

PROJECT PLANNING AND DESIGN

Landscape plan development within FTE requires processes and procedures unique to FTE. Designers must be fully knowledgeable of the Turnpike Design Handbook, FDOT Design Manual in addition to their scope document in order to meet these requirements.

» **Turnpike Design Handbook (TDH):**

<https://floridasturnpike.com/business-opportunities/design/turnpike-design-handbook/>

» **FDOT Design Manual:**

<https://www.fdot.gov/roadway/fdm/default.shtm>

The process begins with Existing Roadway Conditions Assessment Report (ERCAR). In most instances this document will be supplied to the design consultant. This is followed by the development of a Concept Plan Long Range Estimate of Construction Cost (also know as a budget). In most instances these will also be provided to the consultant by the district.

The concept plan is followed by the Vegetation Assessment/Disposition Plans and Landscape Construction Plans. The consultant will be required to refine the cost estimate through all submittal phases of plan development.

If the consultant is developing Landscape Opportunity Plans for a roadway project with no landscape component they will be expected to do a thorough analysis of the project (to be shown on the LOP or as a stand alone document). Refer to TDH chapter 301 and FDM chapter 228.



SITE ANALYSIS PLANS (SAP)

Site Analysis Plans must be developed in order to portray issues with the existing site and serve as a basis for the development of design solutions. The primary purpose of developing site analysis plans is to convey to the DLA a clear understanding of the field conditions. These typically include impact on existing vegetation, areas of erosion, critical views, utility impacts, and other physical or regulatory constraints that will impact design solutions. Refer to the Turnpike Design Handbook for further guidance.

In addition to identifying the existing conditions found in the field, SAP's should also identify areas available for landscape using the following terms: Unrestricted, Moderately Restricted, and Restricted.

Unrestricted areas indicate unimpeded open areas free of regulatory constraints and utilities available for landscape improvements.

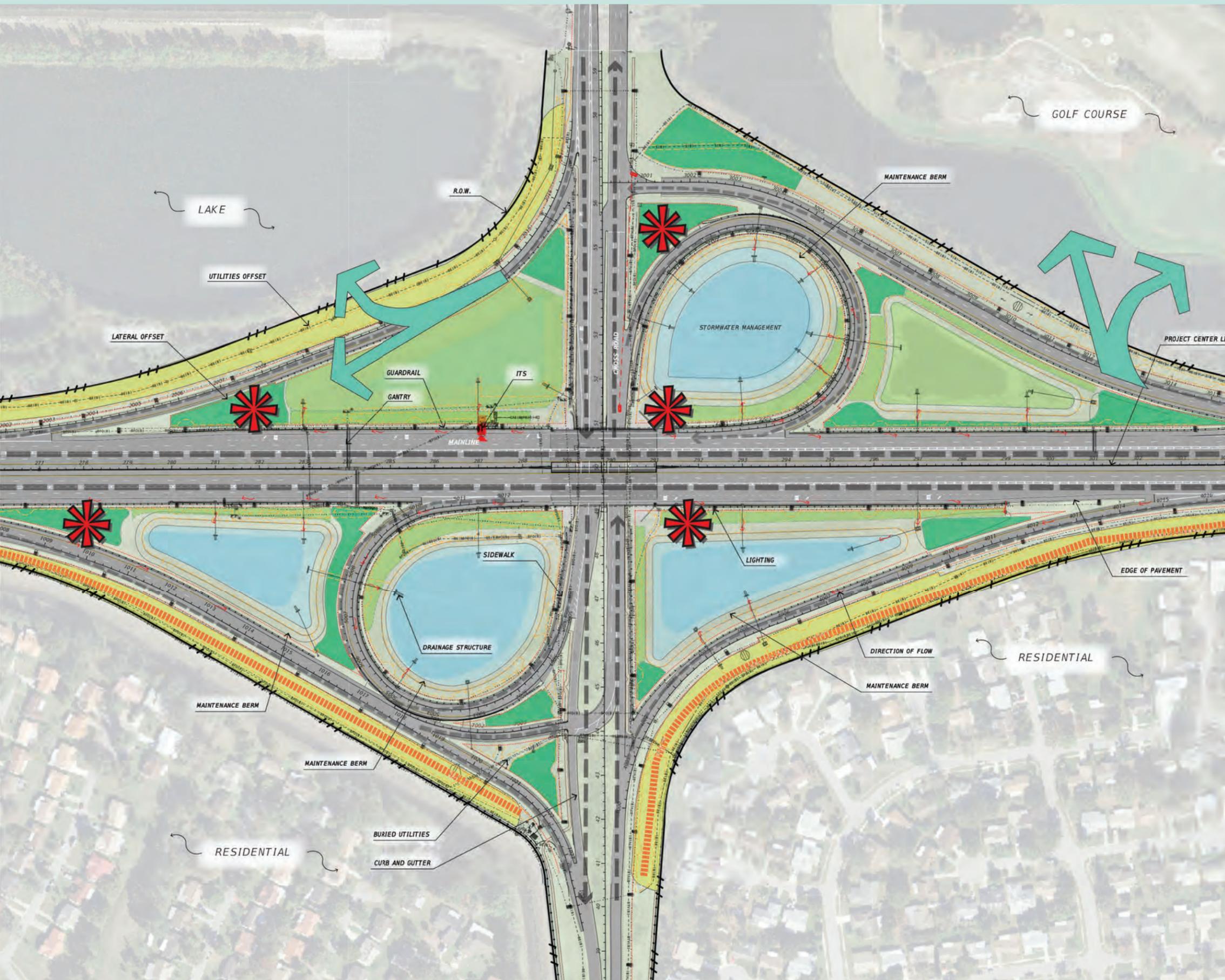
Moderately Restricted areas are open space available for landscape with limited constraints. For example, a utility and its offset dividing the available landscape area into two areas.

Restricted areas are open space impacted by significant regulatory constraints such as lateral offsets, ITS view zones, and/or utilities, storm structures, and other permanent objects preventing the planting of landscape materials other than sod or groundcover. SAP's should also include a discussion of buffers and desirable and undesirable views from and of the roadway.

Buffers are areas on site or off site to be visually screened through the use of landscape material or hardscape, such as a soundwall, to provide visual privacy.



SITE ANALYSIS PLAN (SAP)



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SCALE: 1" = 500'

- CONDUIT
- - BE (B) - - BE (B) - - BURIED ELECTRIC POWER
- - BFO (B) - - BFO (B) - - FIBER OPTICS CABLE
- - BTV (B) - - BTV (B) - - CABLE TV CONDUIT
- - BT (B) - - BT (B) - - TELEPHONE CABLE
- LATERAL OFFSET
- - - - UTILITIES OFFSET
- - - - CLEAR SIGHT
- /// /// R.O.W.
- ➔ DIRECTION OF FLOW

- UNRESTRICTED**
AVAILABLE UNIMPEDED LANDSCAPE AREA FREE OF REGULATORY CONSTRAINTS AND UTILITIES.
- MODERATELY UNRESTRICTED**
OPEN SPACE AVAILABLE FOR LANDSCAPE WITH LIMITED CONSTRAINTS. FOR EXAMPLE, A UTILITY AND ITS OFFSET DIVIDING THE AVAILABLE LANDSCAPE AREA INTO TWO AREAS.
- RESTRICTED**
OPEN SPACE IMPACTED BY SIGNIFICANT REGULATORY CONSTRAINTS SUCH AS LATERAL OFFSETS, ITS VIEW ZONES, AND/OR UTILITIES, STORM STRUCTURES, AND OTHER PERMANENT OBJECTS PREVENTING THE PLANTING OF LANDSCAPE MATERIALS OTHER THAN SOD.
- BUFFER**
AN AREA ON SITE OR OFF SITE TO BE VISUALLY SCREENED THROUGH THE USE OF LANDSCAPE MATERIAL OR HARDSCAPE SUCH AS A SOUNDWALL TO PROVIDE VISUAL PRIVACY.
- VIEW OPPORTUNITIES**
- ITS CAMERAS**
- FOCAL POINT**

EXISTING SITE FEATURES

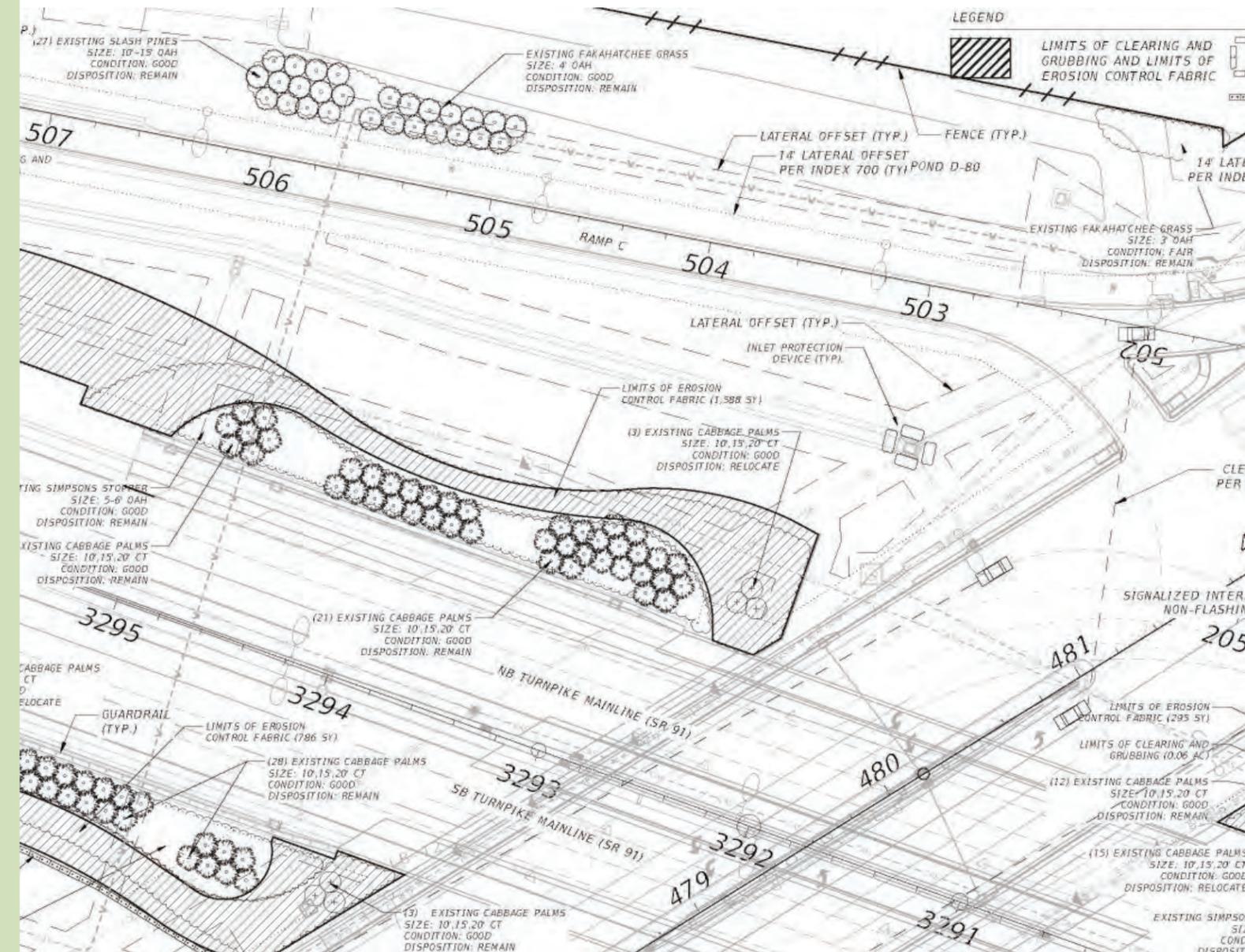
Most sites contain other existing site features critical for further identifying both opportunities and constraints. Examples of these are the following:

EXISTING VEGETATION

Vegetation preservation is the most cost effective way to provide highway beautification. Existing trees that are preserved also contribute more to Ecosystem Services than newly planted trees. State Statute and Departmental Policy require that we conserve existing landscape to the greatest extent possible. Consistent with Departmental Policy, each project must include an evaluation of the existing vegetation and a recommendation for its protection, relocation or removal. Documents included in the Resources section of this manual provide further guidance for vegetation assessment as part of the Existing Roadway Condition Report (ERCAR) process.

Also, refer to FDM chapter 229. Selective Clearing and Grubbing.

