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October 10, 2014

Justin B. Green
Robert F. Bull
Siting Coordination Office
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 5500
Tallahassee, FL 32399

Re: Duke Energy Florida Citrus County Combined Cycle Project Completeness Responses,
DOAH Case No. 14-3632EPP, OGC Case No. 14-0431

Dear Mr. Green,

Pursuant to Section 403.5066(2), Florida Statutes, Duke Energy Florida (DEF) hereby submits information responsive to the Florida Department of Environmental Protection's First Determination of Incompleteness issued September 10, 2014.

Copies of these responses are being distributed to the other reviewing agencies as indicated on the attached list. Additional copies are available upon request.

We look forward to continuing to work with you, the Department and other agencies participating in the site certification process. Should you, your staff, or any other agency representatives have any questions regarding this submittal please do not hesitate to contact me at 727-820-5657 (or at Amy.Dierolf@duke-energy.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Amy C. Dierolf", written in a cursive style.

Amy C. Dierolf
Lead Environmental Specialist

**DISTRIBUTION LIST FOR
DUKE ENERGY FLORIDA, INC.
CITRUS COMBINED CYCLE PROJECT**

COMPLETENESS RESPONSES—October 10, 2014

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Duke Energy Florida, Inc. Citrus Combined Cycle Project Completeness Responses



Prepared by:

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October 2014

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Citrus Combined Cycle Project Completeness Responses

I. DEP Southwest District Comments

A. Potable Water

Potable water for drinking, safety showers, emergency eyewash stations, and sanitary uses will be treated in a new potable water treatment facility on the Project Site.

- 1. Any new or modified component of the potable water supply system shall be designed and operated in conformance with applicable Chapters of 62-550, 62-555, 62-560, and 62-699 F.A.C. Information as required in 62-555, F.A.C., shall be submitted to the Department prior to construction and operation of any new or modified components of the system. The operator of the potable water supply system shall be certified in accordance with Chapter 62-699, F.A.C. Please submit a preliminary design report or drawings, specifications and design data in accordance with Rule 62-555.520(4)(a) and (b), F.A.C., for the proposed potable water system.*

Response:

The potable water treatment system will be designed, constructed, and operated in accordance with all applicable nonprocedural requirements. To serve the population of the facility, it is expected that the system will be classified as a nontransient, noncommunity (NTNC) potable water supply system that will utilize the same raw groundwater source that currently supplies Crystal River Units 1, 2, and 3 (PWS ID 6090601).

As discussed with the Florida Department of Environmental Protection (FDEP) Southwest District (SWD) (Cindy Zhang-Torres, P.E.), the design of the potable water system will be completed during the detailed design phase of the Project, and provision of such detail is most appropriately addressed in postcertification submittals. Duke Energy Florida (DEF) will, therefore, agree to a condition of certification requiring the postcertification submittal of the design detail in accordance with

Rule 62-555.520(4)(a) and (b), Florida Administrative Code (F.A.C.) for FDEP review and approval prior to installation and operation of the potable water system.

In accordance with FDEP's first determination of incompleteness suggesting that DEF propose conditions of certification where appropriate, DEF proposes the following conditions of certification related to the potable water system:

1. The potable water supply system shall be designed and operated in conformance with the applicable requirements of Chapters 62-550, 62-555, 62-560, and 62-699, F.A.C. Information as required in Chapters 62-550, 62-555, 62-560, and 62-699, F.A.C., shall be submitted to FDEP prior to installation and operation of any potable water system. The operation of the potable water supply system shall be certified in accordance with Chapters 62-602 and 62-699, F.A.C. All monitoring reports shall be submitted to FDEP SWD, Potable Water Section, and the Siting Coordination Office (SCO).
2. The list of requirements for a preliminary design report can be found in Rule 62-555.520(4), F.A.C. A preliminary design report or specifications, details, and design drawings are required for approval of a potable water system and shall be submitted to FDEP SWD, Potable Water Section, and the SCO prior to installation and use of the potable water system components.
3. This system will be an NTNC potable water supply system. Pursuant to Section 62-555.525, F.A.C., a demonstration of financial, managerial, and technical capacity (capacity development) form must be completed and submitted to FDEP SWD, Potable Water Section, and the SCO prior to installation and use of the potable water system components.

B. Domestic Wastewater

Sanitary wastewater will be disposed in a new septic tank and tile drainfield system or package Plant on the Site. The septic system or package treatment plant with land application will be located, designed, and constructed in accordance with all applicable nonprocedural requirements.

- 1. Any new or modified component of the domestic wastewater system shall be designed and operated in conformance with applicable Chapters of 62-600, 62-602, 62-604, 62-610, 62-620, 62-640 and 62-699 F.A.C. Information as required in 62-600, F.A.C, shall be submitted to the Department prior to operation of any new or modified components of the system. The operator of the domestic wastewater system shall be certified in accordance with Chapter 62-699, F.A.C. Please note that septic tanks are under the jurisdiction of the Department of Health while package treatment plants will be under the jurisdiction of the DEP. If a package treatment plant with land application will be used for domestic wastewater treatment and disposal, please provide the following information: treatment facility description, design capacity, disinfection level provided, estimated influent and effluent quality, type of land application system (slow rate or rapid rate), land application site design capacity and hydraulic loading rate, treatment facility and land application site setback distances, biosolids treatment and disposal method, process flow diagram, and site plan.*

Response:

Domestic wastewater will be disposed of via an on-Site package treatment plant with a land application system. Based on discussions with reviewing agencies in which a preference for an on-Site package plant was expressed, DEF is no longer proposing a septic tank system. The package domestic wastewater treatment plant and associated land application system will be designed, constructed, operated, and maintained in accordance with all applicable nonprocedural requirements. The system is anticipated to be a Type III, extended aeration domestic wastewater treatment plant consisting of flow equalization, aeration, clarification, chlorine contact chamber, and digester. Land application is expected to be accomplished via a two-cell rapid infiltration basin (RIB) system located on-Site.

The design of the domestic wastewater system will be completed during the detailed design phase of the Project and is most appropriately addressed in postcertification submittals. As discussed with FDEP (Mauryn McDonald, P.E.), DEF will agree to a condition of certification requiring the postcertification submittal of the design detail in accordance with applicable nonprocedural requirements.

In accordance with FDEP's first determination of incompleteness suggesting that DEF propose conditions of certification where appropriate, DEF proposes the following conditions of certification related to the domestic wastewater system:

1. The domestic wastewater treatment and disposal facilities shall be designed and operated in accordance with any applicable provisions of Chapters 62-600, 62-602, 62-604, 62-610, 62-620, 62-640, and 62-699, F.A.C. At least 180 days prior to commencing installation of the domestic wastewater treatment and disposal facilities, the Licensee shall submit final plans for the domestic wastewater facilities to FDEP SWD, Domestic Wastewater Section, and the SCO for review and approval. The submittal shall include calculations, drawings, reports, completed permit application forms, and a preliminary engineering report with information for the domestic wastewater treatment and disposal facilities. All documents must be signed and sealed by a professional engineer registered in the State of Florida.
2. The Licensee shall give FDEP written notice at least 60 days before inactivation or abandonment of a wastewater facility and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment.

C. Industrial Wastewater

Wastewater from containment areas, floor drains, and equipment drains throughout the plant facilities will be collected, treated through oil/water separators, and disposed in a new on-site industrial wastewater (IWW) percolation pond system. Other low-volume wastewaters will also be disposed in the percolation pond system. The percolation pond system will be designed in accordance with all applicable nonprocedural requirements for industrial wastewater percolation ponds.

1. *Please submit a waste stream characterization for the new source wastewater that will be discharged to the new percolation pond system, including parameters of concern and anticipated concentrations of these parameters. Once the plant is built, a full waste stream characterization with sampling results of wastewater for all primary and secondary drinking water parameters will be required.*

Response:

Attachment A provides a waste stream characterization for low-volume wastewater based on sampling conducted at DEF's Bartow Combined Cycle (CC) facility in 2012.

The Citrus Combined Cycle (CCC) Project low-volume waste streams (industrial wastewater), consisting of reverse osmosis (R.O.) reject, filter backwash, boiler blowdown, miscellaneous floor and equipment drains, etc., are expected to be similar in composition to that of the Bartow CC facility. The main difference between the two is that the proposed CCC Project will be utilizing groundwater as the raw water source to the water treatment system, whereas the Bartow CC facility relies on the city of St. Petersburg's potable water system as a raw water source. Any differences in the CCC effluent are anticipated to be due to the differences in the source water alone. Once the plant is constructed and in operation, a full waste stream characterization will be conducted, and DEF will provide such characterization as a postcertification submittal. DEF will coordinate with FDEP SWD on an appropriate condition of certification.

2. *Please submit the design criteria information for the proposed percolation pond system, including pond capacity, pond soil boring data, mounding analysis, setback distances, and free board.*

Response:

The new industrial wastewater percolation pond system is expected to be a two-cell system sized to allow alternate use of the cells. The final design of the percolation pond system, based on site-specific pond soil boring data, mounding analysis, setback distances, and freeboard, will be completed during the detailed design phase of the Project, and provision of detailed design information is most appropriately addressed in postcertification submittals. DEF will agree to a condition of certification requiring the postcertification submittal of the design detail in accordance with applicable nonprocedural requirements. DEF will coordinate with FDEP SWD on an appropriate condition of certification.

3. *Please submit a proposed Groundwater Monitoring Plan for the new percolation pond system. Please note that prior to installation of any new monitoring wells, proposed monitor well construction details should be submitted to DEP SWD for approval. Upon receipt of an approval and facility completion of installation, the following documents should be submitted for each individual well, under the signature and seal of the Florida licensed Professional Geologist or Engineer responsible for completion or submission:*

SWFWMD Forms

§ State of Florida Permit Application to Construct, Repair, Modify, or Abandon a Well (LEG-R.040.01 (June 2010) 40D-3.101(1), F.A.C.) http://www.swfwmd.state.fl.us/download/view/site_file_sets/24/41.10-410l.pdf § Well Completion Report (LEG-R.005.02 (June 2010) 40D-3.411(1)(a), F.A.C.)

DEP SWD Forms

§ DEP Form # 62-520.900(3)

Response:

The final design of the percolation pond system, based on site-specific pond soil boring data, mounding analysis, setback distances, and freeboard, will be completed during the detailed design phase of the Project, and such detail is most appropriately addressed in postcertification submittals. DEF will agree to a condition of certification requiring the postcertification submittal of the design detail, including a groundwater monitoring plan incorporating the new pond system. This would include proposed new monitoring wells, in accordance with applicable nonprocedural requirements. DEF will coordinate with FDEP SWD on an appropriate condition of certification.

D. Submerged Lands and Environmental Resource Program (ERP)

Stormwater:

1. *Please revise the design of the wet detention ponds (Construction Stormwater Treatment Pond #1 and #2, and Stormwater Detention Pond #3, #4, and #5) to include a littoral zone. [Pursuant to Applicant's Handbook, Volume II, Section 4.l.a.2] FYI, wet detention ponds can be permitted without the use of littoral zones provided that the permanent pool volume is sized 50% larger than the calculation provides. If the applicant desires to not provide a littoral zone, please provide design revisions showing the 50% increased pool volume.*

Response:

Littoral zones were included in the design of the wet detention ponds. Littoral zones cover approximately 35 to 50 percent of the pond area with a 6:1 slope. The preliminary drawings in the site certification application (SCA) and environmental resource permit (ERP) application information showed the outline of the ponds and cross-sections of the discharge structures. Revised drawings showing the littoral zones are included in the revised Conceptual Stormwater Pond Design Basis report provided as Attachment B.

2. *Please justify the use of the Conservation Wet Detention design as found in Appendix B of the Applicant's Handbook. The calculation in Appendix B is done using the assumption that the wet pond is designed with the littoral shelf. [Pursuant to Applicant's Handbook, Volume II, Appendix B, Page A-2]*

Response:

The calculation is based on Appendix B page A-2 of the Applicant's Handbook, Volume II, and the commercial example. The average depths of the permanent wet detention ponds are 2 feet (ft), because the minimum pond must be set at elevation 3.6 ft to stay above the groundwater elevation. The littoral zone areas will be located on both the runoff detention zone and part of the permanent pool.

3. *The design of the dry detention ponds (Stormwater Detention Pond #1 and #2) should be revised so as to not include a bleed down orifice. Dry detention ponds obtain treatment through infiltration of the treatment volume via underdrain or infiltration. [Pursuant to Applicant's Handbook, Volume II, Section 4.1.b or c]*

Response:

The dry detention ponds have been revised to include infiltration, and the typical infiltration pond section has been added in the revised Conceptual Stormwater Design Basis report drawings, which are provided in Attachment B. The bottom of the infiltration area will be reduced by increasing the water depth. The control elevation has been kept the same, so the overall pond area will not change.

4. *The control structures on all ponds shall be designed with a baffle system to encourage discharge from the center of the water column rather than the top or bottom. [Pursuant to Applicant's Handbook, Volume II, Section 5.1.e]*

Response:

The discharge structure has been modified to have a baffle at the top, and the weirs will not allow flow from the bottom of the ponds, since the control elevation is above the treatment volume. Drawings including the skimmer and baffle systems are provided in the revised attached Conceptual Stormwater Design Basis report, which is provided in Attachment B.

5. *Drawdown calculations for wet ponds need to be included that comply with the requirements as set forth by the regulations. Wet detention system's treatment volume shall be discharged in no less than 120 hours with no more than one-half the total volume being discharged within the first 60 hours. [Pursuant to Applicant's Handbook, Volume II, Section 4.1.a.4]*

Response:

The wet ponds were designed based on the requirements in 5.2a. of the Applicant's Handbook, Volume II, and the v-notch in each pond has been resized. Since the total pond volume design is based on peak inflow and outflow, the pond size does not change. The weir discharge elevation has been revised, since the head on the v-notch has been reset to control the discharge to keep the minimum angle of the v-notch not less than 20 degrees. Attachment B provides the revised Conceptual Stormwater Pond Design Basis report.

6. *Drawdown calculations for dry ponds need to be included that comply with the requirements as set forth by the regulations. For a dry pond with an effluent filtration system, the total detention volume shall again be available within 36 hours. For an online treatment system, total treatment volume shall again be available within 72 hours, however, only that volume which can again be available within 36 hours may be counted as part of the volume required for water quantity storage. [Pursuant to Applicant's Handbook, Volume II, Section 4.1.b.4 or 4.1.c.2]*

Response:

The dry pond discharge and calculations have been revised with the soil infiltration rate of 0.375 inch per hour (in/hr) for 36 hours of treatment volume. Attachment B provides the revised Conceptual Stormwater Pond Design Basis report.

Wetlands:

1. *The application proposes the construction of the combined cycle plant with associated cooling towers, stormwater ponds, switch yards, transmission lines, access roads, parking areas, pipelines, discharge structures, etc. Additionally, the application states that the existing ground elevations will be raised approximately 8-9 feet for the construction of Units 1 and 2 and that a paving and grading plan will be provided in the future. Conceptual aerial figures and some typical cross-section drawings were provided for some of the above mentioned structures. Please provide detailed planview and cross-section construction drawings which include elevations for all new proposed structures. If agreed, the applicant may also provide this detailed information as part of a postcertification submittal. [pursuant to Applicant's Handbook, Volume I, Sections 10.1.1, 10.2.1, and 10.2.2.4]*

Response:

As discussed in Section 5.1.1 of the SCA, approximately 193 acres of the 400-acre Site will be impacted by construction activities. This includes grubbing and clearing of vegetation from the areas to be used for construction. The cleared areas will then be graded and stabilized. The plant facilities area will be raised approximately 8 to 9± ft. The switchyard area will be raised approximately 2 to 3± ft. Additional details regarding paving and grading will be developed as detailed Project design progresses. DEF anticipates having this information available before the end of 2014. While it is DEF's intent to provide FDEP with this information prior to issuance of the final order of certification, if it is not provided prior to certification, DEF would accept a condition of certification requiring submittal of such information prior to construction.

2. *The application proposes to provide mitigation to offset unavoidable wetland impacts through the purchase of credits from the Upper Coastal and Old Florida Mitigation Banks. Proof of available type and number of credits will be required prior to authorization of impacts. [Pursuant to Applicant's Handbook Volume I, Sections 10.3 and 10.3.1.3]*

Response:

DEF proposes to purchase credits from the Upper Coastal or Old Florida Mitigation Bank to offset unavoidable wetland impacts. DEF has communicated with representatives of the mitigation banks, and the banks anticipate having sufficient mitigation credits of the appropriate type available prior to Project certification. Letters of reservation from the mitigation bank will be provided once the final number of credits needed has been determined.

3. *Figures 5 and 6 of Appendix 10.4 reference FLUCCS Code 630 as Hardwood Conifer Mixed. This appears to be a typographical error and would more accurately read Wetland Mixed Forested.*

Response:

The referenced Florida Land Use, Cover, and Forms Classification System (FLUCFCS) code for 630 in the figure legends has been corrected to Wetland Mixed Forested. Attachment C provides the revised Figures 5 and 6.

4. *On Table 1 of Appendix 10.4, Wetland #6 appears to have been scored with a temporary construction wetland impact and a permanent conversion to non-forested wetland impact. However, the Permanent Functional Loss was not included with the Total Functional Loss. Please clarify.*

Response:

Wetland #6 is a shrub wetland surrounded by forested uplands. The initial rationale for the scores was that permanent conversion of a portion of that wetland to an herbaceous system would create a different habitat type for wildlife use, which is not abundant in the vicinity, and therefore would be an overall benefit to wildlife and wetland function. However, after further discussions with FDEP SWD (Mark Langford), it was agreed to drop the Community Support score by two points and leave the Location and Landscape Support score as is. The revised Table 1 in Attachment D

provides the corrected Permanent Functional Loss included in the Total Functional Loss for Wetland #6.

5. *On Table 1 of Appendix 10.4, permanent conversion of some forested systems to herbaceous systems were scored with a drop of 1-3 points from the vegetated community. While this is typical, depending on the system, it may be appropriate to also consider a drop in score for Location and Landscape Support due to the loss of structure and change in habitat type and FLUCCS Code. Please clarify the scoring in these areas of permanent conversion from forested systems to herbaceous. [Pursuant to Chapter 62-345, F.A.C., and the Applicant's Handbook Volume I Sections 10.2.2 and 10.2.7]*

Response:

The scoring of each wetland is assessed on an individual basis with respect to its functional value, the overall location in the landscape, and its relationship with other wetlands and uplands in the immediate vicinity. Based on FDEP's completeness comment and subsequent discussions with Mark Langford, the Location and Landscape Support scores for the wetlands located on the proposed Site, with the exception of Wetland #6 as previously addressed in wetland Comment 4, were lowered by two points. The Location and Landscape Support scores for the wetlands located in the existing transmission line corridor remained unchanged, because these wetlands were altered and fragmented by past construction activities associated with the transmission line.

The revised Table 1 in Attachment D provides the corrected Location and Landscape Support scores for Permanent Functional Loss for Wetlands #16, #17, and #27.

II. Southwest Florida Water Management District (District)

1. *The proposed project will combine all water uses at the existing Crystal River power facilities and for the proposed combined cycle project into one site certification. Documents submitted with the Site Certification Application do not provide support for maintaining the requested groundwater quantities which are currently authorized under existing Water Use Permits (WUP) No. 20004695.004 issued for Crystal River Units 1,2 and 3, and the existing site certification issued for Crystal River Units 4 and 5. Specifically, the information provided in the application demonstrates that significant reductions in demand from groundwater have occurred and are projected to occur in the near future and which are not addressed in the current authorizations. One of the criteria set forth in Rule 40D-2.301, F.A.C., Conditions of Issuance of Water Use Permits, requires that an Applicant must demonstrate that the water use is necessary to supply a certain reasonable need or demand; and only the portion of demand that is supported by adequate documentation will be permitted. Permittees who have not utilized the full previous allocation because circumstances prevented full implementation of the plan on which the allocation will occur with the next permit term. To support any future needs, this demonstration must include substantive documentation of the proposed need, such as material orders, construction plans, or an operations or business analysis or plan that otherwise specifically justifies the requested facilities. To address this matter, please provide a business plan that demonstrates that the full allocation of the requested groundwater quantity will occur in the foreseeable future. If it is agreed that the full requested groundwater quantities are not necessary for the business plan under consideration, please provide a time line of anticipated changes in annual average and peak month water use resulting from the operational changes detailed in the current application. The timeline should include groundwater use changes resulting from: retirement of Unit 3; interconnection with the reclaimed water from the City of Crystal River (current and up to future capacity); start-up of the proposed CCC Project; retirement of Units 1 and 2; and any other potential new demands or water conservation expected from changes in industrial processes or operational practices at the facility. Note that groundwater quantities may still be permitted for standby use in the event of reclaimed water supply interruption and such quantities can be identified and factored into the demand projections. [Rule 40D-2.301, F.A.C.]*

Response:

As stated in Section 4.5 of the SCA, DEF is seeking to consolidate all groundwater usage at the Crystal River Energy Complex (CREC), including the groundwater usage for the CCC Project, in the site certification. At present, a separate water use permit

(No. 2004695.004) for Crystal River Units 1, 2, and 3 authorizes an annual average use of 1.0 million gallons per day (MGD) and a peak month use of 1.5 MGD. In addition, the existing CREC conditions of certification authorize withdrawal of up to 4.309 MGD (on a rolling annual average daily flow basis) for the operational needs of Units 4 and 5. It is anticipated that the CCC Project will need up to approximately 200,000 gallons per day (gpd) of groundwater, primarily for plant process/service purposes. Given the retirement of Crystal River Unit 3 and associated reduction in groundwater use, DEF is not requesting an increase in the total groundwater allocation. DEF is, however, requesting to maintain the total current consolidated allocation of 5.309 MGD.

This consolidated allocation of groundwater is justified by DEF's expected ongoing operations plans for the CREC and CCC facilities and the foreseeable, continuing need for groundwater to support those operations, as discussed in the following paragraphs. Attachment E contains recent consumptive use trends for both Crystal River Units 1, 2, and 3 and Units 4 and 5. This attachment reflects increased water usage over the past 3 months, which is largely due to peak summer electrical demand (which translates to increased water usage) in conjunction with boiler tube leaks at both the Crystal River Units 1, 2, and 3 and Units 4 and 5 facilities, which results in more frequent draining and filling of the boilers to maintain correct boiler water chemistry.

DEF acknowledges that certain activities at CREC could result in a reduction of the groundwater demand facility-wide. These activities include: (1) implementation of a project to use all reclaimed water available from the city of Crystal River to offset some groundwater use for Crystal River Units 4 and 5, (2) the retirement of Crystal River Unit 3, and (3) the future retirement of Crystal River Units 1 and 2 in coordination with the commencement of operation of the CCC Project, following certification. However, as stated in Section 4.5 of the SCA and explained more fully in the following paragraphs, there are also future uncertainties regarding water demand related to new air emissions regulations (i.e., greenhouse gas regulation) for Crystal River Units 4 and 5, the long-term decommissioning of Crystal River Unit 3, the demolition of Crystal River Units 1 and 2, and the total volume of reclaimed water that will be available from Crystal River such that the 5.309 MGD currently authorized is still necessary to supply a reasonable need or demand on a facility-wide basis.

As discussed with the Southwest Florida Water Management District (SWFWMD) on September 12, 2014, DEF is committed to working with SWFWMD to develop a condition of certification to be applicable facility-wide that requires DEF to submit, as a postcertification submittal, an annual water use summary report that confirms the continued water use allocation of 5.309 MGD and, if appropriate, identifies a reduction in allocation based on any reduction in demand and/or identifies allocated quantities to be authorized for standby purposes.

The following paragraphs describe future issues impacting water use at CREC.

GREENHOUSE GAS REGULATION

On June 2, 2014, the U.S. Environmental Protection Agency (EPA) issued its proposed rule for regulating carbon dioxide (CO₂) emissions from existing fossil fuel fired power plants under Section 111(d) of the Clean Air Act (CAA). With this proposal, EPA aims to achieve significant reductions in CO₂ emissions from fossil fuel-fired electric generating units. DEF, along with other utilities, is in the process of reviewing the proposal. Comments on the proposed rule are due December 1, 2014. Given that the rule is not final, it is too soon to tell what impact EPA's proposal will have on DEF's operations at CREC. EPA has proposed state-wide average emissions rate targets that would take effect in 2020 for the first phase and 2030 for the second phase. States are given flexibility in developing and implementing plans to achieve compliance, and the approach each state takes for implementation will have a significant impact on the measures individual utilities take to comply. CO₂ emissions control technology is water-intensive. Increased water use is necessary to support the increased electricity needed to power the carbon capture and injection systems and cool carbon capture equipment^{1, 2}. Given the uncertainty at this time as to what requirements may apply, DEF cannot predict the future water use that might be needed for CO₂ control.

¹ Newark, R.L., S.J. Friedman, and S.A. Carroll. 2010. Water Challenges for Geologic Carbon Capture and Sequestration. *Journal of Environmental Management*. Volume 45, Issue 4, pp. 651-661. DOI 10.1007/s00267-010-9434-1. <<http://link.springer.com/article/10.1007%2Fs00267-010-9434-1>>

² Energy & Environmental Research Center (EERC). 2010. Northern Great Plains Water Consortium, Water Use Fact Sheet. EERC BK36026.INDD. University of North Dakota Grand Forks. Sponsored in part by the U.S. Department of Energy (DOE) and National Energy Technology Laboratory (NETL). <<http://www.undeerc.org/Water/pdf/Explore-Water-Issues-Related-to-CCS.pdf>>

CRYSTAL RIVER UNIT 3 DECOMMISSIONING

Decommissioning a nuclear plant is a well-defined, lengthy, and proven process that involves many administrative, licensing, and technical processes, as well as a high level of oversight from the Nuclear Regulatory Commission (NRC). DEF has selected the SAFSTOR (SAFe STORage) decommissioning option for Crystal River Unit 3. This involves placing the facility into a safe storage configuration, requiring limited staffing to monitor plant conditions, until the eventual dismantling and decontamination activities occur. During this storage phase, the need for groundwater will be limited, but during the decontamination and dismantlement phases, water use will rise for such activities including flushing piping, hydrolazing, dust abatement, and hydro-demolition. It is likely that a decommissioning contractor would opt to use water for a hydro-demolition technique to completely pulverize the concrete structures, to keep dust to a minimum, and for ease of handling the aggregate for removal and recycling.

