QUESTION 19
STORMWATER MANAGEMENT

BACKGROUND

As noted in the opening responses to Question 16, Floodplains, the detailed drainage analysis is also intended to address many of the drainage issues and concerns raised by various federal, state and city agencies involved in the DRI application review process.

The proposed Restoration Stormwater and Floodplain Management Plan will incorporate an intricate system of retention ponds, detention ponds, stormwater reuse systems, wetland rehydration systems and floodplain attenuation areas. Restoration's on site wetlands, restoration areas and other depressional areas will benefit from an improved hydroperiod that more closely resembles the natural condition that existed before the silviculture operations, where water is released to the downstream drainage system more slowly than what presently occurs. Berms constructed between or around wetland strands would provide for an improved hydroperiod, while the additional inundation (depth) and attenuation (volume) can be designed to regulate discharge such that downstream flood elevations are actually reduced (i.e., improvement above and beyond the status quo). This concept is consistent with modern practices and land stewardship philosophies.

Now that the Applicant has completed the detailed existing drainage analysis, we are better able to address the initial Question 19 ADA question on Stormwater. To that end, the Applicant has gone back and provided updated responses to those initial inquires. Those responses are included herein following sufficiency comments from Volusia County, The Nature Conservancy and the City of Edgewater.

VOLUSIA COUNTY GROWTH AND RESOURCE MANAGEMENT (LETTER DATED JANUARY 15, 2008)

<u>Question 19. Stormwater Management, p. 19-1:</u> The floodplain extent must be established and studied before this ADA can be considered sufficient. The County continues to be concerned about the development of this property relating to both on-site and off-site flooding pursuant to our addressing the applicant's response to question 16. Please respond, in detail including adequate data and analysis, to address the concerns stated in the a-mails from Frank Marshall, PhD, P.E previously provided to the applicant. The floodplain extent must be established and studied before this ADA can be considered sufficient.

A copy of the report entitled *Restoration Existing Conditions Analysis and 100-year Flood Study* with accompanying attachments is being provided under separate cover to select agencies interested in the required flood study. The proposed development plan will require some impacts to the currently mapped floodplain, which is common for most projects of this scale in this part of the State and within Volusia County. Based on the proposed project's master stormwater and floodplain management plan as well as the utilization of treated stormwater for all non-potable water uses, the project will be able to be developed with no off-site impacts. The work that Dr. Marshall previously completed was incorporated into the recently completed flood study. Due to the preservation of significant conservation areas and thereby the necessity and ability to stage and utilize stormwater to assist in the restoration efforts, on-site storage and attenuation will ensure the post-development systems mimic (or reduce) discharges off-site. Further details and refinement of the mater stormwater management system will be provided as final design and permitting initiatives continue when the currently revised Development Plan (Map H) is approved with this DRI/ADA and will be permitted through all jurisdictional and regulatory agencies.

THE NATURE CONSERVANCY (LETTER DATED JANUARY 15, 2008)

- **The proposed stormwater system, which appears to be wet retention, surrounding the western "Village Center" and residential area is an invitation for human-bear conflicts and other wildlife problems. Proposed stormwater ponds that run the length of Airport Road Blvd in this area are particularly problematic, as they are likely to create death zone for wildlife next to the road. It would be much better to design necessary stormwater features as part of a transition between developed areas and adjacent conservation corridors rather than weaving these large features through developed portions of the project. For example, by eliminating the residential area south of the stormwater system in this area, a buffer could be created to the proposed east-west corridor to the south.**

  Please see the revised Map H, Master Development Plan (Revised) and Appendix 12-1, Site Mitigation and Management Plan (SMMP) Executive Summary and the attached CD for our revised plan(s).

CITY OF EDGEWATER (LETTER DATED JANUARY 11, 2008)

2. **The detailed drainage basin study is a necessary item in evaluating any further responses, as this document will outline the absolute number of units that will be allowable.**

   A copy of the report entitled *Restoration Existing Conditions Analysis and 100-year Flood Study* with accompanying attachments is being provided under separate cover to select agencies interested in the required flood study.

A. Describe the existing drainage patterns on site, as shown on Map I, including any potential flooding and erosion problems.

Map I-1, Existing Drainage Map, shows the existing topography and major drainage basins. The Federal Emergency Management Agency's (FEMA) flood prone areas are shown on Map C, Topographic Map with Floodplain.