- » https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/fdm/2020/2020fdm229selcleargrubdsn.pdf?sfvrsn=3370acb0_2



ENVIRONMENTAL FEATURES

Site analysis must include identification and understanding of the benefits or impacts created by existing environmental conditions. Soils must be analyzed to determine the most suitable plant materials or remediation that may be required for a successful landscape planting. Sites must be analyzed for the presence of threatened or endangered species and the appropriate measures taken if present. Storm water facilities, surface waters and wetlands must be identified and accommodated within the landscape design either as elements to be avoided or enhanced in accordance with current environmental laws.

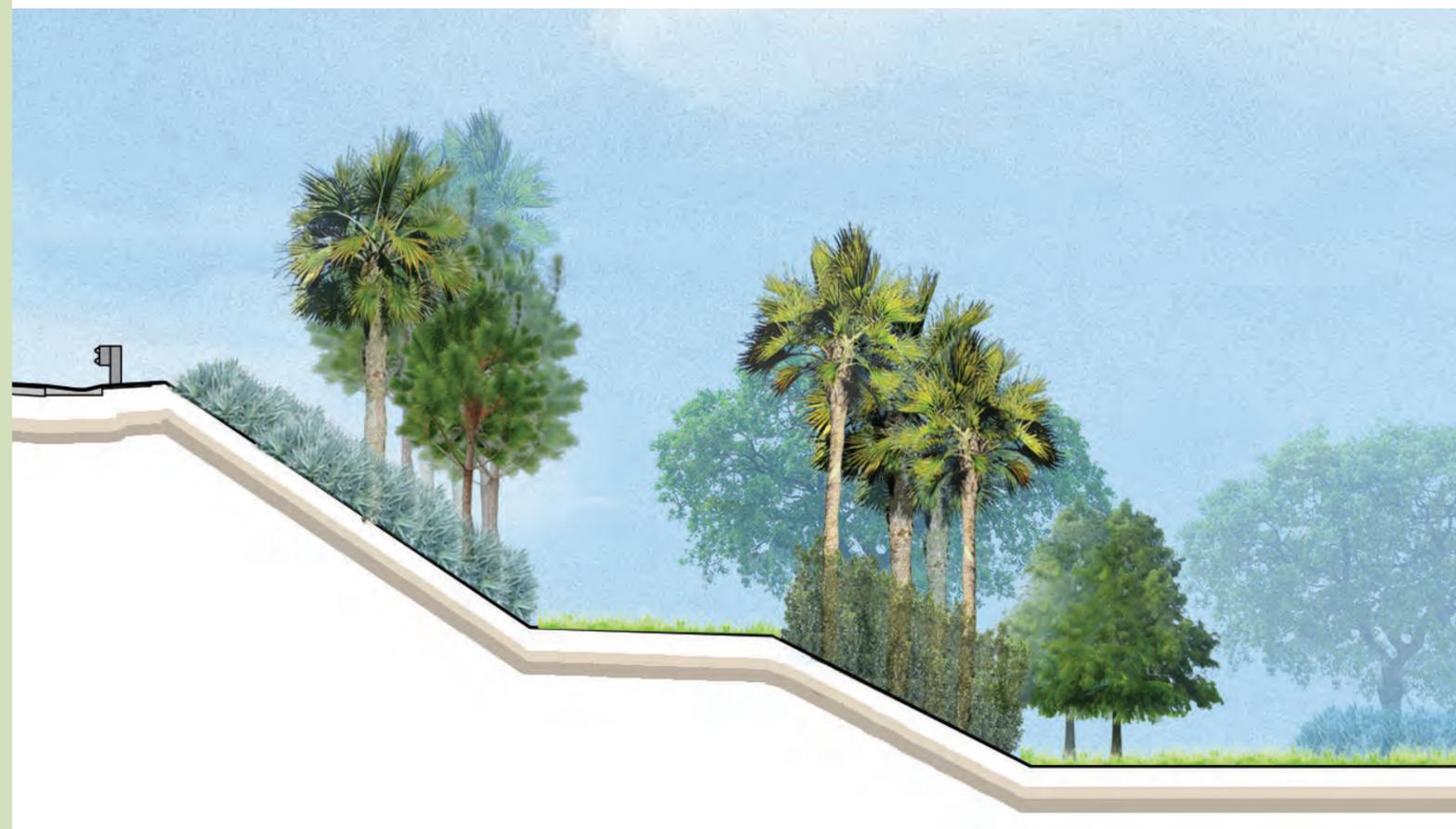


- LEGEND**
- Soil Boring Location
 - Gopher Tortoise Burrow

SLOPE ANALYSIS

A common issue associated with FTE landscape projects is the presence of steep slopes. Steep slopes are dangerous to mow, difficult or impractical to plant on and often suffer severe erosion. Accordingly, designers must assess slopes for these conditions and recommend suitable solutions. Preferred methods include planting tree species that require little if any maintenance, under-planting trees with shrubs to eliminate mowing and help stabilize soils, the use of erosion control fabric or providing terrace walls. Some erosion issues will require more than the installation of plant material to resolve.

- » Slopes 4:1 or less are considered mild to moderate
- » Slopes 3:1 or greater are considered moderate to extreme and are the upper limit of what is considered mowable.
- » Slopes 2:1 or greater are considered extreme and may require the introduction of retaining walls to create areas suitable for planting.



LANDSCAPE OPPORTUNITY PLANS (LOP)

Landscape Opportunity Plans are developed for PD&E design projects and roadway design projects with no landscape component. The intent is for the landscape architect to work closely with the roadway design team to preserve existing vegetation and areas for future landscape plantings. The design approach must be consistent with the philosophy and directives already outlined.

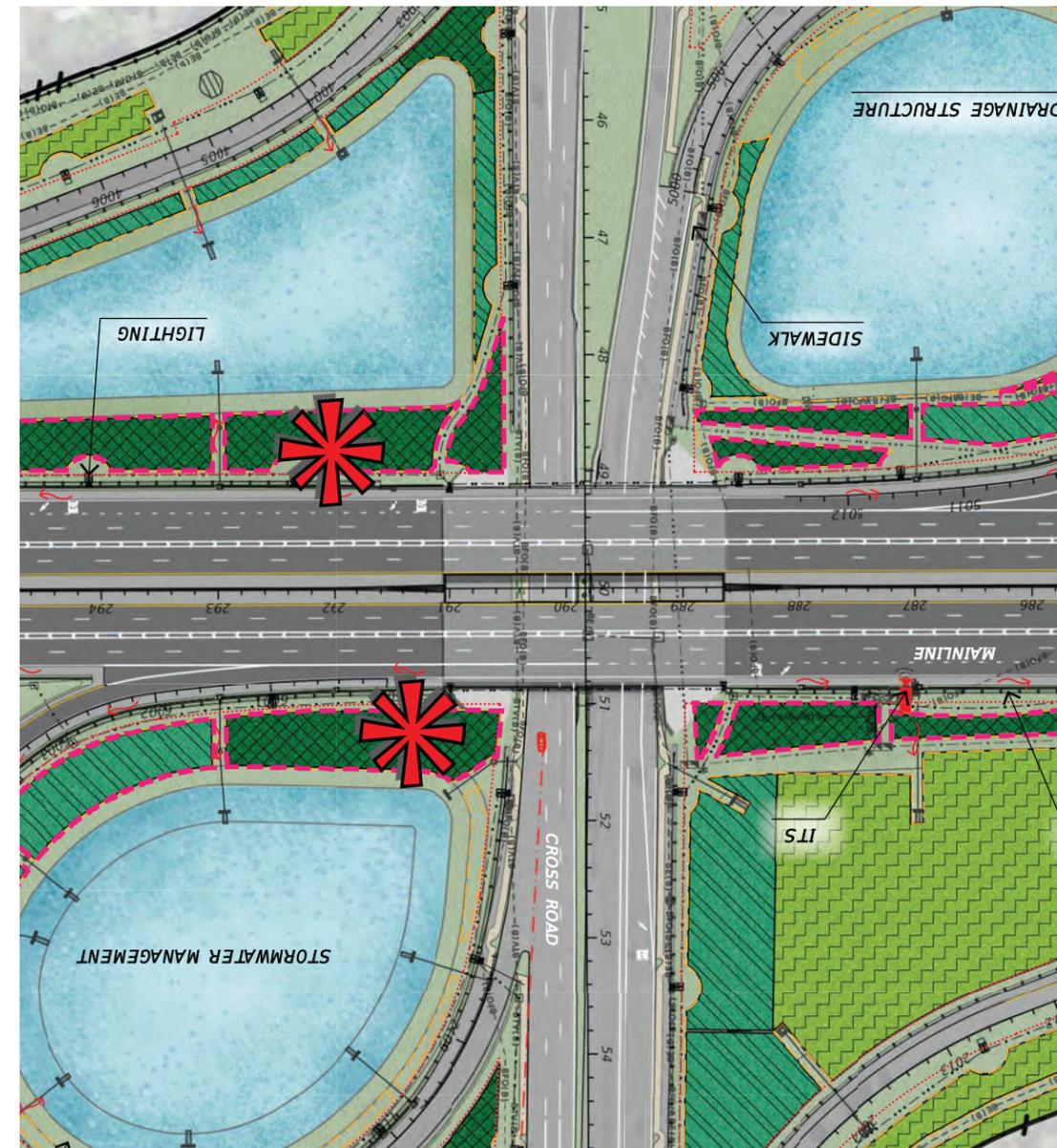
1. GOALS AND EXPECTATIONS

- » The designer should begin by establishing goals for the project through coordination with the FTE Project Manager and determining if there are any commitments that have been made to the impacted community regarding landscape enhancement.
- » Goals should be developed based on specific project conditions. Examples include slope stabilization, the enhancement of favorable views, buffering of roadway impact on residential neighborhoods, mitigation for impacted ecosystems, etc.

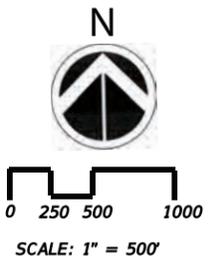
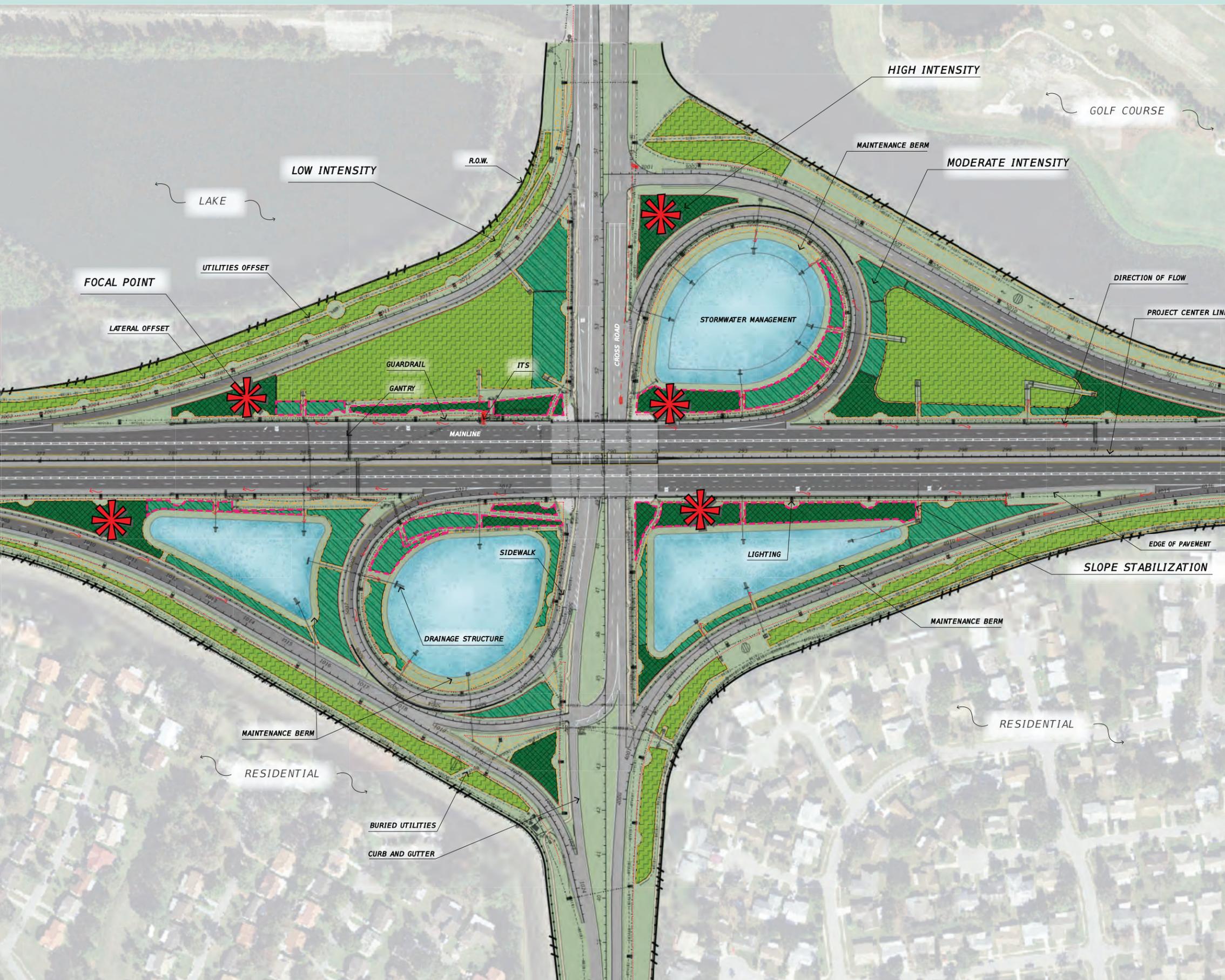
2. IDENTIFYING LANDSCAPE

- » Intensity Zones: After identifying site constraints and defining goals for the project, the designer should develop a landscape concept to be depicted on the LOP. In addition to the information required in the [Turnpike Design Handbook in Section 301.2.1](#), designers should identify landscape intensity for the project site based on the definitions found in Chapter 2 Design Philosophy. These include, but are not limited to, Low Intensity, Moderate Intensity, and High Intensity.