CRYSTAL RIVER UNITS 1 AND 2 RETIREMENT AND DEMOLITION

Crystal River Units 1 and 2 will cease commercial power operation in conjunction with commercial operation of the new CCC facility. There will be some period of overlap of Crystal River Units 1 and 2 and the new CCC Units. At this time, final detailed plans for the ultimate retirement and demolition of Crystal River Units 1 and 2 are in development but not finalized. In addition, demolition of Crystal River Units 1 and 2 will require water use. Thus, while it is anticipated that groundwater use for Crystal River Units 1 and 2 will be reduced in the future, the exact timing of that reduction is not yet certain.

Finally, although the existing Crystal River Units 1, 2, and 3 are retired or will be retired following commercial operation of the new CCC Project, water use will still be needed for potable use and fire protection for these facilities.

RECLAIMED WATER FROM CRYSTAL RIVER

It is anticipated that DEF will receive approximately 750,000 gpd of reclaimed water from the city of Crystal River in 2015. However, until such time as the project is completed and DEF has been in receipt of the water for some period of time, any reduction in groundwater demand associated with the receipt of the reclaimed water remains uncertain.

2. *SWFWMD understands that the current Site Certification application under review seeks to consolidate the groundwater authorized under the existing WUP No. 20004695.004 with the Site Certification for the existing Crystal River Units 4 and 5, and to have all water use authorized pursuant to the proposed new Citrus County site certification. Please confirm that it is the request of Duke Energy to cancel WUP 20004695.004 as part of this site certification application.*

Response:

DEF seeks to consolidate all groundwater withdrawals associated with Crystal River Units 1, 2, 3, 4, and 5, and the CCC Units 1 and 2 in the conditions of certification for CREC. Therefore, once the certification of the CCC Project is final and no longer subject to appeal and the conditions of certification have been updated to reflect the consolidated CREC groundwater allocation (i.e., the separate water use allocation authorized under existing Water Use Permit No. 20004695.004 is no longer needed), DEF will request that the separate water use permit be cancelled.

In accordance with FDEP's first determination of incompleteness suggesting that DEF propose conditions of certification where appropriate, DEF proposes the following condition of certification related to the cancellation of Water Use Permit No. 2004695.004:

1. All groundwater withdrawals associated with Crystal River Units 1, 2, 3, 4, and 5 and CCC Units 1 and 2 are intended to be consolidated and authorized under these conditions of certification rather than via separate water use permit(s). Therefore, within 30 days after the expiration of the time for filing an appeal of the final order of certification for the CCC Project, which includes this condition of certification consolidating the facility water use or, if appealed, within 30 days after the final resolution of all appeals, DEF shall submit a notice of abandonment of Water Use Permit No. 2004695.004 issued by the Southwest Florida Water Management District (SWFWMD), and such permit shall be administratively cancelled by SWFWMD pursuant to Rule 40D-2.341(3), F.A.C.

III. Florida Fish and Wildlife Conservation Commission

1. *Anticipated effects of discharge water: We note that the temperatures provided in Table 4.5.1-1 are based on average seasonal water temperatures observed in the intake water for the months of March through November. To fully understand the potential effects of the thermal discharge from the proposed CCC facility on aquatic resources, we request that the applicant provide a similar projection of effluent temperatures for intake water from the months of December through February. The winter months are the ones during which the water temperatures in this area are most critical to the West Indian manatee (Trichechus manatus, Federally Endangered).*

Response:

The revised Table 4.5.1-1, Projected Effluent Temperatures, provided in Attachment F, has been updated to include the scenario of average seasonal water temperatures for the months of December through February.

Please note that the computations provided in Table 4.5.1-1 present a scenario whereby the water discharge flow and thermal loading from the closed-cycle cooling tower blowdown of the CCC operation are significantly reduced compared to the historic once-through cooling water volume and thermal loading associated with the operations of Crystal River Units 1, 2, and 3.

Limitations on the geographic range of manatees are largely determined by water temperature. Manatees are essentially confined to the waters of Florida during the winter months due to this requirement for warm water. Historically, manatees have relied on natural springs and other passive warmwater sites that maintain water temperatures averaging 22 degrees Celsius (°C). The documented primary and secondary warmwater sites in the northwest region of Florida include three primary sites (Crystal River Springs Complex, Homosassa River Springs Complex, and Weeki Wachee/Mud/Jenkins Creek Springs) and three secondary sites (CREC discharge canal, Manatee/Fanning Springs, and Wakulla/St. Mark's Complex).

The Crystal River Springs Complex is the second largest natural spring system in Florida and is a first magnitude spring. Combined, the Crystal River/Homosassa Springs Complexes winter approximately 10 to 15 percent of the total manatee population in Florida and approximately 20 to 30 percent of the west coast population of manatees.

When the first manatee sanctuary in the Crystal River Springs Complex was designated in 1980, approximately 100 manatees were using the network of springs. Since that time, an average annual increase in manatee usage of the springs has been documented at 9.7 percent. Today more than 550 manatees use the complex. The Crystal River Springs Complex provides water temperatures consistently greater than 20°C, sufficient to maintain manatees over winter. The Crystal River Springs Complex has documented consistent and increasing manatee use and is large enough to be considered a warmwater site of regional significance.

The CREC discharge canal has been historically designated as a secondary artificial thermal refuge for manatees during the winter months. Manatees mostly utilized the thermal refuge of the discharge canal during the “shoulder” months of the spring and fall migration, as manatees move to and from the nearby natural winter thermal refuge provided by the extensive Crystal River Springs Complex. Manatee use of the CREC discharge canal is primarily for temporary thermal benefit and not for consistent thermal refuge over the winter. There is a recognized preference for the manatee population to utilize the natural springs systems in the area rather than the artificial secondary refuge provided by the CREC discharge canal. In fact, in 1999, the Florida Fish and Wildlife Conservation Commission (FWC) recognized that requiring the production of warm water during the winter months is not warranted. Manatee use of the CREC discharge canal has decreased since the retirement of Crystal River Unit 3 in 2009.

With the cessation of condenser cooling water flow from Crystal River Unit 3 beginning September 2009 and the concomitant reduction in discharge flow and thermal loading by more than 50 percent, the number of manatees occupying the CREC discharge canal for thermal refuge has decreased during each subsequent winter period, as these animals seek the warmer and more consistent natural refuges in the Crystal River springs system.

A further reduction in discharge flow and thermal loading will occur with the retirement of Crystal River Units 1 and 2. Prior to the final retirement of those units and the cessation of all once-through condenser cooling water flow at CREC, DEF will develop and implement a manatee monitoring plan in consultation with, and approval from, FWC and the U.S. Fish and Wildlife Service. This plan will address the loss of viable artificial thermal refuge in the discharge canal and potential impacts to manatees still utilizing the canal and will include, at a minimum, the following tasks:

1. Manatee identification cataloging and visual monitoring of animals utilizing the CREC discharge canal at least one winter period prior to Crystal River Unit 1 and 2 retirement and at least two to three winter periods following the units' retirement, depending on observed manatee response.
2. Discharge canal temperature monitoring, including ambient temperature, cooling tower blowdown discharges, and any significant thermal spring seeps present in the discharge canal.
3. Plan communications, contacts, response, and reporting requirements.

DEF will coordinate with FWC on an appropriate condition of certification reflecting the requirement to submit a manatee monitoring plan as a postcertification submittal.

2. *The application indicates that there are no plans to monitor the effluent except for those required under a National Pollution Discharge Elimination System (NPDES) permit. The requirements under Chapter 62-620, Florida Administrative Code, are largely focused on toxicity tests and therefore would not address potential impacts to the aquatic environment, specifically potential impacts to the West Indian manatee, marine turtles, oyster (*Crassostrea* spp.) reefs, bay scallops (*Argopecten irradians*), or other protected or regulated marine and estuarine species that are managed by the FWC. If a monitoring plan that addresses these species is already in place, then we request that the applicant provide it so we can determine if it already addresses the above-mentioned species' distributions within the effluent canal. If no such monitoring plan is in place, then we request that the applicant provide a plan for monitoring the impacts on manatees and sea grass beds (an essential food for manatees), marine turtles, oysters, and bay scallops that occur within the discharge canal. This monitoring plan should begin before construction and end at a mutually agreed-upon time after Units 1 and 2 have been retired.*

Response:

As authorized by the Clean Water Act (CWA), the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. An NPDES permit addresses much more than toxicity testing and includes compliance with Sections 316(a) and 316(b) of the CWA. Monitoring programs are required to characterize waste streams and receiving waters, evaluate wastewater treatment efficiency, and determine compliance with permit conditions, including water quality-based effluent limitations. These effluent limitations are based on Florida's water quality standards for surface waters (Chapter 62-302, F.A.C.), which are established based on potential adverse impacts to sensitive aquatic organisms.

Since heat is listed in the definition of a pollutant in Title 40, Part 122.2, Code of Federal Regulations (CFR), Section 316(a) of the CWA states that states may impose thermal limitations that will assure the protection and propagation of a balanced and indigenous population, based on thermal studies performed by permittees. Florida mandated such detailed studies for the once-through condenser cooling water systems of Crystal River Units 1, 2, and 3 in the 1980s. These studies evaluated thermal discharge impacts on water quality, benthos, macrophytes, salt marshes, and fisheries, as well as intake effects in the form of ichthyoplankton entrainment and adult fisheries impingement.

As a result of these studies, the regulatory agencies determined that, at that time, approximately 3,000 acres of bay bottom were adversely affected by the combined once-through thermal discharges of Crystal River Units 1, 2 and 3. Consequently, the Crystal River Units 1, 2, and 3 NPDES permit reissued on September 1, 1988, included more restrictive thermal and flow limitations and the requirement for the construction and operation of a multispecies marine hatchery. To meet temperature limits, helper cooling towers were installed to limit maximum 3-hour rolling average discharge temperatures to Crystal Bay to 96.5 degrees Fahrenheit (°F).

Per Administrative Order AO-024-TL issued April 7, 2014, along with the reissued NPDES permit, it was acknowledged by FDEP that with the shutdown of Unit 3 in the fall of 2009 and the subsequent announced retirement of that unit, the amount of thermal discharge to Crystal Bay has been reduced by roughly 50 percent, resulting in a level of improvement in discharge conditions that would further assure protection and propagation of a balanced and indigenous population of aquatic plants and animals in and around Crystal Bay. With the final retirement of Crystal River Units 1 and 2, all once-through thermal discharges at CREC will cease. Crystal River Units 4 and 5 will continue to operate using a closed-cycle cooling system, and the new CCC Project combined cycle units will use closed-cycle condenser cooling as required by federal regulation. With the operation of closed-cycle cooling systems, water flow and thermal loading in the CREC discharge canal will be a fraction of the present permitted levels, resulting in a significant decrease in any thermal effects from plant operation. As discussed with FWC on September 16, 2014, there may be a relatively brief period of overlap of the CCC units and Crystal River Units 1 and 2. The discharge volume and thermal loading during any brief period of overlap will still be significantly below that authorized for operation of Crystal River Units 1, 2, and 3.

With respect to sea turtles and other indigenous aquatic species, the reduction in condenser cooling water flow as a result of Units' 1, 2, and 3 retirement and use of closed-cycle cooling technology with remaining operational units will greatly reduce impacts from entrainment and impingement addressed by Section 316(b) of the CWA. The new CCC facility will use the existing Unit 3 intake structure that will be repurposed to comply with the requirements of the recently issued 316(b) rule. Through-screen velocities will be reduced to less than 0.5 foot per second (fps) to comply with impingement mortality reduction requirements, and the units will employ

closed-cycle cooling to comply with the entrainment mortality reduction requirements. At CREC, the National Marine Fisheries Service (NMFS) previously issued a biological opinion with incidental take statement (BO/ITS) for the operation of the Crystal River Units 1, 2, and 3 intake systems. The BO/ITS determined that the continued operation of the cooling water intake systems at CREC would not jeopardize the continued existence of sea turtles. The BO/ITS includes reasonable and prudent measures that have been implemented at the Site to minimize the effects of CREC operations on sea turtle populations. Again, with the retirement of Units 1, 2, and 3, the potential effects to sea turtles considered in the BO/ITS are substantially reduced.

It is widely recognized that a decrease in thermal loading is beneficial to the environment. It is also widely recognized that marine habitat, seagrasses in particular, can be affected by numerous factors beyond thermal loading. FWC acknowledged both of these points in a meeting with DEF on September 16, 2014. DEF maintains that monitoring to demonstrate improvements associated with a documented reduction in discharge effects is not warranted or required, and DEF is not aware of an applicable nonprocedural requirement supporting the request for such monitoring. However, DEF acknowledges the monitoring request by FWC and agrees to work with FWC to develop a reasonable monitoring plan of limited scope and duration pre- and postoperation of the Project to document conditions in the previously thermally-affected areas of Crystal Bay. It should be recognized, however, that given the number of other factors that can impact seagrass health and recovery trends, DEF will not be required to document ongoing favorable trends.

In accordance with FDEP's first determination of incompleteness suggesting that DEF propose conditions of certification where appropriate, DEF proposes the following related to pre- and postoperational monitoring of the CCC Project.

Within 180 days following certification of the CCC Project or such other date as agreed to by DEF and FWC, DEF will submit to FWC and FDEP's SCO a CCC Project discharge monitoring plan (DMP) for review and approval in accordance with Condition XX, Postcertification Submittals. Unless otherwise agreed to by DEF and FWC, the DMP will include the following components:

1. Limited preoperational surveys of seagrass, oyster, and hardbottom resources will be conducted starting 1 year in advance of the CCC Project

beginning commercial operation, and postoperational surveys will be conducted 1 year following the shutdown of Crystal River Units 1 and 2 in conjunction with commercial operation of the CCC Units.

2. Surveys and monitoring will be limited to stations within the historical thermally-affected areas of Crystal Bay. Due to the fact that nearshore coastal areas north and south of Crystal Bay area are strongly influenced by other factors, such as freshwater inputs, a reference station approach may not be valid. Hence a pre- and postoperational comparison is the primary approach proposed for the DMP.
3. Schedules, specific survey and monitoring locations, sampling frequencies and methods, and specific parameters to be surveyed will be included in the DMP.
4. Surveys will include protocols to monitor seagrass, oyster reef, and hardbottom resources. Monitoring of physical and chemical parameters shall include surface and bottom temperature, salinity, dissolved oxygen, and water column transparency data collection. Bay scallops are motile invertebrates with short life spans, and extreme population fluctuations and collapses of local bay scallop populations are a natural occurrence. Direct monitoring of this species to evaluate effects of the CCC Project operation would be ineffective; therefore, scallop monitoring will not be included in the DMP.
5. Preparation of reports, including all data and statistical analyses resulting from the surveys and monitoring, will be included as part of the DMP.

DEF is committed to working with FWC to develop a condition of certification that includes reasonable pre- and postoperational monitoring of limited scope and duration.

3. *From pre-application discussions with the applicant, we understand that there will be a period of overlapping operations during which time the CCC will be evaluated to ensure that it is operating as planned. However, the application does not provide information on how long Units 1 and 2 would continue to operate after the CCC has been constructed and is ready for use. During this transition period, up to six units may be discharging into the discharge canal simultaneously; however, the application materials do not contain information on the quality or quantity of discharge during the transition period. The materials also do not include an assessment of the anticipated effects on the aquatic community during this period. The monitoring plan should account for the additional discharge associated with the transition period and include information on the anticipated effects to the aquatic community during the transition period.*

Response:

DEF anticipates retiring Crystal River Units 1 and 2 in conjunction with the commercial operation of the CCC units. More specifically, current plans are to retire one of the fossil steam units in conjunction with commercial operation of the first CCC Project unit, with the second steam unit being retired in conjunction with commercial operation of the second CCC unit. While precise details are not yet available, there may be a brief period of overlap of operation of the units. It should be noted that the new CCC units will both employ closed-cycle condenser cooling, meaning that current intake and discharge flows, which have already been reduced by approximately 50 percent with the retirement of Crystal River Unit 3, will be further reduced by nearly 50 percent again when the first steam unit (Crystal River Unit 1 or 2) is retired and reduced to less than 10 percent of historic Units 1, 2, and 3 flows after the second steam unit is retired (Crystal River Unit 1 or 2). Use of closed-cycle cooling not only reduces total flow rates but also the thermal loading. The discharge volume and thermal loading during any brief period of overlap will be significantly below that authorized for operation of Crystal River Units 1, 2, and 3. More specifically, the anticipated discharge volume for the CCC Units is approximately 82.3 MGD average, 109.3 MGD maximum. The authorized discharge volume for the retired Crystal River Unit 3 during operation was 979.2 MGD. The current discharge volume for Crystal River Unit 3 is 43.5 MGD permitted, 16 to 18 MGD actual. This amount will reduce to less than 1 MGD after 2015, prior to commercial operation of the CCC Project.

Information as to the anticipated constituents in the discharge from the CCC units is provided in Appendix 10.2.2 of the CCC Project SCA. Given the reduced thermal loading and discharge as compared to operation of Crystal River Unit 3 and the brief

period of overlap with Crystal River Units 1 and 2 operation (anticipated only to be during testing and initial startup of the CCC units prior to full commercial operation of both CCC units), monitoring is not warranted.

IV. CITRUS COUNTY

In addition to the information provided in the following responses , please see the information in Attachment G, which was provided to Citrus County on August 26, 2014, in response to an inquiry from Citrus County on August 14, 2014, and which DEF likewise intends to be considered part of these completeness responses. Some of the information provided on August 26, 2014, has been supplemented and/or updated herein based on further discussions with Citrus County staff.

1. *Please provide site calculations, size of site, ISR [Impervious Surface Ratio], FAR [Floor to Area Ratio], and parking calculations. Provide location and type of buffers. [LDC Section 4003 subsections A,2.g., A,2.m. and A.2.p., Section 2415, Section 7230, Section 5400, and Section 5550]*

Response:

The total area of the Site is approximately 400 acres. It is DEF's understanding, based on conversations with Citrus County staff, that the impervious surface area requirement is a maximum coverage of 70 percent, as specified in Section 2417, Citrus County Land Development Code (LDC). As discussed in Section 5.1.1 of the SCA, only approximately 193 acres of the 400-acre Site will be impacted by Project construction activities. Under one half of the 193 acres impacted during construction will result in permanent impervious surface area during Project operation. More specifically, less than 90 acres of the approximately 400-acre Site (i.e., less than 23 percent), including the power block area, switchyard, gas metering/regulating station, and site roads, will be impervious surface area. Thus, the Project is well below the maximum lot coverage of 70 percent for the Transportation/Communication/Utilities (TCU) District in Section 2417, Citrus County LDC.

With regard to the floor-to-area ratio (FAR), again, less than one-half of the 400-acre Site will be impacted by Project construction activities. Thus, the Project will necessarily be well under the 1.0 maximum FAR for the TCU land use district specified in Section 2417, Citrus County LDC. More specifically, the only proposed facility with "floor" area (i.e., the only building that will be occupied by Project operation staff) is the administration building/warehouse. As outlined in Table 4.2.0-1 of the SCA, that

combined area occupies approximately 32,000 square feet (ft²). DEF is proposing to include a second story on the administration building to house critical control equipment above Category 3 storm surge levels. Please note that Table 4.2.0-1 on page 4-9 of the SCA lists the approximate height of the administration building as 15 ft. With a second story, the approximate height of the administration building will instead be approximately 25 ft. This revision is shown in the revised Table 4.2.0-1 (Rev. 1) provided in Attachment H. The additional story adds approximately 16,000 ft² of floor area, resulting in a FAR of approximately 0.00275. This is well below the 1.0 FAR for the TCU land use district specified in Section 2417, Citrus County LDC. Other structures on the Site include the following:

- Service enclosure (approximately 15,000 ft²).
- Oil storage enclosure (approximately 4,900 ft²).
- Cooling towers (two) (approximately 41,800 ft² each).
- Cooling tower chemical feed enclosure (approximately 1,200 ft²).
- Firewater pump enclosure (approximately 600 ft²).
- Gas turbine generator electrical enclosure (four) (approximately 880 ft² each).
- Phosphate feed enclosure (four) (approximately 100 ft² each).
- Continuous emissions monitoring system enclosure (four) (approximately 255 ft² each).
- Starting system electrical enclosure (four) (approximately 730 ft² each).
- Excitation system electrical enclosure (two) (approximately 220 ft² each).
- Fuel gas enclosure (four) (approximately 80 ft² each).
- Sample panel enclosure (four) (approximately 160 ft² each).
- Gas turbine generator auxiliary enclosure (two) (approximately 130 ft² each).
- Carbon dioxide storage enclosure (two) (approximately 150 ft² each).
- Steam turbine enclosure (two) (approximately 2,100 ft² each).
- Switchyard control equipment building (approximately 3,200 ft²).

These structures will collectively occupy approximately 123,000 ft² with the largest being the cooling towers. Even considering these additional structures, the FAR is conservatively estimated at [0.00979], still well below the standard in Section 2417, Citrus County LDC.

With regard to parking calculations, DEF confirmed with Citrus County staff on August 19, 2014, that such calculations are only required for the parking area associated with the administration/warehouse building that will be used during the operation of the Project. The remainder of the parking areas shown on the Site layout in Figure 4.2.0-2 is intended for construction parking. As outlined in Section 5.1.1.1 of the SCA, a minimal amount of that construction parking area (approximately 3 to 5 acres) will be maintained for future DEF and contractor use during plant maintenance outages and other support purposes. TCU uses are not specifically listed in the parking schedule in Section 7230, Citrus County LDC. As such, the “number of spaces required . . . shall be determined by staff.” During discussions on August 21 and September 16, 2014, Citrus County staff confirmed that it is appropriate to determine the minimum number of required parking spaces based on the maximum employee shift.

DEF is proposing 50 parking spaces in the parking area associated with the administration building/warehouse, with four handicap-accessible spaces. As outlined in Section 7.1 of the SCA, the Project will employ approximately 50 full-time employees during operation. Those employees will be assigned to the administration building and will work in shifts. The maximum number of employees per shift is anticipated to be 8, with an additional approximately 16 plant staff and, at times, janitorial staff. Therefore, the maximum number of employees anticipated to ordinarily be assigned to the administration building at any one time is 24. At the time of shift change, there would be a brief overlap of an additional 8 employees, for a total of approximately 32. The building will not serve the general public (there will be an electronic gate that can only be opened by employees with appropriate badges). Therefore, 50 spaces will be more than sufficient to serve the parking needs of the Project during operation. The addition of another story to the administration building to house critical control equipment will not increase the maximum number of employees per shift. The final design of the parking area associated with the administration building/warehouse will comply with all applicable Citrus County substantive requirements in Section 7200, et seq., Citrus County LDC.

With regard to buffers, as shown on Figure 3.2.2-1 of the SCA, the Site is surrounded by property designated Extractive (EXT) or TCU. Therefore, only a “sodded strip” is

required pursuant to Section 5550(B), Citrus County LDC. DEF will comply with this requirement.

2. *Please provide a Tree Preservation Plan that addresses trees to be removed and trees to be preserved. [LDC Sections 5700 and 5725]*

Response:

Most of the Site has been managed for timber production in the past and altered by land preparation (furrowing) and periodic timber harvesting. DEF designed the Project to avoid and minimize impacts to wetlands by, among other things, placement of the proposed power plant facilities in the eastern portion of the Site, which has been impacted by past silvicultural activities.

As discussed in Section 5.1.1 of the SCA, approximately 193 acres of the 400-acre Site will be impacted by construction activities. This includes grubbing and clearing of vegetation from the areas to be used for construction. The cleared areas will then be graded and stabilized. The plant facilities area will be raised approximately 8 to 9± ft. The switchyard area will be raised approximately 2 to 3± ft. Therefore, all trees within the construction footprint must be removed.

It is DEF's understanding based on discussions with Citrus County staff that, following certification, trees in wetlands, surface water bodies, or construction buffer areas are not subject to tree preservation and mitigation requirements per Section 5710(B), Citrus County LDC. Citrus County staff also confirmed that trees within the proposed linear facilities corridor are likewise not subject to tree preservation and mitigation requirements pursuant to Section 5715(D), Citrus County LDC.

DEF is in the process of conducting a tree survey to identify "specimen" trees within the area of the Site that will be impacted by Project construction. It is anticipated that DEF will be able to provide the results of that survey to Citrus County in November 2014. DEF will mitigate for the removal of specimen trees in accordance with Section 5750(C), Citrus County LDC. In addition, DEF recognizes the requirement to maintain 10 trees per acre as specified in Section 5725(B), Citrus County LDC. As stated previously, only 193 acres of the 400-acre Site will be impacted by Project activities. The remaining area of the Site is not proposed to be impacted and contains

more than a sufficient number of trees to meet the requirement of Section 5725(B). Per discussions with Citrus County staff on September 17, 2014, at the time of submittal of the tree survey identifying “specimen” trees to be impacted, DEF will also submit an aerial photograph of the Site to demonstrate that there are more than sufficient trees on the portion of the Site that will not be impacted to meet the requirement of Section 5725(B), Citrus County LDC.

While it is DEF’s intent to provide Citrus County with a tree survey of the portion of the Site to be impacted by Project construction and aerial photograph of the remainder of the Site before the end of 2014, if a tree survey is not provided prior to issuance of the final order of certification, DEF would accept a condition of certification requiring submittal of the tree survey of the portion of the Site to be impacted and aerial photograph to Citrus County prior to construction, as well as requiring compliance with the applicable mitigation requirements in Section 5750, Citrus County LDC.

