
HYDROLOGIC RESTORATION NARRATIVE

Kingston Property

May 2022

Prepared By:

The logo for J.R. Evans Engineering features a stylized circular graphic composed of several overlapping, semi-transparent grey rings. The text "J.R. EVANS" is positioned above "ENGINEERING". "J.R." is in a smaller, grey, sans-serif font, while "EVANS" is in a larger, bold, red, sans-serif font. "ENGINEERING" is in a medium-sized, grey, sans-serif font.

J.R. EVANS
ENGINEERING

J.R. Evans Engineering, P.A.
9351 Corkscrew Road, Suite 102
Estero, Florida 33928

1 INTRODUCTION

1.1 OVERVIEW

The Kingston Property is located south of State Road 82 (SR82) approximately 8 miles east of Daniels Parkway within portions of Sections 02-03, 10-11, 14-15, 23-26, 34-36, Township 46 South, Range 27 East, Lee County, Florida. The property extends from SR 82 south to Corkscrew Road and continues south of Corkscrew Road to the limits of conservation property owned by the South Florida Water Management District (SFWMD) and Audubon Society. The site is approximately 6,676-acres which is proposed for conversion from active agricultural to natural lands restoration, conservation, and residential and commercial development. The phasing of mixed-use development for the Kingston Property project will correspond with the takedown of active agricultural that ultimately results in over 3,280 acres of permanent restoration/conservation area.

1.2 HISTORIC WATER USE

The Kingston property is located on land that has been historically used for agricultural production. The project area falls within the footprint of two large agricultural facilities with separate water use permits issued by the South Florida Water Management District (SFWMD): Agricultural operations have a historic permitted irrigation water use extending from the 1970's through to the present. Currently, the site consists of approximately 4,805 acres of irrigated farm fields. The permitted allocation of water use is approximately 12.8 million gallon of water per day. This allocation is from both the water table aquifer and the sandstone aquifer, which has very limited capacity.

1.3 HISTORIC WATER MANAGEMENT

The farm fields have also been heavily drained through an extensive network of ditches that have generally lowered surface and groundwater levels on the site. The current agricultural water management system is designed to lower site water levels when needed for field preparations and to maintain relatively consistent water levels during active growing periods. In general, the system is designed to keep the water table approximately about three feet below land surface in the citrus areas through the combined use of surface drainage and irrigation. In addition to the drainage system, the existing agricultural fields maintain a series of outer berms for the management of water surrounding the farm fields.

1.4 AGRICULTURAL TRANSITION

The Kingston Property will include a phased removal of agricultural operations and restoration of 50% of the property which will result in an overall reduction in water consumption on the property. The proposed project will comprise approximately 3,280 acres of natural lands restoration, conservation uses, and the balance of land as mixed-use development. The agricultural takedown is anticipated to be completed in phases.

In accordance with the Conditions of Development (#15), individual on-site wells will not be allowed adding central control to the community's irrigation system. The total irrigation requirements for the proposed Kingston Property project site assumes an irrigated area that includes residential yards, common areas, road right of way, and commercial landscaping. This results in an estimated irrigated acreage demand of 827 acres for the total proposed mixed-use development. The irrigation demands for the proposed 827 acres of residential lawn and landscape associated with the Kingston Property development are estimated at 2.9 mgd. The proposed decrease in irrigation demands also includes the elimination of all permitted Sandstone Aquifer withdrawals, totaling approximately 6.1 mgd or 2,230,080,000 gallons on an annual basis. In addition, there is a proposed decrease of approximately 3.8 mgd from the Water Table Aquifer on

an annual average basis. Combined, the overall reductions in permitted groundwater quantities total approximately 9.9 mgd. The retirement of permitted quantities of this magnitude represents a highly significant benefit to the water resources of the DR/GR.