“The intent is for the landscape architect to work closely with the roadway design team early in the roadway design process”



LANDSCAPE OPPORTUNITY PLAN (LOP)



- CONDUIT
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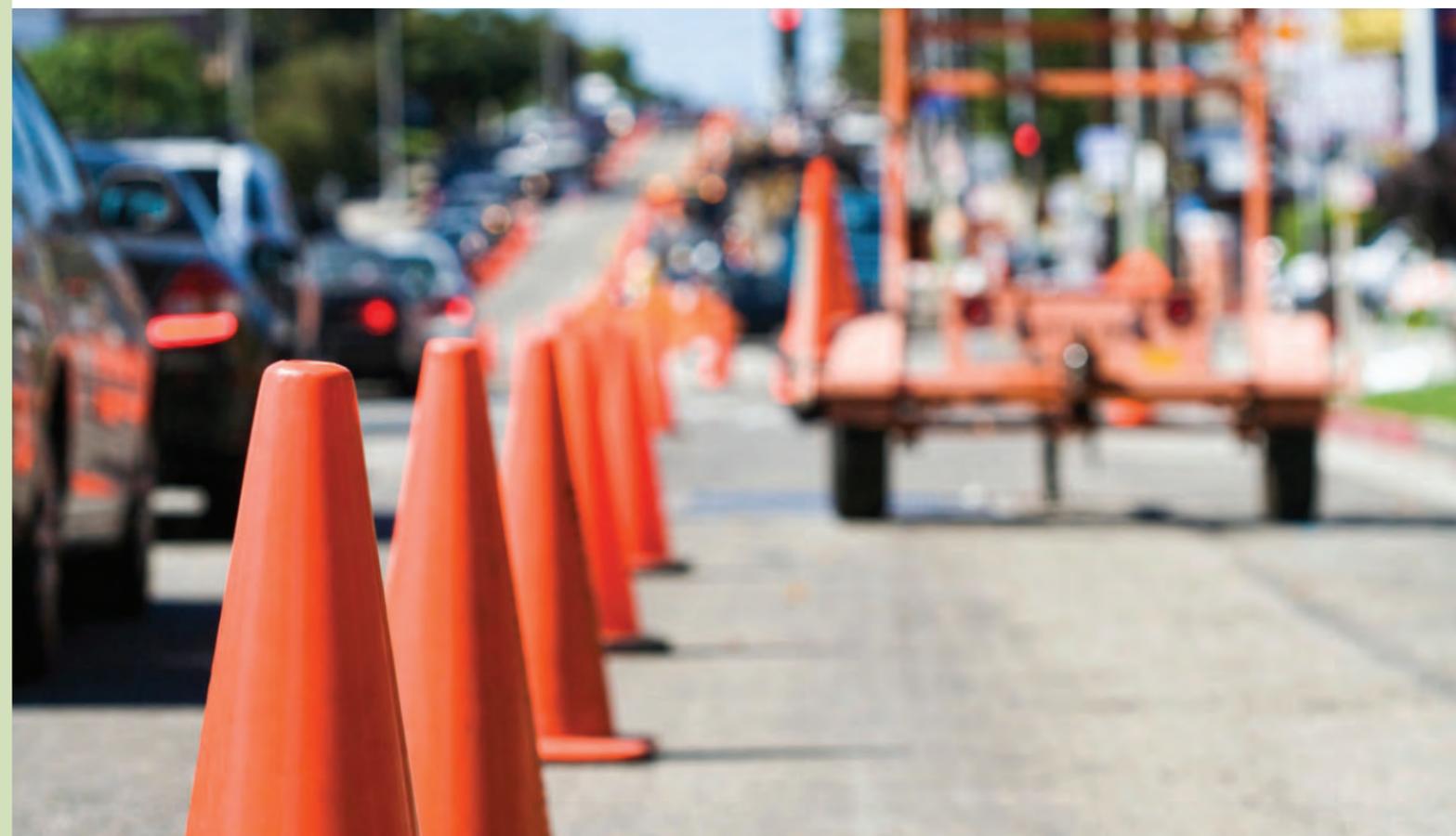
-  **LOW INTENSITY**
AREAS DESIGNATED FOR LOW LANDSCAPE MAINTENANCE SUCH AS MEADOW CONDITIONS, TRANSITIONAL NATIVE PLANTINGS, REFORESTATION, AND NATIVE PLANTINGS THAT ARE EASILY ESTABLISHED.
-  **MODERATE INTENSITY**
AREAS DESIGNATED FOR MODERATE LANDSCAPE MAINTENANCE SUCH AS SECONDARY FOCAL POINTS AND GATEWAYS COMBINING NATIVE PLANTINGS AND NON-NATIVE FLORIDA FRIENDLY PLANTINGS.
-  **HIGH INTENSITY**
AREAS DESIGNATED FOR HIGH INTENSITY LANDSCAPING REQUIRING A HIGHER LEVEL OF LANDSCAPE MAINTENANCE SUCH AS MAJOR FOCAL POINTS, GATEWAYS AND HIGH VISIBILITY AREAS SUITABLE FOR HIGH IMPACT LANDSCAPING TYPICALLY ALONG THE MAINLINE IN VERY VISIBLE AREAS.
-  **OPEN LANDSCAPE**
LIMITED TO TURF ONLY, CONSTRAINED BY LATERAL OFFSETS, SIGN VIEW ZONES, ITS EQUIPMENT, UTILITIES, MAINTENANCE BERMS AND UTILITY OFFSETS. TURF SPECIES VARY DEPENDING ON CONDITION.
-  **SLOPE STABILIZATION**
MEASURES TAKEN TO REDUCE OR ELIMINATE EROSION FOR EMBANKMENTS AND SLOPES WITH 3:1 SLOPE RATIO OR GREATER; CAN INCLUDE PHYSICAL STRUCTURES SUCH AS RETAINING WALLS TO ASSIST IN CREATING PLANTABLE AREAS OR PLANTINGS TO SLOW AND REDUCE STORMWATER RUNOFF.
-  **STORMWATER MANAGEMENT**
WET RETENTION AREAS; DESIGNATED STORMWATER MANAGEMENT AREAS THAT HOLD AND RETAIN STORMWATER.
-  **FOCAL POINT**

COMMON CRITICAL ISSUES

ROADSIDE SAFETY AND FDOT DESIGN STANDARDS

Safety is the most spoken word within FTE. Understanding the roadway components and the regulations that control them is paramount. Designers should be familiar with the TDH, FDM and the AASHTO Green Book and apply the requirements found within to their projects. Typical elements that apply to every project include the identification of clear zones, lateral offsets, and sight distances. Additional elements are identified in the TDH. If designers have specific questions, they should work with their FTE Project Manager to connect with the proper staff to get the answers needed.

- » [Turnpike Design Handbook \(TDH\) - Design Criteria - Part 2](#)
- » [FDOT Design Manual](#)
- » [AASHTO Green Book](#)



INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

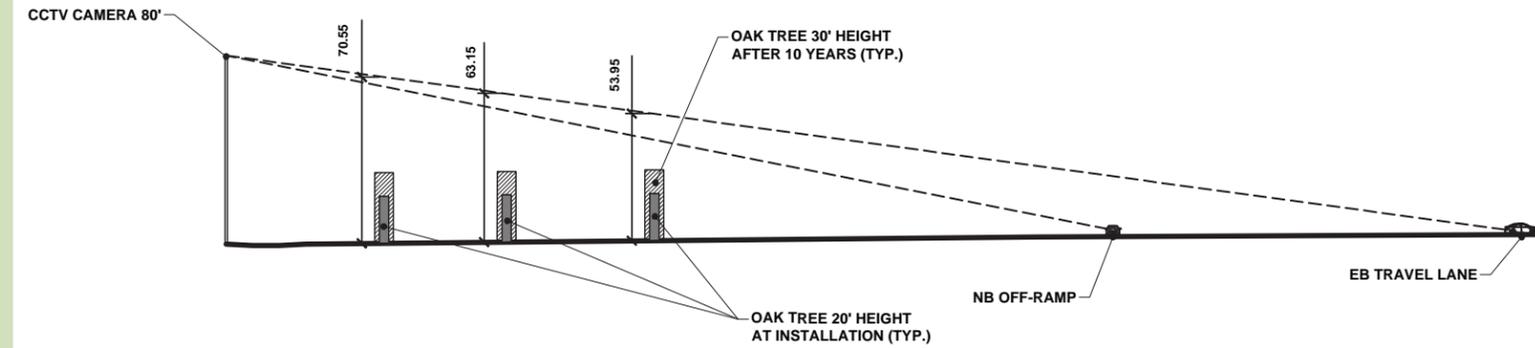
FTE's ITS facilities are managed by Traffic Engineering and Operations and are one of the most critical facilities within the Limited Access Right of Way (LARW) that can affect landscape projects. The main function of the ITS facilities are to provide video feeds through a network of Closed-Circuit Television (CCTV) cameras, and to provide drivers with information through digital message signs.

When planning a landscape project, ITS should be on the top of the designers list of coordination items, for both camera view zones and associated below ground infrastructure. Coordinate with the DLA and ITS Manager to schedule a meeting to review camera locations (including mounting heights) and camera view zones.

Refer to the Turnpike Design Handbook (TDH), Design Criteria - Part 2, Section 221 Intelligent Transportation Systems (ITS) for more information.

