Progress Energy

RESPONSE TO COMMENTS ON CRYSTAL RIVER UNIT 3 UPRATE PROJECT SITE CERTIFICATION APPLICATION

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August 2007

07389531

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ON
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1.0 FDEP SOUTHWEST DISTRICT OFFICE

1. **It appears that the construction laydown and parking areas will impact the following wetland systems: Freshwater Marsh, Florida Land Use, Cover, and Forms Classification System (FLUCFCS 641) and Mixed Wetland Hardwoods (FLUCFCS 617). Also, it appears that the new cooling towers will impact a Saltwater Marsh (FLUCFCS 642). We would recommend having the applicant clearly identify the limits of all wetlands on an aerial photograph. Uniform Mitigation Assessment Method (UMAM) sheets will also need to be included in the application to assess any wetland impacts associated with the project.**

   We also require signed and sealed drawings to be submitted for our projects per Chapter 62-343.070, F.A.C.

   Response: Progress Energy acknowledges the comments of the Environmental Resource Permit Section of the FDEP Southwest District. Conceptual design information for laydown and parking areas that was submitted as part of the Site Certification Application (SCA) was submitted for information purposes only. These areas are to be constructed to support the Steam Generator Replacement Project at CR3 which is an activity that in itself does not trigger the need for Site Certification and will need to be authorized and constructed prior to and separately from the receipt of a Site Certification. The Steam Generator Replacement Project will be undertaken regardless of issuance of a favorable final site certification under the PPSA for the CR3 Uprate Project. It is Progress Energy's intent to file for an Environmental Resource Permit (ERP) for activities requiring an ERP permit and which is related to the Steam Generator Replacement Project as soon as the detailed design work for those impacts has been completed. All information needed to support the issuance of an ERP for the Steam Generator Replacement Project will be supplied with the ERP application. This information will include, but is not limited to wetland delineations, UMAM assessments, storm water runoff calculations and treatment design and any necessary mitigation proposal as necessary. Prior to any construction, Progress Energy will prepare a Storm Water Pollution Prevention Plan and submit the Notice of Intent to use the FDEP Generic Permit for Storm Water Discharge for Large and Small Construction Activities.

   It is expected that the CR3 Uprate Project will not have any ERP-related impacts, except for the potential onsite cooling tower which may impact onsite wetlands. The exact location and design of that cooling tower is not yet known, and will be addressed in the separate NPDES permit renewal application. The design and function of the cooling tower will be based on the water quality considerations to be addressed in that permit renewal. Progress Energy proposes that appropriate conditions of certification to provide for post-certification review of ERP impacts, including impacts to wetlands, be developed for the CR3 Uprate Project.

2. **Please submit aerial surveys that include:**
   - **The limits of any wetlands located within the proposed project area,**
   - **The location of any listed species from the Florida Natural Areas Inventory or observed during site visits.**

   Refer to Chapter 62-343.900(1), Section E, F.A.C.

Response. See Response to Item 1 above. Section 2.3.6 of the SCA provides a description of flora and fauna, including listed species, at the project area and near CR3.

3. **Figure 4.1.1-1 shows the location of the proposed laydown and parking areas and the new cooling towers being constructed over an existing wetland. Attempts to minimize or avoid impacts to wetlands will be required. If dredging and filling of wetlands is unavoidable mitigation may be required. Therefore, a UMAM form must be completed and mitigation must be proposed by the applicant that will offset wetland impacts within all areas of the proposed right of way. Refer to Chapter 3.2.1.1 of the SWFMD Basis of Review, and Chapter 62.345 F.A.C.**

   Response. See Response to Item 1 above.

4. **Pursuant to Chapter 3.2.4.1 of the Basis of Review, the applicant must address the short term water quality impacts of a proposed system by (1) providing turbidity barriers or similar devices for the duration of construction activities in or adjacent to wetlands or other surface waters, and (2) stabilizing newly created slopes or surfaces in or adjacent to wetlands and other surface waters to prevent erosion and turbidity. Please show the location of erosion control barriers on the plan view drawings and describe the specific soil stabilization methods to be used at each site. Erosion control and soil stabilization methods should be included on the plan and cross sectional view drawings.**

   Response: See Response to Item 1 above. Additionally, Progress Energy will obtain coverage for stormwater discharges from construction activities associated with the Uprate Project under the State of Florida Generic Permit for Stormwater Discharge from Large and Small Construction Activities. Also in accordance with Part V of the Generic Permit, Progress Energy will prepare a Stormwater Pollution Prevention Plan (SWPPP) and file a Notice of intent (NOI) to be covered under the generic permit. The location of erosion control barriers will be shown on the plan view drawings and describe the specific soil stabilization methods to be used at each site. Erosion control and soil stabilization methods will be included on the plan and cross sectional view drawings.