2 NUTRIENT LOADING

2.1 PRE-DEVELOPMENT CONDITIONS

Existing land uses within the property include citrus groves, row crops, irrigation canals and ditches, pastures, native uplands and wetlands. Of the property's 6,676 acres, approximately 4,805 acres are dedicated to citrus grove and the network of canals and ditches that support the agricultural operation. The heavily ditched and drained property has isolated wetlands and uplands scattered between the cultivated fields. The property has virtually no surface water bodies besides the canals and ditches. The current land use breakdown of the property is provided in **Table 1**

Table 1. Existing Land Use Breakdown

Existing Land Use	Area (Acres)
Wetlands	1,204.0
Uplands	136.0
Citrus	4,803.0
Road	7.0
Berm	158.0
Ditch	275.0
Open Space	93.0
Totals	6,676

Proposed conditions for the property include single-family residential development, a few amenity parcels and mixed commercial-residential development. Also proposed are restoration/conservation areas totaling approximately 3,280 acres. To support the proposed development parcels, surface water management lakes and dry detention areas will be incorporated throughout the developed areas of the property to provide the water quality treatment and runoff attenuation. The restoration/conservation areas will enhance the existing wetlands and native uplands and convert existing agricultural land to wetland and native upland areas, which will also contribute to improved treatment of surface water. Based on the proposed Development Plan, a preliminary land use summary for the proposed conditions is provided in **Table 2**.

Table 2. Proposed Land Use Breakdown

Proposed Land Use	Area (Acres)
Wetlands	2,464.0
Uplands	812.0
Multi-Family Residential	30.0
Residential	2,197
Commercial	79.0
Amenity (school/commercial)	254.0

Open Space	159.0
Lake	681.0
Totals	6,676

Excess rainfall on a property becomes stormwater runoff, which travels across the ground to low lying areas within the property or to an adjacent property. As the runoff flows over the land to a lake, natural depression, ditch, etc., it will accumulate certain pollutants based on the land cover and use of the property. Two of the main pollutants of concern that accumulate in runoff are nitrogen and phosphorus. These two pollutants are important nutrients for the growth of algae and other biological sources that are detrimental to water quality.

Nitrogen and phosphorus come in several forms, some of which dissolve in the runoff and some of which remain suspended. The typical measurement for nitrogen and phosphorus combines the dissolved and suspended forms into Total Nitrogen (TN) and Total Phosphorus (TP).

Nutrient loading rates for stormwater runoff from specific land uses within the state of Florida have been developed based on numerous research studies. The Harper (2007) report compiled the reported values and has since been used as the accepted reference source by FDEP for nutrient loading rates. The nutrient loading rates applicable to the property are shown in **Table 3**.

Table 3. Nutrient Loading Rates per Land Use

Land Use	Nutrient Loading Rate (mg/L)	
	TN	TP
Wetlands	1.154	0.018
Uplands	1.694	0.162
Citrus	2.240	0.183
Road	1.520	0.200
Berm	1.694	0.162
Ditch	1.694	0.162
Open Space	2.025	0.184
Lake	-	-
Multi-Family Residential	2.320	0.520
Residential	2.070	0.327
Commercial	2.400	0.345
Amenity (school/commercial)	1.130	0.188

2.2 WET DETENTION EFFECT ON NUTRIENT LOADING

Nitrogen and phosphorus concentrations within a water body, such as a water management pond, decrease due to several means. Nutrients are absorbed and degraded by algae, bacteria, vegetation and by other chemical processes given time within an adequately sized pond. Wet detention systems can provide removal efficiencies upwards of 60% for nitrogen and phosphorus.

2.3 ANTICIPATED PRE- VS POST-DEVELOPMENT NUTRIENT LOADING COMPARISON

The reduction of the nutrient load from the property to offsite waters can be expected due to the developed condition of the property when compared to existing conditions. Converting the current agricultural land uses of the property to residential and commercial, while providing adequate wet, dry detention, and retention water management facilities, will result in a lower nutrient runoff concentration and will provide greater detention time of the runoff before leaving the property. The dedicated 3,280 acres of conservation area will further provide a reduction in nutrient loading to the receiving lands. Based on an analysis of the pre-development and post-development nutrient loading quantities, there is an overall average estimated reduction in Total Nitrogen of 49% and reduction in Total Phosphorus of 80%.