» [Turnpike Design Handbook \(TDH\) - Design Criteria - Part 2](#)

ITS SIGHTLINE ANALYSIS

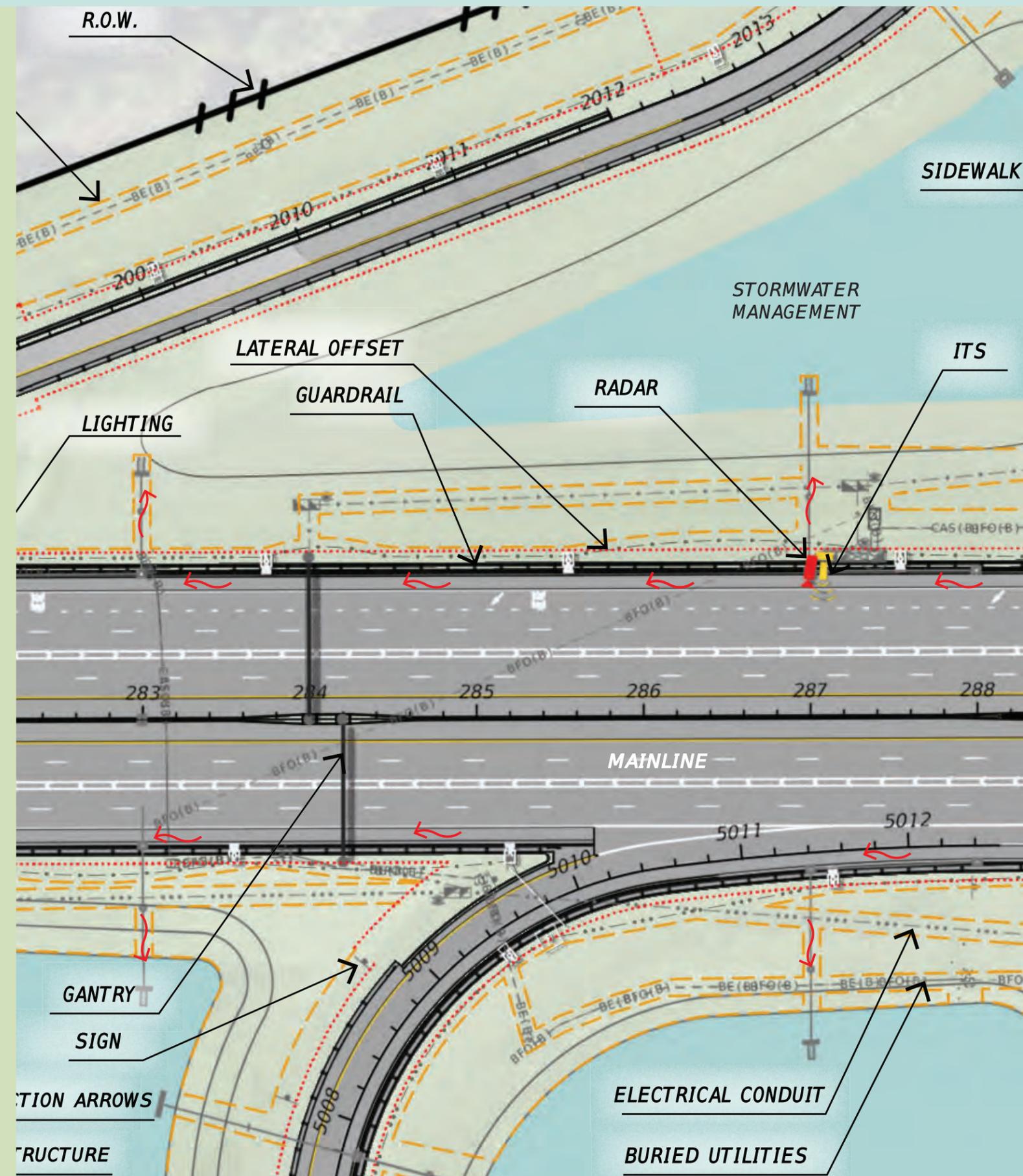


UTILITY COORDINATION

Utility coordination for landscape projects is a critical task. The location of existing utilities plays a significant role in identifying plantable areas within your project limits. FTE maintains a setback chart identifying minimum setbacks requirements for different vegetation types relating to utilities/ facilities. Referring to the Utility Setback Chart, show utilities on the plan with the respected minimum setback requirements set forth by the Turnpike.

Most FTE landscape projects do not provide for utility designation or survey. Utility locations, if shown on the plans, are usually obtained from historical drawings and may not be current or accurate. Accordingly, utility designation and location is delegated to the contractor by means of plan notes.

Utilities will also impact the design of irrigation for your project. Early coordination and documentation with the power service provider when planning for an irrigation system is critical. Designers need to know the location and type of available power for specifying the proper irrigation equipment and establishing service. This will be discussed further under Irrigation Feasibility Report.



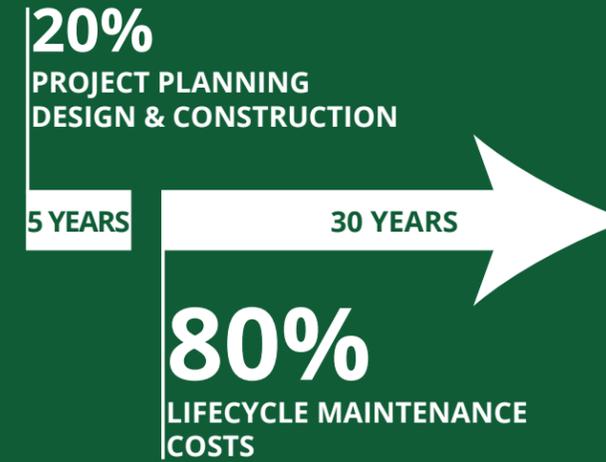
MAINTENANCE

Designs for FTE landscape projects must consider long term maintenance as one of the leading factors. Department policy will require maintenance costs to fall below \$6/SY for new projects. Accordingly, the FTE Landscape Program has developed a strategy for controlling long term maintenance costs for their landscapes and will require designers to develop their designs accordingly and document these efforts.

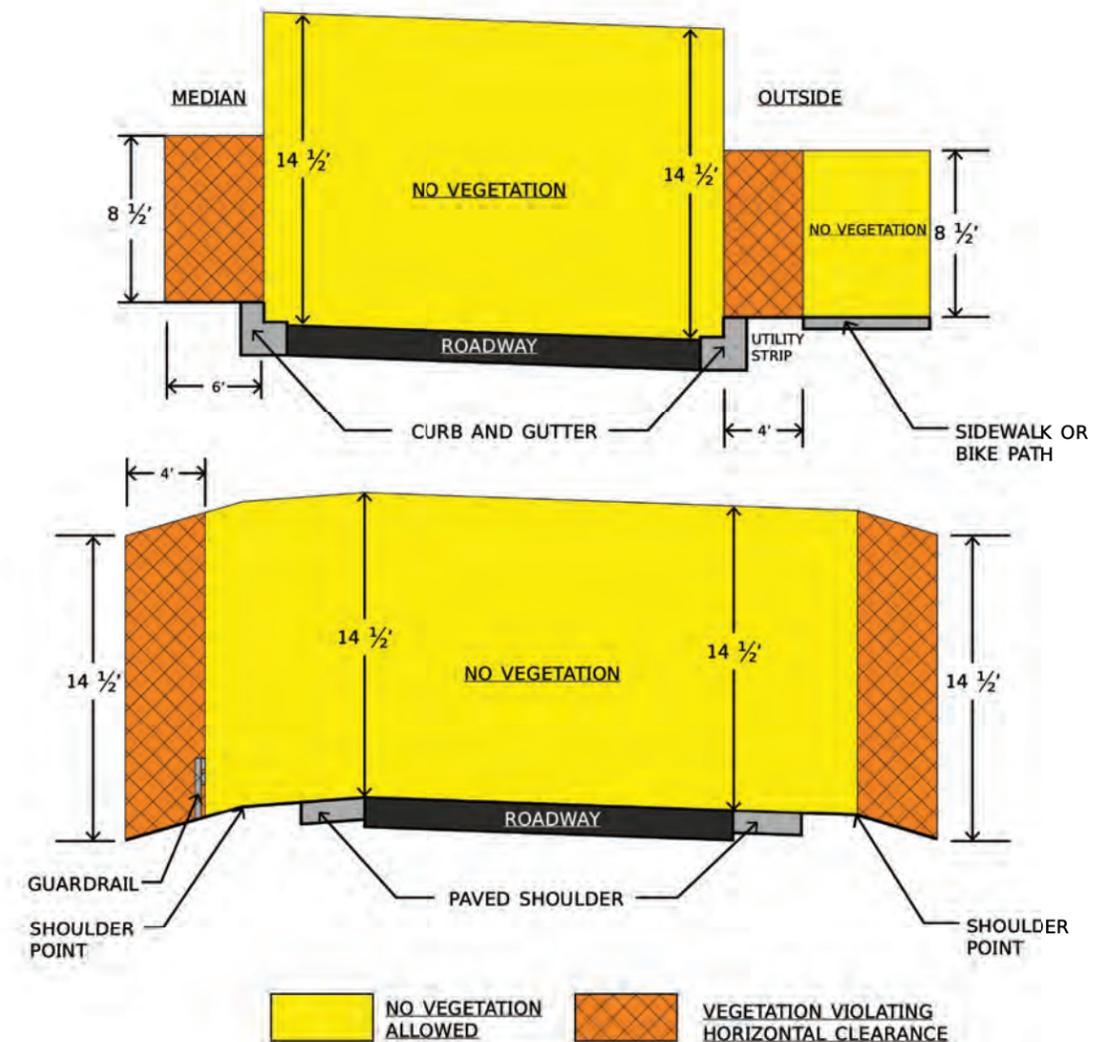
In order to meet this new policy FTE landscape designs will be required to include up to three intensity areas, High Intensity, Moderate Intensity and Low Intensity, and quantify them on their plans. FTE will supply current maintenance costs for each zone and the designer will adjust their plans accordingly to remain below the target maintenance cost.

High Intensity landscape areas are limited to no more than 25% of the project area. Moderate Intensity areas are limited to no more than 50% of the project area and Low Intensity areas must comprise a minimum of 50% of the project area.

LANDSCAPE LIFECYCLE COSTS



CLEAR ZONE VEGETATION CRITERIA



LOW INTENSITY LANDSCAPE DESIGN

Low intensity landscape design areas (buffers, sustainable field conditions, & reforestation) and non-landscaped areas (storm water management, limits of horizontal clearance, etc.) make up 50% of project area.

Low intensity design characteristics:

- » Plantings of pines and cabbage palms with native understory plants to reduce maintenance, mowing operations, and erosion on steep slopes.
- » Naturally occurring pine mulch
- » Annual removal of invasive species
- » Annual removal of dead or dying vegetation
- » Periodic trash removal

LOW INTENSITY LANDSCAPE DESIGNS are native or naturalistic plantings utilized for screening views, ecosystem restoration, or as a backdrop to specimen landscapes. These low intensity areas will accordingly require less long-term maintenance.



- Pine trees - minimal/no pruning necessary
- Mid-level shrubs - minimal/no pruning necessary
- Groundcovers & grasses - once annual/no pruning required

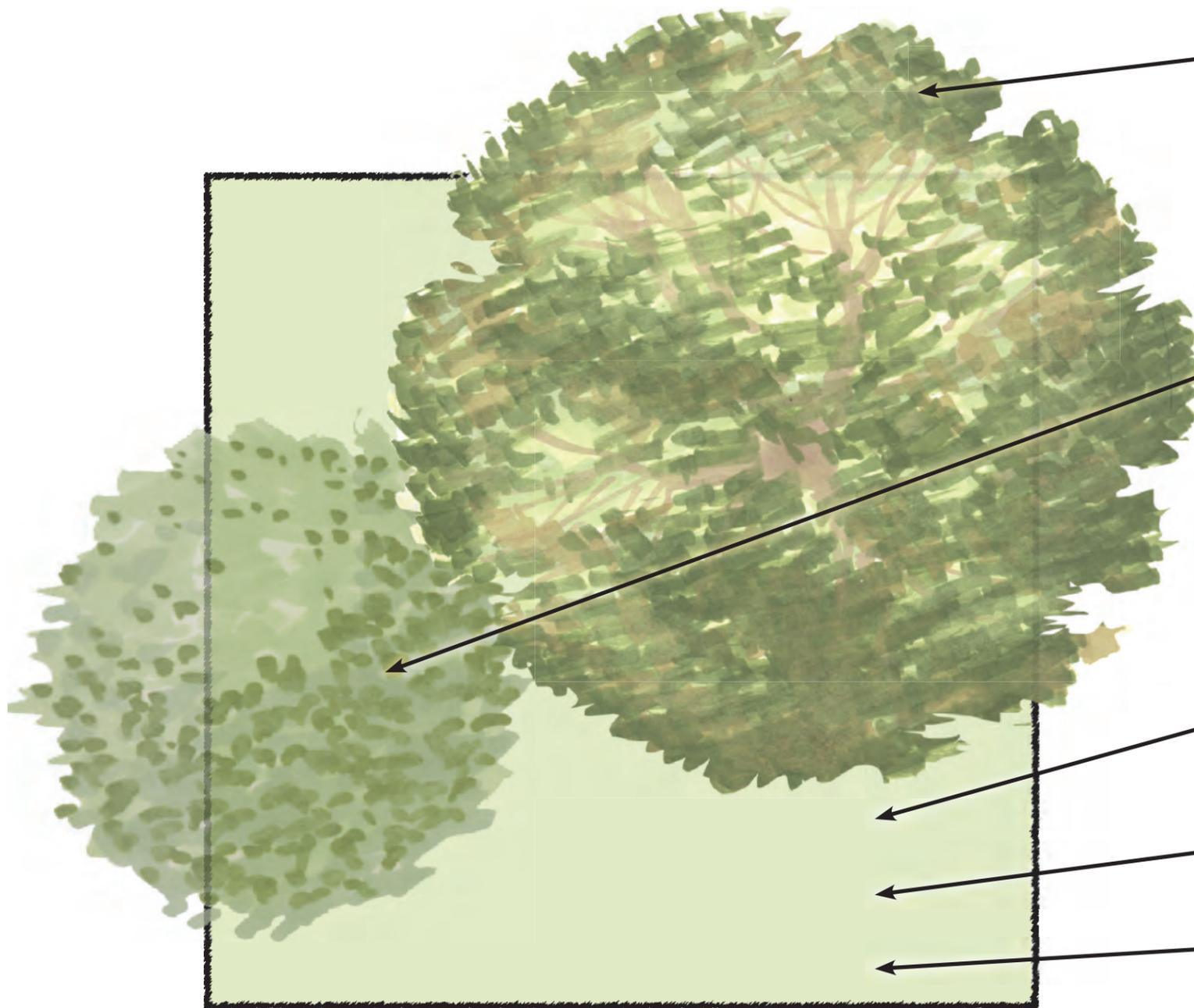


- Native Sabal Palms - only hanging or fallen fronds to be removed
- Groundcovers & grasses - once annual/no pruning required
- Shrubs & Palmetto - no pruning required