5. **Page 2-28 of Volume 1 references "additional construction laydown and parking". This referenced area seems to be a wetland. There were no calculations provided which detail the resultant increase in runoff, and there is no discussion of providing treatment for this runoff.**

   Reference: 40D-4.301, F.A.C., and the Southwest Florida Water Management District Environmental Resource Permit Information Manual, Management and Storage of Surface Waters, Part B, Basis of Review (BOR):

   Response. See Response to Item 1 above.

Industrial Wastewater Comments

6. **Under Section 3.0, The Plant and Directly Associated Facilities, Item 3.5, the applicant indicates that a conservative and conceptual design plan for the South Cooling Tower has been proposed. The applicant also states that a detailed design will be addressed as a part of the NPDES renewal process in 2009. It is recommended that the applicant submit the conservative and conceptual design to Tallahassee's Industrial Wastewater**

Power Plant Section to initiate a preliminary review of this design. Please have the applicant submit the conceptual design of the South Cooling Tower to the Department for review.

Response: The conceptual design of the new South Cooling Tower (SCT) was briefly described at the top of page 3-11 within section 3.5 of the Site Certification Application (SCA), and its proposed location and layout were shown in SCA Figures 3.4.1-1 and 3.5.1-1. The physical, performance, and annual emissions data for the SCT were tabulated in SCA Table 3.4.1-2, and in Table 2-2 in Section 5.0 of Appendix 10.1.5 of the SCA (PSD Application). A detailed design of the SCT will be submitted to the Agency for preliminary review when available. A final design will be included with the regular NPDES permit renewal submittal.

The thermal performance of the SCT was set equal to that of the existing Helper Cooling Towers and is summarized below:

Permanent Helper Cooling Towers **Design Conditions**	
Wet Bulb	81 Degrees F
Hot Water Temperature	103 Degrees F
Cold Water Temperature	89.5 degrees F
Flow	684,600 gpm
Heat Dissipated	4.5689 Billion Btu per hour

Waste Program Comments

7. **Executive Summary. Please include a summary of potential impacts (or lack thereof) to current waste management practices at the facility in this section.**

   Response. There will be no new impacts to current waste management practices as the result of this project.

8. **Section 2.0.**
   a. §2.1.2. indicates that intake screenings are "collected in a sump prior to discharge to the intake canal (page 2-2)". Please clarify what types of materials are discharged (disposed of) in the intake canal.

   Response. The traveling screens are equipped with a backwash system which washes the debris and impinged organisms off the screens into a common trough. The intake screen wash trough slopes to the west where solid material or waste is collected in a screened basket. The collected solid material is placed into the trash for appropriate disposal of in the County landfill. The trough receives combined wash water from all screens and the water is returned to the intake canal via a sump pump per the NPDES permit. Only screen wash water which is ambient seawater pumped from the intake canal is discharged to the intake canal.

b. §2.3.4.4. Please clarify where sludge from the onsite domestic waste treatment and water treatment plants is disposed.

Response. The waste sludge from the domestic wastewater treatment plant is collected by American Pipe and Tank and transported to their facility. This company processes and treats this sludge that is transported from the Progress Energy on-site, permitted domestic/sanitary waste treatment facility. The waste sludge from the water treatment plant is collected and disposed of on-site within the ash landfill.

Both the domestic waste treatment plant and the water treatment plant are common facilities that are authorized under existing permits to serve Units 1, 2, and 3. The permits will remain in effect.

c. Figure 2.3.4-4. Please clarify where the solid materials from the screen wash (intake and discharge canals) is discharged/disposed.

Response. In reference to question 8 c, Figure 2.3.4-4 identifies screen washes. Solid materials from these washes are removed from the water and disposed in the trash for disposal within F.A.C requirements. Following screening, water is discharged back to the intake or discharge canal per NPDES permit requirements.

9. Section 4.0.

a. §4.1.1. Please be advised that debris and other materials generated from the project that may be contaminated shall not be disposed of at unlined landfills (i.e., C&D debris disposal facilities). Materials that may be radioactive shall be managed in accordance with Chapter 404, Florida Statutes and NRC regulations. This comment is for information only and does not require a response.

