the operation of ferries or ferry maintenance equipment. The Environmental Protection Agency's Oil Pollution Prevention Rule (40 CFR 112) became effective January 10, 1974 and was revised on July 17, 2002. It was published under the authority of the Clean Water Act. Facilities subject to the rule must prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines.

The Oil Spill Prevention and Response Act of 1991 (OSPRA) is a state of Texas law that gives authority to the General Land Office to protect the state's coastal waters and adjacent shorelines by preventing spills and discharges of oil by requiring and monitoring preventive measures and response

planning; providing for prompt response to abate and contain spills and discharges of oil and ensure the removal and cleanup of pollution from such spills and discharges; and administering a fund to provide for funding these activities and to guarantee the prompt payment of certain reasonable claims resulting from spills and discharges of oil.

The Resource Conservation and Recovery Act (RCRA) regulates the generation, treatment, storage, transportation, and disposal of solid wastes. RCRA defines which solid wastes are hazardous and specifies handling procedures for hazardous wastes. The RCRA gave the EPA authority to control hazardous waste from the point of generation to the point of disposal otherwise known as "cradle to grave." Under the authority, the EPA also regulates the transportation, treatment, storage, and disposal of hazardous waste.

### 4.11.1 Environmental Consequences

The disposal of hazardous materials is accomplished in a manner that complies with federal and state regulations. When hazardous materials are used, proper use and disposal of hazardous materials are completed. Preventative measures are taken to ensure hazardous materials do not enter the environment. The potential hazardous materials associated with TxDOT fleet maintenance and fixed facilities are managed through several management plans such as SPCC plans, Aboveground Storage Tank (AST) / Underground Storage Tank (UST) management, recycling programs, asbestos-containing materials management plans for structures (offices, picnic arbors, and others).

Currently, TxDOT has no inventory of bridges or other structures that contain lead or asbestos paints or other hazardous materials. Currently, material testing is conducted prior to the removal of paint on bridge structures. When hazardous materials are detected, remediation and proper disposal of hazardous materials are completed prior to any further work.

At a hazardous waste abandonment site, during a hazardous materials spill, or leaking storage tank it is imperative to coordinate with the police or regulatory agency. TxDOT's responsibility, in conjunction and cooperation with regulatory agencies, is to contain spills as quickly and as thoroughly as possible. In doing so, all potentially harmful materials will be prevented from entering into road drains and watercourses by blocking road drains, installing appropriate temporary sediment control devices, and constructing a containment cell around the spill. Any waste material is collected immediately and disposed of in an approved manner. Contaminated absorbents will be swept up and never flushed into roadside ditches. Any soils that have been contaminated by a highway accident, abandonment site, or leaking storage tank are treated according to all applicable regulations and in some cases are excavated from the site and disposed of in an approved waste treatment facility.

Typically, unused traffic pavement marking materials are carried over to the next striping job. However, situations often arise that require a test spray or a complete flush of the kettle and guns. Test sprays prior to thermoplastic striping are often done to warm up the guns and verify that the guns are spraying properly. In addition, kettle and guns are routinely flushed out when switching to a

different color or after finishing for the day. Inspectors verify that contractors are properly disposing of marking materials when performing test sprays or flushes. Although not a standard requirement, some districts require that contractors collect all excess striping material into a pan instead of spraying on the ground. Flushed-out paint material capturing for re-mixing with new material is allowed only if detergents are not used. Flushing of the entire truck is not allowed at the job site for any material, and disposal of any material into storm sewer drains is not allowed. All materials or waste used or generated by contractors becomes the property of the contractor, and the contractor is responsible for disposing of it in an approved method or at an approved landfill.

Drainage maintenance includes maintaining or installing SW3Ps in accordance with EPA regulations. The EPA set regulations on construction/maintenance activities to prevent contamination to water resources through the NPDES. The TCEQ operates this program under the TPDES, which requires storm water be treated to the maximum extent practicable. The SW3P states that BMPs must be used during maintenance activities. These practices are intended to reduce the amount of pollutants traveling through MS4s that could contaminate surface water bodies. BMPs include erosion and sediment controls and storm water management controls. The erosion and sediment controls are measures used to prevent or reduce erosion and redirect storm water flow during maintenance activities. The storm water management controls are used after maintenance is completed to prevent pollution due to storm water runoff.

TxDOT's drainage system is inspected twice a month through an informal process by district maintenance offices. When TxDOT employees find discarded hazardous materials or an illegal dumpsite within a drainage system, preventative measures are taken to ensure hazardous materials do not enter the environment. TxDOT personnel follow standard safety procedures and report pertinent information to their supervisors immediately. TxDOT supervisors contact the district hazardous materials coordinator and local law enforcement officials if needed.

The Maintenance Program involves some activities that remove soil from installation locations within the ROW (i.e. base and sub-grade preparation). If TxDOT personnel encounter a hazardous material while excavating, preventative measures are taken to ensure hazardous materials do not enter the environment. TxDOT personnel follow standard safety procedures and report pertinent information to their supervisors immediately. TxDOT supervisors contact the district hazardous materials coordinator and local law enforcement officials if needed. Standard safety procedures are also followed when TxDOT employees find discarded hazardous materials or any illegal dumpsite along the roadway.

Ferry maintenance activities includes completing necessary repair and/or cleaning work and following environmental guidelines; thereby allowing the ferry system to function properly and reduce the possibility of hazards entering into water or other environmental resources. Preventative measures are taken to ensure hazardous materials do not enter the environment. TxDOT personnel follow standard safety procedures and report pertinent information to their supervisors immediately.

Ferry personnel contact the General Land Office, Coast Guard, district hazardous materials coordinator and local law enforcement officials as necessary.

TxDOT's responsibility, in conjunction and cooperation with regulatory agencies, is to contain spills as much as possible. In doing so, all potentially harmful materials will be prevented from entering into the state's coastal waters and adjacent shorelines by installing appropriate temporary sediment control devices, having readily available absorbent materials, constructing a containment cell around the spill, and having an on-site fully stocked oil spill response station on ferries and on shore. Any waste material is collected immediately and disposed of in an approved manner. Contaminated absorbents are swept up and never flushed into watercourses. Any water or soils that have been contaminated are treated according to all applicable regulations and in some cases soils are excavated from the site and disposed of in an approved waste treatment facility.

Ferry maintenance also includes maintaining or implementing a SPCC Plan in accordance with EPA regulations contained in 40 CFR 112. This plan presents site-specific operating procedures to prevent an oil spill, control measures to prevent a spill from entering navigable water resources, and countermeasures to contain, cleanup and mitigate the effects of any oil spill that may impact navigable waters. TxDOT has a five year Oil Spill Prevention and Response Discharge Prevention and Response Certificate from the General Land Office. This Certificate indicates that the regulatory requirements of the Oil Spill Prevention and Response Act of 1991 have been met. Used oil is stored according to federal regulation and the SPCC plan. All oil containers are closed when not being filled and are maintained in good working condition with no leaks. The tank system is inspected monthly and during fuel transfers for signs of deterioration and/or discharge, including visual inspection of tank, valves, pipes, supports, and foundations.

Cleaning chemicals required to maintain signs and signals can be classified as hazardous materials. The disposal of hazardous materials is accomplished in a manner that complies with federal and state regulations. Concrete for barriers, bridge rails, slabs, and footings is in either a pliable or hardened state and can easily be removed if an accidental spill occurs. Concrete quickly becomes inert and will not travel or penetrate the ground or cause the need for any soil remediation. However, due to the chemical reaction with the natural cement and aggregate products during the hardening process, care should be taken not to touch workable concrete without proper rubber gloves or boots as chemical burns may occur.

Pavement maintenance activities may include hazardous materials such as hydrocarbons and petroleum products, the basic components of bituminous asphalt. The disposal of asphalt paving materials or soils contaminated with hydrocarbons is accomplished in a manner that complies with federal and state regulations.

Other recommended environmental stewardship practices include illicit connection/illicit discharge reporting and removal, illegal spill discharge control, spill prevention and control, safer alternative

products, vehicle and equipment fueling and maintenance, solid and liquid waste management, material use, and sweeping and vacuuming. Under either alternative, the Maintenance Program would reduce the likelihood of hazardous materials and wastes from entering into the environment.

## 4.12 Land Use

Land use varies across the state of Texas from dense urban development common in cities like Houston, Austin, San Antonio, and Dallas-Fort Worth to very rural lands located in areas throughout the state, particularly western Texas. Likewise, land use in the immediate vicinity of TxDOT highways, facilities, and sites also varies considerably. Land use continues to change across Texas due to a number of factors, including economics, population growth, and dispersal patterns.

### 4.12.1 Environmental Consequences

Under either alternative, Maintenance Program activities occur on highways and within TxDOT ROW and do not require any changes to land use adjacent to these areas. Therefore, Maintenance Program activities would not affect land use.

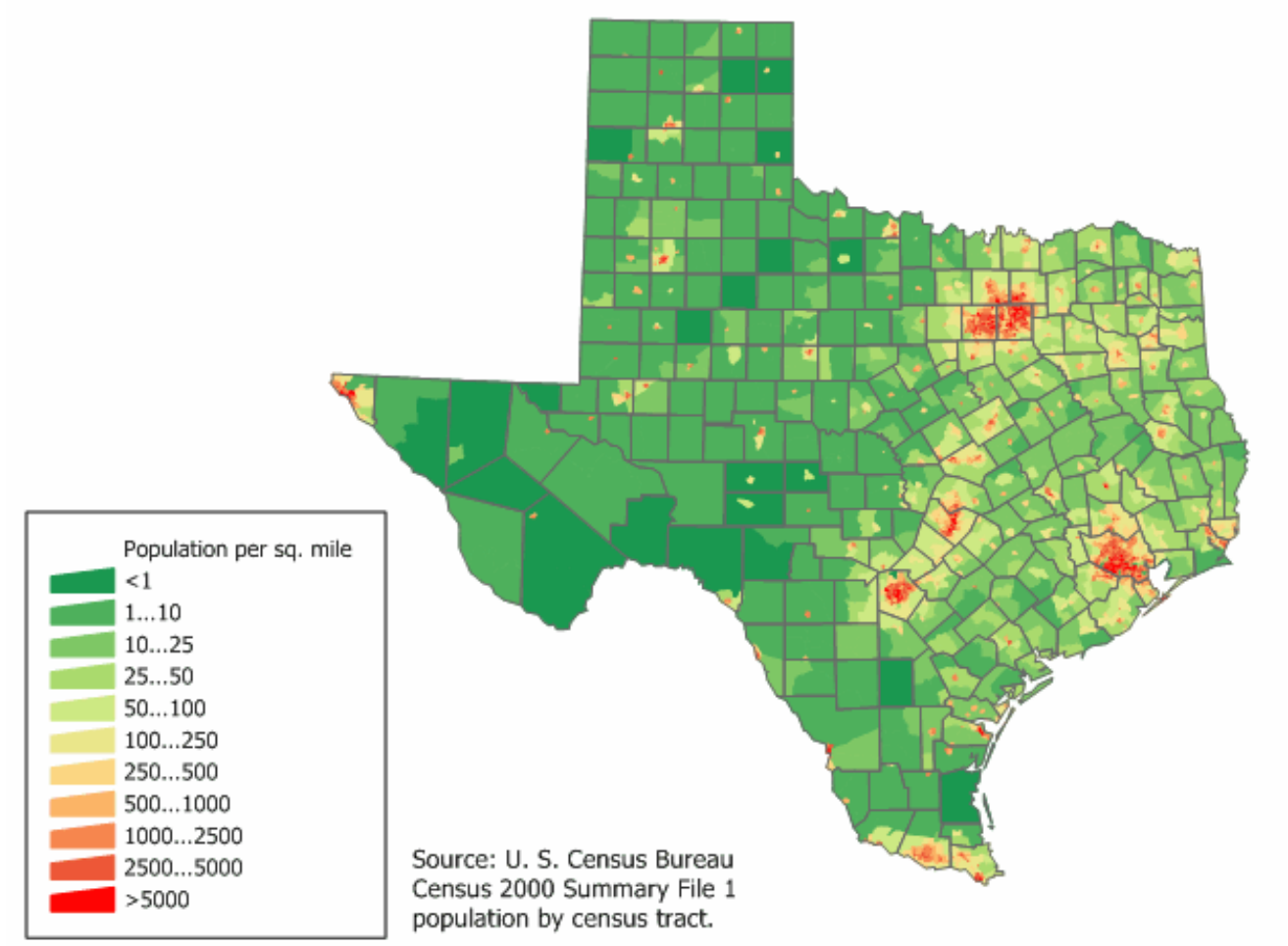
## 4.13 Social Environment

Social impacts include those associated with environmental justice populations, such as low-income populations, non-English speaking persons, communities, neighborhoods, religious facilities, or any other types of resources used by groups of people. Populations potentially affected by Maintenance Program activities under either alternative include three specific groups: 1) users of the state-maintained roadways and facilities; 2) residents who live adjacent to the state-maintained roadways; and 3) special populations.