- Pine trees - minimal/no pruning required
- Natural pine mulch
- Periodic trash/litter removal and invasive species control required

LOW INTENSITY LANDSCAPE DESIGN PLANTING PATTERN & MAINTENANCE EXAMPLE



NATIVE/NATURAL TREE EXAMPLES:

- » Longleaf Pine (*Pinus palustris*) - Requires little to no pruning. Suggested deadwood removal once annually
- » Sabal Palm (*Sabal palmetto*) - Hanging fronds (dead & hanging) or fallen frond removal only
- » Pond Cypress (*Taxodium* spp.) - No pruning required

LARGE SHRUB EXAMPLES:

- » Seagrape (*Coccoloba uvifera*)
- » Wax Myrtle (*Myrica cerifera*)
- » Firebush (*Amelia patens*)
- » All large, mounding forms when placed in areas that allow for full growth. None or once annual pruning required

Natural pine straw mulch - no maintenance or replenishment required

Invasive species removal once annually

Litter / trash removal required annually

MODERATE INTENSITY LANDSCAPE DESIGN

Moderate intensity design characteristics:

- » Areas of indigenous trees or palms with understory plantings. May include native and non-native species requiring fertilization and pruning.
- » Recommend understory plantings to eliminate mowing, or self mulching species.
- » No re-mulching required after establishment.
- » Periodic trash removal.

MODERATE INTENSITY LANDSCAPE DESIGNS are transitional landscapes that complement high intensity landscapes, provide a variety of color and texture.



Royal Palms - dead/hanging frond & fruit removal. Requires fertilization

Wildflower areas - requires mowing after bloom & reseeding



Royal Palms - dead / hanging frond & fruit removal. Requires fertilization

Mowing required between trees planted close together

Florida Thatch palms - no maintenance required

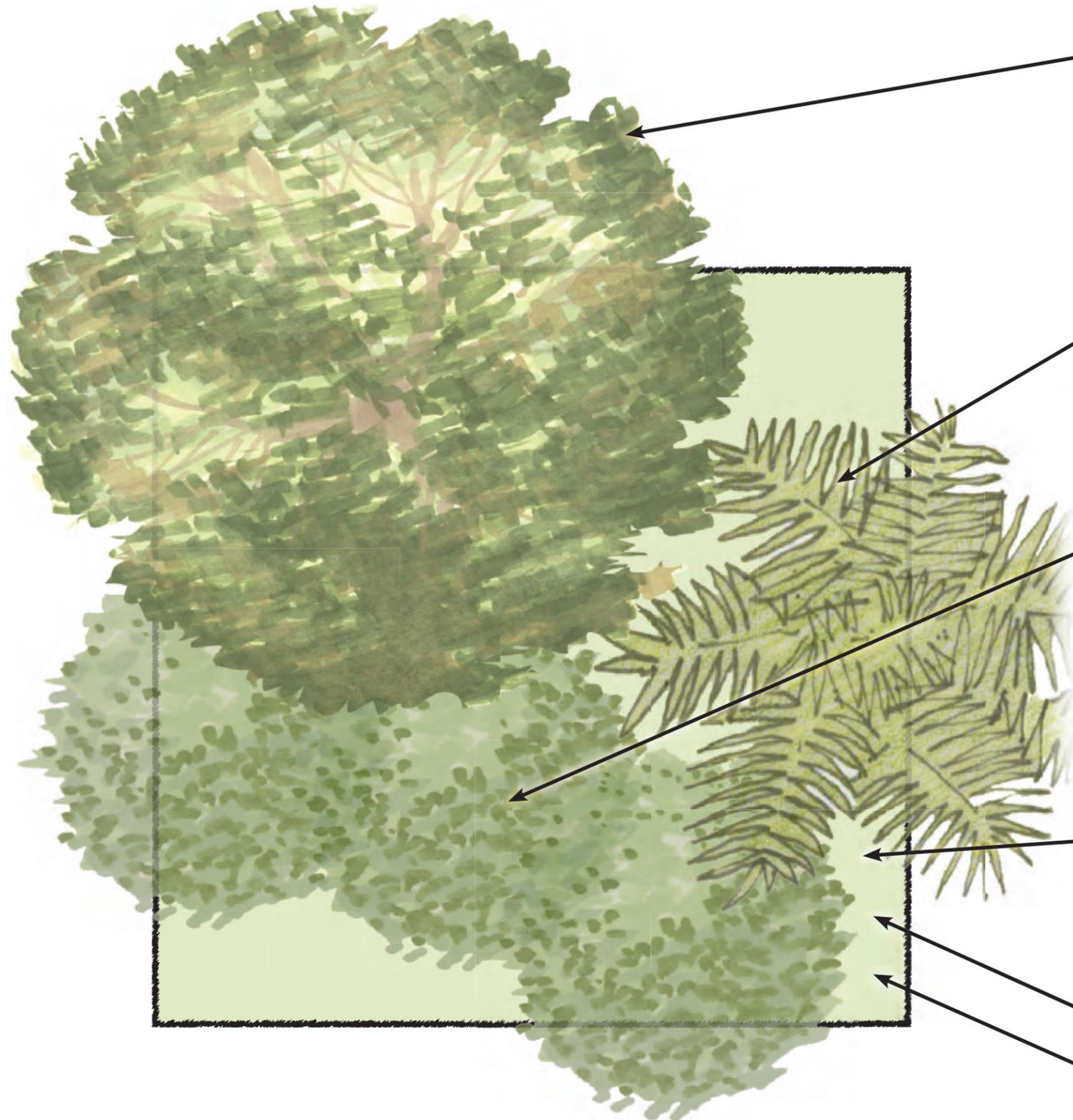


Pine trees - minimal / no pruning necessary. Dead wood removal when necessary

Wax Myrtle - large shrub - no maintenance required

Hedge - requires regular pruning and shaping

MODERATE INTENSITY LANDSCAPE DESIGN PLANTING PATTERN & MAINTENANCE EXAMPLE



TREE EXAMPLES:

- » Live Oak (*Quercus virginiana*) - Required pruning every 2-5 years depending on maturity
- » Buttonwood (*Conocarpus erectus*) - Requires deadwood removal
- » Southern Magnolia (*Magnolia grandiflora*) - No pruning required

PALM EXAMPLES:

- » Sabal Palm (*Sabal palmetto*) - Hanging fronds (dead & hanging) or fallen frond removal only
- » Florida Thatch Palm (*Thrinax radiata*) - No maintenance required

SHRUB EXAMPLES:

- » Stoppers (*Eugenia* spp.)
- » Loropetalum (*Loropetalum chinense*)
- » Cocoplum (*Chrysobalanus icaco*)
- » Can be used as a mounding shape which requires no pruning. Can be shaped or hedged with more maintenance required

GROUNDCOVER EXAMPLES:

- » Grasses - low to no maintenance required
- » Wildflowers - requires once annual mowing and reseeding every 3 years

Trash / litter removal required periodically

Invasive species removal required annually

HIGH INTENSITY LANDSCAPE DESIGN

High intensity landscape design areas should comprise no more than 25% of the total landscape for each project.

High intensity design characteristics:

- » Areas of exotic or indigenous trees and palms.
- » With or without understory plantings.
- » Requires fertilization, pest control, and pruning.

HIGH INTENSITY LANDSCAPE DESIGNS are located in the most visible areas are designed for maximum aesthetic impact and may require a higher level of long-term maintenance.



Greater amount of non-native palms - require more frequent pruning and fertilization

Shrubs close to road or guardrail require frequent maintenance and pruning



Densely planted understory

Clumping palms - require dead frond removal

Date palms - require annual pruning and fertilization

Areas of greater visual interest through variety of plants and planting pattern



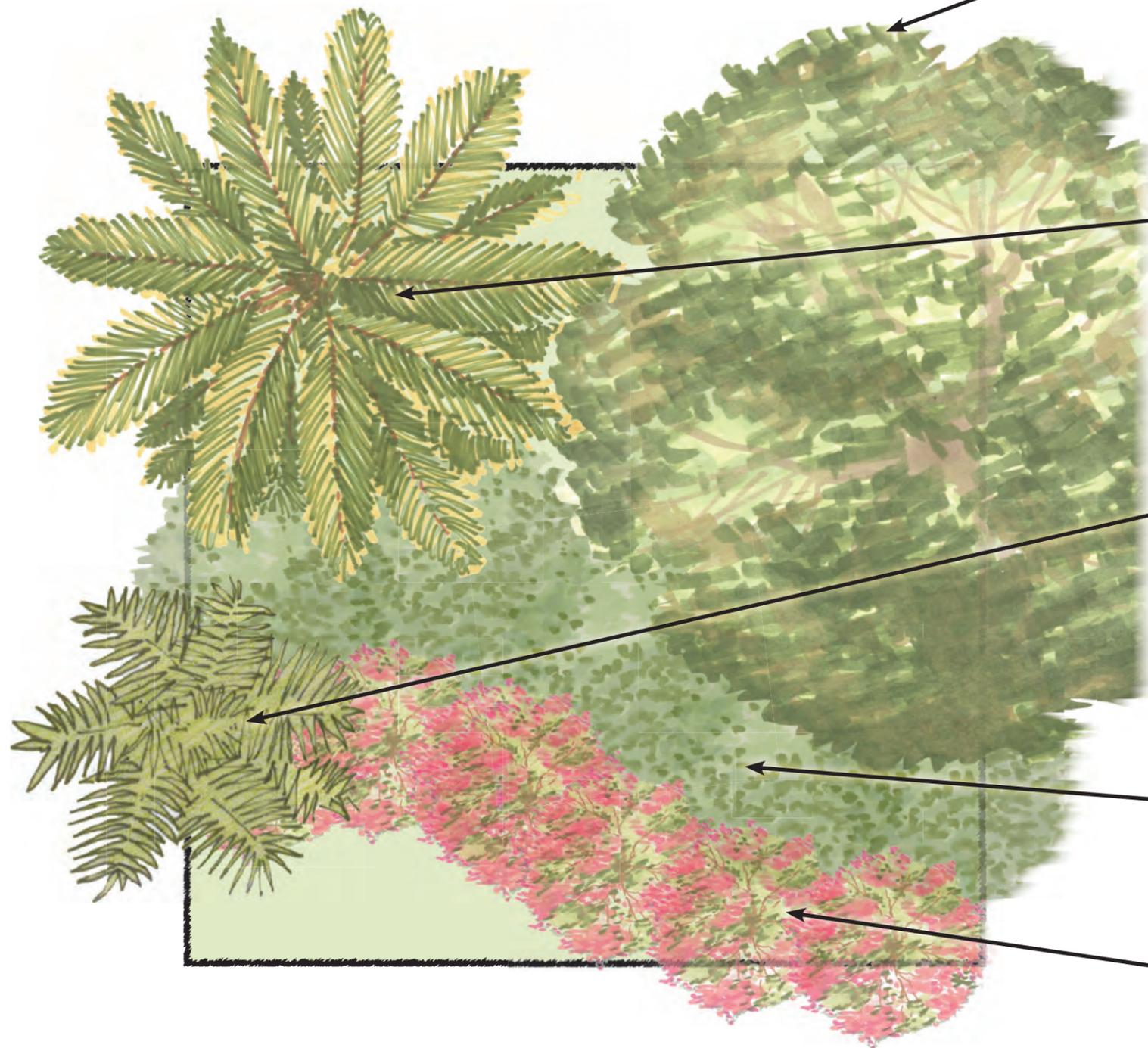
Palms - require annual pruning and fertilization

Flowering trees

Shrubs - require pruning, shaping, and fertilization

Mulched planting beds

HIGH INTENSITY LANDSCAPE DESIGN PLANTING PATTERN & MAINTENANCE EXAMPLE



TREE EXAMPLES:

- » Crape Myrtle (*Lagerstroemia indica*) - Possibly requires once-annual pruning
- » Royal Poinciana (*Delonix regia*) - Occasional pruning and litter removal
- » West Indian Mahogany (*Swietenia mahagoni*) - Occasional pruning and litter removal

PALM EXAMPLES:

- » Royal Palm (*Roystonea regia*) - Requires dead/hanging frond & seed pod removal
- » Bismarck Palm (*Bismarckia nobilis*) - Requires dead/hanging frond & seed pod removal. Requires fertilizer
- » Date Palm (*Phoenix spp.*) - Requires dead / hanging frond & seed pod removal. Requires fertilizer

ACCENT TREE/PALM EXAMPLES:

- » Ligustrum (*Ligustrum japonicum*) - Possibly requires annual pruning
- » Holly (*Ilex spp.*) - Some species require pruning to maintain shape
- » Paurotis Palm (*Acoelorrhaphe wrightii*) - Sucker growth control, requires dead/hanging frond & seed pod removal

SHRUB & GROUNDCOVER EXAMPLES:

- » Hedges - Require regular pruning and shaping
- » Flowering plants - require pruning after flowering. Require fertilization

Trash / litter removal required periodically. Invasive species removal required annually

OUTDOOR ADVERTISING (ODA)

ODA owners have view zone rights. These view zones need to be shown on the plans and cannot be impacted by proposed or existing landscape. When planning the landscape design, give consideration to a plant's future growth and ensure it does not impact the ODA view zone.