Response. Comment acknowledged. No response required. Progress Energy will be in full compliance with these requirements.

10. Section 5.0.

a.§5.1.2. Please specify where "impingement mortality" organisms are disposed. In the event that the quantity of these organisms increases significantly, additional solid waste management measures may be required.

Response. Impingement mortality organisms are collected and placed into the trash for appropriate disposal in the County landfill. Comment acknowledged.

11. Progress Energy has stated that the amount of water proposed to be with drawn from Crystal Bay will be the same volume as currently utilized by the existing infrastructure. They have made assertion that there will be no increase of water withdraw from Crystal Bay estuary due to facility upgrades and use of new improved technologies. Please provide supporting information to substantiate this claim.

Response: Progress Energy has performed a preliminary analysis of the expected operating results from the proposed south Cooling Tower (SCT) described in Response FDEPSW-6 above.
Figure FDEPSW-11-1 (attached) shows the flow diagrams for the pre-uprate and post-uprate

cases. The existing NPDES permit limits the flow through the three units (1, 2, and 3) to 1,318,000 gpm (1,897.9 MGD) during the months May through October, and 1,132,792 gpm (1,613.2 MGD) during the months November through April. These are shown in the top diagram of Figure FDEPSW-11-1 labeled "Pre-Uprate". The existing flow from Crystal Bay to the plant is shown under the words "Intake Canal" as 1,318,000 gpm during May through October and 1,132,792 (in red) during November through April. The diagram assumes that the existing Helper Cooling Towers (HCT) are operating; however, the flow from Crystal Bay is the same whether the HCT operate or not.

The lower diagram in Figure FDEPSW-11-1 shows the estimated plant flow rates after the uprate is complete and the SCT is operational. This diagram assumes the largest potential increase in the circulating water flow rate of 150,000 gpm resulting in flow through the three units of 1,468,000 gpm during the months of May through October, and 1,270,292 gpm during the months of November through April. The conceptual design of the SCT requires that the southernmost 8 cells operate year-round in the recirculating mode, whenever all three units are operating, in order to avoid any increase in discharge temperature or heat rejected to Crystal Bay, and to avoid any increase in flow withdrawn from Crystal Bay. In the Post-Uprate diagram shown in Figure FDEPSW-11-1, it has been assumed that the remaining 10 cells will be operating in the helper cooling tower mode in order to continue to meet the NPDES limits on rolling average discharge canal exit temperature. The 152,136 gpm that is recirculated from the new SCT 1 will be discharged to the intake canal via a diffuser to ensure that it is well-mixed with the incoming flow from Crystal Bay. As shown on the diagram, this recirculation of 152,136 gpm will reduce the amount of water withdrawn from Crystal Bay to 1,315,864 gpm during May through October, and to 1,118,156 gpm during November through April. Both of these withdrawals are reduced from the pre-uprate case and comply with the existing permit limits.

12. The applicant has stated that there will be no net increase in thermal effluent into the Crystal Bay estuary. Please provide supporting information to substantiate this claim.

Response: In order to demonstrate PEF's objective that there is no net increase in thermal effluent to Crystal Bay as a result of the Uprate Project, it is necessary to demonstrate two conditions:

1. There will be no increase in heat (measured in Btu per hour) in the discharge to Crystal Bay, and
2. There will be no increase in the temperature of the discharge to Crystal Bay.

In order to demonstrate these two conditions, it is also necessary to demonstrate that the recirculated water from the SCT will not cause an increase in the temperature of the intake water to units 1, 2, and 3 (Units). Progress Energy has performed a detailed but preliminary analysis of the expected thermal operating characteristics of the circulating water system of Units 1,2 and 3 (Units) after the uprate is accomplished. The preliminary analysis has been performed on a monthly basis for two cases, based on available Discharge Monitoring Reports (DMR) data (January 2003 through February 2007). The two cases are:

1. Average ambient temperature in Crystal Bay, and
2. Maximum ambient temperature in Crystal Bay.

Table 1 shows the existing average monthly intake temperatures and the combined Units 1, 2 and 3 discharge temperatures assuming full load on all three units (worst case). Table 1 also

shows the future SCT cold water temperature which will be recirculated to the intake canal, and the resulting blended temperature of the SCT's recirculating cells combined with the intake water. It shows that in no case does the SCT cooling tower discharge to the intake canal cause the three Units' intake temperature to increase by as much as one degree F. In fact, during summer months of July and August, the cooling tower cold water is predicted to actually reduce the Units' intake temperature slightly. Figure 1 displays the results of Table 1 graphically.