3. *Please provide a copy of the ERP, once approved, along with all supporting documentation. [LDC Section 6310, Development Permit Requirements]*

Response:

Because this Project is proposed for certification under the Electrical Power Plant Siting Act (PPSA), DEF will not be obtaining any separate state (including an ERP) or local permits for construction and operation of the Project. Section 03.511(1), Florida Statutes (F.S.) (“[A]ny certification shall constitute the sole license of the state and any agency as to the approval of the location of the site and any associated facility and the construction and operation of the proposed electrical power plant. . . .”). Certification under the PPSA, however, incorporates substantive criteria of the reviewing agencies, including ERP criteria. See Section 403.509(3)(b), F.S. (recognizing that compliance with “applicable nonprocedural requirements of agencies” is one of the considerations for certification); see also Section 403.502, F.S. (recognizing that one of the purposes of the PPSA is to implement a centrally-coordinated process, which includes consideration of the standards of the reviewing agency). As a statutory reviewing agency, Section 403.508(3)(a)(8), F.S., Citrus County will be copied on the final order of certification issued by FDEP or the Siting Board, including any conditions of certification. To the extent that Citrus County would like to receive copies of ERP-

related postcertification submittals to FDEP, if any, DEF would be willing to accept a condition of certification requiring DEF to provide same to Citrus County for informational purposes.

Attachment A

Bartow Combined Cycle - Low Volume Wastestream Analysis
Sample Date = August, 2012

Parameter	Result	Units
CBOD	< 2.0	mg/L
COD	15	mg/L
TOC	3.9	mg/L
TSS	1.2	mg/L
Total Nitrogen (as N)	2.2	mg/L
Total Phosphorous (as P)	0.27	mg/L
Ammonia (as N)	0.34	mg/L
Specific Conductivity	920	µmhos/cm
pH	8.17	Std. Units
Bromide	0.068	mg/L
Chlorine - Total Residual	0.29	mg/L
Color	5.0	PCU
Fluoride	0.76	mg/L
Nitrate-Nitrite	1.4	mg/L
Nitrogen - Total Organic (as N)	2.2	mg/L
Oil & Grease	1.7	mg/L
Sulfate (as SO ₄)	140	mg/L
Sulfide (as S)	< 1.0	mg/L
Surfactants	0.11	mg/L
Aluminum (total)	< 0.050	mg/L
Barium (total)	0.021	mg/L
Boron (total)	0.063	mg/L
Cobalt (total)	< 0.0020	mg/L
Iron (total)	0.079	mg/L
Magnesium (total)	14.0	mg/L
Molybdenum (total)	0.049	mg/L
Manganese (total)	0.0042	mg/L
Tin (total)	< 0.0060	mg/L
Titanium (total)	< 0.0020	mg/L
Antimony (total)	< 0.0040	mg/L
Arsenic (total)	< 0.0040	mg/L
Beryllium (total)	< 0.00050	mg/L
Cadmium (total)	< 0.0010	mg/L
Chromium (total)	< 0.0020	mg/L
Copper (total)	< 0.0029	mg/L
Lead (total)	< 0.0020	mg/L
Mercury (total)	0.0000016	mg/L
Nickel (total)	< 0.0020	mg/L
Selenium (total)	< 0.0050	mg/L
Silver (total)	< 0.0010	mg/L
Thallium (total)	< 0.0050	mg/L
Zinc (total)	0.02	mg/L
Phenols	< 0.0050	mg/L

Parameter	Result	Units
Acrolein	< 3.8	µg/L
Acrylonitrile	< 1.2	µg/L
Benzene	< 0.50	µg/L
Bromoform	< 0.58	µg/L
Carbon Tetrachloride	< 0.42	µg/L
Chlorobenzene	< 0.63	µg/L
Chlorodibromomethane	1.4	µg/L
Chloroethane	< 2.5	µg/L
2-Chloro-ethylvinyl ether	< 0.95	µg/L
Chloroform	3.5	µg/L
Dichlorobromomethane	2.0	µg/L
1,1, Dichloroethane	< 0.52	µg/L
1,2 Dichloroethane	< 0.57	µg/L
1,1 Dichloroethylene	< 0.45	µg/L
1,2 Dichloropropane	< 0.52	µg/L
1,3 Dichloropropylene	< 0.14	µg/L
Ethylbenzene	< 0.44	µg/L
Methyl Bromide	< 2.5	µg/L
Methyl Chloride	< 1.0	µg/L
Methylene Chloride	< 4.0	µg/L
1,1,2,2,Tetrachloroethane	< 0.15	µg/L
Tetrachlorethylene	< 0.50	µg/L
Toluene	< 0.51	µg/L
1,2,Trans-Dichloroethylene	< 0.44	µg/L
1,1,1 Trichloroethane	< 0.46	µg/L
1,1,2 Trichloroethane	< 0.47	µg/L
Trichloroethylene	< 0.50	µg/L
Trichlorofluoromethane	< 2.5	µg/L
Vinyl Chloride	< 0.50	µg/L
Note - remainder of GC/MS Fraction Acid and Base/Neutral Compounds were all below the limit of detection		

Attachment B



Conceptual Stormwater Pond Design Basis



Duke Energy

Project No. 71404

September 2014

Conceptual Stormwater Pond Design Basis

prepared for

**Duke Energy
Citrus County, Florida**

September 2014

Project No. 71404

prepared by

**Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri**

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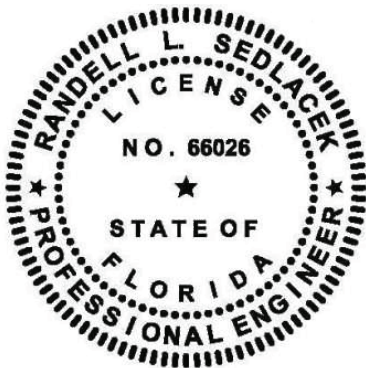
INDEX AND CERTIFICATION

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CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Florida, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by Duke Energy or others without specific verification or adaptation by the Engineer.



Randell L. Sedlacek
 Randell L. Sedlacek, P.E. (Florida License No. 66026)

Date: 9/25/14

* * * * *

This document has been digitally signed and sealed.
 Sep 25 2014

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LIST OF FIGURES

Actual figures are incorporated within and located throughout the document text.

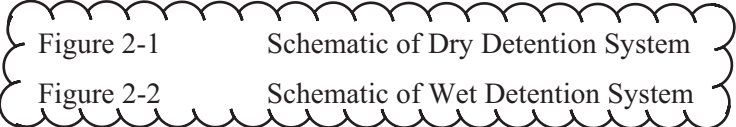
FIGURE NO.**FIGURE TITLE**

Figure 2-1	Schematic of Dry Detention System
Figure 2-2	Schematic of Wet Detention System
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Figure 2-4	25-Year, 24-Hour Rainfall Map
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* * * * *

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APPENDIX C Pre and Post-Construction Site Drainage Plans

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APPENDIX E Drawing CS316A –CS316G Pond Plans, Sections and Outfall Structure Details

* * * * *

1.0 PROJECT OBJECTIVES

This conceptual stormwater pond design basis document will establish the preliminary design criteria, including flow rates and effluent volumes, for the design of new construction stormwater treatment ponds and stormwater detention ponds at the Holcim Site for the Duke Energy, Citrus County Combined Cycle Project.

The objective of the following document is to convey the preliminary design criteria for both pre-construction and post-construction phases of the site, to meet the requirements of the Southwest Florida Water Management District. An overview of the required design intents that will be implemented as part of the combined cycle project is provided in the following sections. Furthermore, Drawing CS307 and CS308 (included in Appendix C) shows the pre and post-construction flow path and ponds as part of an overall site plan for the facility while also showing the various post-construction drainage areas on site.

1.1 References and Resources

The main reference used in the preliminary design of the stormwater ponds was the Environmental Resource Permit Applicant's Handbook Volume II, by Southwest Florida Water Management District, dated October 1, 2013. Figures 2-1, 2-2 and 2-3 were selected from the Southwest Florida Water Management District's document titled, "Three Design Alternatives For Stormwater Detention Ponds", dated June 1997. The software that was used to model the drainage areas and determine pond, weir, and V notch were HEC-HMS, Version 3.5 and Bentley FlowMaster.

1.2 Summary of Stormwater Ponds

The Holcim site consists of five primary drainage areas. Starting on the north side of the plant is the Construction Laydown Area that will drain to the Construction Stormwater Treatment Ponds #1 and #2. The main power block of the site, including the cooling towers, will drain to Stormwater Detention Ponds #1 and #2. Stormwater Detention Pond #3 will receive runoff from the construction parking area on the west of the power block. A majority of the substation will drain to Stormwater Detention Pond #4. The remainder of the substation and the gas yard area will drain to Stormwater Detention Pond #5.

* * * * *

2.0 TYPICAL POND DESIGN

The new treatment ponds will include Construction Stormwater Treatment Ponds #1 and #2, and Stormwater Detention Ponds #1 through #5.

2.1 General Pond Preliminary Design

The primary purpose of the treatment ponds is for solids removal of stormwater runoff. The Construction Stormwater Treatment Ponds will be wet detention ponds, but will only be used temporarily during the extent of construction. The Stormwater Detention Ponds #1 and #2 will be dry detention ponds and the Stormwater Detention Ponds # 3, #4, and #5 will be wet detention ponds. All ponds include a surface skimmer. Ponds side slopes will be 4H:1V or flatter. Inflow and outflow points have been designed to maximize circulation.

The dry detention treatment ponds will be designed as an on-line treatment system, which will obtain treatment through infiltration of the runoff from the first one-inch of rainfall from the contributing area. Runoff in excess of the treatment volume will be discharged through the outlet structure, providing that the total treatment volume of the pond is available in no less than 36 hours. After drawdown of the stored runoff is completed, pond 1 and pond 2 will not hold any water. The interior side slopes of all ponds will be covered with vegetative material. Figure 2-1 shows a typical section of dry detention ponds.

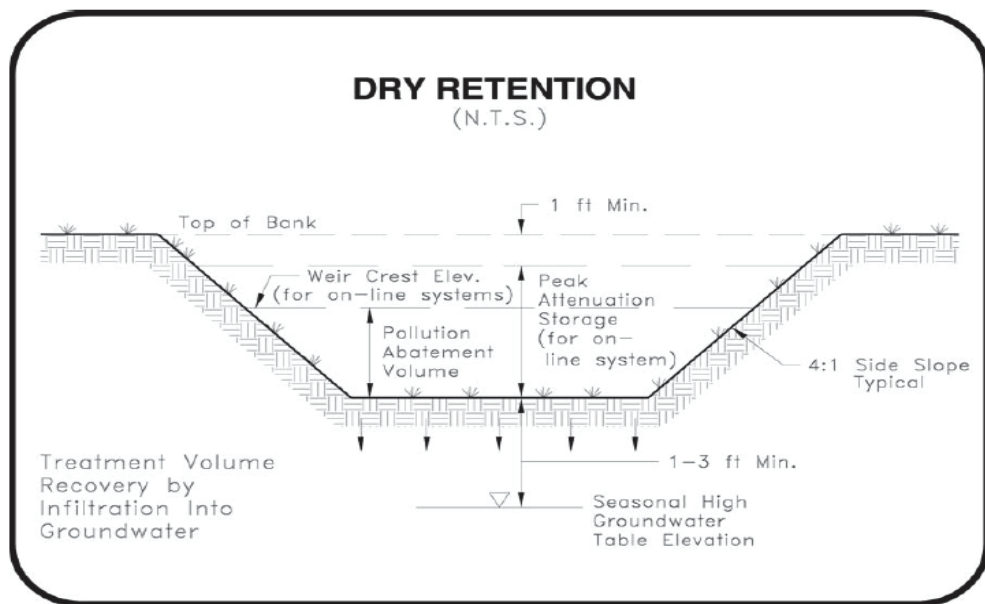


Figure 2-1: Schematic of Dry Detention System

The wet detention treatment volume is designed to treat the first one-inch of runoff from the contributing area, plus 14 days residence volume during the rainy season. All wet ponds will be designed to slowly release collected runoff through the outlet structure and include a minimum of 35 percent littoral zone, covered with vegetative material, concentrated at the outfall for pollutant removal. The littoral zone will be designed to extend no deeper than 2 feet below the control elevation of each pond. Figure 2-2 shows a typical section of wet detention ponds.

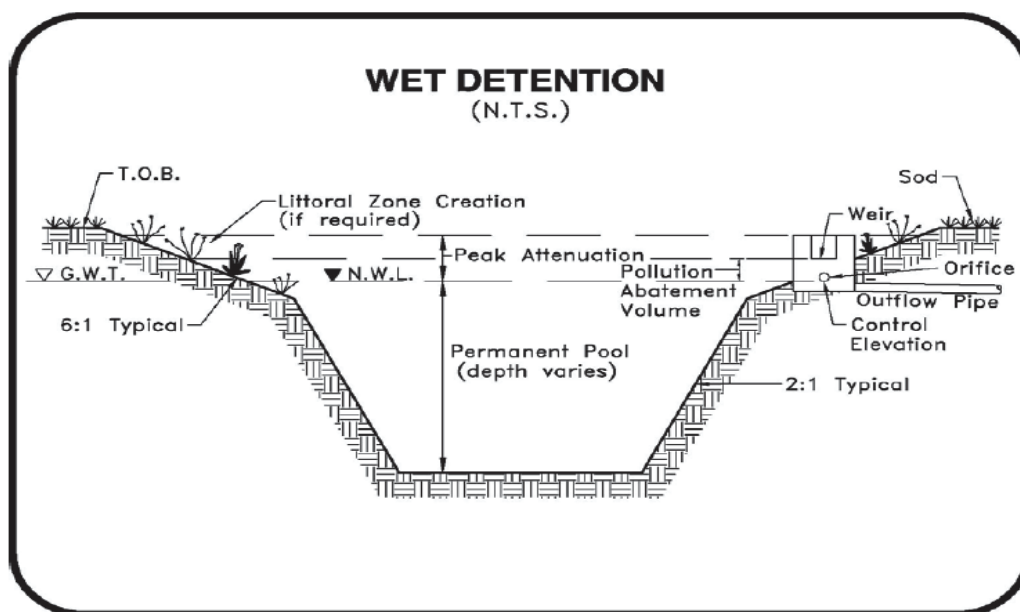


Figure 2-2: Schematic of Wet Detention System

2.2 Outlet Structure and Layout

The outlet structures of the ponds will consist of open-top concrete boxes with weirs for the inflow and pipes to convey the discharge water. Above the overflow weirs will be a baffle system to encourage water to flow from the center of the water column rather than the top or bottom. The outlet structure for each pond will be located on the side of pond opposite of the inlet to allow for the maximum possible detention/solids settling time.

For dry ponds, the rectangular discharge weir on the concrete box was sized to allow the discharged volume for 120 hours of a 25 year, 24 hour stormwater runoff event. The purpose of the weir is to convey flow after the first inch. The top of the concrete box will be set to an elevation for emergency overflow situations.

The outlet structure for wet detention ponds shows is shown in Figure 2-3, below. The weir crest was sized to discharge the detention volume of a 25 year, 24 hour stormwater runoff event in no less than 60 hours (2.5 days).

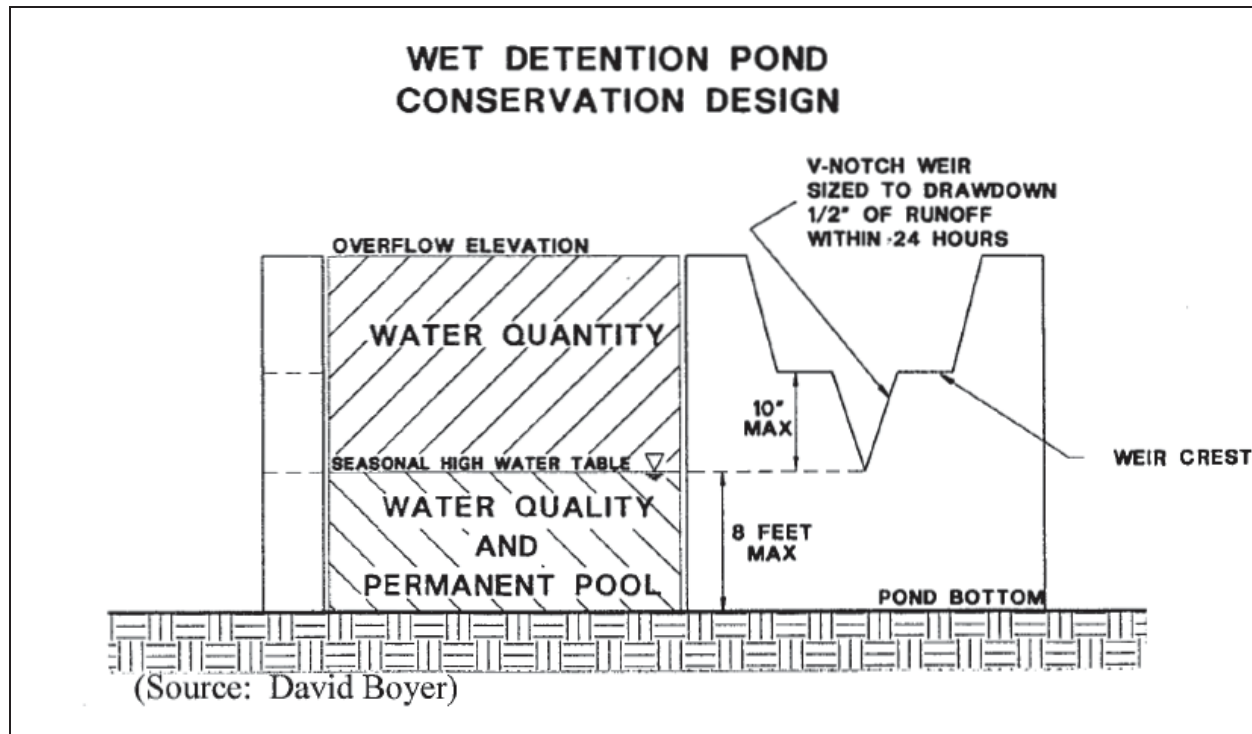
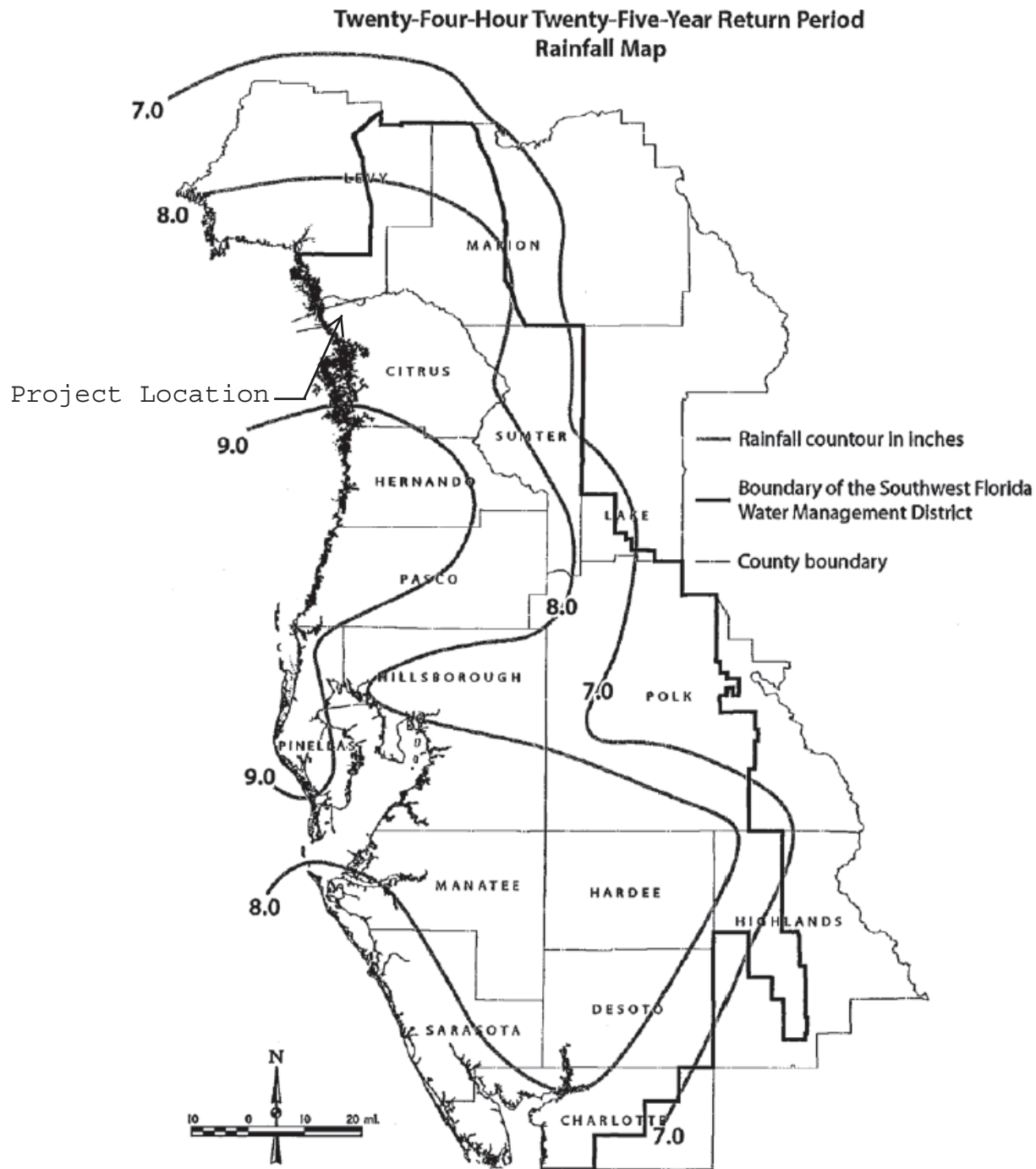


Figure 2-3: Wet Detention Pond Outlet Structure

2.3 Pond Sizing and Depth

The preliminary pond sizing and depths are based on what is required for runoff from a 25-Year, 24-Hour storm event (See Figure 2-4), while also allowing for 24 hours residence time for solids settling. Capacity for the storage of solids has not been accounted for. Final design of each pond will also allow for one foot of freeboard, above the required storage volume depth.



* * * * *

3.0 DESIGN FLOWS FOR PONDS

All pond peak flow stormwater runoff estimates have been preliminarily based on hydrologic modeling of each drainage area for a Type II, 25-Year, 24-Hour storm event. Pre and post-construction peak runoff values are indicated below in Figure 3-1. Summary of all calculation inputs, pond sizing and outflow data, as well as elevation-area tables are included in Appendix A. Hydrologic modeling information is included in Appendix B.

Contributing Pond	Pre- Construction Peak Flow (cfs)	Post- Construction Peak Flow to Ponds (cfs)
Construction Stormwater Treatment Pond #1	51.2	154.2
Construction Stormwater Treatment Pond #2	84.7	221.5
Stormwater Detention Pond #1	58.9	88.6
Stormwater Detention Pond #2	69.9	102.9
Stormwater Detention Pond #3	69.1	125.4
Stormwater Detention Pond #4	90.8	176.2
Stormwater Detention Pond #5	57.6	79.6

Figure 3-1 Pre and Post-Construction Peak Runoff Values

* * * * *

APPENDIX A

POND DESIGN DATA

Preliminary Pond Calculation Data

Contributing Pond Areas	Treatment Method	Pre-Construction Area (acres)	Pre-Construction Area CN	Pre-Construction Peak Flow (cfs)	Post-Construction Area (acres)	Post-Construction Area CN	Post-Construction Peak Flow to Ponds (cfs)	Detention Volume (First Inch Runoff) (ac-ft)	24-Hour Max Discharge (ac/ft/day)	Permanent Wet Pond Volume (ac-ft)
Construction Stormwater Treatment Pond #1 *	wet detention	24	50	51.2	24	80	154.2	1.67	0.83	6.77
Construction Stormwater Treatment Pond #2 *	wet detention	33	50	84.7	39	80	221.5	3.25	1.63	13.10
Stormwater Detention Pond #1	dry detention	24	50	58.9	14	98	88.6	1.15	0.57	...
Stormwater Detention Pond #2	dry detention	26	50	69.9	12	98	102.9	1.00	0.50	...
Stormwater Detention Pond #3	wet detention	18	50	69.1	13	98	125.4	1.12	0.56	4.50
Stormwater Detention Pond #4	wet detention	37	50	90.8	19	80	176.2	1.60	0.80	6.43
Stormwater Detention Pond #5	wet detention	15	50	57.6	8	80	79.6	0.63	0.31	2.52
Total Pond Surface Area					32					
Runoff to Off-Site					17					

* CN relates to period of time during construction.

