PASO ROBLES, HAYS COUNTY, TEXAS
MEASURES TO PROTECT ENDANGERED SPECIES LOCATED IN SAN MARCOS SPRINGS

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Prepared for

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INTRODUCTION

Paso Robles is approximately 1353 acres proposed of mostly residential, and lesser amount of commercial development located just west of Hunter Road in the southern limit of the City of San Marcos. Of the entire development, approximately 206 acres are located in the Recharge Zone to the Edwards Aquifer, 360 acres in the Contributing Zone within the Transition Zone, and with the remaining 787 acres located in the Transition Zone (Figure 1). The purpose of this analysis is to present the comprehensive measures by which the developer of Paso Robles is committed in order to protect the quality of water in the Edwards Aquifer, and by extension, any endangered species associated with the aquifer.

GEOLOGIC SETTING

As mentioned above, the site lies within portions of three designated hydrogeologic zones as defined by the TCEQ in 30 TAC §213. The purpose of Chapter 213 is to regulate activities that have the potential to pollute the Edward Aquifer. The three regulated zones are defined in Chapter 213. The Recharge Zone consists of the stratigraphic units that define the Edwards Aquifer. Specifically, the Zone is where these units crop out (exposed at the surface), and create an avenue for surface runoff to enter the aquifer through solution features. Proceeding eastward, faulting places these units at depth with more recent stratigraphic units overlying the aquifer. The Contributing Zone, while not a part of Paso Robles, consists of the area to the west of the Recharge Zone that produces stormwater runoff that flows to the Recharge Zone, and where avenues exist, largely in creek beds, that recharge the aquifer. The Transition Zone lies to the south and east of the Recharge Zone and consists of the stratigraphic units overlying the aquifer. Potential connection to the aquifer may occur through the existence of faults and fractures, but surface runoff is directed eastward away from the recharge zone. The third zone within the Paso Robles site is the Contributing Zone within the Transition Zone. This area may contain the same stratigraphic units as the Transition Zone, but due to surface topography, stormwater runoff is directed to the Recharge Zone. In the order of potential aquifer recharge within Paso Robles, the Recharge Zone is the zone of the greatest input, followed by the Contributing Zone within the Transition Zone, and lastly, the Transition Zone.

BEST MANAGEMENT PRACTICES (BMPs)

Best Management Practices consist of a suite of both structural and non-structural measures designed to minimize the impact of development upon receiving streams, and in the case of the Edwards Zone, maintain the quality of the recharge to the aquifer, and thus protection of Endangered Species.

Non-Structural Practices

Non-structural measures consist of practices incorporated to minimize the generation of non-point source pollution, i.e., that pollution resulting from stormwater runoff from both developed and undeveloped land. The non-structural aspects include measures that can be undertaken by the individual property owner as well as those incorporated into the design of a subdivision. Some of these practices are described below.

Buffer Zones: Buffer zones consist of land area set aside along both sides of a drainage way in which development is restricted to varying degrees, depending upon the jurisdiction. Road and utility crossings are allowed, but the old practice of routing a wastewater line down the middle of a creek would not be acceptable in a buffer zone. The buffer zone creates a physical separation of the development from the creek where the majority of the recharge occurs. The buffer can also provide an opportunity for a natural treatment of stormwater runoff. In addition to stream buffers, buffers are typically created around sensitive environmental features, such as caves and sinkholes.

Impervious Cover: The effect of impervious cover on stormwater runoff is direct. With increasing impervious cover, runoff occurs more frequently and at a greater intensity. It is the frequent rainfall/runoff events that create the channel forming flows. Without controls, this leads to increased streambank erosion and the potential for increased flooding from large storms. Therefore, a development with impervious levels in the lower range is more amenable to utilizing a suite of non-structural controls to offset the impact of the impervious cover as the starting point is closer to the natural condition.

Low-Impact Development Design: Low-impact design is not limited to low impervious cover levels, but includes a commitment to minimize impact to the environment from the planning stage through design, construction, and occupation. The design includes preservation of open space, efficient layout to reduce the amount of land necessary for streets, use of minimum street

widths without compromising safety, and routing of stormwater to disconnect impervious cover from the conveyance system. A simple example of the latter consists of establishing provisions that downspouts discharge to pervious areas rather than driveways or parking areas. Other elements of low-impact development design include rigorous construction phase erosion controls, creation of an integrated pest management program, and the requirement that landscaping utilize native or native adapted plants. The benefits to the environment of the native plants are that the water requirements can be much less, that the plants are less susceptible to disease that requires application of fungicides and pesticides, and have a minimal need for fertilizer application.