A reduction in the property's nutrient loading is shown per development/restoration phase in the following table:

Table 4. Nutrient Loading Reduction per Phase

Phase	Annual Loading per Phase (kg/yr)				Nutrient Reduction per Phase (%)	
	Existing Conditions		Proposed Conditions		Reduction of Nitrogen (%)	Reduction of Phosphorous (%)
	Nitrogen	Phosphorous	Nitrogen	Phosphorous		
1	1612	164	914	23	43%	86%
2	937.84	96.54	532.09	13.79	43%	86%
3	1104.55	108.9	627.82	17.44	43%	84%
4	554.23	60.74	316.07	11.23	43%	82%
5	201.8	23.38	119.02	6.89	41%	71%
6	136.22	19.46	41.15	5.88	70%	70%
7	448.1	50.78	254.7	8.13	43%	84%
8A	752.35	78.92	427.4	12.25	43%	84%
8B	788.32	82.69	447.39	12.05	43%	85%
9	491.17	53.1	279.17	8.49	43%	84%
10	445.17	47.8	253.28	8.04	43%	83%
11	349.92	43.74	200.95	9.68	43%	78%
12	280.42	30.48	71.73	7.8	74%	74%
16	420.83	59.35	125.33	17.67	70%	70%

3 REGIONAL FLOW PATTERNS

3.1 EXISTING CONDITIONS SURFACE WATER FLOW PATTERN

The Kingston property is located between two regional sub-watersheds, Flint Pen and Corkscrew-West. The Estero River and Imperial River/Spring Creek sub-watersheds are also within close proximity of the property.

The Flint Pen flow way, located west of the property, runs north-to-south starting near SR 82 and conveys surface flow down towards Bonita Springs. The Corkscrew-West flow way, located southeast of the property, flows in a northeast-to-southwest direction, extending from the Corkscrew-East sub-watershed near Lake Trafford and draining into the Corkscrew Canal and Cocohatchee watersheds in north Collier County.

Surface water discharges from the current property's multiple agriculture operations are directed to both the Flint Pen and Corkscrew-West flow ways via control structures, canals and overflow berms.

Based on existing current topography, the ground surface elevations are fairly flat across the northern 1/3rd portion of the property. As the property approaches Corkscrew Road and south, there is a mild slope in elevation of the property towards the south and southwest. Existing ground elevations within the northern portion of the property are approximately 28.0-29.0 FT NAVD and ground elevations at the most southern portion are approximately 22.0-23.0 FT NAVD, with the lowest being at the southwest corner.

3.2 HISTORIC CONDITIONS SURFACE WATER FLOW PATTERN

Prior to the draining, cultivating and berming of the property and adjacent properties in the 1960s and beyond for agriculture operations, a flow way system comprised of wetlands and vegetative areas conveyed surface water through the property from the northeast towards the southwest to the Estero River and Imperial River sub-watersheds. The implementation of agriculture activities has disrupted the historic flow way system connectivity along with impacting ground water levels, as described in previous sections of this report. The historic flow way connection is shown in **Figure 1**. The historic flow ways depicted in **Figure 1** are based upon an evaluation of NRCS hydric and transitional soils along with 1953 aerial photography.