Pond Sizing and Outfall Data

Pond Area	Detention Pond Surface Area (acre)	Total Pond Capacity (ac-ft)	Pond Depth (ft)	Peak Flow Elevation (ft)	Infiltration Design Rate (in/hr)	Bleed down V-notch Angle (degree)	Mimumum Storage Time (hours)	Weir Width (ft)	Weir Elevation (ft)	Littoral Zone Coverage (%)	Mimumum Storage Time (hours)
Construction Stormwater Treatment Pond #1	4.32	15.3	4.3	6.84	...	48	24	1.45	6.26	35	120
Construction Stormwater Treatment Pond #2	6.95	21.9	4.3	6.84	...	82	24	2.07	6.26	35	120
Stormwater Detention Pond #1	2.41	9.2	5.6	8.20	0.375	...	36	0.90	7.73	...	120
Stormwater Detention Pond #2	2.69	9.9	5.6	8.20	0.375	...	36	0.95	7.73	...	120
Stormwater Detention Pond #3	4.00	12.6	5.4	7.80	...	33	24	1.21	6.30	44	120
Stormwater Detention Pond #4	8.94	19.3	4.3	6.84	...	46	24	1.83	6.30	64	120
Stormwater Detention Pond #5	2.45	6.6	4.3	6.84	...	38	24	0.67	6.30	70	120

APPENDIX B

DETENTION BASIN CALCULATIONS

Stormwater treatment system calculation reference

(From Environment resource permitting information manual (SWFWMD))

Treatment volume (ac-ft)	Vt	(At)(1in)(1ft/12in)
	A	Total contributing area (ac)
Perment wet pool volume (ac-ft)	Vr	(A) (C) (P) (R) (1ft/12in)
	A	Total contributing area (ac)
	C	Rational runoff coefficient
	P	Historic average wet season rainfall rate (31.04in/122day Average season rainfall 31.04in/yr (Figure 2)
	R	Residence time (14days)
Design pool volume (ac-ft)	V	Treatment voulme(Vt) + Perment wet pool volume(Vr)
Miminum design pool volume (ac-ft)	Vmin	(A) (0.667in) (1ft/12in)
Miminum pond area	As	

CONSTRUCTION STORMWATER TREATMENT PONDS CALCULATIONS

Pre-construction peak flow -construction stormwater treatment pond #1 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Laydown west
Method	SCS Curve No
Area (MI2)	0.0378
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	12
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak runoff Q 51.2 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Temp pond #1

Jul 14 14:48:17 CDT 2014

laydown area west



Project: Duke Preconstruction Flow Simulation Run: laydown west

Start of Run: 10May2014, 10:10 Basin Model: Temp. pond #1

End of Run: 11May2014, 10:11 Meteorologic Model: 25 year

Compute Time: 14Jul2014, 14:49:51 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
laydown area west	0.0378	51.2	10May2014, 22:24	5.4

Pre-construction peak flow -Construction stormwater treatment pond #2 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Laydown east
Method	SCS Curve No
Area (MI2)	0.0518
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	15
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak runoff Q 84.7 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Temp. pond #2

Jul 14 14:56:00 CDT 2014



laydown east

Project: Duke Preconstruction Flow Simulation Run: Laydown east

Start of Run: 10May2014, 10:10 Basin Model: Temp. pond #2

End of Run: 11May2014, 10:11 Meteorologic Model: 25 year

Compute Time: 14Jul2014, 14:56:27 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
laydown east	0.0518	84.7	10May2014, 22:19	7.4

Post construction Stormwater treatment pond #1 and #2 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Laydown area west	Laydown area east	Temp Pond 1	Temp pond 2
Method	SCS Curve No			
Area (MI ²)	0.0275	0.0609	0.00675	0.0108
Initial Loss (IN)	0.5	0.5		
% Impervious	10	10	100	100
SCS Curve No.	80	80	98	98
SCS Lag (MIN)	9	9	1	1
Baseflow	No	No		

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Result

25 year, 24 hour peak runoff for pond 1 Q_p 154.2 cfs
 25 year, 24 hour peak runoff for pond 2 Q_p 221.5 cfs



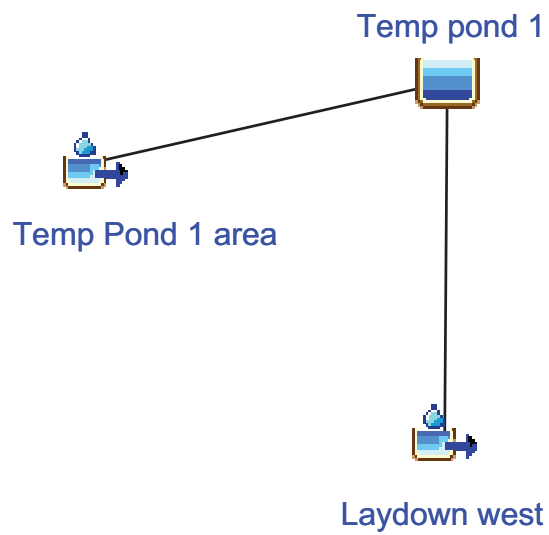


HEC-HMS

Project : Construction Laydown Areas

Basin Model : Laydown area west

Jul 15 10:19:04 CDT 2014



Project: Duke wet ponds Simulation Run: Temp pond 1

Start of Run: 10May2014, 10:00 Basin Model: Temp pond #1
End of Run: 11May2014, 10:11 Meteorologic Model: 25 yr
Compute Time: 21Sep2014, 13:16:06 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Laydown West	0.02750	143.1	10May2014, 22:04	12.0
Temp pond 1 area	0.00675	54.1	10May2014, 21:53	3.1
Temp pond 1	0.03425	154.2	10May2014, 22:01	15.2

Construction Stormwater Treatment Pond #1 discharge system design

Construction Stormwater Treatment pond #1 is wet detention pond
The contributing area 20 acres

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$V_t = (20\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 1.667\text{ac-ft}$$

- 2 Calculate permanent wet pool volume

$$V_r = (A) (C) (P) (R) (1\text{ft}/12\text{in})$$

$$V_r = (20\text{ac}) \times (0.85) \times (31.04\text{in}/122\text{day}) \times (14\text{day}) \times (1/12) = 5.10\text{ac-ft}$$

The min treatment volume of 0.667 inch of runoff of contributing area

$$V_{\min} = (20\text{ac}) (0.667) (1/12) = 0.8251.11\text{ac-ft}$$

$$V_r > V_{\min}$$

Use treatment volume $V = 5.10\text{ ac-ft}$

So, the total wet detention system design pool volume

$$V = 1.667\text{ac-ft} + 5.10\text{ac-ft} = 6.767\text{ ac-ft}$$

- 3 Calculate min. wet pool area

Based on 0.5" of runoff

$$V = (20\text{ac}) \times (0.5\text{in}) \times (1\text{ft}/12\text{in}) = 0.83\text{ac-ft}$$

Max head on V-notch is 10"

$$A_s = (0.83\text{ ac-ft}) / (10") (1/12) = 0.99\text{ ac}$$

Based on design pool volume $V = 6.767\text{ac-ft}$ and max pond depth 2.0ft based on existing surface elevation)

$$6.767\text{ac-ft} = 2.0\text{ ft } A_s$$

$$\text{Min wet pool area } A_s = 3.38\text{ ac}$$

- 4 Sizing discharge V-notch to discharge 0.5" of detention runoff from the contributing area in 24 hours with 10" maximum head

$$\text{First 0.5" runoff } V = 0.83\text{ ac-ft}$$

24hr treatment

$$Q = 0.418\text{ cfs, Use 8" head}$$

From Flowmaster

$$\text{Design discharge } Q = 0.418\text{ cfs}$$

$$\text{Head water } H = 0.667\text{ ft}$$

$$\text{Coefficient } C = 0.600$$

$$\text{V-notch angle } 48.280\text{ degree}$$

Design V-notch 48 degree

- 5 Sizing discharge weir.

From HEC- hms calculation result, total detention volume $V = 15.2\text{ ac-ft}$

Discharge detention volume in 120 hours

$$Q = (15.2\text{ ac-ft}) / (120\text{hr}) = 1.53\text{ cfs}$$

$$\text{Design discharge } Q = 1.53\text{ cfs}$$

$$\text{Head water } H = 0.5\text{ ft}$$

$$\text{Coefficient } C = 3.100$$

$$\text{Contraction } 1.000$$

Use FlowMaster

$$\text{Maximum Crest length } L = 1.450\text{ ft}$$

Worksheet for temp pond V-Notch Weir

Project Description

Solve For Notch Angle

Input Data

Discharge	0.42	ft ³ /s
Headwater Elevation	0.67	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Coefficient of Discharge	0.60	

Results

Angle	48.28	degrees
Headwater Height Above Crest	0.67	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.20	ft ²
Velocity	2.10	ft/s
Wetted Perimeter	1.46	ft
Top Width	0.60	ft

Worksheet for Temp Pond 1 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	1.53	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	1.45	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.72	ft ²
Velocity	2.12	ft/s
Wetted Perimeter	2.45	ft
Top Width	1.45	ft



HEC-HMS

Project : Construction Laydown Areas

Basin Model : laydown area east

Jul 15 10:21:11 CDT 2014

Temp pond 2



Temp pond 2 area



laydown east

Project: Duke wet ponds Simulation Run: Temp pond 2

Start of Run: 10May2014, 10:00 Basin Model: Temp pond #2

End of Run: 11May2014, 10:11 Meteorologic Model: 25 yr

Compute Time: 21Sep2014, 13:18:46 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Laydown east	0.0386	200.8	10May2014, 22:04	16.9
Temp pond 2 area	0.0108	86.6	10May2014, 21:53	5.0
Temp pond 2	0.0494	221.5	10May2014, 22:00	21.9

Construction Stormwater Treatment Pond #2 discharge system design

Construction Stormwater Treatment pond #2 is wet detention pond
The contributing area 39 acres

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$V_t = (39\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 3.25\text{ac-ft}$$

- 2 Calculate permanent wet pool volume

$$V_r = (A) (C) (P) (R) (1\text{ft}/12\text{in})$$

$$V_r = (39\text{ac}) \times (0.85) \times (31.04\text{in}/122\text{day}) \times (14\text{day}) \times (1/12) = 9.84\text{ac-ft}$$

The min treatment volume of 0.667 inch of runoff of contributing area

$$V_{\min} = (39\text{ac}) (0.667) (1/12) = 2.16\text{ac-ft}$$

$$V_r > V_{\min}$$

Use treatment volume $V = 9.84 \text{ ac-ft}$

So, the total wet detention system design pool volume

$$V = 3.25\text{ac-ft} + 9.84\text{ac-ft} = 13.09 \text{ ac-ft}$$

- 3 Calculate min. wet pool area

Based on 0.5" of runoff

$$V = (39\text{ac}) \times (0.5\text{in}) \times (1\text{ft}/12\text{in}) = 1.625\text{ac-ft}$$

Max head on V-notch is 10"

$$A_s = (1.625 \text{ ac-ft}) / (10") (1/12) = 1.95 \text{ ac}$$

Based on design pool volume $V = 13.09 \text{ ac-ft}$ and max pond depth 2.5ft based on existing surface elevation)

$$13.09 \text{ ac-ft} = 2.0 \text{ ft } A_s$$

$$\text{Min wet pool area } A_s = 6.54 \text{ ac}$$

- 4 Sizing discharge V-notch to discharge 0.5" of detention runoff from the contributing area in 24 hours with 10" maximum head

$$\text{First 0.5" runoff } V = 1.625 \text{ ac-ft}$$

24hr treatment

$$Q = 0.819 \text{ cfs, Use 8" head}$$

From Flowmaster

Design discharge $Q = 0.819 \text{ cfs}$

Head water $H = 0.667 \text{ ft}$

Coefficient $C = 0.600$

V-notch angle 82.570 degree

Design V-notch 82 degree

- 5 Sizing discharge weir.

From HEC- hms calculation result, total detention volume $V = 21.9 \text{ ac-ft}$

Discharge detention volume in 120 hours

$$Q = (21.9 \text{ ac-ft}) / (120\text{hr}) = 2.21 \text{ cfs}$$

Design discharge $Q = 2.21 \text{ cfs}$

Head water $H = 0.5 \text{ ft}$

Coefficient $C = 3.100$

Contraction 1.000

Use FlowMaster

Maximum Crest length $L = 2.07 \text{ ft}$

Worksheet for temp pond 2 V-Notch Weir

Project Description

Solve For Notch Angle

Input Data

Discharge	0.82	ft ³ /s
Headwater Elevation	0.67	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Coefficient of Discharge	0.60	

Results

Angle	82.57	degrees
Headwater Height Above Crest	0.67	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.39	ft ²
Velocity	2.10	ft/s
Wetted Perimeter	1.78	ft
Top Width	1.17	ft

Worksheet for Temp Pond 2 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	2.21	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	2.07	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	1.03	ft ²
Velocity	2.14	ft/s
Wetted Perimeter	3.07	ft
Top Width	2.07	ft

STORMWATER DETENTION POND #1
CALCULATIONS

Pre-construction peak flow -stormwater detention pond #1 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Power Block West
Method	SCS Curve No
Area (MI ²)	0.0375
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	16
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Result

25 year, 24 hour peak Storm runoff  58.9 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Pond #1

Jul 14 16:29:43 CDT 2014

Power Block West



Project: Duke Preconstruction Flow Simulation Run: Power block west

Start of Run: 10May2014, 10:10 Basin Model: Pond #1
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 14Jul2014, 16:39:06 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Power Block West	0.0375	58.9	10May2014, 22:20	5.3

Stormwater detention pond #1 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Power block west	Cooling tower west	Chill area	Switch yard west	Pond area
Method	SCS Curve No				
Area (MI ²)	0.0109	0.00203	0.001076	0.003228	0.004388
Initial Loss (IN)	0.04	0.04	0.04	0.04	0.02
% Impervious	100	100	100	100	100
SCS Curve No.	98	98	98	98	99
SCS Lag (MIN)	6	8	9	9	1
Baseflow	No	No	No	No	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak storm runoff 88.6 cfs



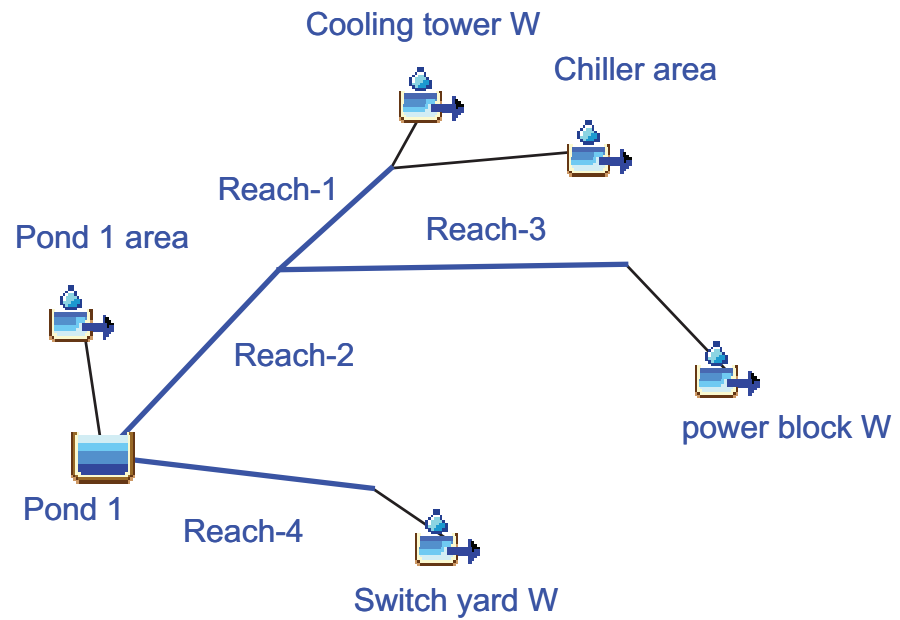


HEC-HMS

Project : Post construction pond #1

Basin Model : power block and cooling W

Jul 15 09:05:10 CDT 2014



Project: Duke dry pond 1 Simulation Run: Dry Pond 1

Start of Run: 10May2014, 10:10 Basin Model: Dry pond 1

End of Run: 11May2014, 10:11 Meteorologic Model: 25 year

Compute Time: 15Sep2014, 14:08:38 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
power block W	0.010900	65.8	10May2014, 22:12	5.0
Reach-3	0.010900	59.9	10May2014, 22:18	5.0
Cooling tower W	0.002030	10.9	10May2014, 22:14	0.9
Chiller area	0.001076	5.2	10May2014, 22:17	0.5
Reach-1	0.003106	14.7	10May2014, 22:24	1.4
Reach-2	0.014006	70.9	10May2014, 22:20	6.4
Pond 1 area	0.003760	30.1	10May2014, 22:03	1.7
Switch yard W	0.003228	15.9	10May2014, 22:12	1.0
Reach-4	0.003228	14.1	10May2014, 22:22	1.0
Dry Pond 1	0.020994	88.6	10May2014, 22:21	9.2

Stormwater detention pond #1 discharge system design

Pond #1 designed as infiltration pond

The contributing area for detention pond 1 A = 13.8 acres

The whole contributing area is impervious.

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$= (13.8\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 1.15 \text{ ac-ft}$$

- 2 Calculate infiltration area

Required detention time 36 hour

Use Infiltration rate $k = 0.375\text{in/hr}$

Use equation:

Infiltration volume = (pond bottom area) $\times$ (infiltration rate) $\times$ (infiltration period)

$$1.15 \text{ ac-ft} = (\text{Pond bottom A}) \times (0.375\text{in/hr}) \times (36\text{hr}) \times (1/12)$$

$$\text{infiltration area A} = 44528 \text{ SF}$$

$$\text{Infiltration pond Depth H} = (1.15\text{ac ft}) / 44528\text{SF} = 1.125 \text{ FT}$$

- 3 Sizing discharge weir

25 yr 24 hr peak flow volume $V_{25} = 9.2 \text{ ac-ft}$

Required detention time 120 hour

$$\text{Discharge rate Q} = (9.2 \text{ ac ft}) / (120\text{hr}) = 0.93 \text{ cfs}$$

Design discharge

Flow rate $Q = 0.93 \text{ cfs}$

Head water $H = 0.5 \text{ ft}$

Coefficient $C = 3.1$

Contraction 1

Use FlowMaster

Maximum Crest length $L = 0.90 \text{ ft}$

Worksheet for pond 1 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	0.93	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	0.90	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.45	ft ²
Velocity	2.07	ft/s
Wetted Perimeter	1.90	ft
Top Width	0.90	ft

STORMWATER DETENTION POND #2
CALCULATIONS

Pre-construction peak flow -stormwater detention pond #2 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Power Block East
Method	SCS Curve No
Area (MI ²)	0.0406
Initial Loss (IN)	1.63
% Impervious	0
SCS Curve No.	55
SCS Lag (MIN)	17
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

Result

25 year, 24 hour peak Storm runoff Q 69.9 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Pond #2

Jul 14 16:19:11 CDT 2014

Power block east



Project: Duke Preconstruction Flow Simulation Run: Power block east

Start of Run: 10May2014, 10:10 Basin Model: Pond #2
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 14Jul2014, 16:51:36 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Power block east	0.0406	69.9	10May2014, 22:24	7.0

Stormwater detention Pond #2 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Power block esst	Cooling tower east	Building area	Switch yard east	Pond area
Method	SCS Curve No				
Area (MI ²)	0.0109	0.00203	0.00264	0.003228	0.0036
Initial Loss (IN)	0.04	0.04	0.04	0.04	0.02
% Impervious	100	100	100	100	100
SCS Curve No.	98	98	98	98	99
SCS Lag (MIN)	9	9	6	9	1
Baseflow	No	No	No	No	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak Storm runoff  102.9 cfs

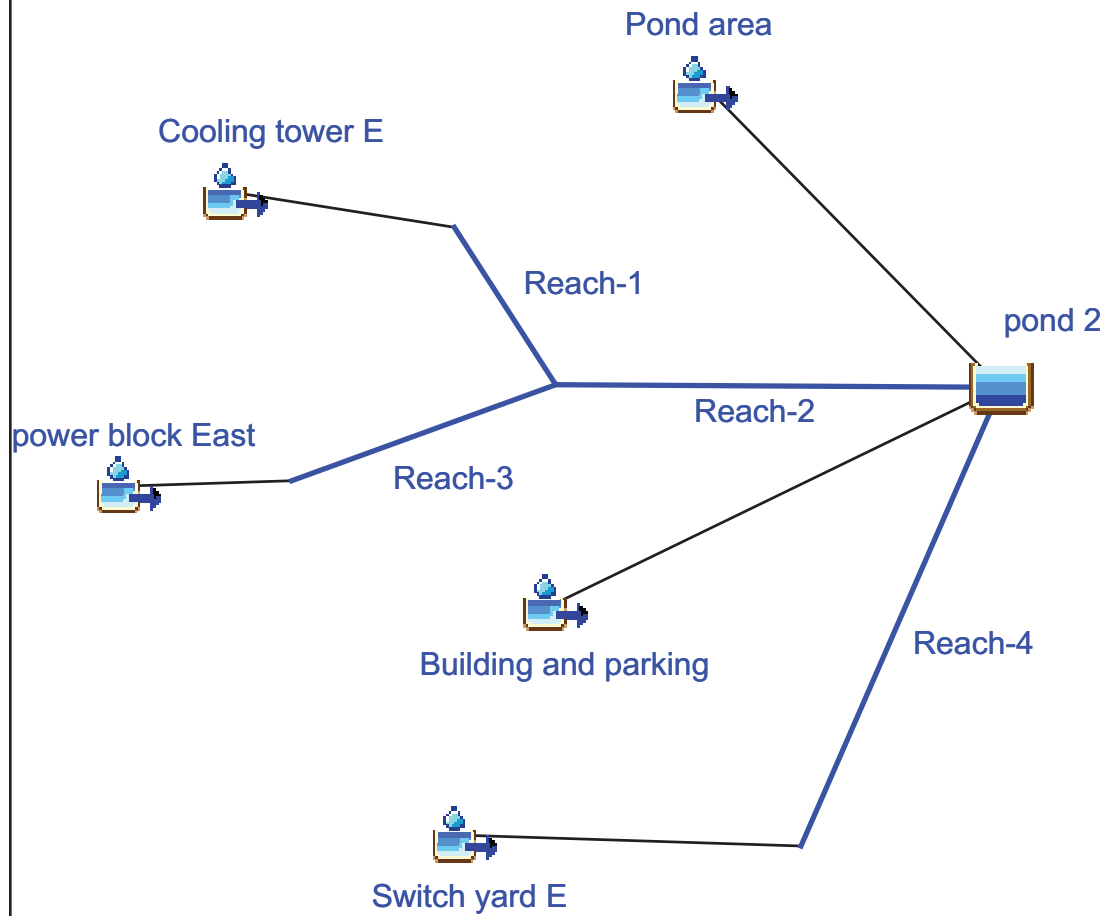


HEC-HMS

Project : Post construction pond #2

Basin Model : Power block and Cooling East

Jul 15 08:53:18 CDT 2014



Project: Duke dry pond 2 Simulation Run: Dry pond 2

Start of Run: 10May2014, 10:10 Basin Model: Power block and Coolir
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 15Sep2014, 14:13:42 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
power block East	0.010900	65.8	10May2014, 22:12	5.0
Reach-3	0.010900	64.1	10May2014, 22:15	5.0
Cooling tower E	0.002030	12.2	10May2014, 22:12	0.9
Reach-1	0.002030	11.8	10May2014, 22:18	0.9
Reach-2	0.012930	74.9	10May2014, 22:16	6.0
Pond 2 area	0.003600	28.9	10May2014, 22:03	1.7
Switch yard E	0.003228	15.9	10May2014, 22:12	1.0
Reach-4	0.003228	15.3	10May2014, 22:18	1.0
Building and parking	0.002640	17.9	10May2014, 22:09	1.2
Pond 2	0.022398	102.9	10May2014, 22:14	9.9

Stormwater detention pond #2 discharge system design

Pond #2 designed as infiltration pond

The contributing area for detention pond 2 A = 12 acres

The whole contributing area is impervious.

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$= (12\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 1.0 \text{ ac-ft}$$

- 2 Calculate infiltration area

Required detention time 36 hour

Use Infiltration rate $k = 0.375\text{in/hr}$

Use equation:

Infiltration volume = (pond bottom area) $\times$ (infiltration rate) $\times$ (infiltration period)

$$1.0 \text{ ac-ft} = (\text{Pond bottom A}) \times (0.375\text{in/hr}) \times (36\text{hr}) \times (1/12)$$

$$\text{infiltration area A} = 38720 \text{ SF}$$

$$\text{Infiltration pond Depth H} = (1\text{ac ft}) / 38720\text{SF} = 1.125 \text{ FT}$$

- 3 Sizing discharge weir

25 yr 24 hr peak flow volume $V_{25} = 9.9 \text{ ac-ft}$

Required detention time 120 hour

$$\text{Discharge rate Q} = (9.9 \text{ ac ft}) / (120\text{hr}) = 0.99 \text{ cfs}$$

Design discharge

Flow rate $Q = 0.99 \text{ cfs}$

Head water $H = 0.5 \text{ ft}$

Coefficient $C = 3.1$

Contraction 1

Use FlowMaster

Maximum Crest length $L = 0.95 \text{ ft}$

Worksheet for pond 2 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	0.99	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	0.95	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.48	ft ²
Velocity	2.08	ft/s
Wetted Perimeter	1.95	ft
Top Width	0.95	ft

STORMWATER DETENTION POND #3
CALCULATIONS

Pre-construction peak flow -stormwater detention pond #3 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Parking area
Method	SCS Curve No
Area (MI2)	0.0281
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	6
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

Result

25 year, 24 hour peak Storm runoff Q 69.1 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Pond #3

Jul 14 16:12:07 CDT 2014

Parking area



Project: Duke Preconstruction Flow Simulation Run: parking area

Start of Run: 10May2014, 10:10 Basin Model: Pond #3
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 14Jul2014, 16:13:27 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Parking area	0.0281	69.1	10May2014, 22:10	4.0

Stormwater detention pond #3 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Parking area and road	Pond area
Method	SCS Curve No	
Area (MI ²)	0.02092	0.00625
Initial Loss (IN)	0.04	0.04
% Impervious	100	100
SCS Curve No.	98	98
SCS Lag (MIN)	9	1
Baseflow	No	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour Peak Storm Runoff Q125.4 cfs



HEC-HMS

Project : Post construction pond #3

Basin Model : Parking area

Jul 15 08:46:07 CDT 2014

Parking area



Pond 3 area



Pond 3

Project: Duke wet ponds Simulation Run: pond 3 peak inflow

Start of Run: 10May2014, 10:00 Basin Model: Pond 3 design

End of Run: 11May2014, 10:11 Meteorologic Model: 25 yr

Compute Time: 21Sep2014, 12:54:05 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
parking	0.02092	112.5	10May2014, 22:04	9.7
pond 3 area	0.00625	50.1	10May2014, 21:53	2.9
pond 3	0.02717	125.4	10May2014, 22:00	12.6

Stormwater detention pond #3 discharge system design

Stormwater detention pond #3 is wet detention pond

The contributing area for detention pond #3 A = 13.4 acres

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$V_t = (13.4\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 1.115\text{ac-ft}$$

- 2 Calculate permanent wet pool volume

$$V_r = (A) (C) (P) (R) (1\text{ft}/12\text{in})$$

$$V_r = (13.4\text{ ac}) \times (0.85) \times (31.04\text{in}/122\text{day}) \times (14\text{day}) \times (1/12) = 3.38\text{ac-ft}$$

The min. treatment volume of 0.667 inch of runoff of contributing area

$$V_{\min} = (13.4\text{ac}) (0.667) (1/12) = 0.739\text{ ac-ft}$$

$$V_r > V_{\min}$$

Use treatment volume $V = 3.38\text{ ac-ft}$

So, the total wet detention system design pool volume

$$V = 1.115\text{ac-ft} + 3.38\text{ac-ft} = 4.495\text{ ac-ft} \quad 1.57$$

- 3 Calculate min. wet pool area

Based on 0.5" of runoff

$$V = (13.4\text{ac}) \times (0.5\text{in}) \times (1\text{ft}/12\text{in}) = 0.558\text{ac-ft}$$

Max head on V-notch is 10"

$$A_s = (0.558\text{ ac-ft}) / (10") (1/12) = 0.67\text{ ac}$$

Based on design pool volume $V = 4.495\text{ac-ft}$ and max pond depth 2ft based on existing surface elevation)

$$4.495\text{ac-ft} = (2\text{ft}) A_s$$

$$\text{Min wet pool area } A_s = 2.247\text{ ac}$$

- 4 Sizing discharge V-notch to discharge 0.5" of detention runoff from the contributing area in 24 hours with 10" maximum head

First 0.5" runoff $V = 0.558\text{ ac-ft}$

24hr treatment

$$Q = 0.281\text{ cfs, use 8" head}$$

From Flowmaster

Design discharge $Q = 0.281\text{ cfs}$

Head water $H = 0.67\text{ ft}$

Coefficient $C = 0.600$

V-notch angle 33.18 degree

Design V-notch 33 degree

- 5 Sizing discharge weir.