Structural Practices

Structural practices consist of BMPs designed to treat non-point source pollution generated by development where the non-structural practices alone do not meet the goal of a desired level of pollutant reduction. A sampling of these practices is described below.

Vegetative Filter Strips: Vegetative filter strips (VFS) utilize the natural ability of vegetation to retard the rate of stormwater runoff, increase infiltration, and provide uptake of nutrients in the runoff. For the VFS to be effective, they have to meet design criteria that is well documented in the literature. They consist of both existing natural areas or may be constructed to specific design criteria. As a general rule, the criteria specifies maximum slope, degree of vegetative cover, ability of the VFS to receive the runoff as sheet flow, width of the VFS in relation to design flow (flow/foot of width), and depth of VFS in the direction of flow. Vegetative filter strips can be very effective in areas where stormwater runoff has not concentrated. Examples are sheet flow off the back of residential lots adjacent to greenbelts or buffers, sheet flow from the downslope side of streets designed without curb and gutter, and golf course rough areas of native grasses that receive sheet flow off fairways. Where the application of VFS is appropriate, it is a desirable BMP as it can be almost self-sustaining and requires very little maintenance once established.

Sedimentation-Filtration Ponds: Sedimentation-Filtration ponds are the most common structural control used in the Central Texas area. These consist of a sedimentation basin followed by a sand filter (Figure 2). The ponds are designed to capture a specific stormwater runoff volume, and once full, any subsequent runoff bypasses the pond. The design capture volume is such that

the vast majority of the pollutant load in the runoff is captured in the pond, rather than bypass. The function of the sediment basin is to allow time for sediment to settle and trap any floating debris. The sediment pond then drains typically over a 48-hour period to the filtration pond. The filtration pond consists of an 18-inch thick sand filtration media with a gravel underdrain. The filtered runoff is collected in perforated pipe for discharge. Maintenance of this BMP mainly consists of mowing and trash removal, periodic sediment removal, and replacement of the upper portion of the sand media when a crust develops such that filtration is hindered.

Wet Pond: A wet pond generally consists of an in-stream pond designed to receive all stormwater runoff upgradient of the pond rather than capture and isolate a specific design runoff volume. A wet pond design is based upon a calculated hydraulic residence time and on the assumption that entering flow pushes out the water that was stored, and treated, in the pond prior to the runoff event. To achieve this, the pond is configured to minimize any short-circuiting of the entering flow. Configuration consists of a forebay and main pool (Figure 3). The forebay aids in preventing short circuiting and allows for initial sedimentation of the heavier sediment. The design hydraulic residence time determines the volume of the stored water, defined as the permanent pool volume which is made up of both the forebay and main pool volume. The pond is constructed with a vegetated bench along its perimeter. This bench is vegetated with shallow water plants that help in nutrient uptake. The effectiveness of a wet pond is increased with the allowance for an extended detention volume, a normally dry volume, that exists above the permanent pool and is designed to detain additional runoff and slowly release it. This enhances the sediment removal efficiency of the pond. Wet ponds can be adapted from existing ponds that were previously used for agricultural purposes. Contributing drainage areas must be such to produce sufficient runoff to maintain the level of the permanent pool. Besides the water quality function, wet ponds can serve as an amenity to the development. Depending upon location in the drainage basin, wet ponds may require a Water Rights Permit from the Texas Water Development Board.

Other BMPs exist, but those presented above are the most common ones that have been historically used in Central Texas.

SUMMARY OF WATER QUALITY REGULATIONS

The City of San Marcos and the TCEQ both have water quality regulations pertaining specifically to the Edwards Aquifer and by which Paso Robles must comply.

As part of the subdivision approval process, the City of San Marcos requires a Watershed Protection Plan meeting the requirements of that City's Land Development Code. The requirements to obtain approval of the plan require removal of 80 percent of the increase in Total Suspended Solids (TSS) caused by the development, establishment of Water Quality Zones (WQZ) and Buffer Zones (BZ) along waterways, sensitive geologic feature protection, and impervious cover limits. The water quality zones are based upon the limits of the FEMA 100-year floodplain, if one exists, otherwise the width is based upon the waterway classification. For all water quality zones, a buffer zone of 100 feet exists beyond the water quality zone. The following table summarizes the City of San Marcos stream corridor protections.

Waterway Classification	Contributing Drainage Area (acres)	Water Quality Zone (feet from creek centerline)	Buffer Zone (feet)
Minor	50 – 250	50	100
Intermediate	250 – 1000	100	100
Major	>1000	200	100

The City of San Marcos requirements and standards for BMPs state that they *must be constructed, operated and maintained in accordance with the standards, criteria and requirements in the TCEQ Edwards Aquifer rules and the TCEQ BMP guidance manual*.