Users of the roadways include both residents and visitors to the state. The total population of the state of Texas was 20,851,820 people in 2000 (see **Figure 4-11**) and estimated at 24,326,974 in 2008 (U.S. Census Bureau, 2005). In fiscal year (FY) 2007, 20.8 million motor vehicles were registered in the state of Texas. The total population, specifically those with registered motor vehicles, is assumed to be residents who use state-maintained roadways. No exact figures are available on the number of out-of-state visitors on TxDOT roadways; however, 3.5 million people visited TxDOT's Travel Information Centers in FY 2006 (TxDOT, 2007).

Populations residing adjacent to state managed roadways also have minimal potential to be affected by Maintenance Program activities. State-maintained roads in higher density areas have a greater potential to directly affect a greater number of adjacent residents. Additionally, based on the extent of the TxDOT managed roadway system and distribution of the population, many highways have adjacent populations.

**FIGURE 4-11**
**2000 CENSUS TEXAS POPULATION**




There is also a minimal potential for populations residing adjacent to TxDOT ferry systems to be affected. Port Aransas ferry, lies within the city of Port Aransas which population in July 2007 was 3,775 people. The Galveston-Port Bolivar ferry lies within the city of Galveston and Bolivar Peninsula. The population of Galveston in 2007 was 56,940 and the population of Bolivar Peninsula was 4,364.

EO 13166, "Improving Access to Services for Persons with Limited English Proficiency," requires agencies to examine the services they provide, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so that LEP persons can have meaningful access to them.

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires each federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and

low-income populations." The Federal Highway Administration (FHWA) has identified three fundamental principles of environmental justice:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations;
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process; and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Disproportionately high and adverse human health or environmental effects are defined by FHWA as adverse effects that:

- Are predominately borne by a minority population and/or a low-income population; or
- Will be suffered by the minority population and/or low-income population and are appreciably more severe or greater in magnitude than the adverse effects that will be suffered by the nonminority population and/or non-low- income population.

Special populations may both use the roadways, live adjacent to the roadway, or both. These populations include minority and low-income individuals. Of the 2000 Census total state population, 29 percent identified themselves as a racial minority (non-white), 32 percent as Hispanic or Latino, and 15 percent reported incomes below the poverty level. The environmental justice strategy includes identifying and addressing disproportionately high and adverse human health or environmental effects to groups such as these. Also, special populations may both use the ferries, live adjacent to the ferry landing, or both. As of 2007, in the city of Port Aransas, 6 percent identified themselves as non-white, 6 percent as Hispanic or Latino, and 11 percent reported incomes below the poverty level. In the city of Galveston in 2007, 41 percent identified themselves as non-white, 26 percent as Hispanic or Latino, and 22 percent reported incomes below the poverty level. On the Bolivar Peninsula in 2007, 6 percent identified themselves as non-white, 7 percent as Hispanic or Latino, and 12 percent reported incomes below the poverty level.

### 4.13.1 Environmental Consequences

The Maintenance Program is a statewide program serving the entire population of Texas as well as visitors to the state. Maintenance activities do not disproportionately impact environmental justice or any other populations. Maintenance is completed regardless of location or surrounding populations and within TxDOT ROW. The TxDOT Maintenance Division adheres to all applicable rules and regulations of EOs 12898 and 13166, which ensures equal opportunities and services to all populations. By maintaining the highway in a manner that provides a safe environment for all, TxDOT preserves and extends the public's investment and ensures the safety of the traveling public. Specific maintenance enhancement activities like the construction of sidewalks and ADA ramps

benefit special populations including disabled people and people opting to walk as a means of transportation.

Bridge inspection is done routinely on all state owned bridges. Maintenance is completed on an as needed basis, as determined by inspections. While certain individuals residing beneath bridge structures in urban areas may be disturbed by bridge maintenance activities and temporarily displaced they frequently return upon completion.

The frequency of litter removal and disposal depends on the roadway and the average daily traffic (ADT). High volume areas are done weekly, major or secondary roads every two weeks, some lower volume Farm to Market (FM) roads rarely require debris and spills maintenance practices like litter removal. The frequency street sweeping occurs depends on the type of roadway. Toll roads are swept weekly, major roads like interstates are swept every two weeks, and other major roads are swept once a month. Hazardous material spills or abandonment sites, spot litter or debris, illegal dumpsites, and illegal signs or encroachments are addressed as soon as possible regardless of location or surrounding population.

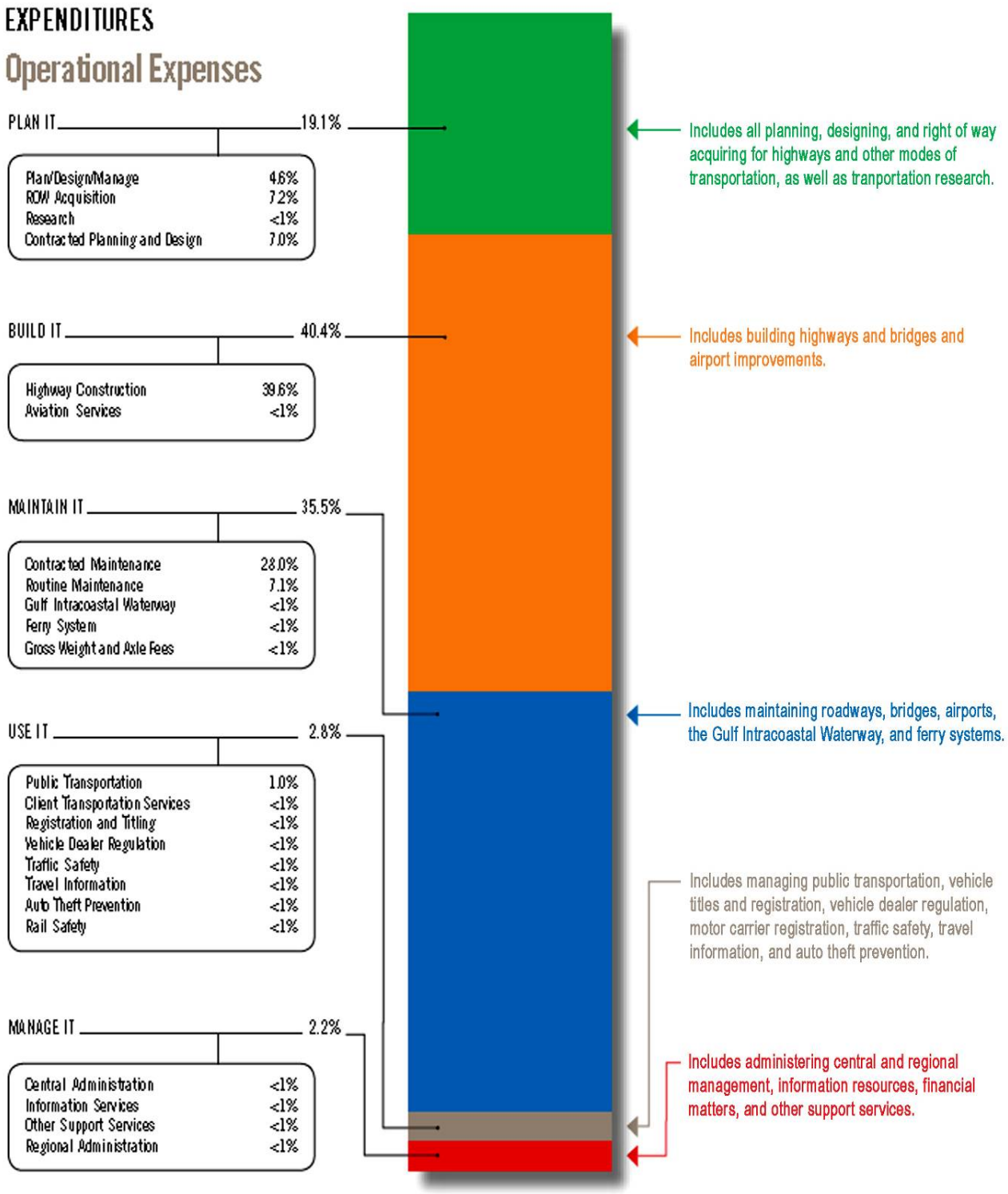
Ferry ridership rules set forth for all individuals wanting to use the ferry services are the same for everyone. **Appendix A** contains the Prohibited on Board and Boarding Procedures and Policy document that applies to both the Port Aransas ferry and the Galveston-Port Bolivar ferry. Adverse effects on human use potential from dredging and dredged material disposal or placement can be minimized by selecting sites and following procedures to prevent or minimize any potential damage to the aesthetically pleasing features of the site, particularly with respect to water quality; selecting sites which are not valuable as natural aquatic areas; timing dredging and dredged material disposal or placement activities to avoid the seasons or period when human recreational activity associated with the site is most important; and selecting sites that will not increase incompatible human activity or require frequent dredge or fill maintenance activity in remote fish and wildlife areas.

## 4.14 Economics

The economy of the state of Texas continues to grow and expand. However, funds available for transportation projects and programs are becoming increasingly scarce as federal transportation dollars are diverted to other non-transportation oriented initiatives. As previously stated, federal transportation dollars are not used for Maintenance Program activities. However, when fewer federal transportation dollars are available, TxDOT must reallocate state funds to maximize its ability to leverage available federal dollars, which means that funds slated for maintenance may be reallocated for construction projects or other programs.

Current funding for Maintenance Program activities are adequate, but maintenance needs continue to grow. From a maintenance perspective, TxDOT spends more of its budget on the "Maintain It" Program (Statewide Preservation Program [SPP], which includes the Maintenance Program) than any other program, other than the "Build It" program (see **Figure 4-12**).

**FIGURE 4-12**
**2009 TXDOT EXPENDITURES REQUEST**




*Source: TxDOT 2009 – 2013 Strategic Plan*

The "Maintain It" Program funds five categories of preservation programs:

- Category 1 – Preventative Maintenance and Rehabilitation;
- Category 6 – Structures Replacement and Rehabilitation;
- Category 8 – Safety;
- Maintenance Budget – including routine and contracted maintenance; and
- Multimodal Preservation Projects – including waterway and rail.

Maintenance program activities are funded as part of the overall maintenance budget. **Error! Reference source not found.5** shows the estimated funding for the maintenance budget and total "Maintain It" budget. Projected budgets show an increase of nine percent for the routine maintenance budget and an increase of 32 percent for contracted maintenance between 2006 and 2009. Based on projected funding levels the total maintenance budget would account for 28 to 36 percent of the total SPP budget. Funding for maintenance program activities will continue to be funded as part of the total maintenance budget.

**TABLE 4-5**
**MAINTAIN IT – STATEWIDE PRESERVATION PROGRAM TOTALS**

| Budget Type | Fiscal Year | | | |
|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2009 |
| Maintenance Budget - Routine Maintenance | $477,895,409 | $492,106,098 | $506,869,281 | $522,075,360 |
| Maintenance Budget - Contracted Maintenance | $348,246,596 | $433,694,199 | $446,705,025 | $460,106,175 |
| Total SPP Budget ("Maintain It") | $2,902,089,086 | $2,814,311,528 | $2,799,115,582 | $2,758,576,645 |
| Maintenance Budget as part of total SPP Budget | 28% | 33% | 34% | 36% |

TxDOT serves as both a major employer and purchaser of goods within the state. Employment in the form of full-time permanent jobs with TxDOT or contractual employment provides incomes to state residents and general tax revenues in the form of income tax. Of the approximately 13,000 full-time equivalent positions with TxDOT, approximately 46 percent are associated with the "Maintain It" Program (TxDOT, 2005). TxDOT is continually working to find the most cost effective ways to meet the state's Maintenance Program needs. **Table 4-6** shows the amount of work performed, unit cost, and total cost of riprap installation and maintenance, ditch maintenance, reshaping ditches, and slope repair and stabilization.