The existing topography shows elevations ranging from lows of approximately 18 ft. to highs on the ridges of 29 ft. The surface is characterized by a series of ridges and depressions.

Pursuant to the report entitled *Restoration Existing Conditions Analysis and 100-year Flood Study,* the site lies within five major drainage basins: Spruce Creek, Turnbull Creek, Gabordy Canal, Cow Creek, and Little Cow Creek. The site appears to be a confluence of an upstream terminus of all five basins. Detailed drainage information can be found in the flood study. The existing drainage basins and approximate areas are described as follows:

Spruce Creek: The northern and western portions of the site consisting of approximately 2,731 acres in two major basins, SPRUCE CREEK and SPRUCE CREEK-W, drains northerly and westerly to canals that discharge to the Spruce Creek Swamp.

Turnbull Creek: The northeastern corner of the site, consisting of approximately 228 acres, discharges northeasterly across I-95 into ditches. The series of ditches convey the stormwater to Turnbull Creek and Turnbull Bay.

Gabordy Canal: The easterly portion of the site consists of approximately 773 acres. The runoff from this portion of the site primarily drains easterly. It is then conveyed under I-95 to ditches that discharge to Gabordy Canal.

Cow Creek: The central and southern portions of the site, consists of approximately 1,952 acres. The runoff from the basin drains southerly across Opossum Camp Road (CR 442) and then westerly toward Cow Creek which discharges to Deep Creek and ultimately to the St. Johns River north of Lake Harney.

Little Cow Creek: This southeasterly portion of the site consists of approximately 120 acres. It drains southerly across Opossum Camp Road (CR 442) and then easterly across I 95 to Little Cow Creek. Little Cow Creek discharges into a large low area east of I 95 referred to as Turnbull Hummuck which discharges to the south through Turnbull Creek into the Northern end of the Indian River Lagoon.

The 100-year flood prone areas for the property are reproduced from the FEMA Flood Insurance Rate Maps (panel numbers 12127C0508G, 12127C0516G, 12127C0525G and 12127C0700G,Volusia, County, Florida, effective date July 3, 2002 and map number 12095C0375 E, Orange County, Florida, effective date April 15, 2002). The site lies in Zone X ("areas determined to be outside the 500-year floodplain") and Zone A ("no base flood elevations determined").

The project will be designed to provide flood management consistent with the design criteria of Edgewater and New Smyrna Beach respectively within each City and of SJRWMD.

Slopes on the property are relatively flat and the property is highly vegetated resulting in minimal erosion potential from the current condition. All new construction will include erosion and flood control techniques to be permitted by SJRWMD and FDEP (NPDES).

B. Describe the various elements of the proposed drainage system shown on Map I, including any wetlands to be used as part of the system, and discuss the design criteria (including stage-storage/stage discharge assumption) to be used for the various elements. Provide typical cross-sections (showing dimensions, slopes, and control elevations) for any proposed lakes or swales. Identify the control elevation for all drainage structures. Include information as to what design storm will be used for what portions of the system.

The post-development drainage basins and conceptual stormwater management facility locations are shown on Map I-2, Proposed Drainage Plan.

The proposed stormwater management systems will be designed in accordance with criteria of the St. Johns Water Management District (SJRWMD), the City of Edgewater and the City of New Smyrna Beach. Approximately 2,731-acres of the site lie within the Spruce Creek Hydrologic Basin, however none of the area is within the designated Riparian Habitat Protection Zone. This area is subject to the District's recharge standards for Most Effective Recharge Areas as represented by hydrologic soil type "A" and for no reduction of floodplain storage criteria will apply within the Spruce Creek Hydrologic Basin. However, the nature of the soils in this area is such that the hydrologic type A/D soils will be characterized as type D and would not function as most effective recharge areas.

Systems will be generally consistent with the natural drainage patterns described above. Should any basins be determined to be completely landlocked, they will be served by wet detention ponds

designed to provide pollution abatement and to limit post-development volume and rates to pre-development in accordance with agency criteria. Those basins discharging to basins having positive outfalls will be served by wet detention ponds designed to provide pollution abatement and to limit post-development rates to pre-development in accordance with agency criteria.

Existing wetlands/surface waters that are wholly owned within the property or those that can be shown to have a defined point or points of entry to the site and discharge from the site may be utilized for rate attenuation. In such cases, water quality treatment will be provided in Stormwater Management Areas (SMAs) upstream of and prior to discharge into the wetlands/surface waters. Rate management will be evaluated at the points of discharge across the property lines of the project.