The TCEQ Edwards Aquifer Protection Program (EAPP) consists of rules for development within the four hydrogeologic zones discussed above. Texas Administrative Code (TAC) Chapter 213 establishes the regulations pertaining to the aquifer. In 213.1, the purpose of the rules is stated *to regulate activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams in order to protect existing and potential uses of groundwater and maintain Texas Surface Water quality Standards.* The TCEQ document "Complying with the Edwards Aquifer Rules – Technical Guidance on Best Management Practices, dated July 2005 and online amendments details the measures by which the requirments may be met.

PASO ROBLES MEASURES

The water quality protection measures proposed for Paso Robles development will consist of not only mandatory measures, voluntary measures designed to protect the water quality of the Edwards Aquifer. Non-point source pollution may be generated not only from development but from agricultural operations. Stormwater runoff from pasture used for cattle grazing introduces coliform bacteria as well as nutrients into receiving streams as well as direct introduction into streams serving as a water source for the cattle. The first step for Paso Robles will be to remove all cattle from the property.

As part of the San Marcos permitting process, Paso Robles developed a Watershed Protection Plan that exceeds the requirements of the Land Development Code. Under the terms of this plan, all development proposed over the Recharge Zone and the Contributing Zone within the Transition Zone is required to remove 85 percent of the increase in Total Suspended Solids caused by the development. Within the Transition Zone, 70 percent removal is required. However, per TCEQ requirements this area will actually require 80 percent removal. These removals exceed the requirements both of the City of San Marcos Land Development Code and the TCEQ Edwards Aquifer Protection Program.

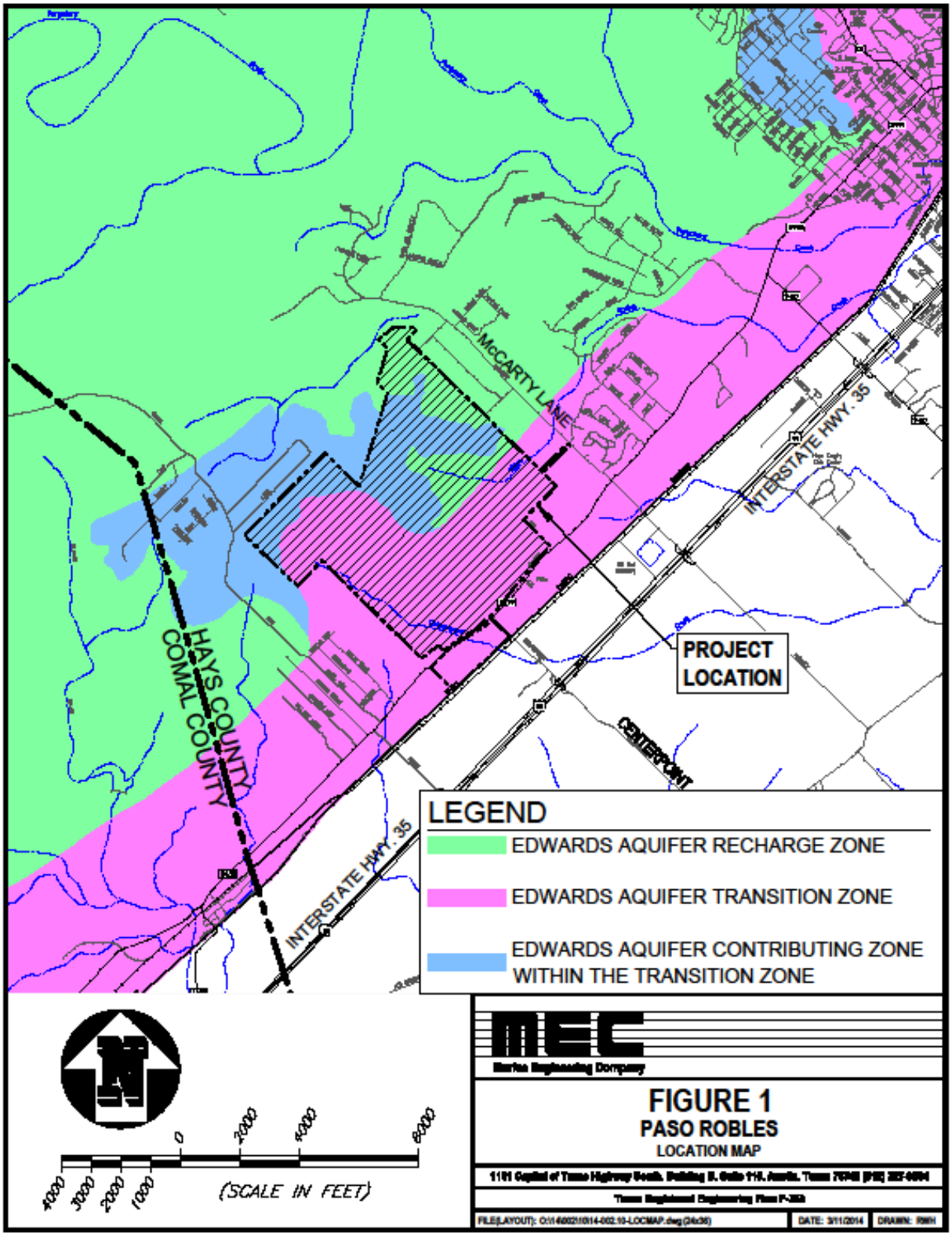
In addition to the BMPs necessary to achieve the above pollutant removals, the Paso Robles residential development is committed to additional measures designed to minimize the generation of pollutants. Control of pollutants at the source provides an integrated plan of control not dependent upon one end-of-pipe treatment to achieve the water quality goals. In this regard, Paso Robles, as part of the restrictive covenants, will develop an Integrated Pest Management (IPM) plan. This plan will provide guidance to residents in the selection and use of environmental friendly herbicides, pesticides, and fertilizers. However, to minimize the use of the IPM controls, the developers are committed to a landscape design relying heavily on native or native adapted plants. At least ninety percent of trees, shrubs, and flowers will be selected from native and adapted plants selected from the City of Austin "Preferred Plant List" contained in Appendix 'N' of the City of Austin Environmental Criteria Manual, from the LCRA Texas Hill Country Landscape Option specifications, the Texas Native Tree and Plant Directory, or other source, such as the Lady Bird Johnson Wildflower Center, recognized as providing native