From HEC- hms calculation result, total detention volume $V = 12.6\text{ ac-ft}$

Discharge detention volume in 120 hours

$$Q = (12.6\text{ ac-ft}) / (120\text{hr}) = 1.27\text{ cfs}$$

Design discharge $Q = 1.27\text{ cfs}$

Head water $H = 0.5\text{ ft}$

Coefficient $C = 3.100$

Contraction 1.000

Use FlowMaster

Maximum Crest length $L = 1.210\text{ ft}$

Worksheet for pond 3 V-Notch Weir

Project Description

Solve For Notch Angle

Input Data

Discharge	0.28	ft ³ /s
Headwater Elevation	0.67	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Coefficient of Discharge	0.60	

Results

Angle	33.18	degrees
Headwater Height Above Crest	0.67	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.13	ft ²
Velocity	2.10	ft/s
Wetted Perimeter	1.40	ft
Top Width	0.40	ft

Worksheet for pond 3 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	1.27	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	1.21	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.60	ft ²
Velocity	2.10	ft/s
Wetted Perimeter	2.21	ft
Top Width	1.21	ft

STORMWATER DETENTION POND #4
CALCULATIONS

Pre-construction peak flow -stormwater detention pond #4 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Substation North west area
Method	SCS Curve No
Area (MI2)	0.0578
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	16
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

Result

25 year, 24 hour peak Storm runoff Q 90.8 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Pond #4

Jul 14 15:51:49 CDT 2014

Substation area



Project: Duke Preconstruction Flow Simulation Run: Substation

Start of Run: 10May2014, 10:10 Basin Model: Pond #4
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 14Jul2014, 15:54:24 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Substation area	0.0578	90.8	10May2014, 22:20	8.2

Stormwater detention pond #4 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Substation North West	Pond
Method	SCS Curve No	
Area (MI ²)	0.0294	0.0139
Initial Loss (IN)	0.5	0.04
% Impervious	30	100
SCS Curve No.	80	98
SCS Lag (MIN)	9	1
Baseflow	No	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour Peak Storm Runoff 176.2 cfs



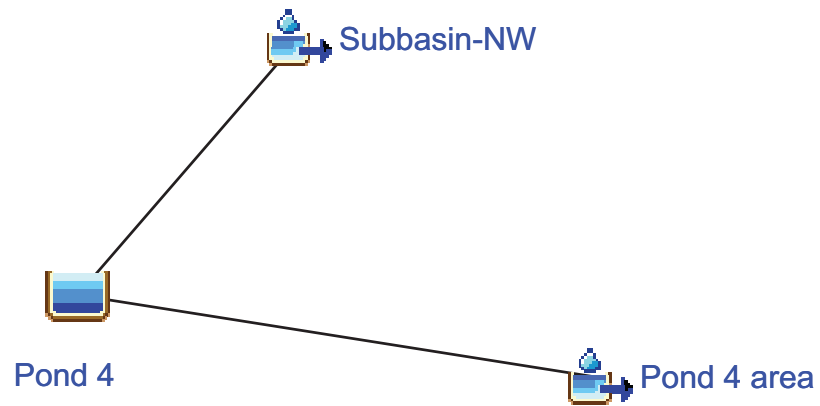


HEC-HMS

Project : Post construction pond #4

Basin Model : Substation

Jul 15 08:26:36 CDT 2014



Project: Duke wet ponds Simulation Run: pond 4 peak flow

Start of Run: 10May2014, 10:00 Basin Model: Pond 4 design

End of Run: 11May2014, 10:11 Meteorologic Model: 25 yr

Compute Time: 21Sep2014, 12:59:56 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Substation NW	0.0294	137.2	10May2014, 22:07	12.9
Pond 4 area	0.0139	111.4	10May2014, 21:53	6.4
Pond 4	0.0433	176.2	10May2014, 21:55	19.3

Stormwater detention pond #4 discharge system design

Stormwater detention pond #4 is wet detention pond
The contributing area for detention pond #4 $A = 19.2$ acres

- 1 Calculate required treatment volume as 1" of runoff of contributing area
 $V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$
 $V_t = (19.2\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 1.59\text{ac-ft}$
- 2 Calculate permanent wet pool volume
 $V_r = (A) (C) (P) (R) (1\text{ft}/12\text{in})$
 $V_r = (19.2\text{ ac}) \times (0.85) \times (31.04\text{in}/122\text{day}) \times (14\text{day}) \times (1/12) = 4.84\text{ac-ft}$
The min. treatment volume of 0.667 inch of runoff of contributing area
 $V_{\min} = (19.2\text{ac}) (0.667) (1/12) = 1.07\text{ac-ft}$
 $V_r > V_{\min}$
Use treatment volume $V = 4.84\text{ ac-ft}$
So, the total wet detention system design pool volume
 $V = 1.59\text{ac-ft} + 4.84\text{ac-ft} = 6.43\text{ ac-ft}$
- 3 Calculate min. wet pool area
Based on 0.5" of runoff
 $V = (19.2\text{ac}) \times (0.5\text{in}) \times (1\text{ft}/12\text{in}) = 0.8\text{ac-ft}$
Max head on V-notch is 10"
 $A_s = (0.8\text{ ac-ft}) / (10") (1/12) = 0.96\text{ ac}$
Based on design pool volume $V = 6.43\text{ac-ft}$ and max pond depth 2.0 ft (based on existing surface elevation)
 $6.43\text{ac-ft} = 2\text{ ft } A_s$
Min wet pool area $A_s = 3.215\text{ac}$
- 4 Sizing discharge V-notch to discharge 0.5" of detention runoff from the contributing area in 24 hours with 10" maximum head
First 0.5" runoff $V = 0.8\text{ ac-ft}$
24hr treatment
 $Q = 0.4\text{ cfs}$
From Flowmaster

Design discharge	$Q =$	0.4	cfs
Head water	$H =$	0.667	ft
Coefficient	$C =$	0.600	
V-notch angle		46.43	degree
Design V-notch 46 degree			

- 5 Sizing discharge weir.
From HEC- hms calculation result, total detention volume $V = 19.3\text{ ac-ft}$
Discharge detention volume in 120 hours
 $Q = (19.3\text{ ac-ft}) / (120\text{hr}) = 1.95\text{ cfs}$

Design discharge	$Q =$	1.95	cfs
Head water	$H =$	0.5	ft
Coefficient	$C =$	3.100	
Contraction		1.000	
Use FlowMaster			
Maximum Crest length	$L =$	1.830	ft

Worksheet for pond 4 V-Notch Weir

Project Description

Solve For Notch Angle

Input Data

Discharge	0.40	ft ³ /s
Headwater Elevation	0.67	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Coefficient of Discharge	0.60	

Results

Angle	46.43	degrees
Headwater Height Above Crest	0.67	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.19	ft ²
Velocity	2.10	ft/s
Wetted Perimeter	1.45	ft
Top Width	0.57	ft

Worksheet for Pond 4 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	1.95	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	1.83	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.91	ft ²
Velocity	2.13	ft/s
Wetted Perimeter	2.83	ft
Top Width	1.83	ft

**STORMWATER DETENTION POND #5
CALCULATIONS**

Pre-construction peak flow -stormwater detention pond #5 area

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Pond 5 area
Method	SCS Curve No
Area (MI2)	0.02343
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	6
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

Result

25 year, 24 hour peak Storm runoff Q 57.6 cfs



HEC-HMS

Project : Duke Preconstruction Flow

Basin Model : Pond #5

Jul 14 16:06:18 CDT 2014

Gas yard area



Project: Duke Preconstruction Flow Simulation Run: Gas yard area

Start of Run: 10May2014, 10:10 Basin Model: Pond #5

End of Run: 11May2014, 10:11 Meteorologic Model: 25 year

Compute Time: 14Jul2014, 16:08:35 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Gas yard area	0.02343	57.6	10May2014, 22:10	3.4

Stormwater detention pond #5 sizing with 25yr, 24hr storm

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Substation South Eest	Gas Yard	Pond
Method	SCS Curve No		
Area (MI2)	0.00781	0.0039	0.00309
Initial Loss (IN)	0.5	0.5	0.04
% Impervious	3	5	100
SCS Curve No.	80	80	98
SCS Lag (MIN)	9	9	1
Baseflow	No	No	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour Peak Storm runoff Q 79.6 cfs



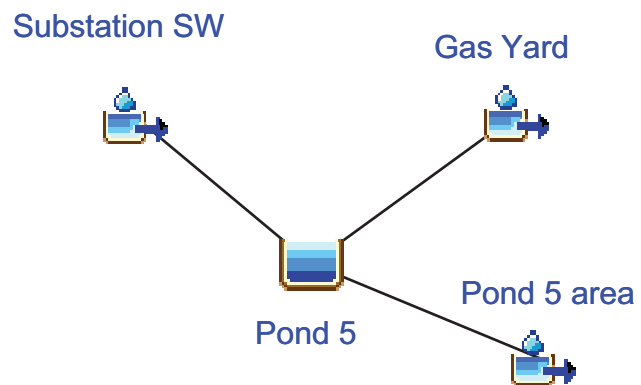


HEC-HMS

Project : Post construction Pond #5

Basin Model : Gas yard

Jul 14 18:10:59 CDT 2014



Project: Duke wet ponds Simulation Run: pond 5 peak flow

Start of Run: 10May2014, 10:00 Basin Model: Pond 5 design

End of Run: 11May2014, 10:11 Meteorologic Model: 25 yr

Compute Time: 21Sep2014, 13:10:26 Control Specifications: 24 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Substation SE	0.007812	45.7	10May2014, 22:02	3.4
Gas yard	0.003900	22.8	10May2014, 22:02	1.7
Pond area	0.003090	24.8	10May2014, 21:53	1.4
Pond 5	0.014802	79.6	10May2014, 21:59	6.6

Stormwater detention pond #5 discharge system design

Stormwater detention pond #5 is wet detention pond

The contributing area for detention pond #5 $A = 7.5$ acres

- 1 Calculate required treatment volume as 1" of runoff of contributing area

$$V_t = A \times (1\text{in}) \times (1\text{ft}/12\text{in})$$

$$V_t = (7.5\text{ac}) \times (1\text{in}) \times (1\text{ft}/12\text{in}) = 0.625\text{ac-ft}$$

- 2 Calculate permanent wet pool volume

$$V_r = (A) (C) (P) (R) (1\text{ft}/12\text{in})$$

$$V_r = (7.5\text{ac}) \times (0.85) \times (31.04\text{in}/122\text{day}) \times (14\text{day}) \times (1/12) = 1.89\text{ac-ft}$$

The min treatment volume of 0.667 inch of runoff of contributing area

$$V_{\min} = (7.5\text{ac}) (0.667) (1/12) = 0.417\text{ac-ft}$$

$$V_r > V_{\min}$$

Use treatment volume $V = 1.89$ ac-ft

So, the total wet detention system design pool volume

$$V = 0.625\text{ac-ft} + 1.89\text{ac-ft} = 2.515\text{ac-ft}$$

- 3 Calculate min. wet pool area

Based on 0.5" of runoff

$$V = (7.5\text{ac}) \times (0.5\text{in}) \times (1\text{ft}/12\text{in}) = 0.3125\text{ac-ft}$$

Max head on V-notch is 10"

$$A_s = (0.3125\text{ac-ft}) / (10\text{in}) (1/12) = 0.375\text{ac}$$

Based on design pool volume $V = 2.515\text{ac-ft}$ and max pond depth 2ft

$$2.515\text{ac-ft} = 2.0\text{ft } A_s$$

$$\text{Min wet pool area } A_s = 1.2575\text{ac}$$

- 4 Sizing discharge V-notch to discharge 0.5" of detention runoff from the contributing area in 24 hours with 10" maximum head

$$\text{First 0.5" runoff } V = 0.3125\text{ac-ft}$$

24hr treatment

$$Q = 0.1575\text{cfs, Use 8" head}$$

From Flowmaster

Design discharge	Q=	0.1575	cfs
Head water	H=	0.5	ft
Coefficient	C=	0.600	
V-notch angle		38.280	degree
Design V-notch 38 degree			

- 5 Sizing discharge weir.

From HEC- hms calculation result, total detention volume $V = 6.7$ ac-ft

Discharge detention volume in 120 hours

$$Q = (6.7\text{ac-ft}) / (120\text{hr}) = 0.68\text{cfs}$$

Design discharge	Q=	0.68	cfs
Head water	H=	0.5	ft
Coefficient	C=	3.100	
Contraction		1.000	
Use FlowMaster			
Maximum Crest length	L=	0.670	ft

Worksheet for Pond 5 V-Notch Weir

Project Description

Solve For Notch Angle

Input Data

Discharge	0.16	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Coefficient of Discharge	0.60	

Results

Angle	38.28	degrees
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.09	ft ²
Velocity	1.82	ft/s
Wetted Perimeter	1.06	ft
Top Width	0.35	ft

Worksheet for Pond 5 Rectangular Weir

Project Description

Solve For Crest Length

Input Data

Discharge	0.68	ft ³ /s
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.10	US
Number Of Contractions	1	

Results

Crest Length	0.67	ft
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.34	ft ²
Velocity	2.03	ft/s
Wetted Perimeter	1.67	ft
Top Width	0.67	ft

APPENDIX C

PRE AND POST-CONSTRUCTION SITE DRAINAGE PLANS

AEKM

NAME	DISCIPLINE	LICENSE_NO
ALLEN, JAMES	MECHANICAL	12345
BROWN, SARAH	ELECTRICAL	67890
CHEN, DAVID	PLUMBING	11111
DAVIS, LUCAS	WELDING	22222
EVANS, EMILY	PAINTING	33333
FERREIRA, CARLOS	ROOFING	44444
GARCIA, ANA	LANDSCAPE	55555
HARRIS, MICHAEL	CONCRETE	66666
HILL, JESSICA	INSULATION	77777
JACKSON, ROBERT	WATERWORKS	88888
JONES, OLIVIA	HVAC	99999
KIM, JENNIFER	GLASS	10101
KOONIN, ANDREW	IRONWORK	12121
LI, MICHAEL	STEELWORK	13131
LONG, CHRISTOPHER	BRICKWORK	14141
MA, JASON	CONCRETE	15151
MARTIN, ALEXANDER	PAINTING	16161
MARTINEZ, LUCAS	WELDING	17171
MCCOY, JESSICA	PLUMBING	18181
MILLER, DAVID	ELECTRICAL	19191
MORRIS, EMILY	MECHANICAL	20202
MURPHY, ROBERT	LANDSCAPE	21212
NEAL, SARAH	CONCRETE	22222
NEEDHAM, MICHAEL	PAINTING	23232
OLIVER, JESSICA	WELDING	24242
ORTEGA, CARLOS	PLUMBING	25252
PARKER, ANA	ELECTRICAL	26262
PATE, LUCAS	MECHANICAL	27272
PEREZ, EMILY	LANDSCAPE	28282
PHILLIPS, ROBERT	CONCRETE	29292
POPE, SARAH	PAINTING	30303
REED, MICHAEL	WELDING	31313
REYES, JESSICA	PLUMBING	32323
RHODES, DAVID	ELECTRICAL	33333
RILEY, EMILY	MECHANICAL	34343
ROBERTS, ROBERT	LANDSCAPE	35353
RODRIGUEZ, SARAH	CONCRETE	36363
ROSE, MICHAEL	PAINTING	37373
ROTH, JESSICA	WELDING	38383
SANCHEZ, CARLOS	PLUMBING	39393
SCHMIDT, ANA	ELECTRICAL	40404
SEAN, LUCAS	MECHANICAL	41414
SEAR, EMILY	LANDSCAPE	42424
SEBASTIAN, ROBERT	CONCRETE	43434
SEYMOUR, SARAH	PAINTING	44444
SHAW, MICHAEL	WELDING	45454
SHAW, JESSICA	PLUMBING	46464
SHAW, DAVID	ELECTRICAL	47474
SHAW, EMILY	MECHANICAL	48484
SHAW, ROBERT	LANDSCAPE	49494
SHAW, SARAH	CONCRETE	50505
SHAW, MICHAEL	PAINTING	51515
SHAW, JESSICA	WELDING	52525
SHAW, CARLOS	PLUMBING	53535
SHAW, ANA	ELECTRICAL	54545
SHAW, LUCAS	MECHANICAL	55555
SHAW, EMILY	LANDSCAPE	56565
SHAW, ROBERT	CONCRETE	57575
SHAW, SARAH	PAINTING	58585
SHAW, MICHAEL	WELDING	59595
SHAW, JESSICA	PLUMBING	60606
SHAW, DAVID	ELECTRICAL	61616
SHAW, EMILY	MECHANICAL	62626
SHAW, ROBERT	LANDSCAPE	63636
SHAW, SARAH	CONCRETE	64646
SHAW, MICHAEL	PAINTING	65656
SHAW, JESSICA	WELDING	66666
SHAW, CARLOS	PLUMBING	67676
SHAW, ANA	ELECTRICAL	68686
SHAW, LUCAS	MECHANICAL	69696
SHAW, EMILY	LANDSCAPE	70707
SHAW, ROBERT	CONCRETE	71717
SHAW, SARAH	PAINTING	72727
SHAW, MICHAEL	WELDING	73737
SHAW, JESSICA	PLUMBING	74747
SHAW, DAVID	ELECTRICAL	75757
SHAW, EMILY	MECHANICAL	76767
SHAW, ROBERT	LANDSCAPE	77777
SHAW, SARAH	CONCRETE	78787
SHAW, MICHAEL	PAINTING	79797
SHAW, JESSICA	WELDING	80808
SHAW, CARLOS	PLUMBING	81818
SHAW, ANA	ELECTRICAL	82828
SHAW, LUCAS	MECHANICAL	83838
SHAW, EMILY	LANDSCAPE	84848
SHAW, ROBERT	CONCRETE	85858
SHAW, SARAH	PAINTING	86868
SHAW, MICHAEL	WELDING	87878
SHAW, JESSICA	PLUMBING	88888
SHAW, DAVID	ELECTRICAL	89898
SHAW, EMILY	MECHANICAL	90909
SHAW, ROBERT	LANDSCAPE	91919
SHAW, SARAH	CONCRETE	92929
SHAW, MICHAEL	PAINTING	93939
SHAW, JESSICA	WELDING	94949
SHAW, CARLOS	PLUMBING	95959
SHAW, ANA	ELECTRICAL	96969
SHAW, LUCAS	MECHANICAL	97979
SHAW, EMILY	LANDSCAPE	98989
SHAW, ROBERT	CONCRETE	99999

7/10/2014

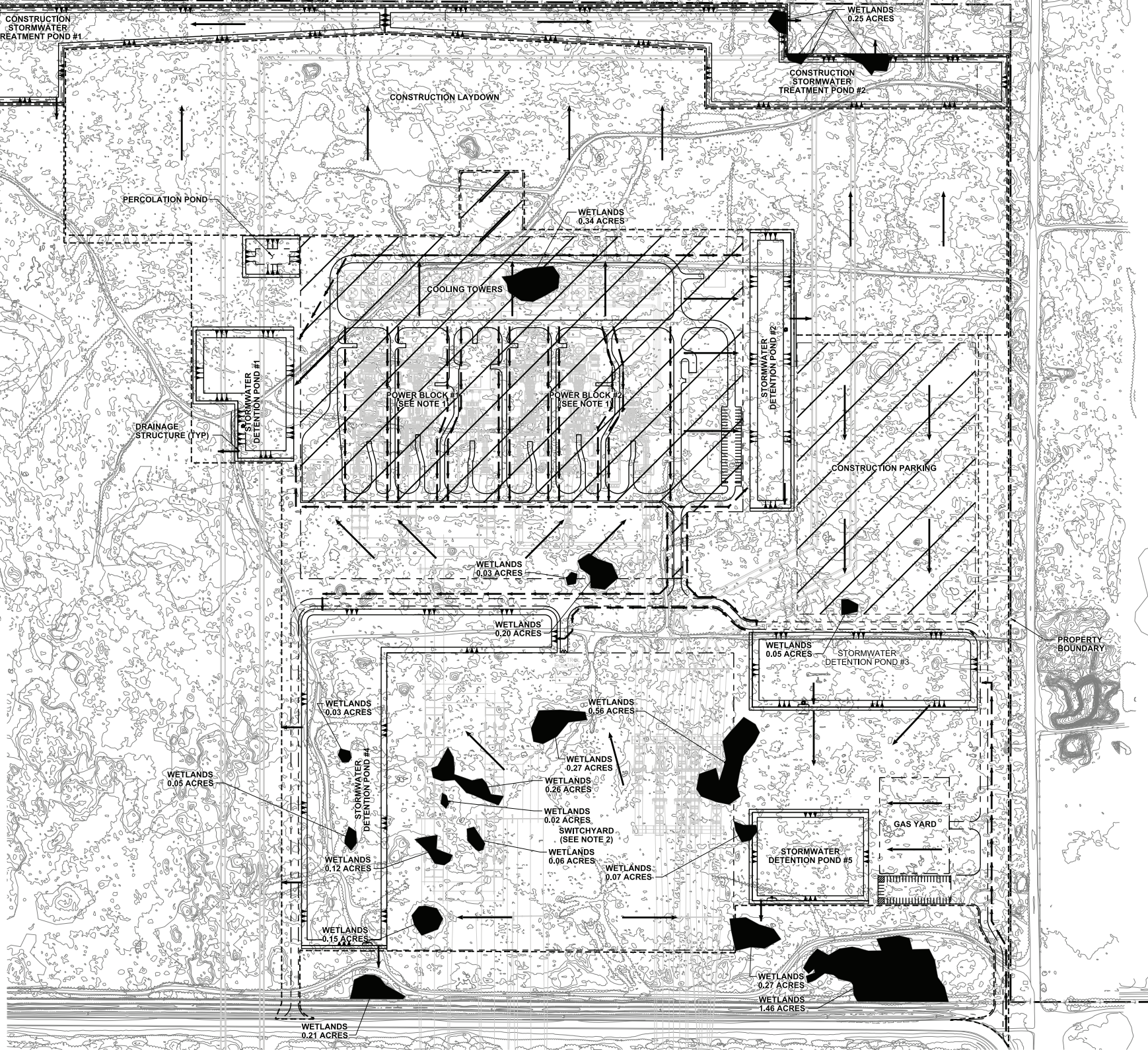
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Scale For Micromapping
Inches
Meters

- NOTES:
1. POWER BLOCK AREA AT APPROXIMATELY 15' MSL.
 2. SWITCHYARD AREA AT APPROXIMATELY 9' MSL.

LEGEND

- POST-CONSTRUCTION AREA FLOW
- PATH FLOW
- DRAINAGE STRUCTURE
- IMPERVIOUS AREA
- NON-IMPERVIOUS AREA
- STORMWATER POND
- LIMITS OF DISTURBANCE
- IMPACTED WETLANDS



**PRELIMINARY - NOT
FOR CONSTRUCTION
SUBJECT TO CHANGE**

no.	date	by	ckd	description
A	04/02/14	BL		ISSUED FOR REVIEW
B	05/07/14	BL		ISSUED FOR OWNER REVIEW
C	06/04/14	BL		ISSUED FOR OWNER REVIEW
D	06/16/14	BL		ISSUED FOR OWNER REVIEW
E	06/30/14	BL		ISSUED FOR OWNER REVIEW
F	07/01/14	BL		ISSUED FOR OWNER REVIEW
G	07/10/14	BL		ISSUED FOR OWNER REVIEW



Burns & McDonnell
SINCE 1898
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

date: APRIL 1, 2014
designed: B. LIU
checked: C. ALTES



CITRUS COUNTY, FLORIDA
CITRUS COUNTY COMBINED CYCLE
SITE DRAINAGE PLAN

project	71404	contract	
drawing	CS308	rev.	- G
sheet	of	sheets	
NAME	DISCIPLINE	LICENSE_NO	

9/25/2014

APPENDIX D

PRE AND POST-CONSTRUCTION WHOLE SITE PEAK FLOW

Pre-construction Site Peak Flow

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input Whole Site

Method	SCS Curve No
Area (MI ²)	0.2765
Initial Loss (IN)	2
% Impervious	0
SCS Curve No.	50
SCS Lag (MIN)	19
Baseflow	No

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak flow Q 425.8 cfs

Pre construction whole site peak flow does not reflect actual site condition.