"The Outdoor Advertising regulatory program is based on federal law and regulations as well as state statute and rule. Federal law is set forth in the Highway Beautification Act while federal regulations can be found at 23 C.F.R., Section 750. State laws are found in [Chapter 479](#), Florida Statutes. In addition to the state statutes, the Department writes administrative rules to interpret the intent of the statute for the general public. [Chapter 14-10](#), Florida Administrative Code, is the Department's rule chapter which governs outdoor advertising. Copies of the complete rule chapter may be obtained from the Outdoor Advertising Office. Local governments often have their own ordinances which regulate outdoor advertising in their community. The Department cannot issue a permit for an outdoor advertising sign which is not allowed by local ordinances."

The process of working with ODA owners to ensure that their rights are preserved is well documented and described on FDOT's website.

- » <https://www.fdot.gov/rightofway/OutdoorAdvertising.shtm>
- » <https://www.fdot.gov/rightofway/VegetationManagement.shtm>



AVIATION IMPACTS

Federal, state, and local regulations exist to protect the national airspace system and must be considered when a project is within 10 nautical miles (11.5 statute miles) of an airport or spaceport. For additional information refer to FDM 110.5.1:

- » FDM 110: <https://www.fdot.gov/roadway/fdm/default.shtm>

PROJECT AVIATION REQUIREMENTS (FDM 110.5.1)

Step 1: Federal aviation requirements must be met when the project is within 10 nautical miles (11.5 statute miles) of a facility.

- » Contact the District Aviation Coordinator if you are within the 10 nautical miles (11.5 statute miles).

Step 2: Utilize Notice Criteria Tool to input coordinates of any proposed construction or alteration of structures (including natural growth, vegetation, and landscaping) if within the 10 nautical miles.

- » Determine if necessary to file "Notice of Proposed Construction or Alteration."
- » Document structures requiring notice.

Step 3: If notice is required, use FAA Form 7560-1 to file a "Notice of Proposed Construction or Alteration."

- » 45 to 60 days advance filing to accommodate the review process and issue the FAA determination letter.
- » "Determination" valid 180 days for construction.
- » FAA will grant only one extension to a determination for 180 days.



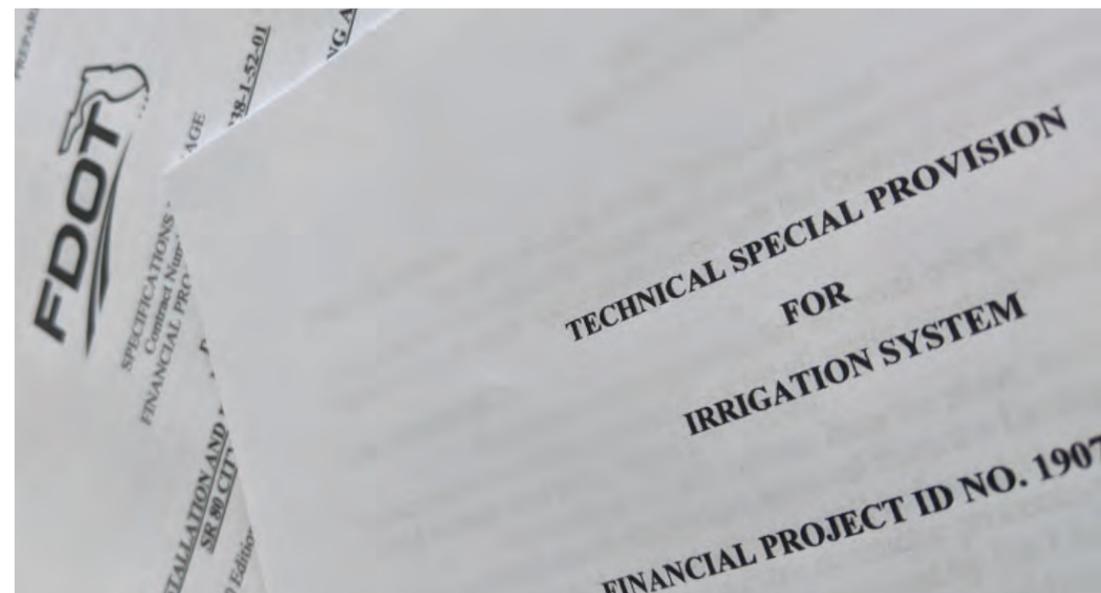
LANDSCAPE IRRIGATION

Roadsides are a hostile environment for plant materials. Less than desirable soils, drainage patterns, heat-island effect and wind make plant survival difficult. Even the most drought-tolerant plants require supplemental watering particularly during the establishment period.

While it is generally not feasible for Florida's Turnpike Enterprise (FTE) to maintain irrigation systems for extended periods, it has been determined that the design and installation of an underground irrigation system can be in the best interest of FTE. Providing a resilient and well-designed underground irrigation system for use during the establishment period provides several advantages, including:

- » **Ensuring FTE's significant investment in plant materials is successful.** Lack of adequate water during the contractor's establishment period may result in deficiencies in expensive plant materials, particularly palms, which will not be manifested until well after the contractor's obligations for establishment have expired. This results in FTE inheriting many substandard plants that will not perform well or die during their anticipated lifetime.
- » **Confirming contractors' bids are comparable.** Experience has demonstrated that if an irrigation system is not included in the bid documents, many contractors will not include sufficient funds in their bids to cover the minimum water requirements for successful plant establishment. They will rely on manual watering or worse, rainfall. These methods have proven unsuccessful on for the majority of projects on which they have been used.
- » **Enhancing roadside safety and protection of the right of way (ROW).** Relying on heavy water tanker trucks entering and leaving the highway at uncontrolled points and traveling over buried utilities and drainage structures or over soft ground creates safety and maintenance concerns.

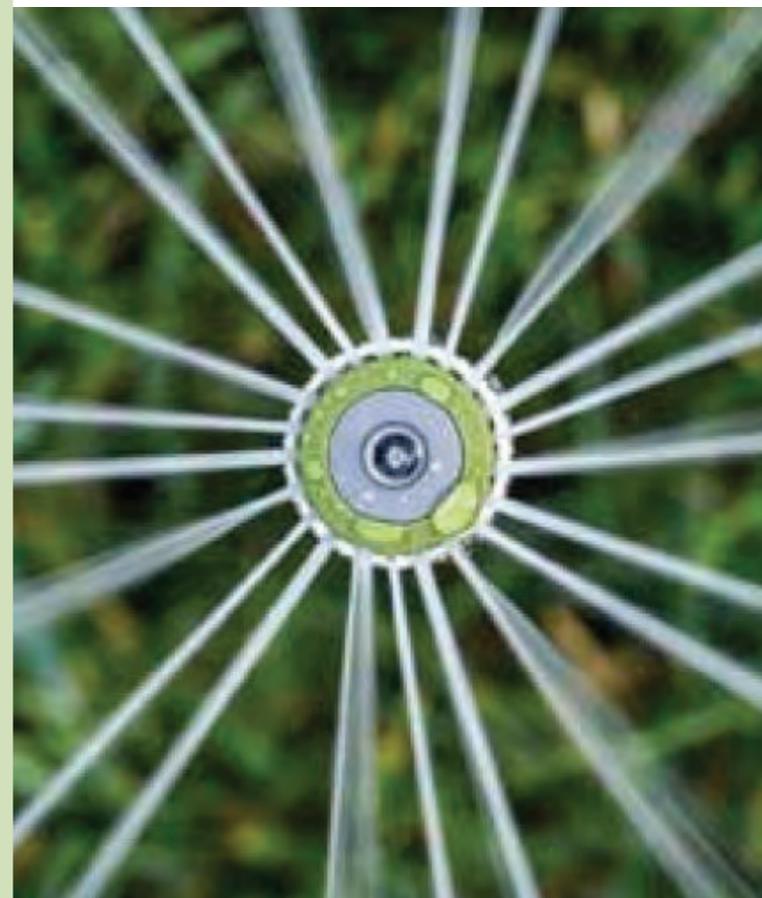
Accordingly, FTE has required, under most circumstances, irrigation systems to be installed with the landscape projects.



IRRIGATION FEASIBILITY STUDY

The purpose of the Feasibility Study will be to document the design process that may be used to complete irrigation system design documents, determine availability of a reliable water and power source, and to determine the financial feasibility of installing the irrigation system. The consultant shall prepare a Feasibility Report including an analysis of the water sources, power sources, permitting requirements, watering methods, materials and operational costs associated with a proposed irrigation system design. The Feasibility Report shall include an overall map of the project limits showing preliminary locations of major system components, including water sources, controllers, electrical connections, and sleeves.

It is imperative that the designer contact the utility providers and verify the availability of both water and power and document this in the report.



WATER SOURCES

The consultant shall determine the appropriate water sources, selected to meet the intent of the project on the basis of durability, cost, water conservation and efficiency, and compatibility with existing Turnpike operations and facilities. FTE encourages the use of a well and manufactured pump system or reclaimed water where available.

WELL WATER

A pump system utilizing a well will provide a very reliable water source for both a permanent and temporary irrigation system installation. There are high initial installation costs for constructing and permitting a well with a pump, however the costs for maintaining an efficient system are low compared to other sources.

The installation of pump system will be dependent on the availability of establishing an electrical service if not already available within the project limits. The well sources may be utilized during construction and during establishment by water trucks as an on-site water source, or utilized by a more permanent installation with an automated irrigation controller.



POTABLE WATER

A potable water connection is the most reliable water source with low installation costs for construction. However, potable water has potential high impact fees and high ongoing costs for water usage for life of system.

This water source would not require an electrical connection to operate a pump system or controller.

WATER TRUCK

Another potential irrigation source is manual hand watering with the use of water trucks, hose spraying, and tree water bags. This can be ideal for isolated areas where temporary or permanent irrigation system could not be installed due to location or lack of availability of a reliable power source. In addition, water trucks could utilize any of the above water sources to eliminate the cost for delivering water to the site.

Manual irrigation will require additional costs of labor, safety, and mobilization for the length of plant establishment, however there will be no continuing maintenance costs after plant establishment.



POWER SOURCES

Coordination with the appropriate electrical utility provider on the availability and type of electrical source will be a critical step to establishing the feasibility of installing an irrigation system. The consultant must pull a design ticket to identify utility providers within the project limits. Proposed irrigation system utilizing a power source will require an independent electrical meter account that will be established and owned by the contractor throughout the installation and establishment period.