or adapted plant guidance for the Hill Country. The use of invasive plants will be avoided. Turfgrass is limited to hybrid bermuda, zoysia, buffalo, or native mixes such as Habiturf™ and Thunder Turf™. No seeded varieties of Bermuda grass are allowed (i.e., Common, Sahara, or Coastal). All turfgrass areas must be sodded or seeded prior to initial occupancy.

SUMMARY

The commitment by the developers of Paso Robles towards providing an integrated water quality plan ensures that receiving streams will maintain a water quality to achieve the goal of protection of endangered species. The characteristics of the integrated water quality plan contain at a minimum the following:

- Increased pollutant removals
- San Marcos creek buffer zones
- Low-impact development design measures
- Integrated Pest Management Plan
- Source control through landscaping requirements



MEC
Martin Engineering Company

FIGURE 1
PASO ROBLES
LOCATION MAP

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Texas Registered Engineering Firm F-352

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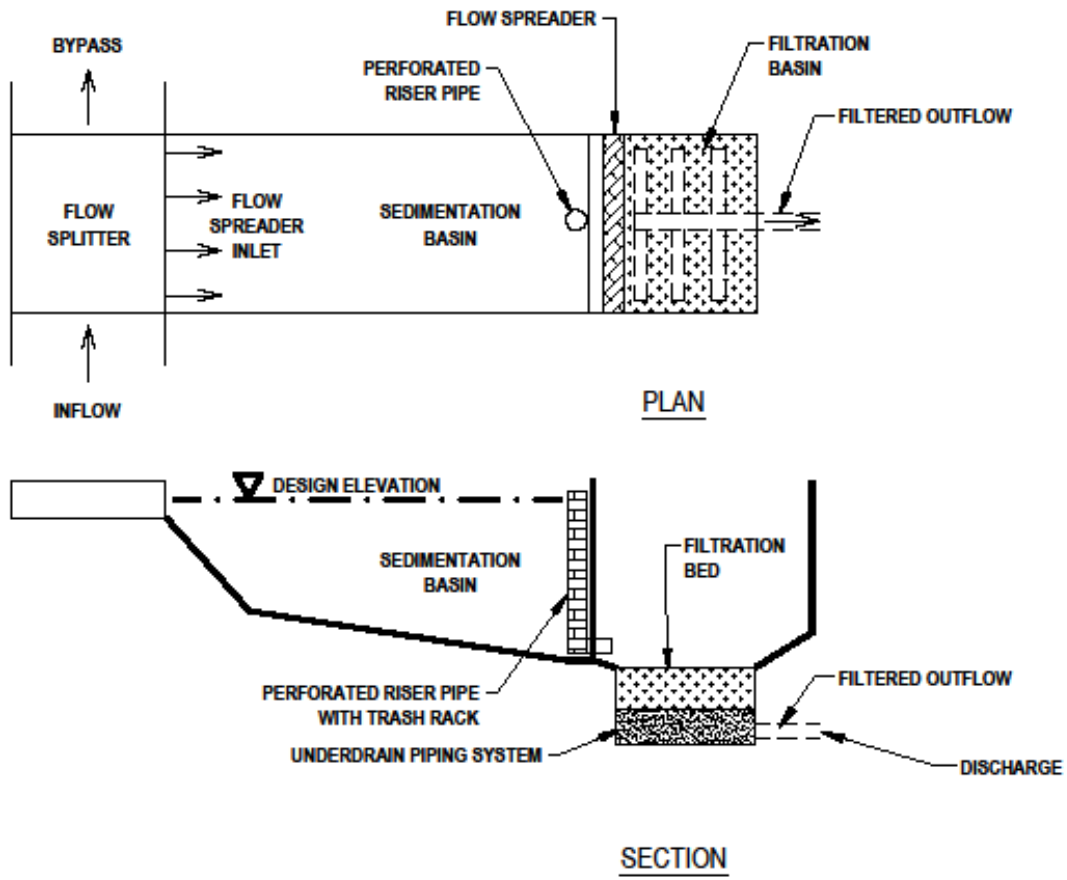