**TABLE 4-6**
**COST AND QUANTITY OF DRAINAGE MAINTENANCE WORK PERFORMED**

| Function Code* | Function Name | Year-to-Date Work Performed** | Unit Cost | Fiscal Year | | |
|---|---|---|---|---|---|---|
| | | | | State | Contract | Total |
| 560 | Riprap Installation and Maintenance | 316,992 SY | $12.25 | $866,051 | $3,017,930 | $3,833,981 |
| 561 | Ditch Maintenance | 2,184,271 CY | $7.46 | $13,490,852 | $2,798,018 | $16,288,870 |
| 562 | Reshaping Ditches | 20,998,791 LF | $0.32 | $4,554,407 | $2,186,127 | $6,740,534 |
| 563 | Slope Repair/ Stabilization | 911,780 SY | $2.92 | $1,828,630 | $832,469 | $2,661,099 |

*Function codes 558, 570, and 571, which relate to the Drainage Maintenance Program were not included in report.

** SY = Square Yard; CY = Cubic Yard; LF = Linear Foot

*Source: TxDOT FY 2008 Maintenance Division Annual Report.*

## 4.14.1 Environmental Consequences

Economic impacts associated with either of the Maintenance Program alternatives include the expenditure of funds on program activities, as funds used for maintenance are unavailable for other TxDOT projects and programs. Private contractors and local economies benefit from outsourced TxDOT Maintenance Program activities and practices. Likewise, TxDOT employs maintenance personnel in each district who work on the Maintenance Program providing jobs and expenditures into local and state economies. Under the Optimal Action alternative more jobs would be created for TxDOT and more jobs may be available for private contractors as well.

Safe bridges provide a vital transportation link for intra- and inter- state travel which positively affects the economy of the State of Texas. TxDOT spends millions of dollars on pavement markings each year. Traffic pavement markings should be managed to optimize the cost-effectiveness of a pavement marking program. Pavement marking management is based largely on retroreflectivity performance over time. If used correctly, pavement marking management provides a comprehensive approach to designing, constructing, maintaining, and rehabilitating pavement markings in the most cost-effective manner.

Currently TxDOT does not have an objective statewide pavement marking management program. Most districts base restripe decisions on visual observations performed on an annual basis, while some restripe based on a regular cycle. In these instances, markings could be restriped before or after their end of service life, wasting monetary resources and presenting safety issues. Under the Optimal Action alternative, TxDOT would have more resources available for the Traffic Pavement Markings Maintenance Program and could develop an objective statewide pavement marking management program.

# 5.0 INDIRECT EFFECTS

Indirect impacts are those caused by the action and are later in time and farther removed in distance than direct impacts, but are still reasonably foreseeable. Indirect impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air and water and other natural systems, including ecosystems. The seven-step process outlined in TxDOT's *Guidance on Preparing Indirect and Cumulative Impact Analyses*, (Revised 2009) is presented in **Table 5-1**. TxDOT's guidance references a three-part test established by Sierra Club v. Marsh 976 F. 2d, 763, 767 (1st Circuit, 1992) that can be used to determine if indirect impacts are either certain enough or too speculative for consideration:

1. Is the agency confident that impacts are likely to occur?
2. Can impacts be sufficiently described and specified now to allow for useful evaluation?
3. If impacts are not evaluated now will the future evaluation of impacts be irrelevant?

In the case of the maintenance program, TxDOT is confident that impacts are likely to occur. As such, indirect impacts, while not specific to a geographic location and associated environs given the scope of this programmatic review are identified. Identifying potential indirect effects associated with the maintenance program now (see **Table 5-2**) provides TxDOT with an opportunity to further develop and refine BMPs and adaptively manage impacts through its Environmental Management System (EMS).

**TABLE 5-1**
**SEVEN STEP GUIDELINES FOR CONDUCTING AN INDIRECT IMPACT ANALYSIS**

| Step | Description |
|---|---|
| 1 | Scoping |
| 2 | Identify the Study Area's Goals and Trends |
| 3 | Inventory the Study Area's Notable Features |
| 4 | Identify Impact-Causing Activities of Proposed Action and Alternatives |
| 5 | Identify Potentially Substantial Indirect Effects for Analysis |
| 6 | Analyze Indirect Effects and Evaluate Results |
| 7 | Assess Consequences and Consider/Develop Mitigation,(as Appropriate) |

Providing a programmatic evaluation of indirect impacts now does not render the future evaluation of impacts irrelevant rather it serves to ripen their consideration when specific maintenance activities or programs that are of particular concern to an agency or the public, or for specific locations at a scale where meaningful impacts are identified.

## TABLE 5-2 IMPACT CAUSING ACTIVITIES AND INDIRECT IMPACTS

| Resource | Impact Causing Activities | Indirect Impacts[1] |
|---|---|---|
| Geology, Soils, and Farmland | Maintenance Program activities occur on previously disturbed TxDOT ROW or property. Direct effects include the potential for increased salinity due to de-icing practices. Such increases would be contained within the ROW. Storage tanks can leak allowing chemicals to enter the soil environment. Where erosion control measures are implemented, impacts to geologic features, soils, and even nearby farmlands when erosion, is prevented from spreading. Ferry landing dredging activities occur on previously disturbed soil and are permitted through the USACE and all regulations set forth in the USACE permit are followed. | Localized erosion could occur when grading activities are implemented for wildfire control and management. Effects would be localized and contained within the ROW. Sweeping ice-rock and sediments from bridge decks and roadways decreases the levels of salinity in soils within and directly adjacent to the right-of-way. Adverse impacts associated with erosion to properties adjacent to maintenance areas are minimized since proper maintenance minimizes erosion. |
| Land Use | Program activities occur on previously disturbed ROW and do not require any changes to existing land use. There are no direct impacts. | There are no indirect impacts to land use associated with this program. |
| Social Characteristics | The Maintenance Program is a statewide program serving the entire population of Texas as well as visitors to the state.<br>Direct impacts to social characteristics include relocations of businesses, residences, community facilities, etc. Maintenance does not require relocations.<br>The program provides benefits for society, particularly disabled individuals and those who are able to walk as a means of transportation. | Safe and aesthetically appealing highways, bridges, rest areas, roadside parks, picnic areas, pull-outs, parking areas and ferries benefit all of the traveling public. Bridges often provide vital transportation links for communities – allowing the efficient movement of goods and people. |
| Economics | Direct economic impacts of the program consist of the expenditure of taxpayer fund and employment for TxDOT staff and contractors. | Program activities afford employment opportunities to the public and private sectors. Funds used for maintenance are unavailable for other TxDOT projects and programs. Safe bridges, highways, facilities and rest areas provide a vital transportation link for intra- and inter-state travel which indirectly and positively affects the economy of the State of Texas. |

| Resource | Impact Causing Activities | Indirect Impacts[1] |
|---|---|---|
| Air Quality | Effects to air quality would include dust and exhaust produced by the operation of maintenance vehicles and equipment. These impacts would be temporary in nature and would not make measurable contributions of any pollutants to Texas air quality. Maintenance Enhancement activities could result in minimal releases of pollutants into the air as petroleum powered equipment is sometimes used as part of the Program activities. Such releases would be minor and temporary and attributed to specific work activities.<br>Stage 1 and Stage 2 requirements under TAC, Title 30 for TxDOT fleet refueling locations located in non-attainment, near non-attainment, and early action compact areas will be followed to limit the amount of vapors and emissions that may be released into the atmosphere.<br>TCEQ regulations limit the amount of cutback asphalt that can be used statewide (7%) and in non-attainment areas (6%). Currently, there are no OSHA air quality standards for asphalt fumes. Therefore, air sampling is not required or typically performed during asphalt paving. | Vehicle grinding of sand allows fine particulate matter, PM 10 (or PM 2.5), to become airborne when dry thereby causing localized increases in PM. By sweeping ice-rock and sediments from bridge decks and roadways dust is reduced thereby improving air quality. |
| Water Quality | Activities under this program are constructed, in a manner that minimizes adverse effects to water quality. Some activities have the potential to accidentally knock dirt and debris into adjacent or underlying water bodies causing temporary increases in turbidity and suspended solids. Such impacts are infrequent and temporary. Bridge and drainage maintenance activities prevent impacts to water quality by minimizing erosion around bridge and drainage structures. SW3Ps provide benefits to wetlands and surface waters by removing pollutants and thus do not find its way into nearby surface waters. The Ferry Maintenance Program does not have a direct or significant adverse impact on the coastal natural resource areas and therefore is in accordance with the CMP. Adverse impacts will be minimized by employing BMPs where it is appropriate and practicable. Overspray, dust, spills and leaks may create pollutants. Program activities sometimes result in the accidental direct application of de-icing agents into surface water bodies. | Some maintenance activities may create pollutants, indirectly affecting water quality as some of the pollutants may enter nearby surface water bodies or percolate into groundwater. Indirect impacts to down-stream water quality from specific activities would generally be local and temporary. Site specific BMPs would be employed to minimize all impacts. Localized changes in water chemistry could occur as a result of de-icing and grading for wildfire control and management. Trash and litter are removed from TxDOT ROWs and thus do not find their way into nearby surface water environments via runoff. By sweeping ice-rock and sediments from bridge decks and roadways, it reduces the impacts of de-icers and sediments on water. Ensuring dirt, litter, and debris are removed from landings and ferries provides indirect benefits to water-ways. Activities that involve the disturbance of soils can indirectly affect water quality as some of the disturbed soils may inadvertently enter nearby surface water or percolate into groundwater. |

| Resource | Impact Causing Activities | Indirect Impacts[1] |
|---|---|---|
| Wetland and Vegetative Communities | Activities under this program are constructed, in a manner that minimizes adverse effects to wetlands and vegetative communities.<br>Disturbance to vegetation includes crushing of roadside vegetation by vehicles driving on the ROW to maintain the roadway system. Trimming and removal of native vegetation may be required at times, but no impacts to this resource are expected.<br>De-icing agents could enter directly into wetland environments.<br>SW3Ps provide benefits to wetlands and surface waters by removing pollutants and thus do not find its way into nearby surface waters.<br>Vegetation removed during drainage maintenance is re-vegetated and erosion control devices are put into place before work begins.<br>Some maintenance activities have the potential to knock dirt & debris into nearby wetlands causing temporary increases in suspended solids. Such impacts are infrequent & temporary. | Localized effects to water quality could affect receiving wetlands.<br>Stormwater runoff from bridges often enters downstream wetlands. Bridge maintenance activities can reduce the amount of road debris that drains into these systems.<br>Sweeping ice-rock and sediments from bridge decks and roadways reduces the amount that could be deposited on vegetation and in wetlands.<br>Removal of litter and debris from wetlands helps wetlands to maintain better ecological function.<br>Ensuring dirt, litter, and debris are removed from landings and ferries provides indirect benefits to nearby wetland environments.<br>TxDOT's Current Action alternative complies with all applicable regulatory requirements related to wetlands and Waters of the U.S. |
| Wildlife | Program activities could cause any wildlife presence in the area to leave temporarily as a result of an increase in noise and human presence.<br>Program activities could result in the loss of individual wildlife species that cannot move out of the way during maintenance activities.<br>Adverse effects on plant and animal populations from dredging and dredged material disposal may cause a temporary increase in turbidity and any wildlife to leave the area temporarily. | Localized effects of water quality on aquatic and semi-aquatic species. All water quality regulations will be followed and site specific BMP's will be used to reduce any adverse effects. Temporary increase in sodium chloride levels of adjacent aquatic and terrestrial habitats. Localized and short-term in nature. Increase in road kills. By sweeping ice-rock and sediments from bridge decks and roadways it decreases the impacts of de-icers on wildlife. Removal of roadkill prevents the attraction of additional wildlife and reduces the potential for vehicle-animal collisions. |
| Floodplains | Most activities performed under the Maintenance Program do not directly impact floodplains.<br>Drainage maintenance activities would help to control erosion, ensure free flow conditions, and therefore would not adversely impact floodplains. The proposed dredging and dredge disposal would be located within the 100-year floodplain. Consistent with Executive Order (EO) 11988 on floodplain management, dredging and dredge disposal in these areas are considered to be a repetitive action in the floodplain and would not adversely impact flooding or floodplain values. | Program activities reduce the potential for the introduction of litter and debris into floodplains, which can then alter water flows.<br>Program activities reduce the potential for the introduction of litter and debris into floodplains, which can then alter water flows.<br>Program activities reduce the potential for localized flooding, which can then alter water flows within the floodplain. |