Table 2 is similar to Table 1, except that the starting intake temperatures are the recorded maximum monthly values rather than the average temperature. The results are similar in that the blended intake temperature is predicted to not exceed the ambient temperature by more than 1 degree F, except for the winter months December through February during which the maximum increase is 1.2 degrees F. Figure 2 is a graphical presentation of the information in Table 2.

Tables 1 and 2, and Figures 1 and 2, demonstrate that the recirculated water from the SCT will not cause a significant increase in the intake temperature to the units thereby helping to avoid any increase in the thermal discharge, as discussed below.

Table 3 shows the existing average monthly discharge temperatures before and after the effects of operation of the existing Helper Cooling Towers (HCT), and the predicted discharge canal exit temperatures after the CR3 Uprate Project, assuming the HCT are utilized whenever the Units' discharge temperature exceeds 96.5 degrees F. Table 3 assumes whenever the HCT are needed, all of them are operated. In actuality, not all of them would always be needed; however, whenever Table 3 predicts that the discharge canal exit temperature is less than 96.5 degrees F it simply means that not all of the HCT need to be operated. Table 3 also predicts the Units' average monthly discharge temperatures after the uprate project and the predicted discharge canal exit temperatures, assuming the HCT are utilized during the same months they were utilized for the existing case. In every case, the discharge canal exit temperature is predicted to be less for the Units after the uprate project than for the existing condition. The reduction in discharge canal exit temperature in every month is more than the increase in predicted blended intake canal temperature shown in Table 1. Thus, under monthly average conditions, the discharge canal exit temperature is predicted to always be less after the uprate than before. Figure 3 presents the results from Table 3 graphically.

Table 4 is similar to Table 3, except that starting intake temperatures are the maximum monthly values rather than the average. The results are similar in that the discharge canal exit temperature is predicted to be less for the units after the uprate than for the existing condition. The reduction in discharge canal exit temperature in every month is less than the increase in predicted blended intake canal temperature shown in Table 2 except for November in which they are the same. Thus, under monthly maximum conditions, the discharge canal exit temperature is predicted to always be no more after the uprate than before. Figure 4 presents the results from Table 4 graphically.

Tables 1 through 4, and Figures 1 through 4, demonstrate that the uprate of CR3 as proposed by Progress Energy will not cause the discharge canal exit temperature to increase over that of the existing Units.

Table 5 contains the estimated heat load to Crystal Bay from the existing units, and the units after the uprate, during average monthly conditions. The heat load is a function of the product of the temperature difference between the entrance to the intake canal and the exit from the discharge canal, and the discharge canal exit flow rate. In each case, the heat load after the uprate is estimated to be less than that before the uprate. Figure 5 portrays the results from Table 5 graphically.

Table 6 contains the estimated heat load to Crystal Bay from the existing Units, and the Units after the uprate, during maximum monthly conditions. The heat load is a function of the product of the temperature difference between the entrance to the intake canal and the exit from the discharge canal, and the discharge canal exit flow rate. In each case, the heat load after the uprate is estimated to be less than that before the uprate. Figure 6 portrays the results from Table 6 graphically. Please note that these estimates are preliminary, however, the goal of the SCT portion of the project is to maintain the current heat load limitation to Crystal Bay. Final detailed analyses will be submitted as part of the forthcoming NPDES permit renewal for the CR site.

Tables 5 and 6, and Figures 5 and 6, demonstrate that the uprate of CR3 as proposed by Progress Energy will not cause the heat load to Crystal Bay to increase over that of the existing Units.

13. **Please provide thermal dissipation modeling for the existing and proposed heat dissipation systems. Please provide current benthic habitat surveys for the areas that have the potential to be affected by an increase of thermal effluent.**

Response: Thermal modeling of the existing Crystal River Units 1, 2, and 3 was performed in the 1980s and is documented within the report "*Crystal River Units 1, 2, and 3, 316 Demonstration", Final Report, Crystal River 316(b) Studies*, January 15, 1985. This report was provided to EPA and FDEP in response to requirements of Part III-H of NPDES Permit FL0000159 for Crystal River Units 1, 2, and 3, dated July 9, 1979. Because of the size of the document, a copy is being sent under separate cover to the commenter. As demonstrated in Response FDEPSW-12 above, the thermal discharge after the uprate will be substantially the same as the existing discharge, although slightly reduced in heat load and discharge temperature. Therefore, as discussed in Section 5.1.1 of the SCA, the modeling presented in the document referenced above can be considered slightly conservative but applicable when applied to the thermal discharge after the uprate. Please note that these estimates are preliminary, however, the goal of the SCT portion of the project is to maintain the current heat load limitation to Crystal Bay. Final detailed analyses will be submitted as part of the forthcoming NPDES permit renewal for the CR site.