Control elevations for wet detention systems will typically be set at the approximate wet season water table elevation as determined by the project's geotechnical engineer and/or environmental consultant during final engineering. Where discharge is to a water body or wetland, the control elevation will be set at the normal water elevation of the water body or wetland, if higher. Ultimately, normal water elevations will be determined by the geotechnical engineer and/or environmental consultant.

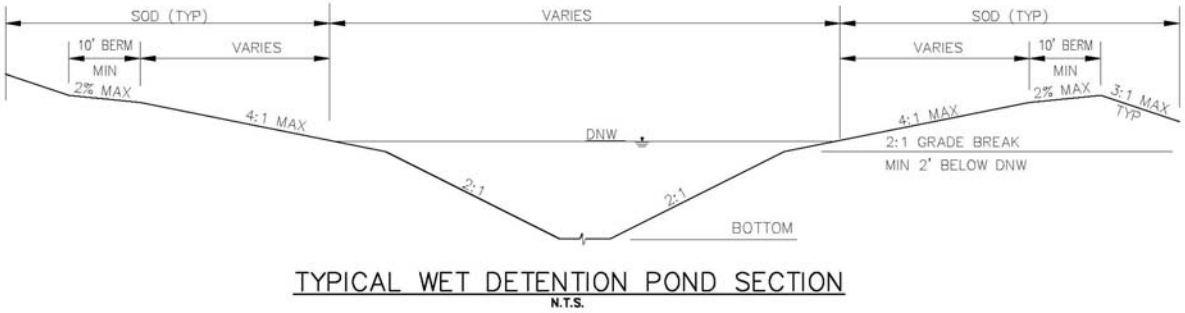
Tailwater-time discharge relationships will be established using the normal water elevations at time zero and the peak stage elevations as determined from the flood routing models to be developed in analyzing and permitting this project.

The design storms to be used are:

Basins with Positive Outfall	Rate:	25 year – 24 hour (P= 9.0”)
	Floor elevations:	100 year – 24 hour (P=11.1”)
Landlocked Basins	Volume (SJRWMD):	25 year – 96 hour (P= 11.5”)
	Volume (NSB)	100 year – 72 hour (P= 13")
	Rate:	25 year – 24 hour (P= 9.0”)
	Floor elevations:	100 year – 24 hour (P= 11.1”)

Typical SMA cross-sections are shown in Exhibit 19.B-1, Typical Section.

Exhibit 19.B-1
Typical Section



C. From Map I, indicate the total number of acres in each drainage area and specify the acreage of any portions of drainage areas outside the site boundaries. Complete the following table for on site drainage areas.

Table 19.C-1**,** Drainage Basin Areas is completed based on Map I-2, Proposed Drainage Plan as follows:

Table 19.C-1
Drainage Basin Areas

Phase/Basin	Impervious Surfaces (acres)	Stormwater Management Areas & Wetlands (acres)[1]	Pervious Surfaces (acres)	Total (acres)
SPRUCE CREEK-W	0	476	15	491
SPRUCE CREEK	0	982	1258	2240
TURNBULL CREEK	0	20	51	71
RESTORATION	1074	1376	1027	3477
PROJECT TOTALS	**1074**	**2854**	**4576**	**6279**

[1]Category includes lakes (internal wetlands/surface waters), ponds, storage areas, etc.

D. Specify and compare the volume and quality of run-off from the site in its existing condition to the anticipated run-off at the end of development. (The parameters to be used to define "quality" and methodology should be agreed to by the regional planning council and other reviewing agencies at the preapplication conference stage.) Identify any changes in timing or pattern of waterflows between pre- and post-development conditions. Indicate major points of discharge and ultimate receiving water body(ies). Indicate what provisions will be incorporated in the design of the drainage system, including a summary description of any Best Management Practices to be utilized, to minimize any increase in run-off from the site and to minimize any degradation of water quality in the ultimate receiving body over that occurring in its pre-development state.

The proposed stormwater management system will be designed to comply with discharge quantity and quality requirements and design criteria of the St. Johns River Water Management District and the Cities of Edgewater and New Smyrna Beach respectively within each City. Water quality of post-development discharges will be accomplished by compliance with Chapter 40C-42, Regulation of Stormwater Management Systems. Management of runoff water quantities will be accomplished by compliance with Chapter 40C-4, Surface Water Management Systems. Any requirements of the Cities that are more stringent will also be applied.