FIGURE 2

CONCEPTUAL SEDIMENTATION/FILTRATION POND

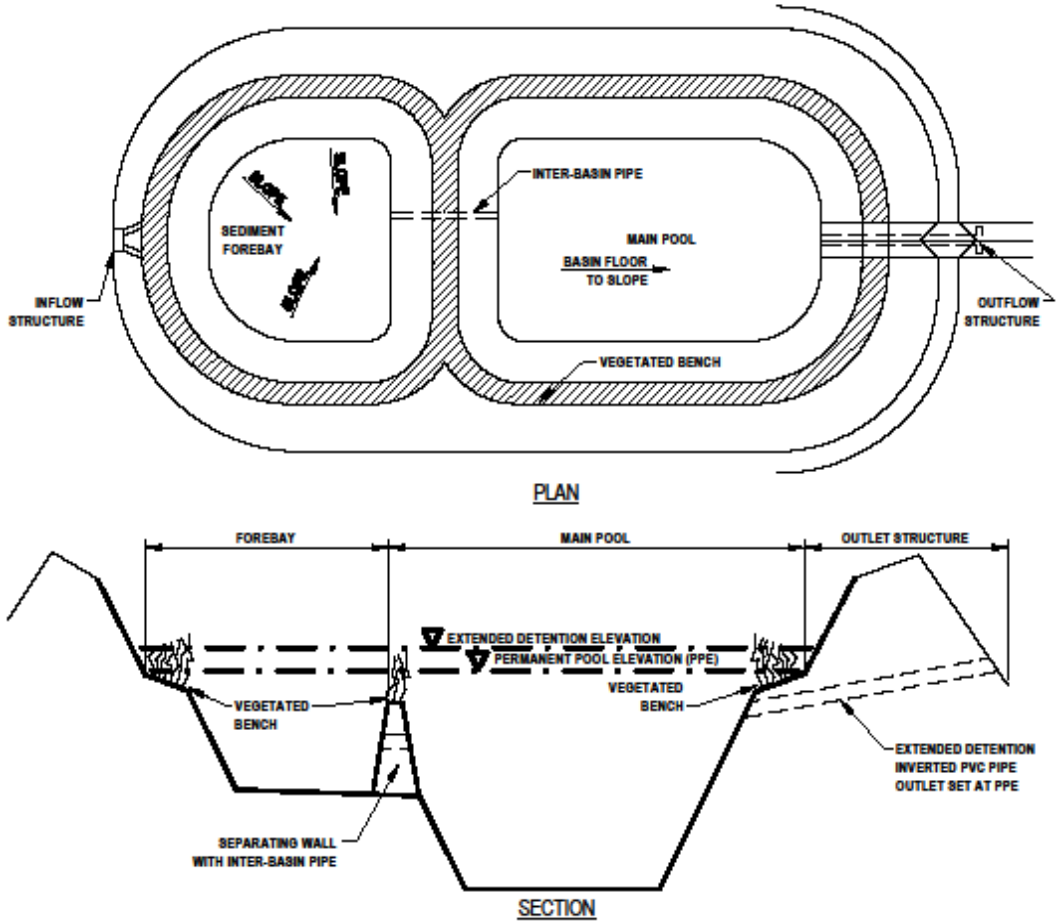

FIGURE 3

CONCEPTUAL WET POND