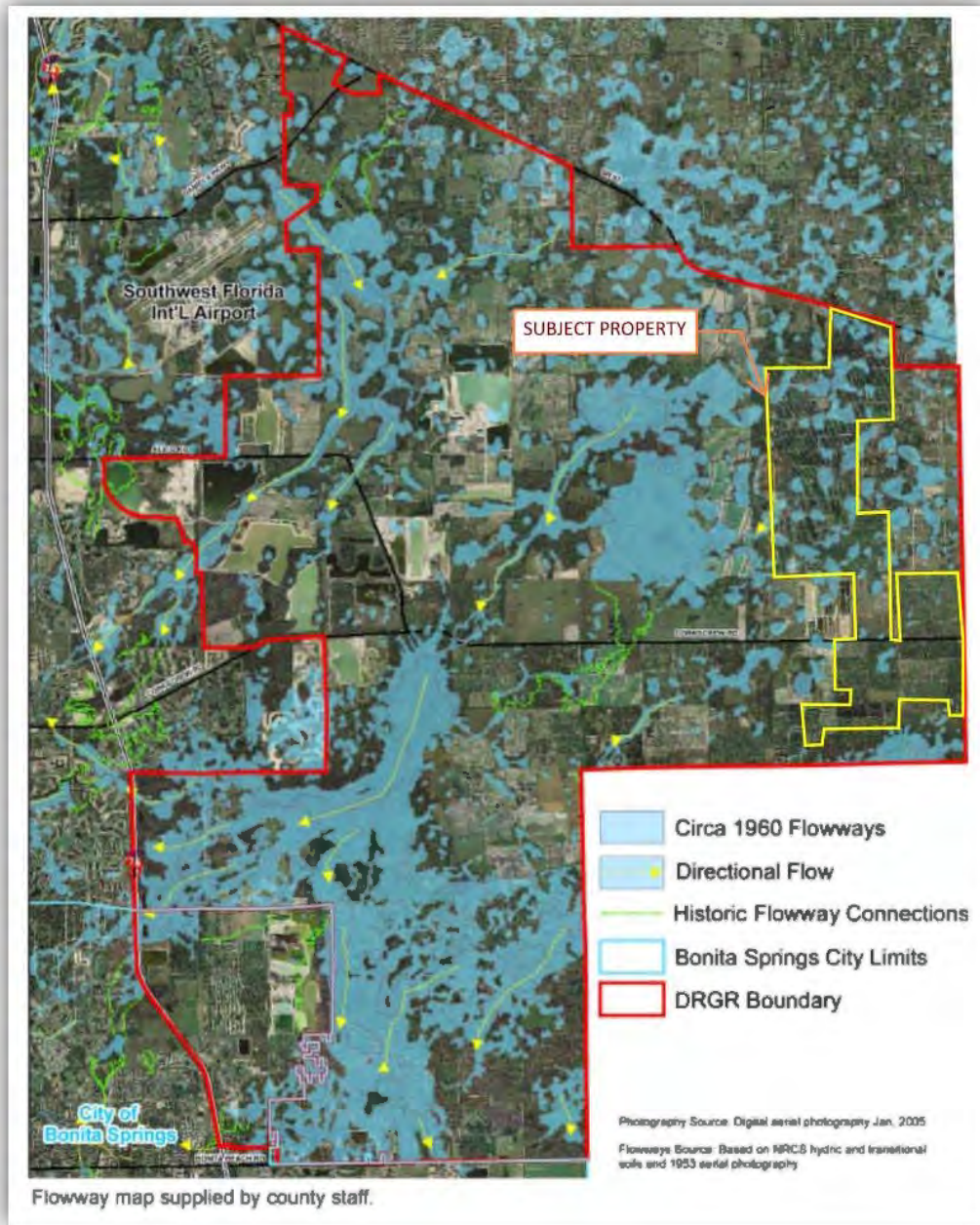


Figure 1. Historic Flow Way Map (excerpt from the 2008 DR/GR Dover-Kohl Report)

3.3 PROPOSED CONDITIONS SURFACE WATER FLOW PATTERN AND HYDROLOGIC RESTORATION

Developing the property provides the opportunity to re-establish the historic flow way connections that existed prior to the agricultural driven changes.

The concept plan for the Kingston Property was designed to follow the general intent of the plan amendment/zoning approvals for properties in the Density Reduction Groundwater Resource (DR/GR) areas along State Road 82 combined with the intent of the Environmental Enhancement and Preservation Communities Overlay (EEPCO) for properties along Corkscrew Road. Historic flow-ways were analyzed, incorporated into the site plan, and the conservation areas were established to both follow and re-establish historic flow corridors, provide significant wildlife corridors, and join adjacent preserve areas surrounding the property. An additional consideration

for the restoration plan includes an approach to addressing the issue with insufficient hydroperiods occurring within the existing wetlands systems of the Audubon lands, located downstream of the property. In a recent hydrologic modeling project for the National Audubon Society's Corkscrew Swamp Sanctuary, dated February 2021 and prepare for the South Florida Water Management District, the results of the study indicate that one of the main factors affecting the wetland hydroperiods is downstream drainage and conveyances. In addition, the study demonstrated that nearby agriculture uses, and increased groundwater usage/pumping also adversely impacted the hydroperiods, due to lack of groundwater recharge and the increased spread of the willow plant. The Kingston Property Hydrological Restoration Plan aims to significantly reduce the groundwater usage with the elimination of the agriculture activities. The flow-way design of the restoration plan will provide surface water storage capacity upstream of the Audubon lands with the intent to further increase groundwater recharge and to properly manage (timing and flow) discharge into the Audubon lands to improve hydroperiods.