| Resource | Impact Causing Activities | Indirect Impacts[1] |
|---|---|---|
| Coastal Zone Management | Most Maintenance Program activities would not directly affect coastal zones. The Ferry Maintenance Program does not have a direct or significant adverse impact on the coastal natural resource areas and therefore is in accordance with the CMP. The disposing and placing of dredged material will comply with the requirements under the CMP. | There are no indirect impacts to coastal zones due to the Maintenance Program. |
| Coastal Barriers | Maintenance Program activities would not directly affect Coastal Barriers. | There are no indirect impacts to coastal barrier resources due to the Maintenance Program. |
| Essential Fish Habitat (EFH) | Impacts to EFH would include increased turbidity in waters near boat ramps where TxDOT conducts maintenance activities. By employing BMPs during such activities TxDOT minimizes adverse effects to water quality and any associated EFH.<br>Essential Fish Habitat exists at both TxDOT ferry locations. TxDOT will consult with the National Marine Fisheries Service regarding potential impacts of their actions on EFH. | Indirect impacts to water quality from ferry landing dredging maintenance activities could affect EFH. Site-specific BMPs would be employed to minimize all impacts. |
| Threatened & Endangered Species | Maintenance Program activities are not expected to adversely impact federally or state-listed animal species. However, this environmental review addresses potential impacts at a program level and district environmental personnel will review site-specific Maintenance Program activities within their district's jurisdiction. In some cases, such activities may warrant coordination with TPWD due to potential impacts to unregulated but sensitive habitat. Determinations will be evaluated on an individual project basis and coordination will be conducted as appropriate. TxDOT will incorporate best management practices or other measures suggested by TPWD, when practical and reasonable, to avoid or minimize impacts.<br>In the event that federally or state listed species may be affected by a maintenance activity, appropriate coordination would occur as required by the ESA and/or TPWD MOU. | Program activities are not likely to indirectly impact threatened and endangered species. However, this environmental review addresses potential impacts at a program level and district environmental personnel will review site-specific Maintenance Program activities within their district's jurisdiction. In some cases, such activities may warrant coordination with TPWD due to potential impacts to unregulated but sensitive habitat. Determinations will be evaluated on an individual project basis and coordination will be conducted as appropriate. TxDOT will incorporate best management practices or other measures suggested by TPWD, when practical and reasonable, to avoid or minimize impacts.<br>In the event that federally or state listed species may be affected by a maintenance activity, appropriate coordination would occur as required by the ESA or TPWD MOU. |

| Resource | Impact Causing Activities | Indirect Impacts[1] |
|---|---|---|
| Cultural Resources | With proper implementation this program has no direct impacts to cultural resources. Program activities provide access to historic markers within the ROW. Extensive maintenance of NRHP-eligible or listed resources must be coordinated with the District Environmental Coordinator and TxDOT ENV. | There are no indirect impacts to cultural resources as a result of the Maintenance Program with proper implementation. By providing access to historic markers, public interest in the cultural heritage of the state of Texas is maintained. |
| Visual and Aesthetic Qualities | Maintenance activities occur on existing highways and ROW and would result in no change to very minor change in the visual and aesthetic qualities. Maintenance practices in some cases may improve the aesthetic value of highways to the traveling public. | There are no indirect impacts to visual and aesthetic qualities due to the Maintenance Program. |

*Source: Study Team 2010*

**Note:** [1] According to 40 CFR 1508.27, "significantly" requires the consideration of both *context* and *intensity*. *Context* means the affected environment in which a proposed action would occur; it can be local, regional, national, or all three, depending upon the circumstances. *Intensity* means the degree to which the proposed action would involve one or more of the following 10 factors: 1) adverse effects associated with "beneficial projects"; 2) effects on public health or safety; 3) unique characteristics of the geographic area; 4) degree of controversy; 5) degree of highly uncertain effects or unique or unknown risks; 6) precedent-setting effects; 7) cumulative effects; 8) adverse effects on scientific, cultural, or historical resources; 9) the degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973; and 10) whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

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# 6.0 CUMULATIVE EFFECTS

A cumulative effect is defined as that "which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time" (40 CFR Part 1508.7). The eight-step process outlined in TxDOT's *Guidance on Preparing Indirect and Cumulative Impact Analyses*, (Revised 2009) is presented in **Table 6-1**.

**TABLE 6-1**
**EIGHT STEP GUIDELINES FOR IDENTIFYING AND ASSESSING CUMULATIVE IMPACTS**

| Step | Description |
|---|---|
| 1 | Identify the resources to consider in the analysis |
| 2 | Define the study area for each affected resource |
| 3 | Describe the current health and historical context for each resource |
| 4 | Identify direct and indirect impacts that may contribute to a cumulative impact |
| 5 | Identify other reasonably foreseeable actions that may affect resources |
| 6 | Assess potential cumulative impacts to each resource |
| 7 | Report the results |
| 8 | Assess and discuss mitigation issues for all adverse impacts |

TxDOT's maintenance program is implemented across the State of Texas. As discussed in previous sections of this document, maintenance program activities vary by District and the affected environments also vary substantially from one part of the state to the next. As discussed in **Section 5.0**, maintenance program activities cause effects, but in the programmatic context, those effects are not linked to specific geographic locations and associated environs. Like that of the maintenance program indirect effects discussed in **Section 5.0**, the consideration of cumulative effects in this review offers TxDOT's an opportunity to focus future, site-specific detailed effects analyses on specific actions that warrant site- and activity-specific environmental analysis. **Table 6-2** summarizes programmatic cumulative effects considerations and identifies resources that may require more detailed, site- and activity-specific cumulative effects analysis at some point in the future.

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**Table 6-2**
**Bases for Carrying of Resources into Detailed Cumulative analysis**