HEC-HMS

Project : Duke Site

Basin Model : Basin 1

Jul 09 08:49:40 CDT 2014

pre construction site



Project: Duke Site Simulation Run: Run 1

Start of Run: 10May2014, 10:10

Basin Model:

Basin 1

End of Run: 11May2014, 10:11

Meteorologic Model: 25 year

Compute Time: DATA CHANGED, RECOMPUTED Control Specifications: 24 hour

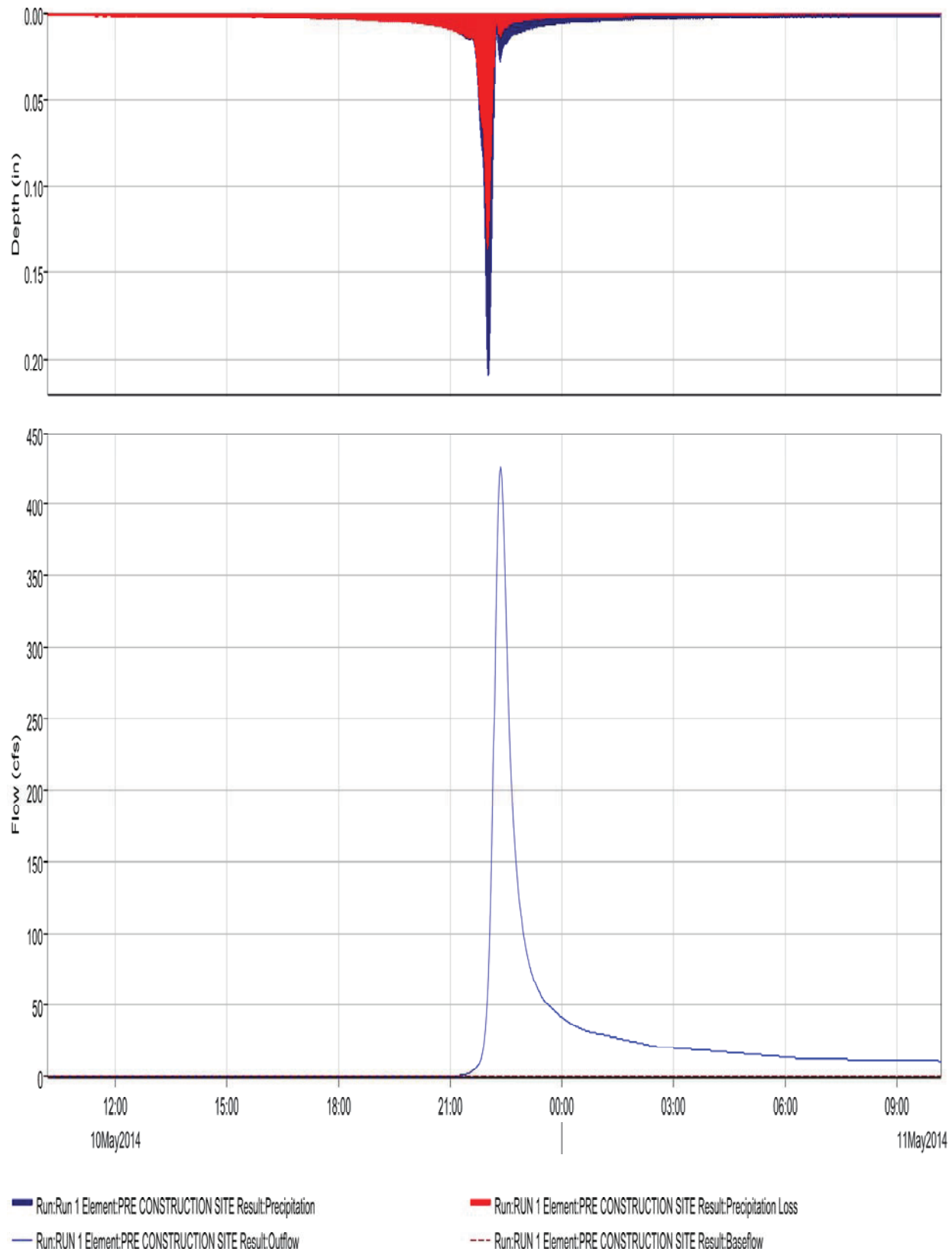
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
pre construction site	0.2765	425.8	10May2014, 22:21	40.2

Project: Duke Site
Simulation Run: Run 1 Subbasin: pre construction site
Start of Run: 10May2014, 10:10 Basin Model: Basin 1
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 08Jul2014, 16:03:58 Control Specifications: 24 hour
Volume Units: AC-FT

Computed Results

Peak Discharge :	425.8 (CFS)	Date/Time of Peak Discharge :	10May2014, 22:21
Total Precipitation :	128.3 (AC-FT)	Total Direct Runoff :	40.2 (AC-FT)
Total Loss :	87.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	40.5 (AC-FT)	Discharge :	40.2 (AC-FT)

Subbasin "pre construction site" Results for Run "Run 1"



Post-construction Site Peak Flow

HEC-HMS Basin Model Input

HEC-HMS Subbasin Input	Impervious Area	Crushed Rock	Seeding		
Method	SCS Curve No				
Area (MI2)	0.06093	0.1406	0.07656		
Initial Loss (IN)	0.04	0.5	2		
% Impervious	100	80	0		
SCS Curve No.	98	80	50	75.7	(weighted CN)
SCS Lag (MIN)	9	10	16		
Baseflow	No	No	No		

HEC-HMS Meteorologic Model Input

Method	SCS Hypothetical Storm
Storm Distribution	Type II
Storm Depth (IN)	8.7

HEC-HMS Control Specification Input

Run Time (HR)	24
---------------	----

HEC-HMS Results

25 year, 24 hour peak flow Q 1244.7 cfs

Post construction whole site peak flow does not reflect actual site condition and each pond drainage design.

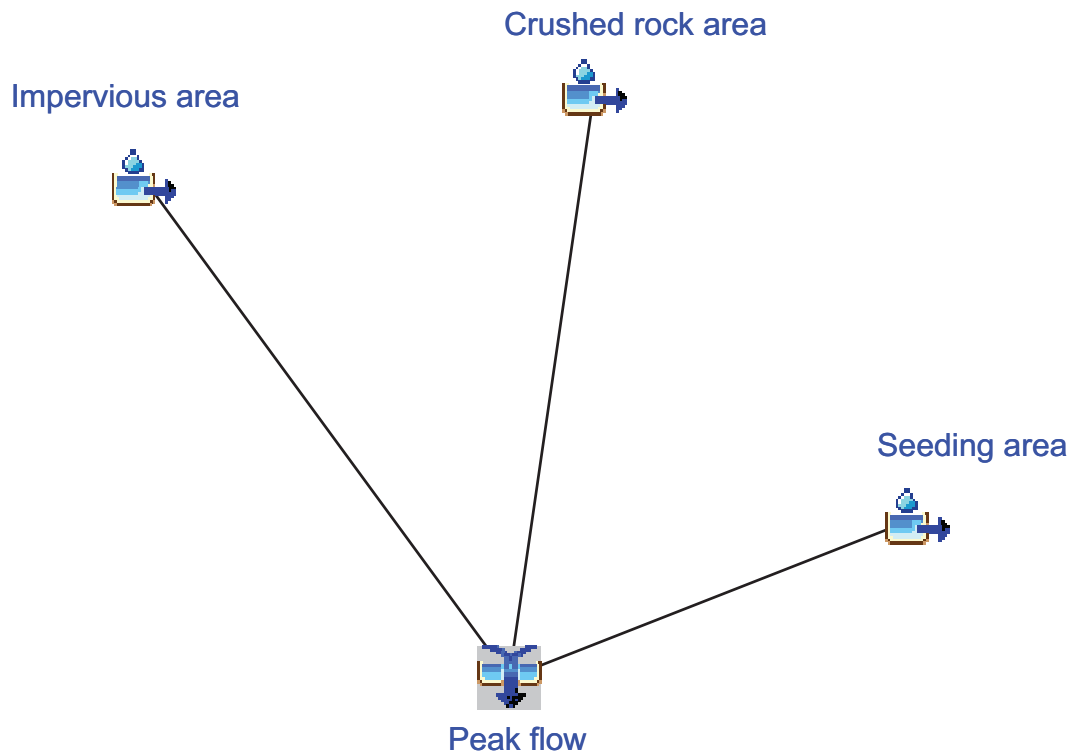


HEC-HMS

Project : Duke Site

Basin Model : Post construction

Jul 15 18:43:26 CDT 2014



Project: Duke Site Simulation Run: Post construction

Start of Run: 10May2014, 10:10 Basin Model: Post construction

End of Run: 11May2014, 10:11 Meteorologic Model: 25 year

Compute Time: 15Jul2014, 18:32:45 Control Specifications: 24 hour

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Crushed rock area	0.14060	790.2	10May2014, 22:13	61.5
Seeding area	0.07656	120.2	10May2014, 22:20	10.9
Impervious area	0.06093	367.6	10May2014, 22:12	28.2
Peak flow	0.27809	1244.7	10May2014, 22:13	100.6

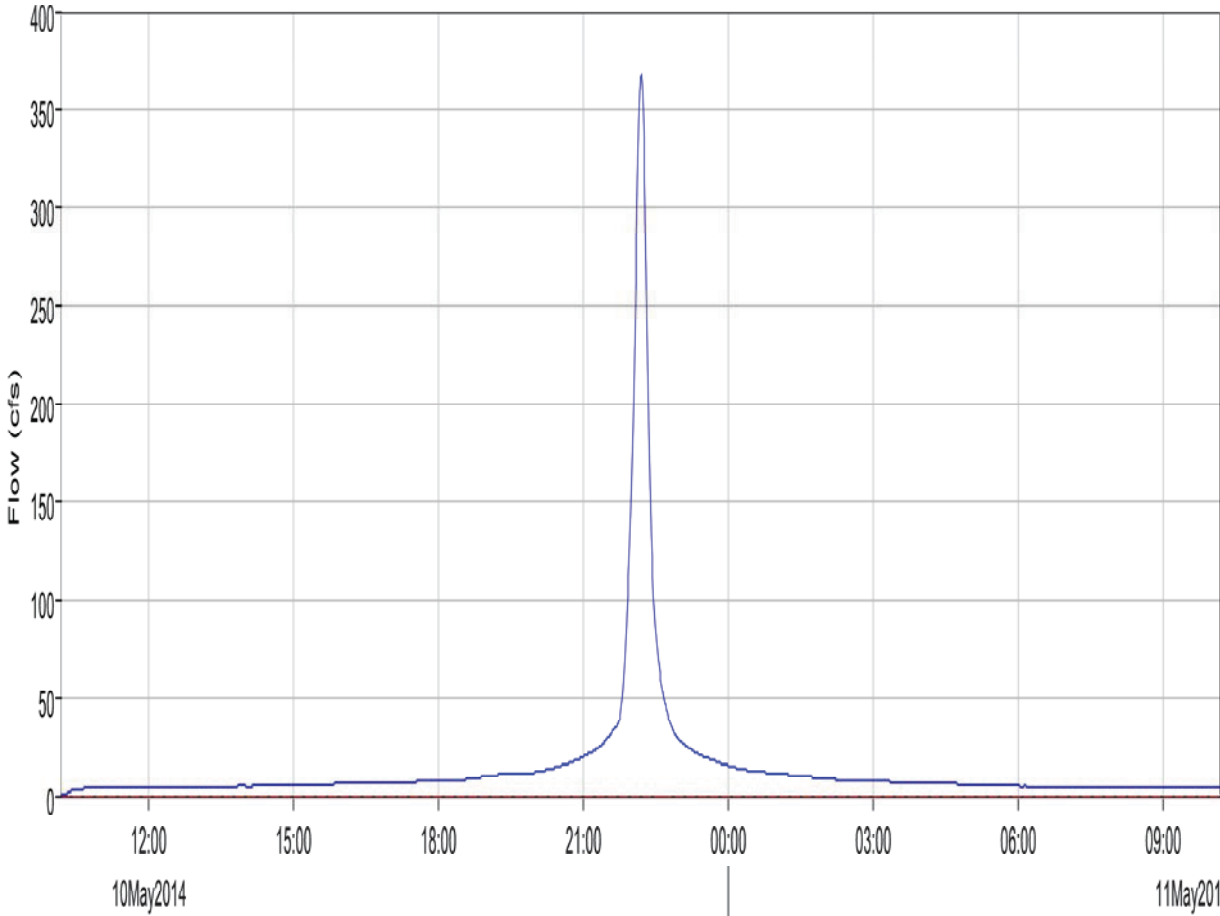
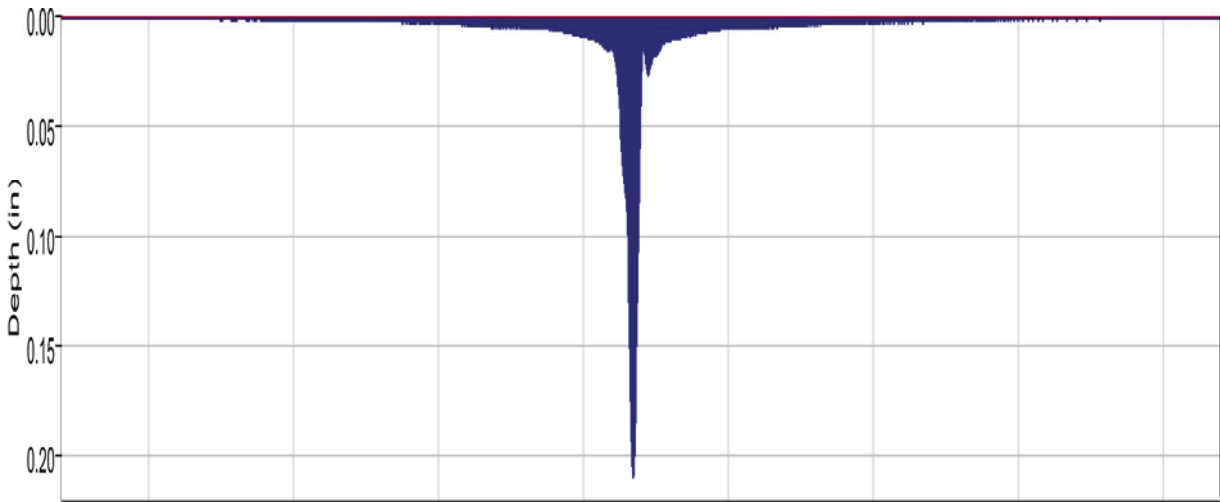
Project: Duke Site
Simulation Run: Post construction Subbasin: Impervious area
Start of Run: 10May2014, 10:10 Basin Model: Post construction
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 15Jul2014, 18:32:45 Control Specifications: 24 hour

Volume Units: AC-FT

Computed Results

Peak Discharge :	367.6 (CFS)	Date/Time of Peak Discharge :	10May2014, 22:12
Total Precipitation :	28.3 (AC-FT)	Total Direct Runoff :	28.2 (AC-FT)
Total Loss :	0.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	28.3 (AC-FT)	Discharge :	28.2 (AC-FT)

Subbasin "Impervious area" Results for Run "Run 3"



- Run:Run 3 Element:IMPERVIOUS AREA Result:Precipitation
- Run:Run 3 Element:IMPERVIOUS AREA Result:Precipitation Loss
- Run:Run 3 Element:IMPERVIOUS AREA Result:Outflow
- Run:Run 3 Element:IMPERVIOUS AREA Result:Baseflow

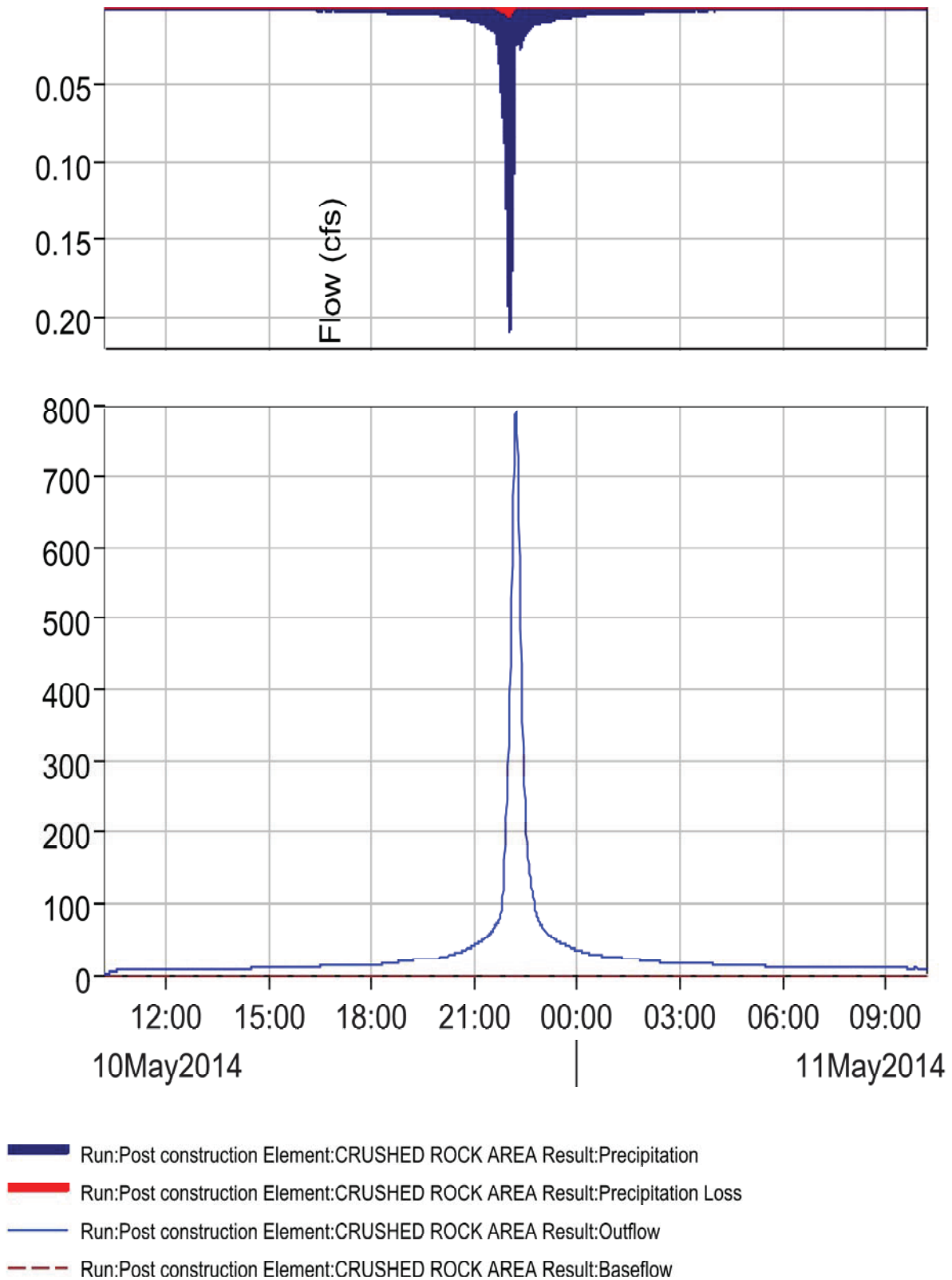
Project: Duke Site
Simulation Run: Post construction Subbasin: Crushed rock area
Start of Run: 10May2014, 10:10 Basin Model: Post construction
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 15Jul2014, 18:32:45 Control Specifications: 24 hour

Volume Units: AC-FT

Computed Results

Peak Discharge :	790.2 (CFS)	Date/Time of Peak Discharge :	10May2014, 22:13
Total Precipitation :	65.2 (AC-FT)	Total Direct Runoff :	61.5 (AC-FT)
Total Loss :	3.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	61.6 (AC-FT)	Discharge :	61.5 (AC-FT)

Subbasin "Crushed rock area" Results for Run "Post construction"



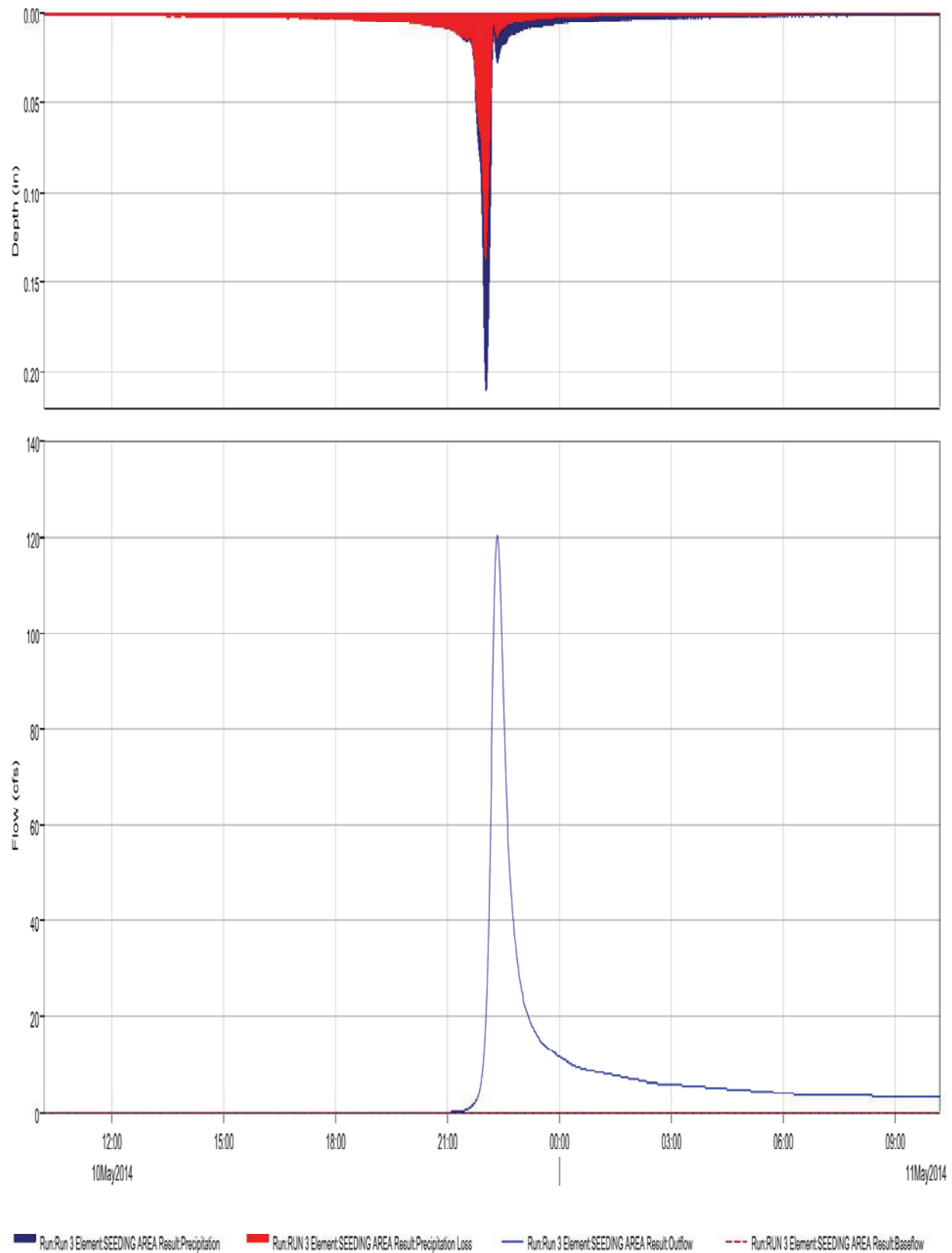
Project: Duke Site
Simulation Run: Post construction Subbasin: Seeding area
Start of Run: 10May2014, 10:10 Basin Model: Post construction
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 15Jul2014, 18:32:45 Control Specifications: 24 hour

Volume Units: AC-FT

Computed Results

Peak Discharge :	120.2 (CFS)	Date/Time of Peak Discharge :	10May2014, 22:20
Total Precipitation :	35.5 (AC-FT)	Total Direct Runoff :	10.9 (AC-FT)
Total Loss :	24.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	11.0 (AC-FT)	Discharge :	10.9 (AC-FT)

Subbasin "Seeding area" Results for Run "Run 3"