The concept of the flow-way system design and conservation areas includes the following components:

- Provide several large contiguous wildlife environmental corridors will be created across the property going both north-south and east-west.
- Strategically placed flow-way system marsh areas and ponds to provide additional surface water storage capacity, enhanced water quality treatment area and wading bird habitat.
- Internal flow-way weirs or culverts to control the flow of surface water between flow-way basins and to offsite properties. This promotes surface water storage, enhanced water quality and control of flow to properties located downstream, specifically environmentally sensitive lands.
- Restoring surface water flow patterns towards the west and south, to restore hydraulic connectivity between on and off-site wetland systems.
- Opportunities for the flow-way system to receive flows from the north (SR 82 and adjacent lands) and east (Wildcat Farms) to aid in alleviating flooding risks. This includes:
 - Removal of berms along east side of property to provide opportunities for Wildcat Farms to experience positive drainage.
 - Potential hydraulic connection in northeast corner of property to existing canal.
- Culverts under Corkscrew Road in two (2) locations.
- Modified/Updated Outfall structures in two (2) to three (3) locations.
- Within the flow-way areas of the property, storage capacity will also be included in the design and will help manage flows discharging south into the conservation lands owned by the Audubon Society and South Florida Water Management District (SFWMD) in Collier County.
- Significant improvements to the water quality and management of surface water discharging from the property to enhance the hydroperiods and overall health of the downstream wetland systems.

The proposed development portion of the property will include a controlled surface water management system to provide sufficient water quality treatment and attenuation for the proposed residential and commercial uses. The development surface water management system will consist of wet detention ponds, dry detention areas and potentially retention areas. Excess rainfall will be directed to the detention areas, allowing for the treatment of nutrients within the development boundary and/or flow-way easement area, prior to discharging to the restored wetland areas. The proposed phased Preserve and Restoration plan for the Kingston Property project is consistent with the Lee Plan goal of restoring historic flow patterns and enhancing the quality of surface water getting into the adjacent Flint Pen flow way and other environmentally sensitive areas.

4 ADDITIONAL EVALUATIONS AND REPORTING

Prior to or concurrent with the first Development Order application, the Kingston Property project will require additional submittals for approval of a Surface & Groundwater Monitoring Plan, Enhanced Lake Management Plan, and Hydrological Restoration Plan.

The Surface & Groundwater Monitoring Plan will be incorporated into the Enhanced Lake Management Plan and will be initiated to establish baseline water quality and water level conditions for the Kingston Property project site and to quantify potential adverse impacts as a result of the proposed mixed-use development. Components of the Surface & Groundwater Monitoring plan will include the following:

- Establishment of baseline groundwater levels.
- Water quality analysis of stormwater entering and leaving the site twice during the wet season and once during the dry season.
- Annual submittals of the results of the water quality monitoring to Lee County Department of Natural Resources (LCDNR) in Electronic Data Deliverable (EDD) approved format.
- Annual Water Quality Monitoring Plan updates to assess water quality trends, potential issues, and if necessary, recommendations for corrective actions or changes to the monitoring plan.

The Hydrological Restoration Plan and Flow Way Re-establishment will be based, in part, on an integrated surface and groundwater model to demonstrate protection of Lee County's natural resources and restore historic flow-ways and improve drainage patterns to the extent possible. Components of the Hydrological Restoration Plan will include the following:

- Detailed calculations/analyses for proposed flow-ways and other drainage improvements to demonstrate hydrologic benefits while ensuring no adverse impacts
- Analyses of post-development phases including peak stages, flows, and inundation (durations and frequency) for design storms (25 yr. – 3 day and 100 yr. – 3 day) and compare hydrologic conditions for wet and dry seasons.
- During the development of the final restoration model and plan, the National Audubon Society will be consulted to confirm that the plan provides discharge patterns that are conducive to re-establishing flows that mimic natural patterns and timing.