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Geology, Soils, and Farmland | Maintenance Program activities occur on previously disturbed TxDOT ROW or property. Direct effects include the potential for increased salinity due to de-icing practices. Such increases would be contained within the ROW. Storage tanks can leak allowing chemicals to enter the soil environment. Where erosion control measures are implemented, impacts to geologic features, soils, and even nearby farmlands when erosion, is prevented from spreading. Ferry landing dredging activities occur on previously disturbed soil and are permitted through the USACE and all regulations set forth in the USACE permit are followed. | Localized erosion could occur when grading activities are implemented for wildfire control and management. Effects would be localized and contained within the ROW. Sweeping ice-rock and sediments from bridge decks and roadways decreases the levels of salinity in soils within and directly adjacent to the right-of-way. Adverse impacts associated with erosion to properties adjacent to maintenance areas are minimized since proper maintenance minimizes erosion. | Geology, soils, and farmland were not identified by the study team as resources concern during the environmental review of this program. | FPPA and TPDES. | Stable. | No. The health of this resource is not declining and program benefits far outweigh adverse effects to this resource. |
| Land Use | Program activities occur on previously disturbed ROW and do not require any changes to existing land use. There are no direct impacts. | There are no indirect impacts to land use associated with this program. | Concerns over impacts to land use were not raised or identified during the development of this document. | Land use regulation is accomplished through local zoning, planning, and ordinances. | Changing. Urban and suburban development is increasing. Land use and changes to land use are a result of market forces, land availability, and a number of other factors. | No. There are no direct or indirect impacts to land use resulting from this program. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Social Characteristics | The Maintenance Program is a statewide program serving the entire population of Texas as well as visitors to the state.<br>Direct impacts to social characteristics include relocations of businesses, residences, community facilities, etc. Maintenance does not require relocations.<br>The program provides benefits for society, particularly disabled individuals and those who are able to walk as a means of transportation. | Safe and aesthetically appealing highways, bridges, rest areas, roadside parks, picnic areas, pull-outs, parking areas and ferries benefit all of the traveling public. Bridges often provide vital transportation links for communities – allowing the efficient movement of goods and people. | There were no concerns raised during the environmental review conducted for this project associated with the social environment. | EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," and EO 13166 LEP. | The state of Texas is growing rapidly relative to other states within the U.S. The program provides benefits to all of the traveling public. Minority populations will continue to in-crease within the state of Texas. | No. There are no direct or indirect impacts associated with this program that merit detailed consideration in a CEA. |
| Economics | Direct economic impacts of the program consist of the expenditure of taxpayer fund and employment for TxDOT staff and contractors. | Program activities afford employment opportunities to the public and private sectors. Funds used for maintenance are unavailable for other TxDOT projects and programs. Safe bridges, highways, facilities and rest areas provide a vital transportation link for intra- and inter-state travel which indirectly and positively affects the economy of the State of Texas. | No concerns regarding current funding levels were expressed during the environmental review of this program. | From an environmental analysis perspective, there are no applicable regulations pertaining to economics. | The Texas economy continues to grow and expand. However, funding for TxDOT projects and programs is not keeping pace with transportation needs. | No. The Texas economy continues to thrive in spite of economic down-turns elsewhere. Funding for maintenance programs may increase in the next several years. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Air Quality | Effects to air quality would include dust and exhaust produced by the operation of maintenance vehicles and equipment. These impacts would be temporary in nature and would not make measurable contributions of any pollutants to Texas air quality. Maintenance Enhancement activities could result in minimal releases of pollutants into the air as petroleum powered equipment is sometimes used as part of the Program activities. Such releases would be minor and temporary and attributed to specific work activities.<br>Stage 1 and Stage 2 requirements under TAC, Title 30 for TxDOT fleet refueling locations located in non-attainment, near non-attainment, and early action compact areas will be followed to limit the amount of vapors and emissions that may be released into the atmosphere.<br>TCEQ regulations limit the amount of cutback asphalt that can be used statewide (7%) and in non-attainment areas (6%). Currently, there are no OSHA air quality standards for asphalt fumes. Therefore, air sampling is not required or typically performed during asphalt paving. | Vehicle grinding of sand allows fine particulate matter, PM 10 (or PM 2.5), to become airborne when dry thereby causing localized increases in PM. By sweeping ice-rock and sediments from bridge decks and roadways dust is reduced thereby improving air quality. | Concerns over impacts to air quality were not raised or identified during the development of this project. | The Clean Air Act and amendments regulate emissions and air quality. | The Houston, Dallas/Ft. Worth, and San Antonio areas are currently classified as non-attainment areas for 8-hour ozone. Widespread concerns related to greenhouse gas emissions and global warming. | Yes. Given concerns over global climate change and emissions a detailed cumulative effects analysis related to air quality could be warranted for site specific maintenance activities. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Water Quality | Activities under this program are constructed, in a manner that minimizes adverse effects to water quality. Some activities have the potential to accidentally knock dirt and debris into adjacent or underlying water bodies causing temporary increases in turbidity and suspended solids. Such impacts are infrequent and temporary. Bridge and drainage maintenance activities prevent impacts to water quality by minimizing erosion around bridge and drainage structures. SW3Ps provide benefits to wetlands and surface waters by removing pollutants and thus do not find its way into nearby surface waters. The Ferry Maintenance Program does not have a direct or significant adverse impact on the coastal natural resource areas and therefore is in accordance with the CMP. Adverse impacts will be minimized by employing BMPs where it is appropriate and practicable. Overspray, dust, spills and leaks may create pollutants. Program activities sometimes result in the accidental direct application of de-icing agents into surface water bodies. | Some maintenance activities may create pollutants, indirectly affecting water quality as some of the pollutants may enter nearby surface water bodies or percolate into groundwater. Indirect impacts to down-stream water quality from specific activities would generally be local and temporary. Site specific BMPs would be employed to minimize all impacts. Localized changes in water chemistry could occur as a result of de-icing and grading for wildfire control and management. Trash and litter are removed from TxDOT ROWs and thus do not find their way into nearby surface water environments via runoff. By sweeping ice-rock and sediments from bridge decks and roadways, it reduces the impacts of de-icers and sediments on water. Ensuring dirt, litter, and debris are removed from landings and ferries provides indirect benefits to water-ways. Activities that involve the disturbance of soils can indirectly affect water quality as some of the disturbed soils may inadvertently enter nearby surface water or percolate into groundwater. | Concerns over impacts to water quality were not raised or identified during the development of this project. | CWA and amendments. | Statewide, 386 water bodies do not meet applicable water quality standards, or are threatened for one or more designated uses by one or more pollutants, which is 42% of total water bodies surveyed (2008 Section 303(d) list). | Yes. Both water quality and water quantity are becoming increasingly important issues as population growth continues to affect water. The recent oil spill in the Gulf of Mexico continues to increase attention on coastal water quality. A more detailed cumulative effects analysis of water quality could be warranted for site specific maintenance activities, particularly those occurring over sole source aquifers like the Edwards Aquifer or along the Gulf Coast. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Wetland and Vegetative Communities | Activities under this program are constructed, in a manner that minimizes adverse effects to wetlands and vegetative communities.<br>Disturbance to vegetation includes crushing of roadside vegetation by vehicles driving on the ROW to maintain the roadway system. Trimming and removal of native vegetation may be required at times, but no impacts to this resource are expected.<br>De-icing agents could enter directly into wetland environments.<br>SW3Ps provide benefits to wetlands and surface waters by removing pollutants and thus do not find its way into nearby surface waters.<br>Vegetation removed during drainage maintenance is re-vegetated and erosion control devices are put into place before work begins.<br>Some maintenance activities have the potential to knock dirt & debris into nearby wetlands causing temporary increases in suspended solids. Such impacts are infrequent & temporary. | Localized effects to water quality could affect receiving wetlands.<br>Stormwater runoff from bridges often enters downstream wetlands. Bridge maintenance activities can reduce the amount of road debris that drains into these systems.<br>Sweeping ice-rock and sediments from bridge decks and roadways reduces the amount that could be deposited on vegetation and in wetlands.<br>Removal of litter and debris from wetlands helps wetlands to maintain better ecological function.<br>Ensuring dirt, litter, and debris are removed from landings and ferries provides indirect benefits to nearby wetland environments.<br>TxDOT's Current Action alternative complies with all applicable regulatory requirements related to wetlands and Waters of the U.S. | Concerns over impacts to wetlands and vegetation were not raised or identified during the development of this project. | Section 404 of the CWA regulates the discharge of dredge and fill materials into wetlands. | Changes in land use due to suburban growth are expected to convert additional wetlands and native vegetation to urban use. No net loss policy affords no net loss of this resource. | Yes. In spite of the No net loss policy wetlands and associated vegetative communities continue to experience cumulative effects from a variety of sources including the most recent oil spill in the Gulf of Mexico. Site specific maintenance activities, particularly those occurring in coastal wetland environs, may warrant a more detailed and site-specific cumulative effects analysis at some point in the future. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Wildlife | Program activities could cause any wildlife presence in the area to leave temporarily as a result of an increase in noise and human presence.<br>Program activities could result in the loss of individual wildlife species that cannot move out of the way during maintenance activities.<br>Adverse effects on plant and animal populations from dredging and dredged material disposal may cause a temporary increase in turbidity and any wildlife to leave the area temporarily. | Localized effects of water quality on aquatic and semi-aquatic species. All water quality regulations will be followed and site specific BMP's will be used to reduce any adverse effects.<br>Temporary increase in sodium chloride levels of adjacent aquatic and terrestrial habitats. Localized and short-term in nature. Increase in road kills.<br>By sweeping ice-rock and sediments from bridge decks and roadways it decreases the impacts of de-icers on wildlife.<br>Removal of roadkill prevents the attraction of additional wildlife and reduces the potential for vehicle-animal collisions. | Concerns over impacts to wildlife and habitat were not raised or identified during the development of this project. | The MBTA requires that impacts to migratory birds, their nests, and their young be avoided. | Declining. Health of wildlife can be determined by availability of suitable habitat. Individual species require varying habitat requirements. | Yes. While maintenance program activities do not produce population level effects on wildlife other events like the Gulf oil spill could, particularly coastal wildlife. As a result, a more detailed evaluation of site specific maintenance activities that could affect wildlife in coastal areas may be warranted. |
| Floodplains | Most activities performed under the Maintenance Program do not directly impact floodplains.<br>Drainage maintenance activities would help to control erosion, ensure free flow conditions, and therefore would not adversely impact floodplains. The proposed dredging and dredge disposal would be located within the 100-year floodplain. Consistent with Executive Order (EO) 11988 on floodplain management, dredging and dredge disposal in these areas are considered to be a repetitive action in the floodplain and would not adversely impact flooding or floodplain values. | Program activities reduce the potential for the introduction of litter and debris into floodplains, which can then alter water flows.<br>Program activities reduce the potential for the introduction of litter and debris into floodplains, which can then alter water flows.<br>Program activities reduce the potential for localized flooding, which can then alter water flows within the floodplain. | Concerns over impacts to floodplains were not raised or identified during the development of this project. | EO 11988 requires federal agencies to avoid impacts to 100-year floodplains. Additionally, county and local ordinances also regulate development in floodplains. | Declining. Development continues to encroach on floodplains. Flooding along river corridors and urban areas near the coast continues to be a problem. | No. Floodplain management activities prevent to the alteration of floodplains. Program activities keep floodplains functioning properly within and adjacent to the ROW. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Coastal Zone Management | Most Maintenance Program activities would not directly affect coastal zones. The Ferry Maintenance Program does not have a direct or significant adverse impact on the coastal natural resource areas and therefore is in accordance with the CMP. The disposing and placing of dredged material will comply with the requirements under the CMP. | There are no indirect impacts to coastal zones due to the Maintenance Program. | Concerns over impacts to coastal zones were not raised or identified during the development of this project. | CZMA of 1972, federal program development and approval regulations, and the Texas Coastal Coordination Act. | Stable. Under active management. | No. There are no adverse direct or indirect impacts to coastal zones of the state of Texas associated with the Maintenance Program. |
| Coastal Barriers | Maintenance Program activities would not directly affect Coastal Barriers. | There are no indirect impacts to coastal barrier resources due to the Maintenance Program. | Concerns over impacts to coastal barriers were not raised or identified during the development of this project. | Coastal Barrier Resources Act ([Pub. L. 97–348, Approved Oct. 18, 1982, 96 Stat 1653 [As Amended Pub. L. 107–136, Jan. 24, 2002] | Declining. Gulf oil spill will detrimentally affect coastal resources. | No. There are no adverse direct or indirect impacts to coastal barriers of the State of Texas associated with the Maintenance Program. |
| Essential Fish Habitat (EFH) | Impacts to EFH would include increased turbidity in waters near boat ramps where TxDOT conducts maintenance activities. By employing BMPs during such activities TxDOT minimizes adverse effects to water quality and any associated EFH.<br>Essential Fish Habitat exists at both TxDOT ferry locations. TxDOT will consult with the National Marine Fisheries Service regarding potential impacts of their actions on EFH. | Indirect impacts to water quality from ferry landing dredging maintenance activities could affect EFH. Site-specific BMPs would be employed to minimize all impacts. | Concerns over impacts to EFH were not raised or identified during the development of this project. | Magnuson-Stevens Fishery Conservation and Management Act (67 FR 2343, January 17, 2002). | Declining. Gulf oil spill will detrimentally affect EFH. | Yes. Given the effects of the Gulf oil spill TxDOT will continue to monitor activities with the potential to affect EFH. |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Threatened & Endangered Species | Maintenance Program activities are not expected to adversely impact federally or state-listed animal species. However, this environmental review addresses potential impacts at a program level and district environmental personnel will review site-specific Maintenance Program activities within their district's jurisdiction. In some cases, such activities may warrant coordination with TPWD due to potential impacts to unregulated but sensitive habitat. Determinations will be evaluated on an individual project basis and coordination will be conducted as appropriate. TxDOT will incorporate best management practices or other measures suggested by TPWD, when practical and reasonable, to avoid or minimize impacts. | Program activities are not likely to indirectly impact threatened and endangered species. However, this environmental review addresses potential impacts at a program level and district environmental personnel will review site-specific Maintenance Program activities within their district's jurisdiction. In some cases, such activities may warrant coordination with TPWD due to potential impacts to unregulated but sensitive habitat. Determinations will be evaluated on an individual project basis and coordination will be conducted as appropriate. TxDOT will incorporate best management practices or other measures suggested by TPWD, when practical and reasonable, to avoid or minimize impacts. | Concerns over impacts to threatened and endangered species were not raised or identified during the development of this project. | Endangered Species Act (16 USC 1531-1543). | Declining. As wildlife habitat is lost to development, critical habitat for endangered species could decline causing more species to be added to the threatened & endangered list. | Yes. Several federally and state listed and candidate species are known to occur within or adjacent to the TxDOT right-of-way. Maintenance activities that could affect these species at known locations may warrant a more detailed cumulative effects analysis at some point in the future. |
| Cultural Resources | With proper implementation this program has no direct impacts to cultural resources. Program activities provide access to historic markers within the ROW. Extensive maintenance of NRHP-eligible or listed resources must be coordinated with the District Environmental Coordinator and TxDOT ENV. | There are no indirect impacts to cultural resources as a result of the Maintenance Program with proper implementation. By providing access to historic markers, public interest in the cultural heritage of the state of Texas is maintained. | Concerns over impacts to cultural resources were not raised or identified during the development of this project. | Texas Antiquities Code, National Historic Preservation Act, Section 4(f) of the Department of Transportation Act of 1966. | Stable. | No. There are no adverse direct or indirect impacts to cultural resources of the state of Texas associated with the Maintenance Program. |
| Visual and | Maintenance activities occur on | There are no indirect impacts | Concerns over | The visual | N/A | No. There are |

| Resource | Direct Impacts[1] | Indirect Impacts[1] | Concerns Raised During Project Development | Regulatory Context | Health of Resource | Future Site-Specific Analysis |
|---|---|---|---|---|---|---|
| Aesthetic Qualities | existing highways and ROW and would result in no change to very minor change in the visual and aesthetic qualities. Maintenance practices in some cases may improve the aesthetic value of highways to the traveling public. | to visual and aesthetic qualities due to the Maintenance Program. | impacts to visual and aesthetic values were not raised or identified during the development of this project. | environment is not a regulated resource. | | no adverse direct or indirect impacts to visual resources of the state of Texas associated with this program. |

*Source: Study Team 2010*

**Note:** [1] According to 40 CFR 1508.27, "significantly" requires the consideration of both *context* and *intensity*. *Context* means the affected environment in which a proposed action would occur; it can be local, regional, national, or all three, depending upon the circumstances. *Intensity* means the degree to which the proposed action would involve one or more of the following 10 factors: 1) adverse effects associated with "beneficial projects"; 2) effects on public health or safety; 3) unique characteristics of the geographic area; 4) degree of controversy; 5) degree of highly uncertain effects or unique or unknown risks; 6) precedent-setting effects; 7) cumulative effects; 8) adverse effects on scientific, cultural, or historical resources; 9) the degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973; and 10) whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

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# 7.0 MITIGATION AND BEST MANAGEMENT PRACTICES

In addition to demonstrating compliance with 43 TAC, Part 1, Chapter 2, Subchapter A, § 218(b), this environmental review also identified impacts and measures and BMPs that TxDOT could implement to further reduce the environmental impacts associated with the Maintenance Program. Under either alternative, Maintenance Program activities and practices result in environmental impacts that are predominantly temporary and minor. Several BMPs were identified during this environmental review that can further reduce the identified environmental impacts. These BMPs include the following:

**Water Resources:**

- Limit the operation of heavy machinery used for Maintenance Program activities to paved areas, areas free of native vegetation, and to areas with slopes that are less than 33 percent consisting of stable soils.
- Avoid using machinery in wet and/or inundated areas to prevent rutting and/or turbidity.
- Coordinate with TxDOT biologists or local fish and wildlife experts for assistance in scheduling activities to avoid aquatic impacts.
- Identify any sensitive habitat areas, including watercourses, streams, and lakes found within the work area prior to beginning Maintenance Program activities and take precautions to avoid impacts to such resources.
- Filter runoff and rinse water prior to discharge when using high pressure water for cleaning.
- Use cloth, netting or other materials to catch any debris (i.e. concrete, epoxy, grease, paints, etc.) generated during maintenance practices.
- Contain all chemical substances used for customer service maintenance, including paints, sealants, cleaners, de-icing agents, and sand until such substances are needed.
- Use only substances approved for use in or near aquatic environments when working near such environments. Consider the following when conducting product procurement for Customer Service Maintenance Program activities (i.e., cleaners for restroom facilities, graffiti removal chemicals, paints, etc.):
    - Minimizes exposure to concentrates
    - No ozone depleting substances
    - Recyclable packaging
    - Recycled-content in packaging
    - Reduced bioconcentration factor
    - Reduced flammability
    - Reduced or no added dyes, except when added for safety purposes
    - Reduced or no added fragrances
    - Reduced or no skin irritants

  - Reduced or no volatile organic compounds (VOCs)
  - Reduced packaging
- Undertake work at rest and picnic areas during periods of dry weather as this allows easier control of sediment, and is typically a less sensitive period for fish and wildlife. If the work must be performed during rain, sediment controls must be installed to prevent release of sediment or hazardous substances.
- Notify the immediate supervisor and the District Stormwater Coordinator if an illegally dumped substance within the TxDOT ROW has the potential of entering a municipal drain system so that the downstream municipality can be contacted.
- When cleaning boat ramp surfaces, take special care to ensure debris and dirt is not blown off of the boat ramp into watercourses, wetlands, or floodplains.
- Dispose of removed material at appropriate stable sites so the material will not be washed into wetlands or waterways.
- Install check dams to protect sensitive resources, when appropriate.
- Where appropriate and practical, place sediment barriers in site-specific locations along stream routes or direct drainage routes, prior to disturbing soil and route material away from watercourses.