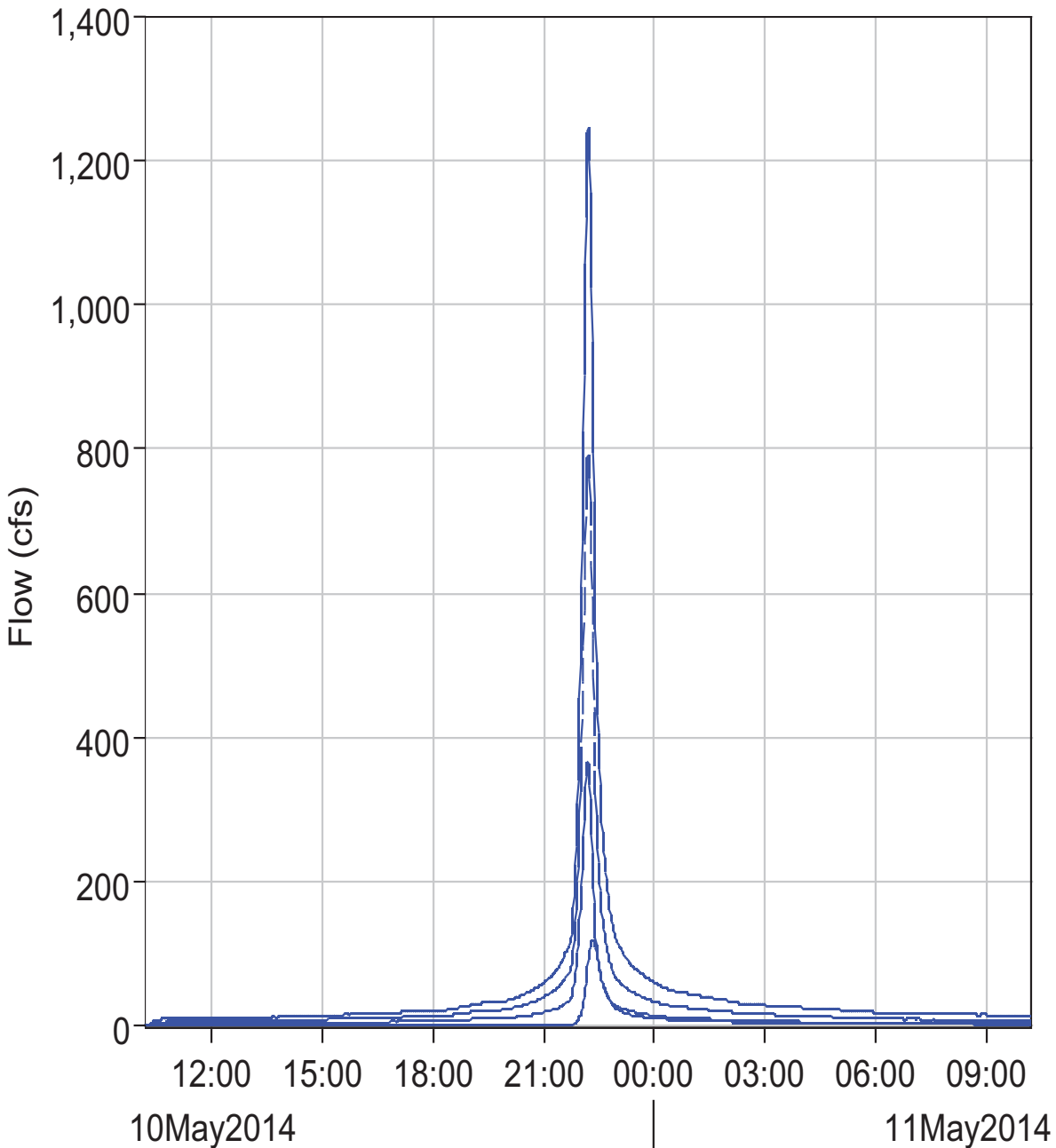


Project: Duke Site
Simulation Run: Post construction Junction: Peak flow
Start of Run: 10May2014, 10:10 Basin Model: Post construction
End of Run: 11May2014, 10:11 Meteorologic Model: 25 year
Compute Time: 15Jul2014, 18:32:45 Control Specifications: 24 hour
Volume Units: AC-FT

Computed Results

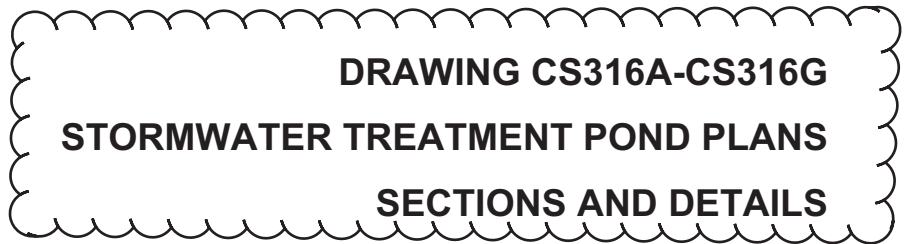
Peak Outflow :	1244.7 (CFS)	Date/Time of Peak Outflow :	10May2014, 22:13
Total Outflow :	100.6 (AC-FT)		

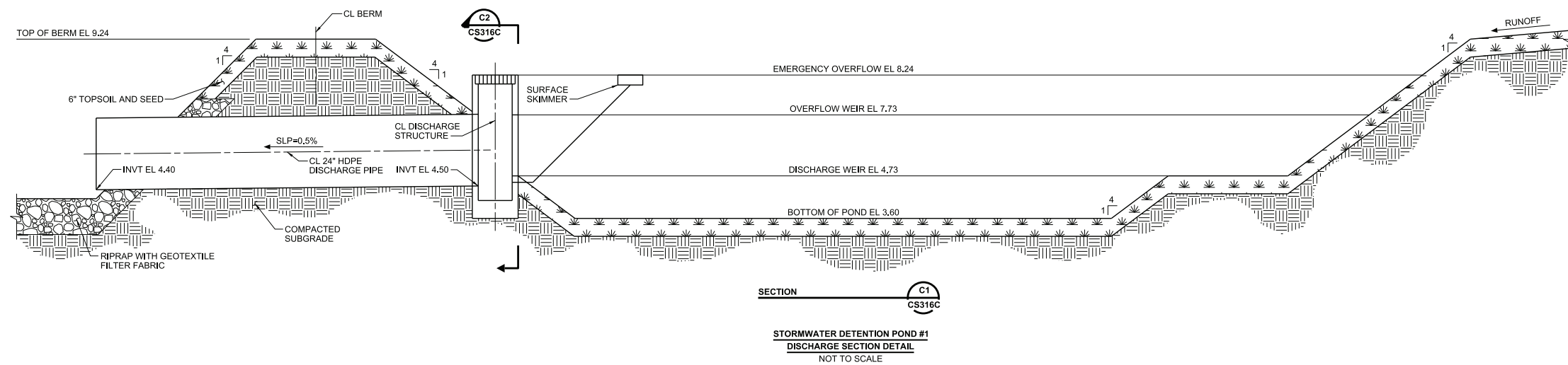
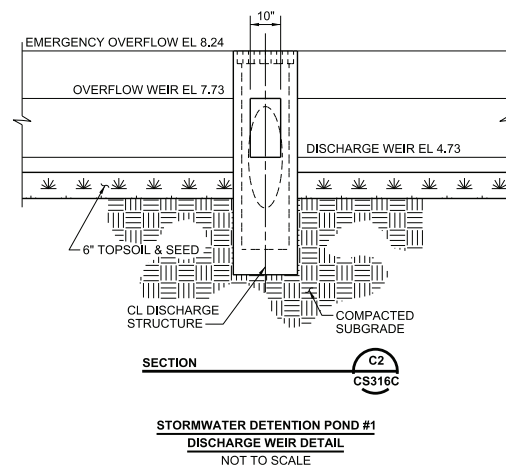
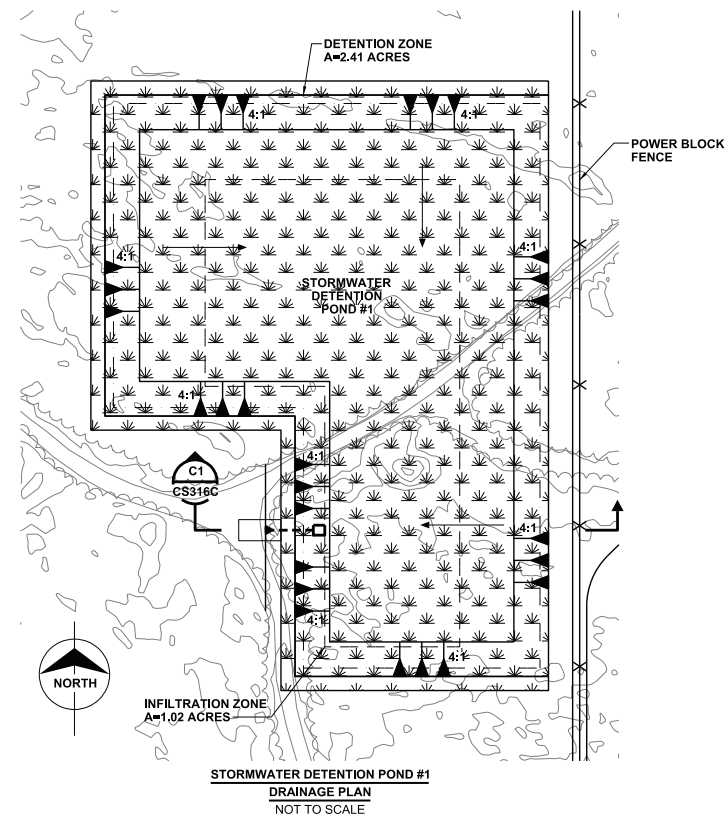
Junction "Peak flow" Results for Run "Post construction"



- Run:Post construction Element:PEAK FLOW Result:Outflow
- - - Run:Post construction Element:CRUSHED ROCK AREA Result:Outflow
- Run:Post construction Element:SEEDING AREA Result:Outflow
- . - . Run:Post construction Element:IMPERVIOUS AREA Result:Outflow

APPENDIX E





NOTES:

1. INSTALL BAFFLE WITH A SPACING OF 1/4 LENGTH OF POND. TO BE DETAIL DESIGN LATER.

**PRELIMINARY - NOT
FOR CONSTRUCTION**

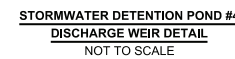
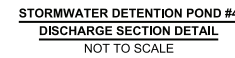
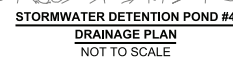
**Burns &
McDonnell**
SINCE 1898

9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400

date SEPTEMBER 18, 2014	detailed C. ALTES
designed R. OWENS	checked



CITRUS COUNTY COMBINED CYCLE STORMWATER DETENTION POND #1 PLAN, SECTIONS & DETAILS	
project	contract
71404	
drawing	rev.
CS316C	-A
sheet	sheets
file 71404CS316C.dgn	



NOTES:

1

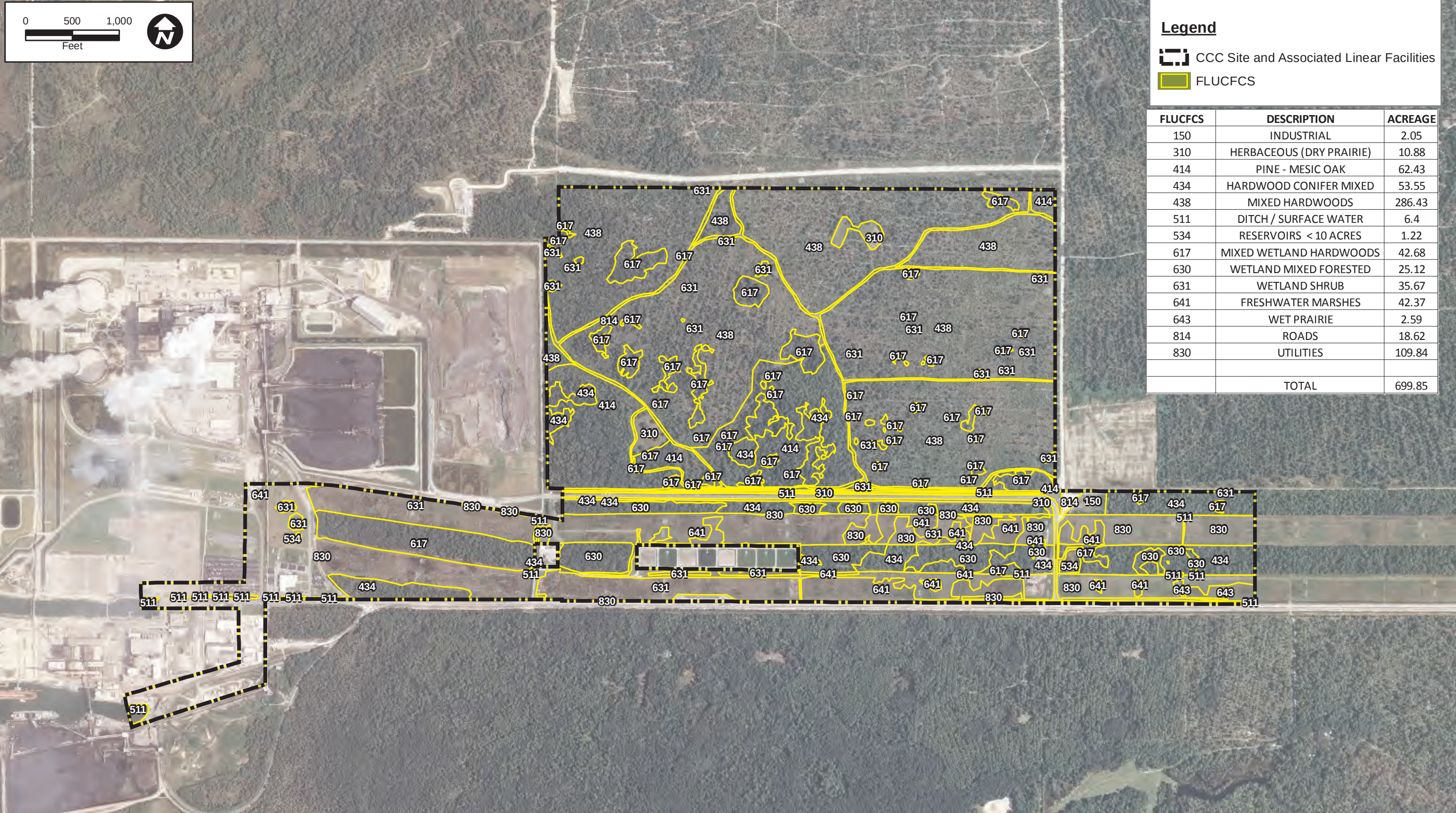
date SEPTEMBER 18, 2014	detailed C. ALTES
designed R. OWENS	checked



project	71404	contract	
drawing	CS316F		rev. -A
sheet	of	sheets	
file 71404CS316F.dgn			

**PRELIMINARY - NOT
FOR CONSTRUCTION**

Attachment C



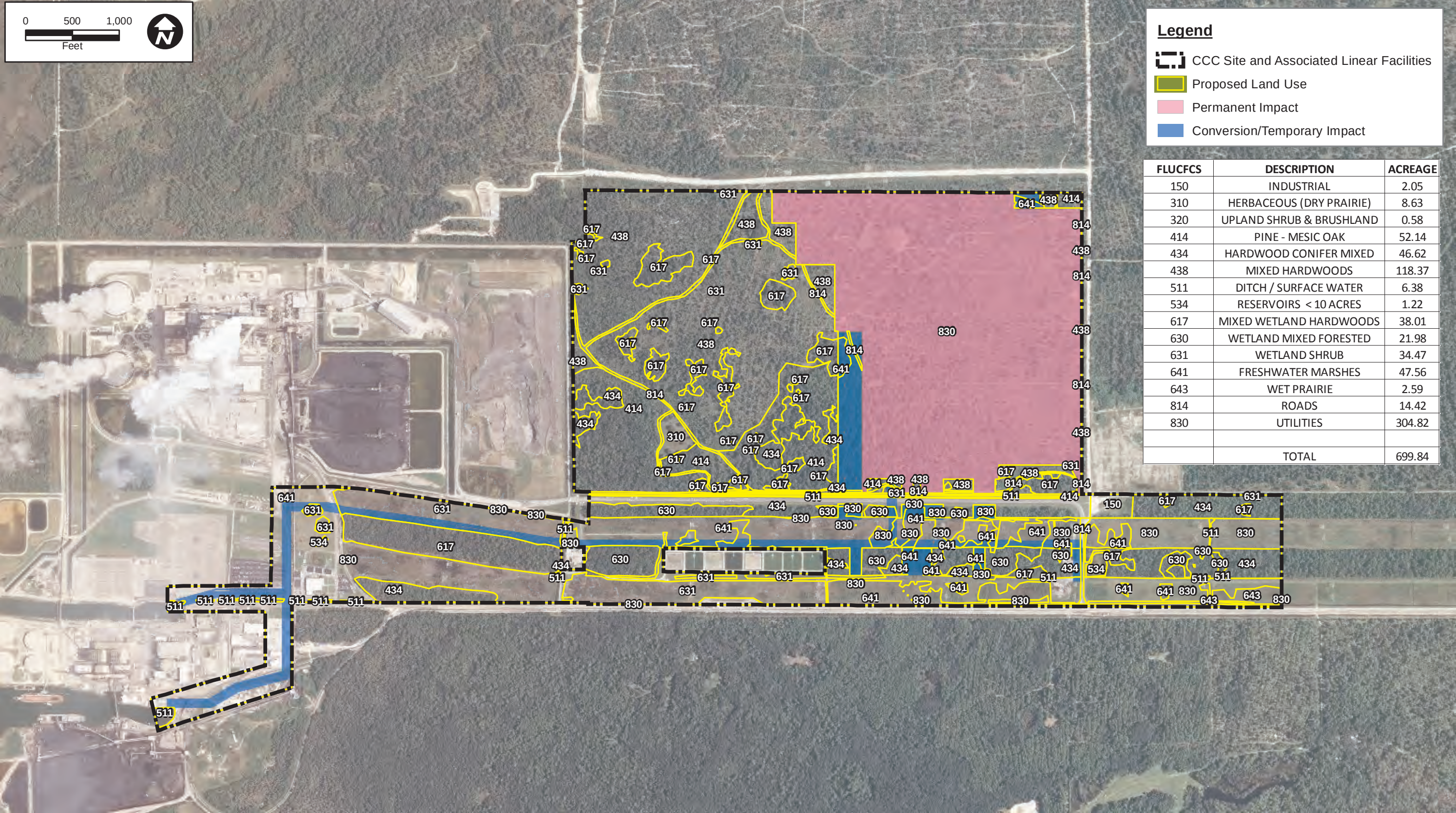


FIGURE 6.
PROPOSED LAND USE/COVER TYPES AND VEGETATION COMMUNITIES USING FLUCFCS (Rev.1 - 10/10/14)

Sources: NAIP, 2013; ECT, 2014.



Table 1. Project Wetland and Other Surface Water and Impact Summary (Revision 1 - 10/10/14)

Wetland ID	FLUCFCS	Permanent Impact										Temporary Construction Wetland Impact							Permanent Conversion to Nonforested Wetland Impact							Total Functional Loss	Impacted Wetland	
		Before UAM Scores*				AFTER UAM Scores*				Permanent Impact Acreage	Functional Loss	After UAM Scores				Delta	Time Lag	TC Impact Acreage	Temporary Functional Loss	After UAM Scores				Delta	PC Impact Acreage			Permanent Functional Loss
		L/L	WE	C S	UMAM	L/L	WE	C S	UMAM			L/L	WE	C S	UMAM					L/L	WE	C S	UMAM					
1	617	6	6	7	0.63	0	0	0	0.00	0.04	0.025	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.025	X
2	617	7	5	6	0.60	0	0	0	0.00	0.02	0.012	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.012	X
3	617	7	5	6	0.60	0	0	0	0.00	0.07	0.042	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.042	X
4	617	7	5	6	0.60	0	0	0	0.00	0.68	0.408	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.408	X
5	631	7	6	6	0.63	0	0	0	0.00	0.05	0.032	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.032	X
6	631	6	6	7	0.63	0	0	0	0.00	0.00	0.000	6	6	6	0.60	0.03	1.25	0.07	0.003	6	6	5	0.57	0.07	0.06	0.004	0.007	X
7	617	7	5	6	0.60	0	0	0	0.00	0.15	0.090	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.090	X
8	617	7	5	6	0.60	0	0	0	0.00	0.12	0.072	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.072	X
9	617	7	5	6	0.60	0	0	0	0.00	0.06	0.036	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.036	X
10	631	7	6	6	0.63	0	0	0	0.00	0.02	0.013	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.013	X
11	617	7	5	6	0.60	0	0	0	0.00	0.26	0.156	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.156	X
12	617	7	5	6	0.60	0	0	0	0.00	0.27	0.162	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.162	X
13	617	7	6	7	0.67	0	0	0	0.00	0.2	0.133	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.133	X
14	617	7	6	6	0.63	0	0	0	0.00	0.03	0.019	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.019	X
15	617	7	7	6	0.67	0	0	0	0.00	0.34	0.227	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.227	X
16	617	7	5	6	0.60	0	0	0	0.00	0.23	0.138	7	5	6	0.60	0.00	1.25	0.00	0.000	5	5	3	0.43	0.17	0.55	0.092	0.230	X
17	630	6	7	7	0.67	6	7	7	0.67	0.00	0.000	6	7	7	0.67	0.00	1.25	0.00	0.000	4	7	5	0.53	0.13	2.05	0.273	0.273	X
18	631	7	6	6	0.63	0	0	0	0.00	0.05	0.032	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.032	X
19	617	7	5	6	0.60	0	0	0	0.00	0.03	0.018	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.018	X
20	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
21	617	6	7	7	0.67	6	7	7	0.67	0.00	0.000	6	7	7	0.67	0.00	1.25	0.00	0.000	6	7	7	0.67	0.00	0.00	0.000	0.000	
22	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.000	
23	630	6	8	8	0.73	6	8	8	0.73	0.00	0.000	6	8	8	0.73	0.00	1.25	0.00	0.000	6	8	8	0.73	0.00	0.00	0.000	0.000	
24	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.000	
25	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.000	
26	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.000	
27	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	5	7	3	0.50	0.17	0.91	0.152	0.152	X
28	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
29	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
30	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
31	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
32	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
33	617	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
34	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
35	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
36	617	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
37	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
38	630	6	8	8	0.73	6	8	8	0.73	0.00	0.000	6	8	8	0.73	0.00	1.25	0.00	0.000	6	8	8	0.73	0.00	0.00	0.000	0.000	
39	630	6	8	8	0.73	6	8	8	0.73	0.00	0.000	6	8	8	0.73	0.00	1.25	0.00	0.000	6	8	8	0.73	0.00	0.00	0.000	0.000	
40	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
41	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
42	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
43	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
44	617	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
45	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
46	631	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
47	631	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00										

Table 1. Project Wetland and Other Surface Water and Impact Summary (Revision 1 - 10/10/14)