As discussed above, there are no areas that have the potential to be affected by an increase of thermal effluent. Therefore, no current benthic habitat surveys are warranted or provided in response to the comments.

14. **According to the application, the increase in velocity could result in an increase in impingement mortality. Does the applicant intend to mitigate for the increased impingement mortality?**

Response: As described in SCA Section 5.1.2, Progress Energy proposes to continue to evaluate the entrainment and impingement impacts associated with the Crystal River Energy Complex (CREC) ongoing facility operations as well as the impacts associated with the CR3 Uprate Project, and will mitigate for the increased impingement mortality if any occurs through the NPDES renewal process. While mitigation is still being considered by regulatory agencies, Progress Energy will continue its current onsite fisheries mitigation program to compensate for impingement.

15. **Please provide reasonable assurance the CR3 Uprate Project will not have adverse negative impacts to fisheries and aquatic resources of the St Martins Marsh and Big Bend Seagrasses Aquatic Preserves.**

    Response: See the responses to FDEPSW-11, FDEPSW-12, FDEPSW-13, and FDEPSW-14 above.

16. **Progress Energy is currently proposing construction of a new nuclear facility in Levy County. This may result in additional thermal effluent discharges within the Crystal Bay and Withlacoochee estuaries- The applicant should consider cumulative impacts to the Crystal Bay and Withlacoochee estuaries.**

    Response: Progress Energy cannot address the impacts associated with the proposed Levy Nuclear Plant since its final design and discharge system are not yet known. Just as the CR3 Uprate Project has had to address cumulative impacts of the existing station and the Uprate Project, the Levy County facility may have to address cumulative impacts between itself and Crystal River Energy Center when that project files an SCA, based on predicted impacts of that project. Further, since the CR3 Uprate Project will not cause any increase in thermal effluent discharges, as demonstrated in the responses above, cumulative impacts with other projects are not warranted.

Industrial Waste Water Section (TLH)

1. **Figure 3.5.1-1 of the application indicates that the once through cooling water discharge from Crystal River Units 1, 2 and 3 has a flow rate of 1,304,271 gpm (or 1878 MGD). However, the facility has a flow limitation of 1,613.2 MGD during November through April. Please explain.**

   Response: Comment acknowledged. Figure 3.5.1-1 depicts the water use diagram during the months May through October and is comparable to SCA Figure 2.3.4-4 for the existing facility. Please see the response to A-FDEPSW-11 and the associated Figures 7 and 8 for the updated water use diagrams for both the existing and proposed facilities.

2. **On page 3-9, the application indicates an increase in the thermal loading due to uprate of Crystal River Unit 3 as 0.768 billion BTUs/hr and the existing helper cooling towers and new six-cell cooling tower in the helper mode would then reduce the combined discharge temperature rise down to 6.46 °F. The NPDES permit has a 3 hr rolling average of 96.5 °F. Progress Energy needs to provide the necessary calculations.**

   Response: Please see the response to A. FDEPSW- Item 12.

3. **On page 3-11 of the application an increase in the through screen-velocity from 1.45 to 2.02 fps is indicated due to the CR3 uprate project. The increased velocity could result in increased impingement mortality. Progress Energy needs to provide necessary impingement and entrainment studies in accordance with Section 316(b) of the Clean Water Act.**

   Response: The necessary impingement and entrainment studies under Section 316(b) are ongoing and will be submitted to the FDEP in accordance with the forthcoming renewal of the site's NPDES permit.

DEP Watershed Assessment Section (TLH)

1. **A review of the cooling tower design by the Department during the permit renewal process will be needed to ensure that there will be no increase in heat load or temperature rise leaving the discharge canal at the point of discharge.**

   Response: Comment noted. Progress Energy proposes to follow this approach to address thermal issues. Please see response to A. FDEP-SW-6 for more details on the cooling tower design and FDEPSW-12 for a preliminary analysis of pre- vs. post-uprate discharge temperatures and heat loads.