**Drainages/ Drainage Structures:**

- Before filling depressions at culvert inlets, check for native mussel species and notify TxDOT Environmental Affairs Division (ENV) before proceeding, if native mussels are found.
- Develop procedures for relocating mussels found stranded in these puddles back into flowing stream reaches, in accordance with TPWD Proclamation §57.157 regulating mussels and clams.
- Investigate and utilize natural materials (wood, brush, boulders, etc.) on submerged banks, abutments and creek beds when stabilizing or rehabilitating a waterway;
- Evaluate existing altered drainages and modify them, when feasible and appropriate, to simulate natural drainage features (e.g., step-slope cross-section instead of trapezoidal cross-section, meander paths instead of straight runs, natural creek bed surface instead of impermeable surface materials);
- Avoid the use of armor (gabion blankets and sacks, concrete riprap, and steel sheet pilings) in natural waterways, wherever feasible; and
- When using armor, always incorporate a natural material cover, such as multiple layers of sod over soil and brush blankets to stabilize the shoreline and to reestablish a vegetated bank.
- Only perform maintenance ditch cleaning in areas where ditch function is impaired. The ditch length, width, and height should be dredged back to its original dimensions. At New York State

DOT, ditches are mowed to control vegetation rather than mechanically cleaning ditches with heavy equipment because mowing causes less erosion of exposed soil and can result in improved water quality.

- In general, clean, repair or replace culverts and ditches only during periods of low water flow and not during intense rainfall events.
- Conduct dredging during low water periods and during dry weather, avoiding rainfall events.
- Evaluate and modify, where feasible and appropriate, existing ditch slopes to trap sediments, and support development of vegetation.
- Use BMPs identified in the local Integrated Vegetation Management Plan.
- Retain existing vegetation when at all possible, especially along the ditch slopes to maintain stability;
- Consider excavating only the first three quarters of the ditch and retaining vegetation in the remainder. WSDOT assessed routine highway ditch cleaning alternatives or service levels for water quality benefits and surveyed biofiltration swales to evaluate conditions promoting water quality benefits. Of the options explored, the study found the greatest water quality benefits when the first three quarters of the ditch were excavated and vegetation was retained in the remainder. The ditch treated in this manner was capable of reducing TSS by approximately 40 percent, total phosphorus by about 50 percent and total and dissolved Cu and Zn each by roughly 20 to 25 percent. Analysis of survey data also showed that biofiltration swales with broad side slopes, wide bases, and total storage volumes equivalent to three inches of runoff from the impervious drainage area consistently supported good vegetation cover and showed few signs of damage.
- Dispose of removed material above the bank line and not in any waterway or wetland. Recycle excavated material when feasible.
- Have adequate siltation control measures in place before dredging operations begin. Use erosion control devices such as check dams, silt fences, and other acceptable techniques when the potential exists to have sediment or other materials enter a Water of the State. Install check dams on steep slopes, as necessary, to slow water velocity reduce erosion and sedimentation. Consult with TxDOT ENV if silt devices are inadequate to filter water prior to draining to watercourses.
- When feasible, begin dredge at fixed flow elevation points (i.e., culvert inlets/outlets, catch basin inlets, etc.).
- Seed and mulch cleaned ditches at the end of each work day. Monitor daily for subsequent erosion until area is stable. Repair as necessary.
- Remove temporary conveyances completely as soon as the surrounding drainage area has been stabilized or at the completion of construction.

- Inspect the measure after every storm and repair the dike, flow channel, and outlet, as necessary. Approximately once a week, whether a storm has occurred or not, inspect the measure and make repairs if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.
- Check the channel lining, embankments, and bed for erosion and accumulating debris and sediment buildup. Remove debris and repair linings and embankments as required.
- Employ energy dissipaters if channelized flow is too strong for the surrounding environment. If vegetation or rock lined ditches reduces the ditch flow capacity, the road may be endangered.
- Develop native material curbs or berms using a grader. Vegetation of these berms will enhance the durability of these constructed features. Hardened curbs such as asphalt or concrete will require a construction crew and an engineer.
- Do not heel or pull the ditch with a grader, except when absolutely necessary. The softest approach to developing vegetated ditches is preferred.
- Create properly sized roadside ditches and have adequate relief drain spacing to carry runoff from moderate storms.
- Establish a ditch gradient between 2 and 8 percent slopes for better performance. Slopes greater than 8 percent provide runoff waters with too much momentum and erosive force and will require more ditch relief. Slopes of less than 2 percent drain water too slowly, or not at all.
- Ensure timely inspection and removal of debris for culverts to continue to effectively move water, fish, sediment, and debris.
- Inspect all culverts at least annually to assure proper functioning. Summary reports should be completed for each crossing evaluated. An annual report should be compiled for all stream crossings and submitted to the resource agencies. A less frequent reporting schedule may be agreed upon for proven stream crossings. Any stream crossing failures or deficiencies discovered should be reported in the annual cycle and corrected promptly addressed.

**Erosion Control:**

- Avoid changes or increases in the material profile, whenever possible.
- Place riprap within in-water work periods (seasonal habitat restrictions are complied with), in non-emergency situations.
- Consider use of bioengineering solutions where practicable. Practicable use areas include areas not shaded by bridge elements, outside of the two-year floodplain where success is probable and safety of the structural elements is assured.
- Coordinate any erosion repair activities (response to and cleanup of erosion problems, not the erosive action itself), which cause significant changes in the topography or vegetation within the riparian management area with DOT environmental staff and/or other regulating agencies.

Also, coordinate when placing riprap that is in addition to existing conditions and within the two-year floodplain of Waters of the State.

- Use erosion control methods in a timely manner, including seeding and mulching specific areas with non-invasive species, installing silt fences, and installing other devices as appropriate.
- Take precautionary measures on erodible areas (chicken wire, chain link, rock matting) where eroding areas are identified, and where precautionary measures can be successfully and safely applied.
- Establish adequate siltation control measures before maintenance begins. Use erosion control devices such as check dams, silt fences, and other acceptable techniques when the potential exists to have sediment or other materials enter a Water of the State. Install check dams on steep slopes, as necessary, to slow water velocity reduce erosion and sedimentation. Consult with TxDOT ENV if silt devices are inadequate to filter water prior to draining to watercourses.

**Equipment Maintenance:**

- Properly maintain all equipment used for Maintenance Program activities to optimize fuel and operating efficiency and to ensure worker safety.
- Use as little solvent as possible to lubricate, not clean, the surfaces and moving parts of the paver.
- Spray solvent on the equipment rather than pour it, during lubrication;
- Prevent solvent from puddling under the equipment. If puddles form, they could wash into a stream during a rainfall. Use absorbent pads to catch any excess during application.
- If absorbent pads are used, do not leave them on the ground beneath the paver. Allow the solvent to drip off, then pick up the pads and store them for future re-use and disposal.
- Properly dispose of pads contaminated with a "listed hazardous waste solvent" as hazardous waste.
- Store pads in closed containers between uses and before disposal.
- Carry a spill kit, Material Safety Data Sheets (MSDS) and emergency phone numbers for use in the event of a significant spill in vehicles carrying fuel and other maintenance fluids.
- Train drivers of these vehicles in how to handle and report a spill.
- When cleaning tools, servicing equipment or doing routine maintenance, use care to avoid spills, leaks and drips of equipment and cleaning fluids.
- Maintain equipment so as to prevent leaks of petroleum products.
- Covered or clean up tack over-spray during construction.

**Other:**

- Adhere to the TxDOT's Standard Plans and Specifications when work is scheduled.
- Schedule and conduct maintenance work during off-peak traffic hours when practicable;
- Generate a list of all programmed maintenance work for the Fiscal year (FY) so that it can be reviewed and coordinated with the appropriate resource agencies.
- Coordinate with ENV and the District Environmental Coordinators prior to grading and blading activities for wildfire management and control;
- Contact environmental support staff before placing excess material to widen the shoulders or smooth out the slopes.
- Prior to excavating soil besides the roadway, contact utility companies to avoid hitting any buried utilities within the ROW.

**Rare, Threatened and Endangered Species, Special Features, and Natural Plant Communities:**

- When federally listed species or critical habitat is observed at or near a maintenance activity, coordinate with the District Environmental Coordinator to determine if further coordination with USFWS or NMFS under the ESA is required.
- Follow rules set forth in The Memorandum of Understanding with the Texas Parks and Wildlife Department (TAC43(1)(2)(B)(22.2)) and memoranda of agreements.
- Observe triggers of The Memorandum of Understanding (MOU) with the Texas Parks and Wildlife Department. These include:
    - More than 1.0 acre of new ROW within floodplains or creek drainages in rural or undeveloped urban areas;
    - Channel modifications to streams, rivers or water bodies;
    - Channel re-alignment requiring the creation of new drainage ways or other excavation impacting more than 1.0 acre of mature woody vegetation;
    - Excavation (scraping, clearing, or other surface disturbance) of the existing channel outside of TxDOT's existing ROW, or of the channel inside the ROW which is not routinely maintained and exhibits native vegetation;
    - Affects to mature woody vegetation or dense mature brush, including any significant remnant native vegetation (e.g., undisturbed native prairie or bottomland hardwood, etc.);
    - Within the range and in suitable habitat of any state or federally listed threatened or endangered species;
    - Mitigation plans or otherwise involve proposals to redress project impacts on fish, wildlife, or plant resources;

  - Previous environmental clearance, i.e., three years have passed without major action(s) and/or TPWD review, but now meets any of the above listed criteria; or
  - Three years passed since environmental clearance with major actions (i.e., the TPWD may have or may not have reviewed, but the project meets any of the above listed criteria).

  If a specific MNT activity involves any of the above listed criteria then coordination with TPWD per the MOU is required.