HARDWIRED (UTILITY)

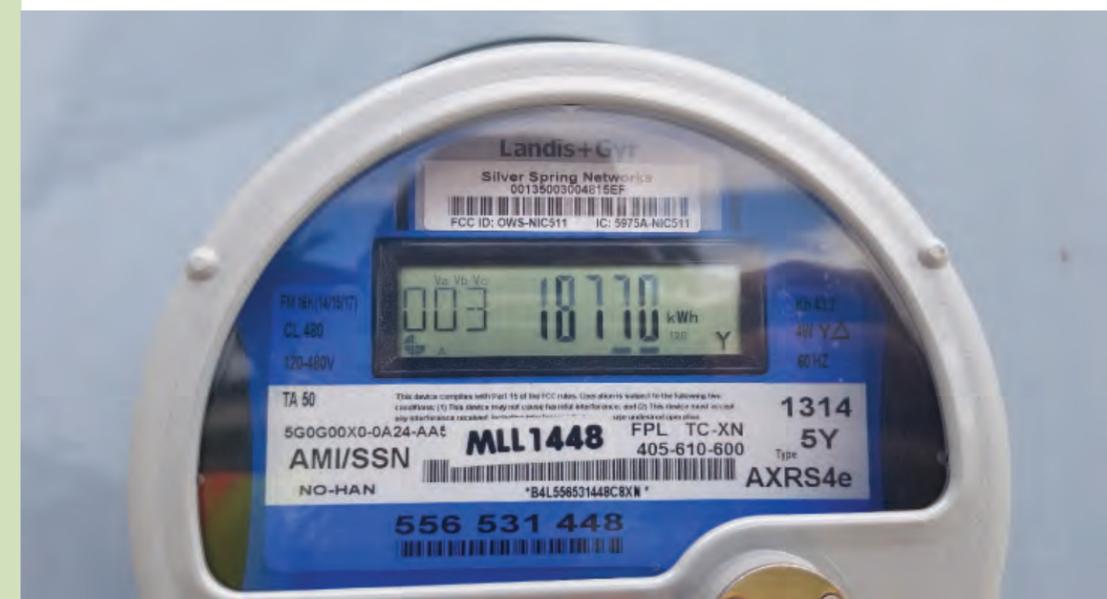
A hardwired power source utilizing a utility will be required for use with well or surface water source to power a pump system. While this configuration is the most reliable, a new power service will have a moderate installation cost with continuing usage costs for the life of the system, with the potential for an impact fee from the utility service provider.

SOLAR

Solar power could be utilized to operate automated controllers on systems utilizing reclaimed or potable water that do not require a pump system. Solar power can have higher installation costs with little to no ongoing costs for life of system and is ideal for isolated areas where power is not available or accessible.

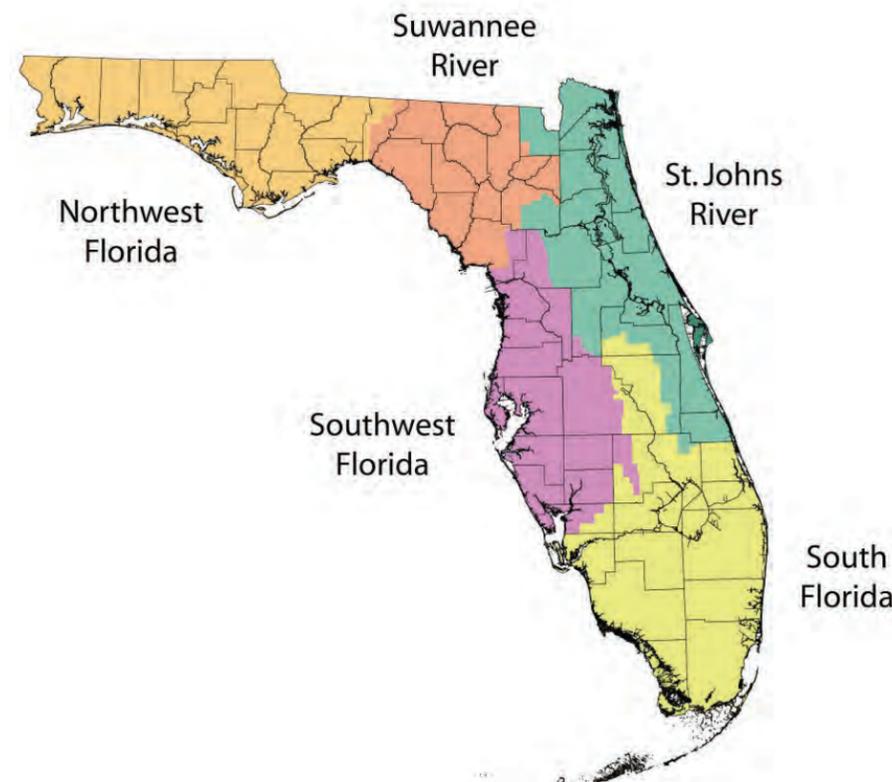
BATTERY

Similar to solar, battery-powered controllers may be utilized to operate automated irrigation controllers on systems utilizing reclaimed or potable water that do not require a pump system. Battery-powered controllers are the most affordable option with low installation costs, however battery-operated controllers will require a maintenance plan for battery replacement. In addition, a typical battery-operated controller lacks features available to traditionally hardwired controllers.



PERMITTING

Water use permits, well construction permits, applications and payment of associated fees should be documented in the Feasibility Report. The consultant shall provide coordination with the appropriate water management district, health department, and local municipalities to determine permit fees and procedures. Permitting, where required, will become the responsibility of the contractor.



STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL

PLEASE FILL OUT ALL APPLICABLE FIELDS (*Denotes Required Fields Where Applicable)

The water well contractor is responsible for completing this form and forwarding the permit application to the appropriate designated authority where applicable.

Permit No. _____
 Florida Unique ID _____
 Permit Stipulations Required (See Attached) _____
 62-524 Caid No. _____ Delimitation No. _____
 CUPWUP Application No. _____

ABOVE THIS LINE FOR OFFICIAL USE ONLY

1. *Owner, Legal Name if Corporation *Address *City *State *ZIP Telephone Number _____

2. *Well Location - Address, Road Name or Number, City _____

3. *Parcel ID No. (PIN) or *Alternate Key _____ Lot _____ Block _____ Unit _____

4. *Section or Land Grant *Township *Range *County Subdivision _____ Check # 62-524: Yes No

5. *Water Well Contractor *License Number *Telephone Number E-mail Address _____

6. *Water Well Contractor's Address _____ City _____ State _____ ZIP _____

7. *Type of Work: Construction Repair Modification Abandonment _____ Reason for Repair, Modification, or Abandonment _____

8. *Number of Proposed Wells: _____ Date Stamp _____

9. *Specify Intended Use(s) of Well(s): _____

Domestic Landscape Irrigation Agricultural Irrigation Site Investigations
 Bottled Water Supply Recreation Area Irrigation Livestock Monitoring
 Public Water Supply (Limited Use/DOH) Nursery Irrigation Test
 Public Water Supply (Community or Non-Community/DEP) Commercial/Industrial Earth-Coupled Geothermal
 Class I Injection Golf Course Irrigation HVAC Supply HVAC Return

Class V Injection: Recharge Commercial/Industrial Disposal Aquifer Storage and Recovery Drainage
 Remediation: Recovery Air Sparge Other (Describe) _____
 Other (Describe) _____

10. *Distance from Septic System if ≤ 200 ft. _____ 11. Facility Description _____ 12. Estimated Start Date _____

13. *Estimated Well Depth _____ ft. *Estimated Casing Depth _____ ft. Primary Casing Diameter _____ in. Open Hole: From _____ To _____ ft.

14. Estimated Screen Interval: From _____ To _____ ft.

15. *Primary Casing Material: Black Steel Galvanized PVC Stainless Steel
 Not Cased Other: _____

16. Secondary Casing: Telescope Casing Liner Surface Casing Diameter _____ in.

17. Secondary Casing Material: Black Steel Galvanized PVC Stainless Steel Other _____

18. *Method of Construction, Repair, or Abandonment: Auger Cable Tool Jetted Rotary Sonic
 Combination (Two or More Methods) Hand Driven (Well Point, Sand Point) Hydraulic Point (Direct Push)
 Horizontal Drilling Plugged by Approved Method Other (Describe) _____

19. Proposed Grouting Interval for the Primary, Secondary, and Additional Casing:
 From _____ To _____ Seal Material Bentonite Neat Cement Other _____
 From _____ To _____ Seal Material Bentonite Neat Cement Other _____
 From _____ To _____ Seal Material Bentonite Neat Cement Other _____

20. Indicate total number of existing wells on site _____ List number of existing unused wells on site _____

21. *Is this well or any existing well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUPWUP) or CUPWUP Application? Yes No If yes, complete the following: CUPWUP No. _____ District Well ID No. _____

22. Latitude _____ Longitude _____

23. Data Obtained From: GPS Map Survey Datum: _____ NAD 27 _____ NAD 83 _____ WGS 84

I hereby verify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities as owner. I hereby verify that all information provided on this application is accurate and that I will obtain necessary reports from other federal, state, or local governments, if applicable, in order to provide a well construction report to the District within 30 days after completion of the construction, repair, modification, or abandonment authorized by this permit. Owner consents to sharing ownership of this WMD's Delegated Authority access to the well site during the construction, repair, modification, or abandonment authorized by this permit.

*Signature of Contractor _____ *License No. _____ *Signature of Owner or Agent _____ *Date _____

BELOW THIS LINE FOR OFFICIAL USE ONLY

Approval Granted By _____ Check No. _____ Issue Date _____ Expiration Date _____ Hydrologist Approval _____
 Fee Received \$ _____

THIS PERMIT IS NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD OR DELEGATED AUTHORITY. THE PERMIT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL CONSTRUCTION, REPAIR, MODIFICATION, OR ABANDONMENT ACTIVITIES.

DEP Form 62-532-900(1) Incorporated in 62-532-400(1), F.A.C. Effective Date: October 7, 2010 Page 1 of 2

IRRIGATION METHODS

If an irrigation system installation is recommended in the Feasibility Report, the consultant shall determine the following:

- » Types of irrigation strategies to be utilized throughout the project.
- » Preliminary calculations of water use to size the water source.
- » Electrical requirements and potential sources.



OVERHEAD

Overhead application of water is the primary application method for landscape and turf irrigation systems due to water efficiency, automation, and cost effectiveness.

Overhead irrigation offers flexibility with water sources. The products commercially available are designed to utilize a variety of water sources including wells, surface water, reclaimed, or potable water. In addition, equipment designs focus on applying water efficiently by maximizing distribution uniformity for various weather and soil conditions. A well-designed system will take into account equipment performance, head spacing, and distribution uniformity to effectively provide supplemental water to landscapes.

Different types of overhead application nozzles include sprays, rotary, and rotor type irrigation application devices.

Rotary nozzles, a type of multi-trajectory rotating stream nozzle, are the most efficient product for overhead type irrigation with a distribution uniformity of 80%. Rotary nozzles distribute water uniformly onto landscape at a slower application rate to allow the soil to intake water without runoff. The low precipitation application is beneficial on slopes and roadway embankments to establish stabilization plantings. Increased efficiency results in 30% less water use when compared to traditional sprays and significantly reduces wasteful runoff.

Water conservation can be improved when utilizing more traditional rotors and sprays through the use of water saving features such as check valves, matched precipitation, and pressure regulation.



MICRO IRRIGATION

Micro irrigation is considered to be the most efficient form of water application when designed and maintained properly. Micro irrigation utilizes slow and frequent application of water to the soil, delivering water efficiently to the base of each plant through a system of flexible irrigation tubing, drip emitters, bubblers, and micro sprays.

Due to the small diameter of pipe tubing and emitters, micro irrigation is prone to clogging where low-quality water is being utilized. A system with a well or surface water source will be dependent on the use of filtration to remove inorganic particles and control the organic material that may enter the system.

MANUAL WATERING

Supplemental water for establishing landscape plantings can be provided to landscape that are isolated from a viable water

or power source through the use of a combination of water trucks, hose spraying, and tree watering bags.

Manual watering requires additional cost for labor, safety, and mobilization. Ensuring the safety of landscape crews and the accessibility of the site will be especially important to consider when selecting suitable areas to receive this method of watering; specifically along high speed areas, pull off areas, and steep embankments.