The historical use of most of these lands and current land use entitlement of these lands is agricultural/pine plantation production.

The specific peak discharge rates will be determined in the detailed design and permitting phases. An increase in the time to peak discharge rate is anticipated in many of the basins. This is not anticipated to have a measurable affect on the rate of discharge from the wetland sloughs due to their substantial routing and attenuation capacity.

The pre-development and post-development runoff volumes are estimated from the proposed conceptual master plan and development program and are presented in the following tables:

Table 19.D-1
Runoff Volume – Existing Basins

Positive Discharge Basins

Existing Basins	Area (acres)	Curve Number	25-yr.- 24-hr. Runoff (P = 9.0")
SPRUCE CREEK-W	491	97	354
SPRUCE CREEK	2715	85	1625
TURNBULL CREEK	228	83	132
GABORDY CANAL	773	88	486
COW CREEK	1952	88	1228
LITTLE COW CREEK	120	90	78
Totals:	**6279**		**3903**

Table 19.D-2
Runoff Volume – Proposed Basins

Positive Discharge Basins

Developed Basins	Area (acres)	Curve Number	25-yr. 24-hr. Runoff (P=9.0")(ac-ft)
SPRUCE CREEK-W	491	97	354
SPRUCE CREEK	2240	87	1386
TURNBULL CREEK	71	83	41
RESTORATION	3477	92	2328
Totals:	**6279**		**4109**

Note: Actual runoff volume will be significantly reduced to account for water to be used for irrigation.

E. Who will operate and maintain the drainage system after completion of the development?

The stormwater management systems will be privately owned and maintained by the project owner(s) until such time as they are formally passed to duly established responsible entities.

CITY OF NEW SMYRNA BEACH (LETTER DATED JANUARY 17, 2008)

Request 30: **Demonstrate that the City's existing Stormwater Management and Conservation Ordinance, which requires that post-development stormwater runoff rates and volumes must approximate pre-development conditions and that precautions must be taken to prevent erosion, sedimentation, and flooding, will be met. In particular, the ordinance requires that:**

1. **On-site retention shall be provided for no less than one inch and one-half of runoff from roofed, paved, and other impervious surfaces caused by or resulting from the project.**
2. **The peak discharge rate and total runoff volume leaving the developed or redeveloped site for a 25 year storm of 24 hours duration shall be limited to 110 percent of the pre-development or pre-redeveloped discharge rate and total discharge volume.**
3. **Stormwater runoff shall be subjected to "best management" practices prior to discharge into natural or artificial drainage systems. Best management shall mean a practice or combination of practices determined by the City Engineer to be the most effective practical means of preventing or limiting the pollution generated by the project to a level compatible with Florida water quality standards found in Chapter 17-3, Florida Administrative Code.**
4. **Runoff computation shall be based on the most critical situation and conform to acceptable engineering practices using rainfall data and other local information applicable to the affected area.**

5. **No site development or alteration shall cause siltation of wetlands, pollution of downstream wetlands, reduction in the natural retention or filtering capabilities of wetlands, or reduction in the elevation of the existing water table.**
6. **No site alteration shall allow water to become a health hazard or contribute to the breeding of mosquitoes.**

7. **Site development or alteration activities shall include construction or installation of such water retention facilities, settling structures and/or flow attenuation devices as may be necessary to ensure that the foregoing standards and requirements are met.**

8. **Design of water retention or detention structures and flow attenuation devices shall be subject to the approval of the City Engineer.**

9. **In subdivisions and on parcels where stormwater retention meeting current standards is not provided, filling of low lots shall not be allowed within**

required yard areas except that a minimum amount of fill may be allowed for:

a. A driveway and up to five (5) feet on either side of the driveway; and
b. No more than six (6) inches of fill may be allowed within the required yard areas provided an adequate drainage scheme is constructed to not allow stormwater onto adjacent lots. Construction techniques allowed to elevate the first floor of a structure include use of stem wall and pier foundations.

As stated earlier in this RAI, the Developer will proved a detailed analysis of future development impacts in conjunction with future applications for New Smyrna Beach development. As a result of the ADA responses from the agencies, notably the City of New Smyrna Beach, the Applicant has chosen to delete the 1,515± acres located in the City of New Smyrna Beach from the Restoration DRI, and no response will be provided since the project has no impact on the City's infrastructure at this time.