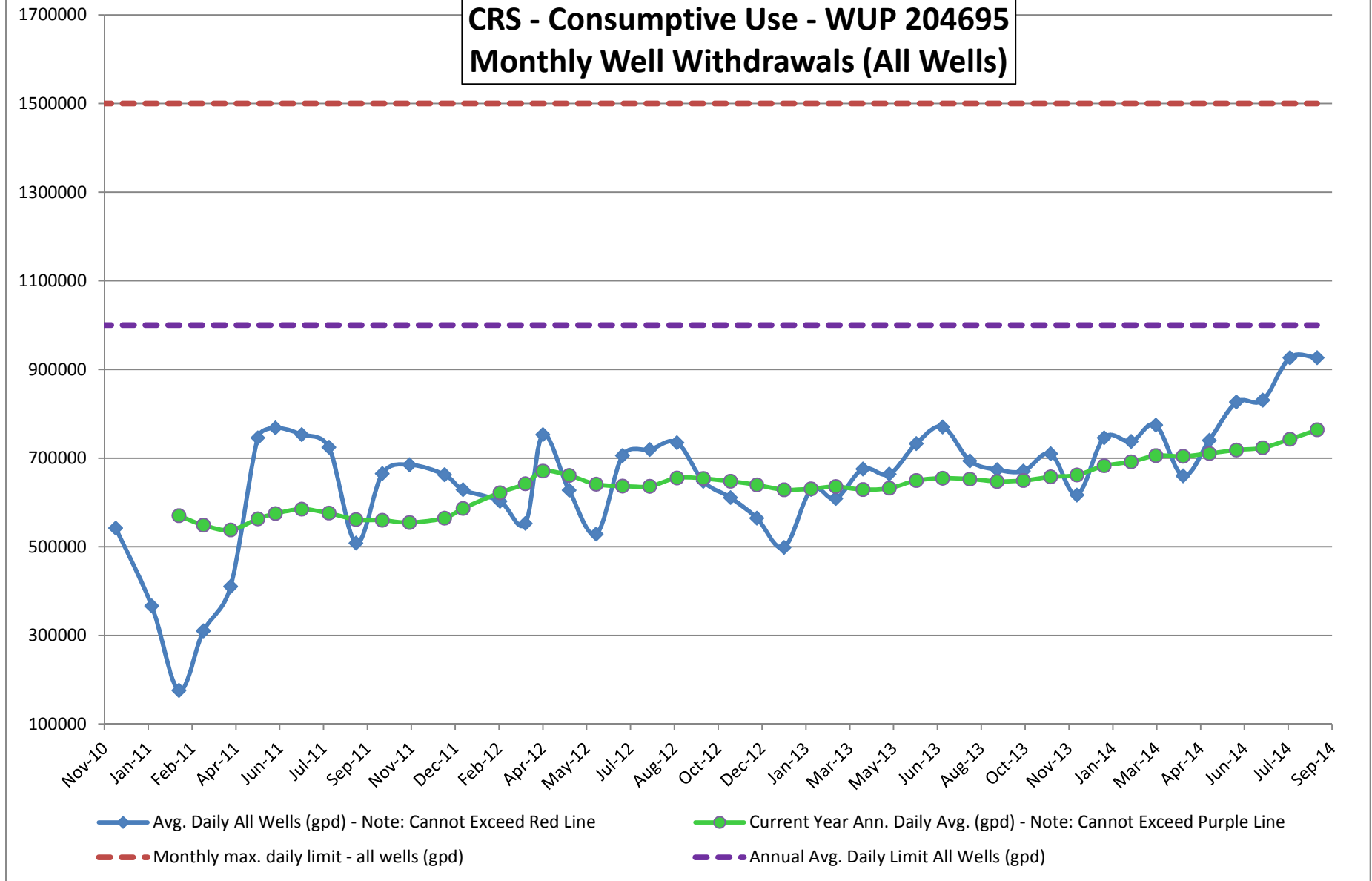
Wetland ID	FLUCFCS	Permanent Impact										Temporary Construction Wetland Impact								Permanent Conversion to Nonforested Wetland Impact								Impacted Wetland
		Before UMAM Scores*				AFTER UMAM Scores*				Permanent Impact Acreage	Functional Loss	After UMAM Scores				Delta	Time Lag	TC Impact Acreage	Temporary Functional Loss	After UMAM Scores				Delta	PC Impact Acreage	Permanent Functional Loss	Total Functional Loss	
		L/L	WE	C S	UMAM	L/L	WE	C S	UMAM			L/L	WE	C S	UMAM					L/L	WE	C S	UMAM					
49	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
50	630	6	8	8	0.73	6	8	8	0.73	0.00	0.000	6	8	8	0.73	0.00	1.25	0.00	0.000	6	8	8	0.73	0.00	0.00	0.000	0.000	
51	617	7	6	6	0.63	7	6	6	0.63	0.00	0.000	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.000	
52	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
53	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
54	617	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
55	617	7	6	7	0.67	0	0	0	0.00	0.07	0.047	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.047	X
56	631	7	6	7	0.67	0	0	0	0.00	0.04	0.027	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.027	X
57	617	7	5	6	0.60	0	0	0	0.00	0.2	0.120	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.120	X
58	617	7	5	6	0.60	0	0	0	0.00	0.13	0.078	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.078	X
59	631	7	6	6	0.63	0	0	0	0.00	0.00	0.000	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.000	
60	617	7	5	5	0.57	0	0	0	0.00	0.02	0.011	7	5	5	0.57	0.00	1.25	0.00	0.000	7	5	5	0.57	0.00	0.00	0.000	0.011	X
61	631	7	5	6	0.60	0	0	0	0.00	0.14	0.084	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.084	X
62	631	6	6	7	0.63	0	0	0	0.00	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
63	617	7	6	4	0.57	0	0	0	0.00	0.03	0.017	7	6	4	0.57	0.00	1.25	0.00	0.000	7	6	4	0.57	0.00	0.00	0.000	0.017	X
64	631	7	6	6	0.63	0	0	0	0.00	0.00	0.000	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.000	
65	631	6	6	7	0.63	0	0	0	0.00	0.04	0.025	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.025	X
66	631	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
67	631	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
68	631	7	7	7	0.70	7	7	7	0.70	0.00	0.000	7	7	7	0.70	0.00	1.25	0.00	0.000	7	7	7	0.70	0.00	0.00	0.000	0.000	
69	617	7	7	6	0.67	7	7	6	0.67	0.00	0.000	7	7	6	0.67	0.00	1.25	0.00	0.000	7	7	6	0.67	0.00	0.00	0.000	0.000	
70	631	7	6	6	0.63	7	6	6	0.63	0.00	0.000	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.000	
71	631	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
72	631	6	6	7	0.63	0	0	0	0.00	0.17	0.108	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.108	X
73	631	7	6	6	0.63	0	0	0	0.00	0.08	0.051	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.051	X
74	617	7	5	6	0.60	0	0	0	0.00	0.1	0.060	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.060	X
75	617	7	5	6	0.60	0	0	0	0.00	0.08	0.048	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.048	X
76	617	7	5	6	0.60	0	0	0	0.00	0.04	0.024	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.024	X
77	617	7	5	6	0.60	7	5	6	0.60	0.00	0.000	7	5	6	0.60	0.00	1.25	0.00	0.000	7	5	6	0.60	0.00	0.00	0.000	0.000	
78	631	7	6	6	0.63	7	6	6	0.63	0.00	0.000	7	6	6	0.63	0.00	1.25	0.00	0.000	7	6	6	0.63	0.00	0.00	0.000	0.000	
79	617	6	6	7	0.63	6	6	7	0.63	0.00	0.000	6	6	7	0.63	0.00	1.25	0.00	0.000	6	6	7	0.63	0.00	0.00	0.000	0.000	
80	511	4	4	4	0.40	0	0	0	0.00	0.02	0.008	4	4	3	0.37	0.03	1.25	0.11	0.005	4	4	4	0.40	0.00	0.00	0.000	0.013	X
81	511	4	4	4	0.40	4	4	4	0.40	0.00	0.000	4	4	4	0.40	0.00	1.25	0.00	0.000	4	4	4	0.40	0.00	0.00	0.000	0.000	
82	631	4	4	4	0.40	0	0	0	0.00	0.00	0.000	4	4	3	0.37	0.03	1.25	0.18	0.008	4	4	4	0.40	0.00	0.07	0.000	0.008	X
83	534	4	4	4	0.40	4	4	4	0.40	0.00	0.000	4	4	4	0.40	0.00	1.25	0.00	0.000	4	4	4	0.40	0.00	0.00	0.000	0.000	
84	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	7	0.73	0.07	0.02	0.001	0.001	X
85	631	6	6	6	0.60	0	0	0	0.00	0.00	0.000	6	6	5	0.57	0.03	1.25	3.5	0.146	6	6	3	0.50	0.10	0.99	0.099	0.245	X
86	641	7	8	9	0.80	0	0	0	0.00	0.01	0.008	7	8	8	0.77	0.03	1.25	6.94	0.289	7	8	9	0.80	0.00	0.00	0.000	0.297	X
87	631	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
88	631	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
89	631	6	5	6	0.57	6	5	6	0.57	0.00	0.000	6	5	6	0.57	0.00	1.25	0.00	0.000	6	5	6	0.57	0.00	0.00	0.000	0.000	
90	630	7	8	9	0.80	0	0	0	0.00	0.00	0.000	7	8	9	0.00	0.80	1.25	0.00	0.000	7	8	7	0.73	0.07	0.49	0.033	0.033	X
																				7	8	6	0.70	0.10	2.63	0.263	0.263	X
91	631	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	5	0.57	0.03	1.25	0.02	0.001	6	6	6	0.60	0.00	0.00	0.000	0.001	X
92	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
93	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	8	0.77	0.03	1.25	0.00	0.000	7	8	7	0.73	0.07	0.01	0.001	0.001	X
94	641	6	6	6	0.60	0	0	0	0.00	0.00	0.000	6	6	5	0.57	0.03	1.25	0.13	0.005	6	6	6	0.60	0.00	0.00	0.000	0.005	X
95	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	

Table 1. Project Wetland and Other Surface Water and Impact Summary (Revision 1 - 10/10/14)

Wetland ID	FLUCFCS	Permanent Impact										Temporary Construction Wetland Impact							Permanent Conversion to Nonforested Wetland Impact							Impacted Wetland		
		Before UMAM Scores*				AFTER UMAM Scores*				Permanent Impact Acreage	Functional Loss	After UMAM Scores				Delta	Time Lag	TC Impact Acreage	Temporary Functional Loss	After UMAM Scores				Delta	PC Impact Acreage		Permanent Functional Loss	Total Functional Loss
		L/L	WE	C S	UMAM	L/L	WE	C S	UMAM			L/L	WE	C S	UMAM					L/L	WE	C S	UMAM					
96	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
97	511	6	5	5	0.53	0	0	0	0.00	0.00	0.000	6	5	4	0.50	0.03	1.25	0.04	0.002	6	5	5	0.53	0.00	0.00	0.000	0.002	X
98	641	4	4	4	0.40	4	4	4	0.40	0.00	0.000	4	4	4	0.40	0.00	1.25	0.00	0.000	4	4	4	0.40	0.00	0.00	0.000	0.000	
99	511	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
100	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
101	641	4	4	4	0.40	4	4	4	0.40	0.00	0.000	4	4	4	0.40	0.00	1.25	0.00	0.000	4	4	4	0.40	0.00	0.00	0.000	0.000	
102	534	5	5	5	0.50	5	5	5	0.50	0.00	0.000	5	5	5	0.50	0.00	1.25	0.00	0.000	5	5	5	0.50	0.00	0.00	0.000	0.000	
103	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
104	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
105	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
106	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
107	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
108	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
109	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
110	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
111	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
112	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
113	511	6	5	6	0.57	6	5	6	0.57	0.00	0.000	6	5	6	0.57	0.00	1.25	0.00	0.000	6	5	6	0.57	0.00	0.00	0.000	0.000	
114	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
115	631	7	6	7	0.67	7	6	7	0.67	0.00	0.000	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.000	
116	641	7	6	7	0.67	7	6	7	0.67	0.00	0.000	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.000	
117	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
118	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
119	511	6	5	5	0.53	0	0	0	0.00	0.00	0.000	6	5	4	0.50	0.03	1.25	0.06	0.003	6	5	5	0.53	0.00	0.00	0.000	0.003	X
120	641	7	6	7	0.67	7	6	7	0.67	0.00	0.000	7	6	7	0.67	0.00	1.25	0.00	0.000	7	6	7	0.67	0.00	0.00	0.000	0.000	
121	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
122	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
123	617	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
124	643	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
125	630	7	8	9	0.80	7	8	9	0.80	0.00	0.000	7	8	9	0.80	0.00	1.25	0.00	0.000	7	8	9	0.80	0.00	0.00	0.000	0.000	
126	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
127	511	6	5	5	0.53	6	5	5	0.53	0.00	0.000	6	5	5	0.53	0.00	1.25	0.00	0.000	6	5	5	0.53	0.00	0.00	0.000	0.000	
128	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
129	641	6	6	6	0.60	6	6	6	0.60	0.00	0.000	6	6	6	0.60	0.00	1.25	0.00	0.000	6	6	6	0.60	0.00	0.00	0.000	0.000	
130	631	4	4	4	0.40	4	4	4	0.40	0.00	0.000	4	4	4	0.40	0.00	1.25	0.00	0.000	4	4	4	0.40	0.00	0.00	0.000	0.000	
131	641	6	5	6	0.57	0	0	0	0.00	0.01	0.006	6	5	6	0.57	0.00	1.25	0.00	0.000	6	5	6	0.57	0.00	0.00	0.000	0.006	X
Total Forested Credits Needed																											3.388	
Total Herbaceous Credits Needed																											0.325	
Total Credits																											3.713	
Permanent conversion to non-forested wetlands (shrub), the rest of the wetlands are converted to herbaceous.																												

Source: ECT, 2014.

CRS - Consumptive Use - WUP 204695
Monthly Well Withdrawals (All Wells)



CRN Consumptive Use - COC PA 77-09P Monthly Well Withdrawals (All Wells)

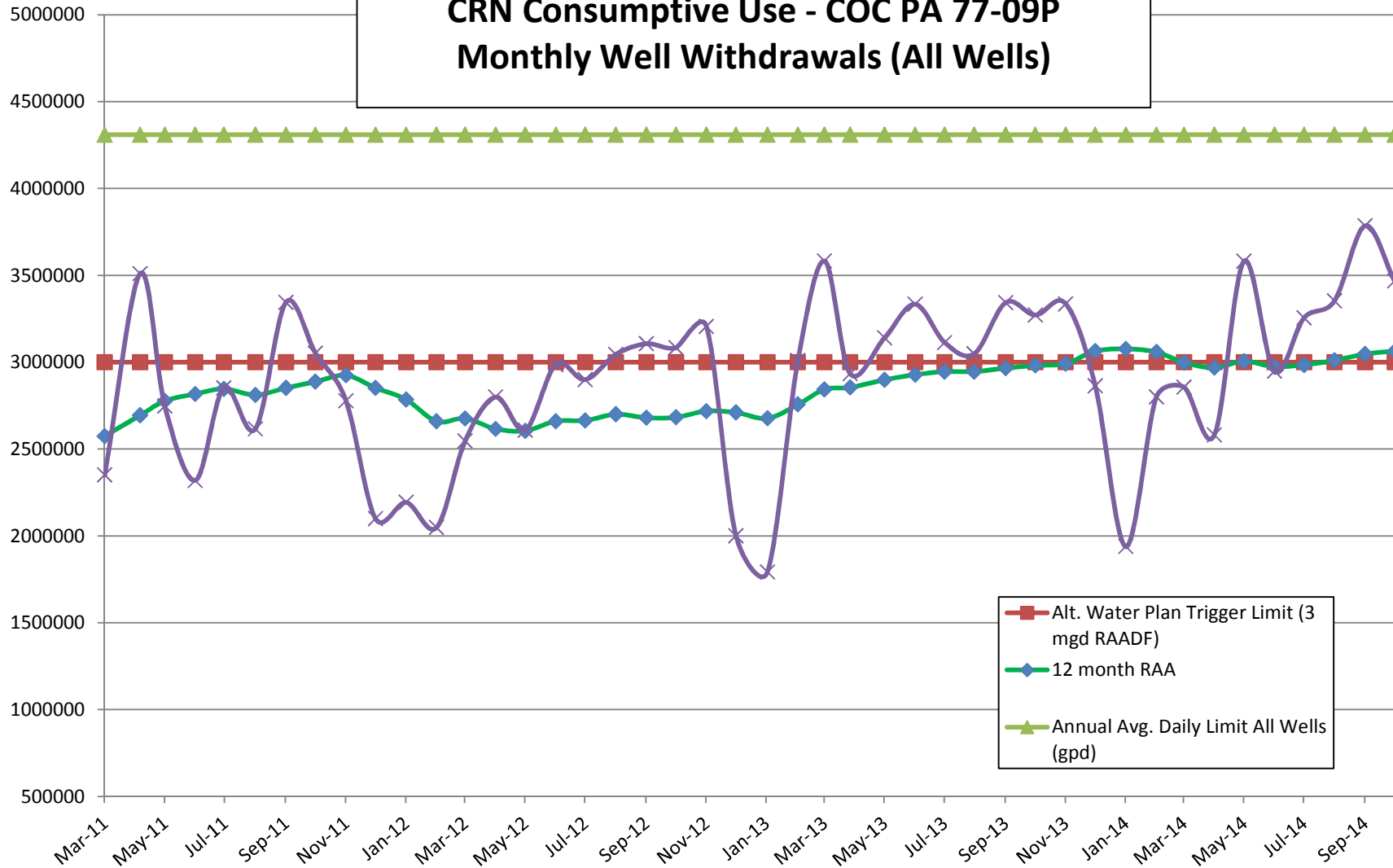


Table 4.5.1-1. Projected Effluent Temperatures (Revision 1 - 10/10/14)

Parameter	Winter Average*	Spring/Fall Average†	Summer Maximum
Inputs			
Intake canal temperature basis	Average	Average	Maximum
Intake canal temperature (°F)	58	74.6	94.9
Cooling tower blowdown (°F)	77.0	82.8	96.6
Augmentation flow rate (gpm)	30,094	38,026	29,026
Cooling tower blowdown rate (gpm)	15,042	19,010	18,868
Estimate			
Effluent temperature to effluent canal (°F)	64.3	77.3	95.6

*December through February.

†March, April, May, September, October, and November.

Sources: Burns & McDonnell, 2014.
ECT, 2014.

Attachment G

**DUKE ENERGY FLORIDA
CITRUS COUNTY COMBINED CYCLE PROJECT
SITE CERTIFICATION APPLICATION
RESPONSE TO CITRUS COUNTY COMMENTS PROVIDED VIA EMAIL ON 8/14/14**

Please submit a 24x36 to scale plan. Provide site calculations, size of site, ISR, FAR, and parking calculations. Provide the location and type of buffers. Provide parking landscaping (Every 10 spaces shall be designed with 400 square feet of landscaping to be placed in medians or islands, and shall include at least one tree, and six shrubs). Provide a boundary survey.

As discussed with County Staff on August 19, 2014, the maps and figures presented in the Site Certification Application (SCA) are of the size and scale dictated by Section 1.3.6 the Florida Department of Environmental Protection's (FDEP) "Draft Application Instruction Guide for Electrical Power Plant Sites and Associated Facilities" (dated 9/1/09). Additional details regarding the Citrus County Combined Cycle Project (Project) design will be developed as the Project moves forward. That said, to the extent the information requested is based upon an applicable substantive Citrus County requirement, the information necessary to provide reasonable assurance of compliance with the requirement is presented below.

The total area of the Site is approximately 400 acres. As discussed in Section 5.1.1 of the SCA, only approximately 193 acres of the 400-acre Site will be impacted by Project construction activities. Well under one-half of the 193 acres impacted during construction will result in permanent impervious surface area during Project operation. Thus, the Project is well below the "Maximum Lot Coverage" of 70% for the Transportation/Communication/Utilities (TCU) District in Section 2417, Citrus County Land Development Code (LDC).

With regard to the floor-to-area ratio (FAR), again, less than one-half of the 400-acre Site will be impacted by Project construction activities. Thus, the Project will necessarily be well under the 1.0 maximum FAR for the TCU land use district specified in Section 2417, Citrus County LDC. More specifically, the only proposed facility with "floor" area (i.e., building that will be occupied by Project operation staff) is the administration building and warehouse. As outlined in Table 4.2.0-1 of the SCA, that combined area occupies approximately 32,000 ft². The FAR, therefore, would be approximately 0.00184, well below the 1.0 FAR for the (TCU) land use district specified in Section 2417, Citrus County LDC. Duke Energy Florida (DEF) is currently considering proposing the addition of a second story to the administration portion of the administration building. This additional story would add approximately 16,000 ft² of floor area, resulting in a FAR of approximately 0.00275. The FAR would still be well below the standard in Section 2417, Citrus County LDC.

With regard to parking calculations, DEF confirmed with County Staff on August 19, 2014, that such calculations are only required for the parking area associated with the administration/warehouse building that will be used during the operation of the Project. The remainder of the parking areas shown on the Site layout in Figure 4.2.0-2 are intended for construction parking. As outlined in Section 5.1.1-1 of the SCA, a minimal amount of that

construction parking area (approximately 3-5 acres) will be maintained for future DEF and contractor use during plant maintenance outages and other support purposes. TCU uses are not specifically listed in the Parking Schedule in Section 7230, Citrus County LDC. As such, the “number of spaces required . . . shall be determined by staff.” During a discussion on August 21, 2014, Staff confirmed that it is appropriate to determine the minimum number of required parking spaces based on the maximum employee shift.

DEF is proposing 50 parking spaces in the parking area associated with the administration building/warehouse, with 4 handicap accessible spaces. As outlined in Section 7.1 of the SCA, the Project will employ approximately 50 full-time employees during operation. Those employees will be assigned to the administration building and will work in shifts. The maximum number of employees per shift is anticipated to be 8, with an additional approximately 16 plant staff and, at times, janitorial staff. Therefore, the maximum number of employees anticipated to ordinarily be assigned to the administration building at any one time is 24. At the time of shift change, there would be a brief overlap of an additional 8 employees, for a total of approximately 32. The building will not serve the general public (there will be an electronic gate that can only be opened by “badged employees”). Therefore, 50 spaces will be more than sufficient to serve the parking needs of the Project during operation. The addition of another story to the administration building, if proposed, would not increase the maximum number of employees per shift. The final design of the parking area associated with the administration building/warehouse will comply with all applicable Citrus County substantive requirements in Section 7200, et seq., Citrus County LDC.

With regard to buffers and landscaping, as shown on Figure 3.2.2-1 of the SCA, the Site is surrounded by property designated Extractive (EXT) or TCU. Therefore, only a “sodded strip” is required pursuant to Section 5550(B), Citrus County LDC. DEF is not proposing to include parking landscaping and, as confirmed by County Staff, is exempt from the requirement to do so pursuant to Section 3745(C)(2), Citrus County LDC.

DEF provided a boundary survey as part of its application to Citrus County for a comprehensive plan amendment and atlas amendment for the proposed Project. Our understanding is that County Staff is not requesting an additional copy of the survey at this time. However, DEF will certainly provide an additional copy if needed.

Please submit a Tree Preservation Plan that addresses trees to be removed and trees to be preserved.

Most of the Site has been managed for timber production in the past and altered by land preparation (furrowing) and periodic timber harvesting. DEF designed the Project to avoid and minimize impacts to wetlands by, among other things, placement of the proposed power plant facilities in the eastern portion of the Site, which has been impacted by past silvicultural activities.

As discussed in Section 5.1.1 of the SCA, approximately 193 acres of the 400-acre Site will be impacted by construction activities. This includes grubbing and clearing of vegetation from the areas to be used for construction. The cleared areas will then be graded and stabilized. The entire plant facilities area will be raised approximately 8 to 9 ± feet. The switchyard area will be

raised approximately 2 to 3 ± feet. Therefore, all trees within the construction footprint must be removed. DEF will be conducting a tree survey to identify those trees that are subject to the County's preservation and mitigation requirements and will provide the results of that survey when complete. It is DEF's understanding based on discussions with County Staff that, following certification, trees in wetlands, surface water bodies, or construction buffer areas are not subject to tree preservation and mitigation requirements per Section 5710(B), Citrus County LDC. County Staff also confirmed that trees within the proposed linear facilities corridor are likewise not subject to tree preservation and mitigation requirements pursuant to Section 5715(D), Citrus County LDC. If a tree survey is not provided prior to issuance of the final order of certification, DEF would accept a condition of certification requiring submittal of the tree survey to Citrus County prior to construction, as well as requiring compliance with the applicable mitigation requirements in Section 5750, Citrus County Land Development Code.

Citrus County Land Development Code, Sec. 7100 Access Management: Provide scaled Site Development Plans for the proposed development. Plans shall provide an access and circulation plan. Private streets may be allowed within industrial projects. However, private streets shall be designed and constructed pursuant to standards contained herein.

As described in Section 4.2 of the SCA, the Site will be accessed via the Crystal River Energy Complex (CREC) North Access Road. The primary Site access road will run from the CREC North Access Road in the southeast corner of the Site along the eastern Site boundary to the main power facilities area as shown on Figure 4.2.0-2 of the SCA. In addition, although not shown on Figure 4.2.0-2, DEF may utilize an existing road running parallel to the eastern boundary of the Site for Site access during Project construction and operation rather than the Site access point in the southeastern corner of the Site identified in Figure 4.2.0-2. A secondary access road from the CREC North Access Road will be located west of the switchyard. Figures showing the Site access and circulation plan under either option are attached hereto. While these are being provided in an electronic format, DEF will provide hard copies in any desired size upon request. All on-Site roadways will be designed in accordance with applicable Citrus County substantive requirements.

Citrus County Land Development Code, Sec. 6300 Stormwater Management, Nonresidential Design: All proposals for development shall include detailed drainage plans and calculations to be submitted for the review and approval by the County. Provide permit and supporting documentation for incorporation into the County permit file. Provide final approved FDEP/SWFWMD SWERP letter with conditions and final construction drawings approved by FDEP/SWFWMD if different than submitted to Citrus County.

Per discussions with County staff on August 19, 2014, under Section 6310, Citrus County LDC, the certification under the Electrical Power Plant Siting Act (PPSA), which incorporates substantive ERP criteria, will confirm compliance with County stormwater requirements. Citrus County will be copied on the Final Order of Certification issued by FDEP or the Siting Board, including any Conditions of Certification.

I have reviewed the application package and have a few comments. The Florida Building Code section 102.2 exempts "those structures or facilities of electric utilities...which are

directly involved in the generation, transmission, or distribution of electricity" from the requirements of the Florida Building Code and permitting by the local jurisdiction. The proposed project includes two buildings that would not be considered "directly involved" in the generation, transmission, or distribution of electricity. They are the 16,000 square foot Administration building and the 16,000 square foot Warehouse/shop building. These two structures will fall under the jurisdiction of the Citrus County Building Division and the Florida Building Code. Permits and inspections will be required for these two structures. By the time this project commences, the new FEMA FIRM maps will be in effect. The base flood elevation for the site is 12' NAVD88. The design flood elevation for the two aforementioned buildings will be 13' NAVD88. The parking lot which services the Administration building and Warehouse/shop building must be designed with handicap parking spaces and an accessible route to both buildings.

DEF recognizes that the administration building and warehouse will be subject to applicable provisions of the Florida Building Code. The facilities will be designed to comply with all applicable nonprocedural building code requirements. In addition to complying with applicable building code requirements, DEF will allow inspections of the facilities and pay appropriate fees for same pursuant to section 403.511(4), Florida Statutes ("nor shall this act in any way affect the right of any local government to charge appropriate fees or require that construction be in compliance with applicable building construction codes"). DEF will not, however, be obtaining separate building or other permits. Section 403.511(1), Florida Statutes, specifies that the certification "constitute[s] the sole license of the state and any agency as to the approval of the location of the site and any associated facility and the construction and operation of the proposed electrical power plant." "Agency" is defined to include local government entities. § 403.503(2), Fla. Stat. If proposed, DEF would accept a condition of certification that required the administration building and warehouse be constructed in accordance with applicable building codes and allowed for County inspection, along with the payment of appropriate fees for same.

DEF will design and construct the parking lot serving the administration building/warehouse in accordance with all applicable handicap parking and accessibility requirements, including those in Section 7260, Citrus County LDC.

If a "septic treatment system" is to be used for disposal of commercial and or domestic waste water then plans and forms from an engineer licensed in the State of Florida are required as part of an application (DH4015) per 64E-6 F.A.C., herein incorporated by reference and an aerobic system (aerobic treatment unit) is required by Citrus County Ordinance Sec. 42-141 (3). Additionally, a construction permit (DH 4016) shall be obtained before placing or installing any stationary holding tanks.

As described in Section 4.5.2, the SCA proposes to dispose of sanitary wastewater on-Site through the use of an appropriately designed package treatment plant or a subsurface septic treatment system/drainfield. DEF has now determined that the sanitary wastewater will be disposed of through the use of an appropriately designed package treatment plant. The package treatment plant will be located, designed, and constructed in accordance with all applicable non-procedural requirements.

**Table 4.2.0-1. Approximate Dimensions of Major Structures and Facilities
(Revision 1 - 10/10/14)**

Figure 4.2.0-3 Reference	Description	Structure (ft)			
		Height Above Grade	Width	Length	Diameter
1	Gas turbine generator	32	50	45	
2	HRSB	115	45	115	
3	HRSB stack	180			22
5	Gas turbine generator SU	32	25	18	
7	Cooling tower	58	95	440	
11	Demineralized water tank	40			40
12	Service enclosure	20	100	150	
13	Administration building	~~45~~ 25	100	160	
14	Warehouse/shop	25	100	160	
17	Firewater pump enclosure	12	15	40	
22	Inlet air filter	95	65	60	
41	Emergency diesel generator	12	12	32	
50	HRSB PDC	20	25	25	
94	Steam turbine enclosure	75	40	105	
95	Oil storage enclosure	16	70	70	
96	Service/firewater tank	50			50
100	Chiller storage tank (if constructed)	80			170
Throughout plant	Pipe rack	55	30	Varies	

Source: Burns & McDonnell, 2014.