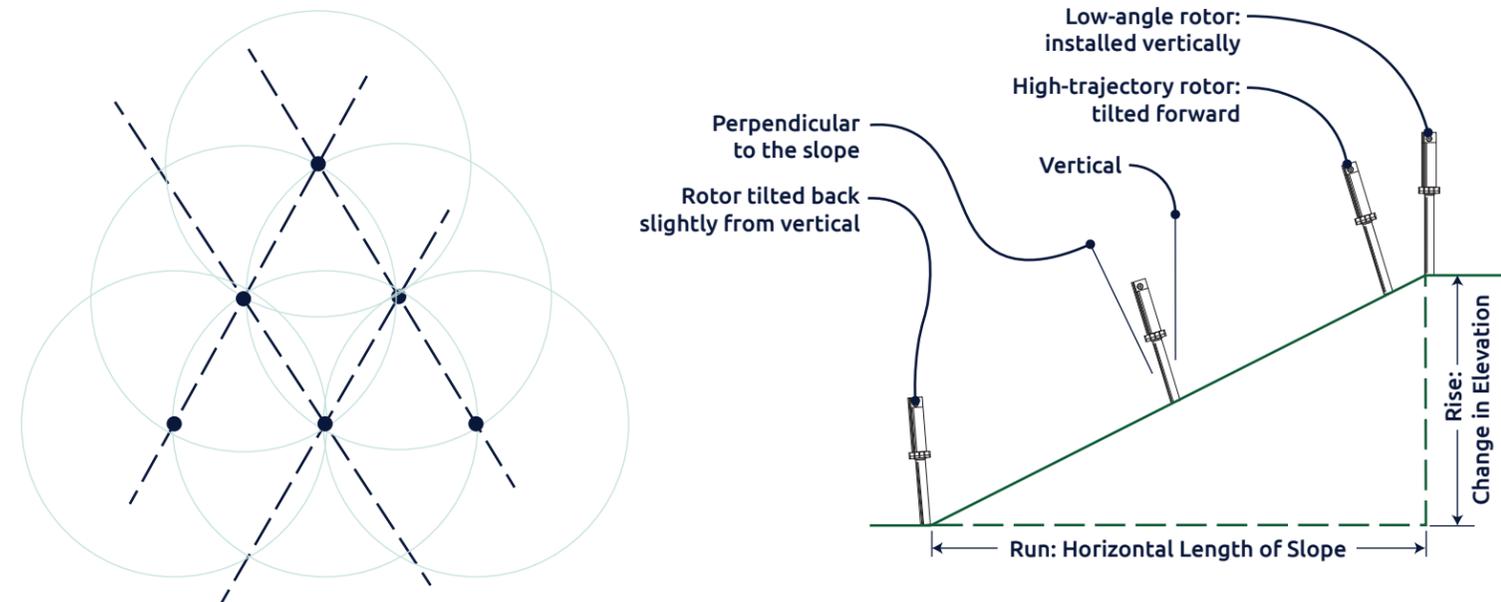
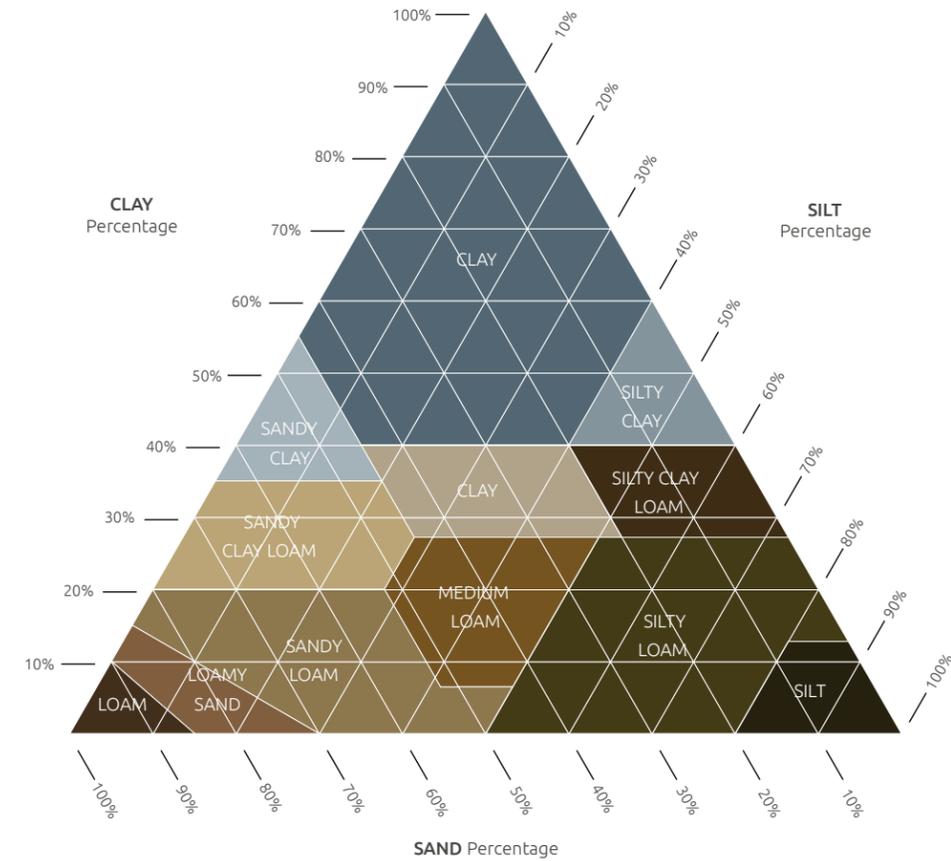
While a sprinkler or drip emitter can be designed to efficiently distribute water automatically, manual watering relies on the expertise of the operator to ensure plant material receives water and can be an inefficient application of water to turf and ornamental landscape. Watering bags for tree establishment provide a slow release of water directly to the root system, but are susceptible to damage.



IRRIGATION DESIGN STRATEGIES

The following irrigation strategies are recommended to encourage consistency between irrigation designs along the FTE system. The strategies have been developed from best practices and lessons learned from previous FTE landscape projects, and are intended to serve as a guide to encourage the design of irrigation systems that help to ensure successful landscape installations, are resilient to harsh conditions, and do not significantly increase project maintenance requirements.

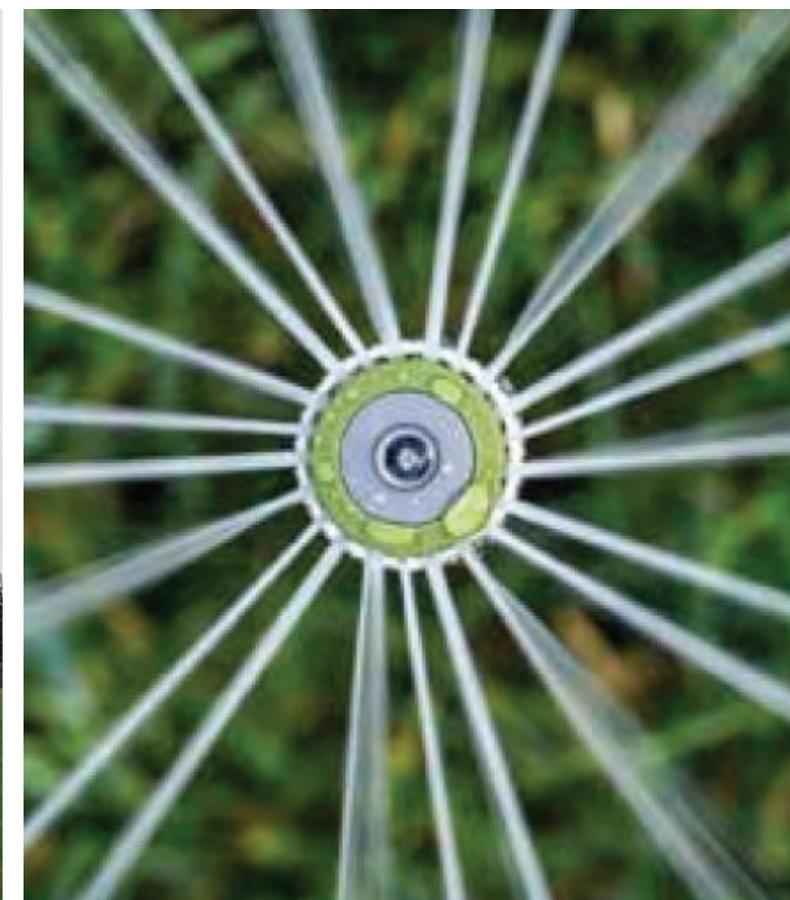
In addition to the design strategies, the irrigation design shall incorporate standards defined in the Florida Building Code, Appendix F. The design shall also incorporate recommendations from the Florida Irrigation Society Standards and Specifications for Turf and Landscape Irrigation Systems, Fourth Edition.



TURF AREAS

Irrigation of turf areas along the FTE is generally discouraged due to the high watering requirement and increased maintenance and mowing of large areas. Turf areas adjacent to heavy pedestrian activity such as parking areas and rest stops may benefit from an irrigation system. High visibility areas, gateways, and areas susceptible to soil erosion where shrubs or groundcovers cannot be utilized may also benefit from irrigation and add to beautification. The use of irrigation for establishing turf areas may be approved on a case-by-case basis.

- » Spray nozzles with matched precipitation installed on a 6" pop-up are recommended for areas 4' wide up to 18'. Factory-installed pressure regulation is recommended to reduce misting and overspray on to roadways and hardscape areas.
- » Low-volume rotary type nozzles installed on a 6" pop-up are recommended for areas 4' wide up to 35', especially where low application rates are desired for embankments and poor soil intake rates.
- » Pop-up rotors may be utilized for irrigating large areas, 25' and greater.



GROUNDCOVERS, SHRUBS, AND ORNAMENTAL GRASSES

Where groundcovers and shrubs are used for screening, embankment stabilization, or beautification, overhead irrigation is encouraged for the duration of the establishment period. The design should consider plant watering requirements, micro-climate factors, and soil intake rates when zoning a system and selecting the appropriate irrigation products.

- » Drip irrigation is only recommended to eliminate overspray onto buildings where hard water or iron deposits are present in the water source. Drip irrigation may also be recommended in areas smaller than 4' wide.
- » Spray nozzles with matched precipitation installed on a fixed shrub riser are recommended for areas 4' wide up to 18'. Factory-installed pressure regulation is recommended to reduce misting and overspray on to roadways and hardscape areas.
- » Low-volume rotary type nozzles installed on a fixed shrub riser are recommended for areas 4' wide up to 35', especially where low application rates are desired for embankments and poor soil intake rates.
- » Rotors installed on a riser may be utilized for irrigating large areas, 25' and greater.



TREES AND PALMS

Trees and palms along the FTE contribute the greatest visual impact in a landscape project. Many of these plantings located in harsh micro-climates and artificially created planting areas are susceptible to stress, making supplemental watering essential to proper establishment. When roadway conditions make these areas inaccessible to maintenance vehicles or water trucks, a well designed irrigation system will ensure proper watering has occurred.

- » Fixed flow rate pressure compensating bubblers on a flex hose riser, installed inside of mulch watering ring. Size flow rate and quantity of bubblers to provide the proper amount of water for each planting. Design to consider planting size, location, elevation, and soil type.
- » Fixed flow rate pressure compensating bubblers installed below grade inside a preferred pipe, ideal for areas with compacted soils or plaza areas with tree planting pits. Size flow rate and quantity of bubblers to provide the proper amount of water for each planting. Design to consider planting size, location, elevation, and soil type.

WILDFLOWERS AND NATIVE PLANTINGS

When necessary for the establishment of native area infill plantings and wildflower areas, manual watering with quick-coupler valves installed on nearby irrigation systems can provide a reliable water source without the need to transport water to the site.

- » Quick-coupler valves installed below grade on a swing-type riser. Valve boxes with SCTE Tier 8 load ratings are recommended in grassed areas for protection from landscape equipment and light trucks.



AUTOMATIC IRRIGATION CONTROLLER

Automated scheduling adjustments based on weather or accumulated rainfall promote water conservation and help to ensure landscape material is not over-watered. Irrigation controllers or pump monitoring systems that feature remote water management will help to ensure the landscape has received irrigation and alerts maintenance of issues in the field.

Decoder controllers allow for future system expansion and can reduce the complexity of an irrigation system on very long or large projects.

DIRECTIONAL BORING

Limit the number of directional bores. Design ticket and utility coordination is critical during the installation. May be used to extend irrigation water sources, electrical service, and automated irrigation control across interchanges, into medians, and other isolated areas that may not have direct access to water or power.

IRRIGATION EQUIPMENT

Valve boxes for irrigation valves installed within grassed areas are more susceptible to damage from incidental traffic and maintenance activity. Where valve boxes cannot be installed in shrub beds, a valve box with SCTE Tier 8 load ratings are recommended to protect irrigation equipment from landscape maintenance equipment and light trucks.

Waterproof irrigation wiring connections should be specified on all wiring splice locations, including junction boxes and solenoid or decoder connections.



IRRIGATION TECHNICAL SPECIAL PROVISIONS

When specifying an irrigation system design, the consultant shall comply with the FDOT Specifications Handbook for developing the Irrigation Technical Special Provisions (TSP) package. The Irrigation TSP must complement the Irrigation Plans and incorporate all recommendations developed in the Irrigation Feasibility Study.

Additional information on preparing a Specification Package and a Technical Special Provision can be found on the FDOT Program Management website:

- » <https://www.fdot.gov/programmanagement/packagepreparation/default.shtm>