- Train maintenance personnel to identify protected species and species of concern, cultural resources, and inform them of all applicable safety and legal requirements.
- Confirm the presence of listed species at or near the project site through pre-maintenance surveys or assume they are present and implement appropriate protection measures.
- Minimize impacts to listed species and their habitats by limiting grading or topsoil removal to areas where this activity is absolutely necessary for maintenance activities.
- Schedule the most effective amount of personnel and equipment to complete t maintenance activities to reduce the time of disturbance to listed species.
- Review temporary roadside material storage locations and notify contractors of the areas with potential to support habitat for rare, threatened, and endangered species and of the conservation need to avoid these areas.
- Identify problematic ROWs that could benefit from alternative ecological approaches to maintenance activities to reduce erosion or other maintenance program impacts.
- Prioritize projects occurring in designated critical habitat, other critical habitat, significant remnant native vegetation, and sensitive managed areas for invasive species removal/revegetation activities.
- Do not disturb, destroy, or remove active nests during the nesting season.
- Avoid the removal of unoccupied, inactive nests, as practicable.
- Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures only when necessary to perform efficient maintenance or enhance safety.
- Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.
- Use non-attractive vegetation for plantings in the ROW.
- Limit the use of machinery in habitat that may support ground-nesting birds during the spring and early summer months.
- Use BMPs identified in the local Integrated Vegetation Management Plan.
- Retain existing vegetation whenever possible

- Avoid use of the 145 non-native invasive plant species identified on http://www.texasinvasives.org/, in addition to the Federal and State of Texas noxious weed species
- Sterilize equipment for tree trimming between trees in areas affected by surface transferable bacterial, viral, and fungal diseases. Large cuts across roots and cut surfaces remaining on tree trunks or roots

**Bridges:**

- Use prefabricated bridge elements and systems to reduce the amount of heavy equipment required and the amount of time required on-site for heavy equipment, causing less disruption to sensitive environments, increasing maintenance personnel safety, and reducing traffic delays.
- Avoid the removal of bird nests and casts attached to bridge structures during the nesting season.
- Avoid conducting Bridge Program Maintenance activities when nesting birds or bats are present.
- Modify timing of maintenance activities to protect bats in bridges, including postponing tree trimming and/or bridge maintenance work until outside of bat season.
- Schedule Bridge Maintenance Program activities to avoid egg incubation, juvenile rearing and downstream migration periods of fish.
- Take special care to ensure debris and dirt is not blown off of the bridge into watercourses, wetlands, floodplains or on to vehicular traffic when cleaning deck and bridge surfaces,
- Properly collect, store, and dispose of all wastes generated during Bridge Program Maintenance activities in approved landfills.
- Contain all chemical substances used for bridge maintenance, including paints, sealants, lubricants and epoxies. Use collection mats, such as drop cloths, filter mats, and containment curtains to prevent chemical substances from entering the environment.
- Create an inventory of bridges that have lead or asbestos containing paints, so as to identify and ultimately abate these materials from TxDOT's infrastructure

**Hazardous Materials:**

- Train maintenance crews on how to handle hazardous chemicals if used, and encourage them to use them sparingly and only when absolutely necessary.
- Ventilate facilities and use fans to create a cross draft when paints, cleaners, etc. are being used.
- Wear personal protective equipment whenever handling a hazardous chemical to reduce exposure, which could cause acute or chronic effects.

- Limit the use of bleaches and chemical cleaners and ensure toxic substances are not placed in toilets.
- Store materials such that rainfall will not cause any runoff (contaminated runoff could impact other areas on site, wetlands, or surface waters.) Store sweepings to minimize the potential for site impacts from road waste contaminants. Storage on an impermeable surface with leachate collection and/or protection from rainfall is preferable. Tarps may be used for cover, or berms or retention ponds may be used to contain runoff.
- Label all tanks and piping.
- Secure valves on storage tanks in the closed position and/or lock dispensers when not in use.
- Post warning signs and/or operating instructions near storage tanks.
- Protect storage tanks from vehicle impact.
- Use overfill indicators and/or overfill protection on fuel tanks.
- Situate tanks on a foundation if site appropriate. It is recommended that tanks be placed on an impervious surface to minimize opportunity for subsurface contamination in the event of a spill.
- Provide secondary containment in areas where spills, leaks, or ruptures could enter nearby creeks or streams.
- Store/dispose of removal materials at an appropriate site in an appropriate manner as part of the local material disposal plan. Removed material may be temporarily stored in stable locations to prevent the material from entering wetlands or waterways.
- Do not handle any unknown substance that may be potentially hazardous. If a substance is known to be hazardous, suspected of being hazardous or cannot be identified, notify the District Maintenance HazMat Manager immediately.

**Deicing:**

- Store de-icing agents in covered areas on impermeable surfaces to prevent leaching of these agents into underlying soils and groundwater and to prevent agents from entering surface waters via runoff.
- Minimize use of salt by reducing salt-to-sand ratio.
- Plow snow in areas that allow vegetation to filter and contain sand.
- Treat sand clean-up as part of the emergency: remove sand as a priority in order to remove sediments.
- Prioritize sand clean-up efforts to aquatic habitat areas to minimize impacts.
- Prioritize sand clean-up in areas without sediment collection systems.
- Ensure equipment is operating properly so salt is applied accurately to road surfaces and prevents over-spray.

- Remove the bulk of snow and ice prior to the application of de-icing agents, as it reduces the need for salt application.
- Develop a salt management plan to minimize salt usage and salt entry into the environment surrounding roads and maintenance facilities.
- Minimize the release of salty snowmelt waters from snow storage piles to soils and groundwater by directing runoff to areas less sensitive to impact.
- Collected and screen and size winter road sand for reuse. If sand washing is required to remove excess fines, minimize site impacts, collect the fine particles, and prevent runoff. (Pretreatment by settling or flocculation then permitted discharge to sanitary sewer is a sound practice).

**Sweeping:**

- Recycle sweeping materials as practicable and appropriate.
- Where feasible, schedule sweeping during damp weather, to minimize dust production.
- Where appropriate and practical, place sediment barriers in site-specific locations along stream routes or direct drainage routes, route sweeping material away from watercourses.
- Free clogged scuppers using a steel rod, then sweep material away. A scupper is an opening in the side walls or parapet of a bridge, for purposes of draining water. They are usually placed at or near ground level, and allow rain or liquids to flow off of the side of the bridge, instead of pooling on the deck.
- Use water (as needed) to reduce dust during sweeping.
- Where feasible, coordinate crews to follow sweeping/flushing with bridge drainage cleaning.
- Sweep and vacuum to removing de-icing abrasives, material from small slides, litter and debris. Sweeping and vacuuming may be implemented anywhere sediment is tracked from off-road maintenance activity sites onto public or private paved roads typically at the points of egress.
- Compost sweeper loads full of fallen leaves and other organic materials rather than use classic waste disposal techniques when possible.
- Do not sweep up any unknown substance that may be potentially hazardous. If a substance is known to be hazardous, suspected of being hazardous or cannot be identified, notify the District Maintenance HazMat Manager immediately;
- Adjust brooms to maximize the efficiency of sweeping operations.
- Do not load hoppers with street sweepings beyond their capacity.
- Screen regular sweepings, disposing trash and litter only at TCEQ-permitted landfills.

- Sidecast minimally contaminated sweepings onto non-ditched shoulders if these roadsides are not adjacent to surface waters, wetlands, or stormwater management systems with discharge to surface waters, wetlands or the subsurface.
- Slow sweeper and broom speed, and change the angle of the broom to prevent sweepings from leaving the road shoulders and entering the stream if the road is parallel to a water body that is less than 25 feet from the fog line.

**Waste Disposal:**

- Store/dispose of removal materials at an appropriate site in an appropriate manner as part of the local material disposal plan. Removed material may be temporarily stored in stable locations to prevent the material from entering wetlands or waterways.
- Dispose of waste to a landfill or approved site in accordance with local regulations and solid waste management best management practices. "Clean" materials should be reincorporated back into the program for future reuse.
- Where possible, recycle abrasives for use in roadside berms instead of putting them into landfills.
- Obtain a site-specific permit if composting over 25 tons per year.
- Determine if a state solid waste permit is required for storage, processing and reuse of materials other than road sand and clean fill.
- Screen materials collected from areas known to have low impacts from road waste contaminants for trash and reuse it as low grade fill in DOT-owned and controlled areas. During storage and processing, fines should not be allowed to become airborne.
- Use general good housekeeping practices and do not leave waste behind on the job site.

**Beaver Control:**

- Avoid disturbing beaver dams, whenever feasible, particularly when the dam supports an offsite wetland or when the dam does not cause drainage or other issues that could create safety hazards or accelerate the deterioration of transportation infrastructure..
- Instead of replacing existing smaller culvert pipes with oversized types, consider other ways to discourage beaver colonization such as building a horseshoe shaped fence around the upstream side of the culvert to prevent the beaver from damming the culvert entrance, installing beaver baffles, Beaver Stop guards, or beaver pipes..
- Ensure TxDOT personnel and contractors use humane techniques to discourage beaver re-establishment of dams where roadway safety is an issue.
- When installing culverts, avoid creating a depression at the inlet. A depression that creates a "pond" at the culvert inlet may encourage beavers to expand that pond.

- Do not install multiple culvert pipes when installing larger pipes is required. Smaller pipes have a much greater probability of being plugged and this probability is not reduced with multiple pipes. In addition, debris collects and is trapped between multiple pipes, which may encourage beavers to expand on this debris and plug the culverts.
- After a culvert has been oversized, do not place a grate or guard in front of the culvert. This will only encourage beavers to plug the culvert's inlet. Once a culvert has been oversized, it should be observed periodically for signs of beaver plugging. If beavers attempt to plug an oversized culvert, consider integrating other techniques such as trapping, deepwater fencing, or water level control devices.

At all times, work cooperatively with landowners when resolving beaver damage problems. When working with landowners to secure permission for a trapper, the objectives for removing the beaver from the roadside area must be made very clear to the trapper.

- Trap at sites where beavers have a history of plugging very large culverts (inlet opening area >38 feet) or when oversizing is not an option.
- Trap established family groups of beavers for one or two years after oversizing a culvert to remove those with experience in culvert plugging
- Make a commitment to continual maintenance in situations where a water level control device can be installed (and is desired).
- When impounded water from an upstream or downstream beaver dam is damaging a road, employ regulated trapping as the most efficient and cost-effective solution.
- At all times, observe state wildlife agency regulations concerning beaver trapping, installation of water level control devices, and beaver dam removal. Contact state wildlife offices for questions concerning conservation law.
- Document the size of the culvert inlet, stream gradient, and percentage of open area. If money is allocated for proactive replacement of culvert pipes, rank sites based on the probability of beaver presence.

**Ferry Maintenance Program/Dredging:**

- Comply with the requirements under the CMP when disposing of or relocating dredged material. The CMP requires that dredging and the disposal and placement of dredged material shall avoid and minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches to the greatest extent practicable. Dredging and dredged material disposal and placement will not cause or contribute to violation of any applicable surface water quality standards established under the CMP.
- Minimize adverse effects on water quality from dredging and dredged material disposal and placement by controlling the location and dimensions of the activity; by complying with

applicable standards for sediment toxicity; by controlling the manner in which material is dispersed; and by adapting technology to the needs of each site.

- Comply with regulations governing water quality when performing Ferry Maintenance Program activities.
- Minimize adverse effects on plant and animal populations from dredging and dredged material disposal or placement by avoiding changes in water current and circulation patterns that would interfere with the movement of animals.
- Select sites or manage discharges to prevent or avoid creating habitat conducive to the development of undesirable predators or species that have a competitive edge ecologically over indigenous plants or animals to minimize adverse effects.
- Time dredging and dredged material disposal or placement activities to avoid spawning or migration seasons and other biologically critical time periods to reduce potential impacts to animal populations.
- Consult with the National Marine Fisheries Service (NMFS) regarding potential impacts of actions on EFH, if activities may adversely impact Essential Fish Habitat (EFH). TxDOT should comply with all Essential Fish Habitat regulations.
- Implement measures to achieve additional emission reductions. Examples of measures include, but are not limited to, operating practices and measures, including application of methods to reduce ferries main engine and barge pump engine idling time; modifications to the ferries engine and support equipment, including adjustments to engine timing, early integration of new marine diesel engines or the retrofit of existing marine diesel engines; early use of regulated fuels as they are made available; and/or other maintenance measures consistent with the ferry support operations.

**Pavement:**

- Use pervious concrete whenever practical and feasible,
- Do not wash out concrete trucks into storm drains, open ditches, streets or streams,
- Do not allow slurry residue to enter storm drains or watercourses; it should be vacuumed and disposed,
- Use care to avoid spills, leaks and drips of equipment and cleaning fluids when cleaning tools, servicing equipment or doing routine maintenance,
- Construct temporary concrete washout facilities with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations,
- Use plastic lining material with a minimum of 10 mil polyethylene and make sure it is free of holes, tears or other defects that would compromise the impermeability of the material;
- Clean washout facilities or construct new facilities once the washout is 75% full.

- Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Ensure that containment devices are structurally sound, leak free and of sufficient quantity or volume to contain all liquid wastes.
- Monitor asphalt mix temperature to ensure conformance with specifications.
- Maintain the lowest possible temperature of asphalt during paving application.
- Consider location of other vehicles and equipment. To the extent feasible, control engine emissions by limiting idling and distancing other vehicles/equipment from paver operations.
- Minimize exposure to asphalt fumes for workers present but not directly involved with paving maintenance.
- Frequently check paver ventilation systems designed to remove asphalt fumes from the screed to ensure proper operation;
- Exhaust tail pipe and ventilation stacks above the height of the paver operator.
- Consider unfavorable weather conditions as a potential problem.
- Consult with Regional Safety Representative regarding the need for personal protective equipment.
- Evaluate safety conditions for workers with asphalt fume-related symptoms and, if necessary, contact the Regional Safety Representative regarding the need to modify operations.
- At the end of the work shift, remove all the excess asphalt from the paver that you can, using pry bars and other hand tools.
- Execute the proper course of action with asphalt removed from the paver. Either incorporate it into the project, scarify and blend it into the stabilized shoulder if practical, or pick it up and haul it back to the plant.
- Do not dispose of asphalt over a hill, in a body of water, or other non-permitted disposal area.
- Park the paver in an area that is not near a stream or a wetland or a ditch that flows directly into a nearby stream or wetland. If you cannot park the paver away from these areas, use absorbent pads under the paver to catch drips of solvent.

**Pavement Markings:**

- Schedule pavement marking activities for dry weather. Do not conduct painting or traffic marking activities during rain events.
- Replace solvent-based alkyd traffic paints with waterborne paints that contain 80 percent less organic solvents and with epoxy paints that release no solvent vapors.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Properly dispose of paints containing lead or tributyltin, which are considered a hazardous waste.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.
- Require all personnel to complete a safety training program that meets state requirements prior to removing yellow thermoplastic and yellow painted traffic stripe and pavement marking.
- Immediately contained and collect all removed residue, including dust, where grinding or other approved methods are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking. Sweeping equipment should not be used. Collection should be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods.
- Store removed yellow thermoplastic and yellow painted traffic stripe and pavement marking residue in labeled covered containers, conforming to state provisions. The containers should be a type approved by the United States DOT for the transportation and temporary storage of the removed residue. The containers should be handled so that no spillage will occur. The containers should be stored in a secured enclosure at a location within the project limits until disposal.

**Cultural Resources:**

- Periodically review the list of all eligible (historic) and non-eligible resources and provide in-house and contracted maintenance personnel responsible for implementing Maintenance Program activities with the list of eligible resources in their respective District so that proper methods are used. Resources can include bridges, historical markers, landscapes, buildings, rest and picnic areas, Depression-Era structures, etc.
- Inspect all historical markers within TxDOT ROW once every year to determine if repairs or cleaning are needed.
- Replace damaged elements (bronze plaques, seals, wreaths, stars) or those missing from granite centennial markers with replacement parts ordered from THC. District environmental coordinators or ENV can provide maintenance personnel with the appropriate order forms.
- Use the least aggressive methods that prove effective for cleaning historic resources. Request guidance for appropriate methods for each type of resource from ENV (guidance sheets are available regarding aluminum state historical markers, older stone and concrete markers and stone and concrete picnic fixtures).

- Coordinate major rehabilitation efforts on historic resources with the district environmental personnel and ENV's Historical Studies Branch. When extensive repair and/or replacement are required, use similar materials and design elements to prevent the loss of the feature's integrity.
- Exercise caution when performing maintenance activities near historical markers, whether they are themselves are historic resources, or more recent commemorative markers.
- Repair rather than remove historic features whenever possible.
- Consult ENV staff for plans and guidance associated with ADA-compliant alterations to historic picnic areas.
- Do not close a historic picnic area due to economic or maintenance concerns without conferring with the district environmental coordinator and cultural resources staff in ENV. A six-step process including public involvement is required.
- Coordinate with the appropriate county historical commission chairperson and receive approval from THC before removing or relocating any historical markers in TxDOT ROW. Most marker relocations that retain a marker in close vicinity to its original location are approved.
- Cease work in the immediate area in the event that evidence of archeological deposits are encountered during Maintenance Program activities and notify the District environmental coordinator who can contact the appropriate individuals to initiate post-review discovery procedures under the provisions of the PA and MOU.

Using these BMPs to the extent practicable and an adaptive management approach, TxDOT will continue to provide effective maintenance while being sensitive to environmental issues.

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# Appendix A – Prohibited On Board and Boarding Procedures and Policies

**General Rules:**

- Don't sit on the rails.
- Feed the gulls only at the rear of the ferry.
- No fishing from the ferry.
- No swimming from the ferry.
- Turn off your vehicle as soon as you are parked, or when directed to do so by the ferry deckhand. Set your parking brake.
- NO smoking allowed anywhere on the ferry, including inside your vehicle.
- Do not tamper with any lifesaving equipment.
- Animals, other than seeing eye and hearing dogs, are not allowed on the deck of the ferry. Animals must remain inside their owner's vehicle.
- Follow the directions of the ferry deckhand while driving on and off the ferry.
- Dumping of trash onto the ferry deck or into the water is prohibited by law.
- No gas tanks unless filled with water.
- No propane tanks.

Vehicle screenings were mandated by the federal government under the 2002 Maritime Transportation Security Act, drafted in response to the Sept. 11, 2001, terrorist attacks and put in place at the ferry landing in 2006. Specific detail as to what screeners are looking for is not available because it is considered “security sensitive” under federal law.

## Texas Administrative Code

| | |
|---|---|
| **TITLE 43** | TRANSPORTATION |
| **PART 1** | TEXAS DEPARTMENT OF TRANSPORTATION |
| **CHAPTER 29** | MAINTENANCE |
| **SUBCHAPTER C** | OPERATION OF STATE-OWNED FERRIES |
| **RULE §29.49** | **Boarding Prohibitions** |

(a) Final authority. The ferry captain is the final decision-maker as to whether a person or item of property is classified as a type of traffic prohibited from boarding a ferry.

(b) Animal assisting disabled passenger. Nothing in this section is intended to prohibit an animal trained in assisting a disabled person from boarding a ferry when the animal is engaged in assisting a passenger with a disability.

(c) Persons and vehicles prohibited. The following persons and vehicles are prohibited from boarding a ferry:

(1) a vehicle or a person carrying any material that according to the CFR or this subchapter is prohibited aboard;

(2) a vehicle exceeding the maximum size or weight allowable on a public highway as provided by Transportation Code, Chapter 621;

(3) a vehicle with one or more persons lying, reclining, standing, or in any other manner riding, in part or in whole, on the outside of a vehicle's passenger cab or a vehicle's truck bed;

(4) a vehicle having one or more flat tires, excluding bicycles;

(5) a vehicle which is stalled or a vehicle with an inoperable motor, excluding vehicles properly in tow as required by this section;

(6) a driver of a vehicle who exhibits one or more characteristics of intoxication or one or more characteristics of being under the influence of any chemical substance;

(7) a vehicle with one or more metal tires;

(8) a vehicle carrying an animal which is not completely confined so as to create, or have the potential of creating, in the opinion of the ferry captain, an unsafe or unsanitary condition aboard the ferry;

(9) a vehicle with inoperable or inadequate brakes, lights, signals, or horns;

(10) a vehicle with a leaking fuel tank or with any type of leaking fluid reservoir or leaky spigot;

(11) a vehicle or any other type of property having any type of metal surface which, in the opinion of the ferry captain, may come in contact with the deck of the ferry;

(12) a vehicle drawn, powered, or otherwise operated by an animal;

(13) double-decked buses having a noncovered upper deck with passengers on the top deck;

(14) a vehicle which, in the opinion of the ferry captain, is emitting an excessive amount of smoke, gases, or fumes, or is giving off an excessive amount of foul odor, thereby creating or having the potential of creating an unsafe, unhealthy, or intolerable environment;

(15) a vehicle whose load, in the opinion of the ferry captain, is inadequately or improperly secured or covered in a manner where it appears that any part of the load may fall off of the vehicle, thereby creating or having the potential of creating an unsafe condition;

(16) a vehicle whose load projects, appears to project, or has the potential of projecting, in the opinion of the ferry captain, in such manner as to be a safety hazard or have the potential of being a safety hazard;

(17) a vehicle being towed by any device, method, or means other than by a tow bar, wrecker, tow truck, or winch truck; and

(18) any person, vehicle, equipment, machinery, animal, or property of any kind which the ferry captain believes to constitute a hazard or a potential hazard to the safe operation of the ferry.

(d) Hazardous materials.

(1) A ferry, whether operating as a passenger vessel or as a cargo vessel, may not carry on board any hazardous material unless the transportation of the hazardous material aboard the ferry is in accordance with the CFR.

(2) A vehicle used for the transportation of hazardous material, or which at anytime has been used for the transportation of hazardous material, may not board the ferry unless the vehicle complies with all federal and state laws and rules.

(3) Any vehicle that the department believes may be carrying or has carried any hazardous material will be subject to inspection at the ferry staging area. The inspection may consist of the department inspecting the shipper's shipping papers. If any inconsistencies are observed such as expired dates on shipping papers, shipping papers that do not agree with placards, or the type of trailer does not appear to be appropriate to transport the material indicated in the shipping papers, the inspection may additionally include the department inspecting the vehicle and its load. If the driver of the vehicle refuses to grant permission to inspect the shipping papers, the vehicle, or its load, the driver shall immediately remove the vehicle from department property, including the ferry staging area. All shipping papers shall be accurate and complete and shall comply in every respect with federal and state laws and rules. Allowing an inspection of shipping papers or the conducting of an inspection does not guarantee or create any right to board the vessel. If the inspection of the shipping papers, the vehicle, or the vehicle's load reveals that the shipment of the hazardous material is not in compliance with federal and state laws and rules, the vehicle will not be permitted aboard the ferry.

(4) All containers of every kind, size, and type shall be in good working condition so as to securely hold, contain, prevent the movement of, and otherwise enclose a hazardous material, thereby ensuring that the material will not leak, spill, spew, overflow, or otherwise empty or escape from the respective container while the material is on department property, including, but not limited to, the ferry staging areas, ferry landings, and the ferry, and all containers shall comply with all federal and state laws and rules regarding hazardous materials.

(5) In accordance with the hazardous material restrictions provided by the CFR, the following materials will

not be permitted aboard ferries classified as passenger vessels:

(A) any hazardous material identified as "forbidden" in Column 3 of the Hazardous Material Table;

(B) any hazardous material identified by the LETTERS B, D AND E in Column 10(a) of the Hazardous Material Table;

(C) any hazardous material which requires special handling, separation, or segregation from other materials, or other stowage requirements due to health risks or violent reactions of the material when in contact with water or other incompatible materials, as specified in the CFR;

(D) any hazardous material identified in the CFR as being in one of the following hazard classes:

(i) class 1 explosive materials;

(ii) class 2 compressed gases, including flammable gases and poisonous gases;

(iii) class 3 flammable liquids with a flash point below 100 degrees Fahrenheit;

(iv) class 4 flammable solids;

(v) class 5 oxidizers and organic peroxides;

(vi) class 6 poisonous materials and etiologic agents;

(vii) class 7 radioactive materials;

(viii) class 8 corrosive materials;

(ix) new explosives as defined by the CFR;

(x) liquefied petroleum gas or compressed natural gas, except when contained in a vehicle as the vehicle's source of fuel;

(xi) asphaltic cements, heavy residual fuel oils, and other similar products which are transported at a temperature greater than 200 degrees Fahrenheit; and

(xii) emulsified asphalts which are transported at a temperature greater than 200 degrees Fahrenheit.

(e) Other materials.

(1) The shipper of a material that is not listed in the CFR or this subchapter, but is derived in whole or in part from a hazardous material listed on the Hazardous Material Table, shall provide the ferry operations manager with a notice including a detailed description of the quantity and the characteristics of the material which the shipper desires to board onto a ferry.

(2) The notice shall also state:

(A) how the material will be packaged;

(B) the description of the vehicle carrying the material;

(C) the estimated date and time of arrival at the ferry staging area; and

(D) the location of the ferry staging area where the vehicle will be arriving.

(3) The department must receive the notice not less than two business days before arrival at the ferry staging area.

(4) The material will not be allowed aboard the ferry if notice is not given.

(5) Providing the required notice does not guarantee or create any right to board the material.

(6) The shipper shall comply with all federal and state laws and rules.

(7) The department may at any time refuse to board the material if the ferry operations manager or the ferry captain believes that refusal is necessary to protect the public health, safety, or welfare, or department property. In no circumstance may the vehicle or the material board a ferry if boarding would be contrary to the CFR or this subchapter.

Source Note: The provisions of this §29.49 adopted to be effective November 21, 1999, 24 TexReg 10145

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