DEP Bureau of Laboratories Biology Section (TLH)

Progress Energy proposes to continue to evaluate the entrainment and impingement impacts associated with Crystal River Energy Center ongoing facility operations as well as the impacts associated with the CR3 Uprate Project. Progress Energy intends to quantify aquatic impacts to offset impacts during the CREC NPDES renewal process (scheduled for submittal in 2009). The additional entrainment and impingement impacts may be avoidable if they are adequately addressed in the 2009 NPDES permit cycle in response to the 316b rule. Increased intake velocities will increase impingement, so, this effect should be addressed in future permits (as stated). It is unclear why the velocity entering the canal is more important to consider, as organisms are not prevented from traveling up the canal to the intake screen. Please explain.

Response: Many investigators have made the case that flow is as important or more important than through-screen velocity. Reed Super of Riverkeeper Inc. made the case at the EPA 316(b) Symposium in 2003 that the level of impingement is proportional to the flow to the 3/2 power (approximately) (See Appendix A for copy of presentation). By recirculating a portion of the SCT flow to the intake canal, the flows before and after the uprate project is complete are presented in Response FDEPSW-11; for all practical purposes, the flow rates into the intake canal are the same pre-uprate as they will be post-uprate. Based on this analysis, the uprate should not cause any increase in impingement impacts.

Analysis of the expected average velocities in the intake canal indicates that the following range can be expected:

	High Tide (MHW)		Low Tide (MLW)	
	Pre-uprate	Post-uprate	Pre-uprate	Post-uprate
Velocity May through October (feet per second)	1.049	1.047	1.263	1.261
Velocity November through April (feet per second)	0.891	0.890	1.074	1.072

The now-vacated 316(b) Phase II rule addressed the impacts of impingement mortality and entrainment, but did not address the impact of what the State of Maryland in their 316(b) program calls entrapment. They define entrapment as the effect that occurs when swimming organisms are drawn into a body of water such as an intake canal and are trapped there because they are unable to swim back out; they cannot overcome the velocity towards the plant in that intake canal. Eventually they tire and are drawn to the screen structures and are impinged. EPA has concluded that a threshold velocity against which most fish cannot be expected to swim upstream is on the order of one foot per second; they further stated that a good safety factor would be 100%. That is why they set BAT for intake velocity as 0.5 feet per second through the screens. Bearing this information in mind, two factors become obvious when viewing the table above:

1. All of the velocities in the table are on the order of one foot per second which are threshold velocities cited by EPA.
2. There is no significant statistical difference between the existing velocities and the predicted velocities after the uprate.

Based on this analysis, Progress Energy expects that the implementation of the uprate project will not cause any measurable increase in impingement mortality since there is no increase in the velocity in the intake canal.

Siting Office

1. **Please provide the applicable federal regulation (rule) citations for the ongoing and anticipated projects mentioned in the application (and any other projects not mentioned) that exclusively fall within the jurisdiction of the Nuclear Regulatory Commission (NRC). These projects include, but may not be limited to, Measurement Uncertainty Recapture, License Renewal, and increase in power output.**

   There are no separate "applicable federal regulations (rules)" associated with power level uprates and other expected projects at CR3. The entire set of applicable federal regulations, principally the NRC, must continue to be met by CR3 at any power level.

   The process for amending commercial nuclear power plant licenses and technical specifications related to power uprates is the same as the process used for other NRC-issued license amendments; therefore, power uprate requests are submitted to the NRC as license amendment requests. This process is governed by 10 CFR 50.90, 50.91 and 50.92

   There is NRC guidance for the format and content of the NRC License Amendment Requests necessary to support any level of power uprate. This guidance is NRC forms RIS 2002-03 for

Margin Uncertainty Recapture and RS-001 for Extended Power Uprates, which are available from the NRC's website

There are extensive requirements and guidance associated with NRC License Renewal. The actual rule is Title 10 of the Code of Federal Regulations, Part 54. Guidance for application format and content are contained in industry guidance (NEI 95-10, Revision 6) and NRC Regulatory Guide 1.188, Revision 1.

Transformer and Steam Generator replacements are standard (albeit large) maintenance activities. There are no requirements for NRC approval and thus no guidance associated therewith except for standard guidance for maintenance activities.

2. **During a pre-application meeting between Progress Energy and the District and Siting Offices, the need for an ERP permit for low-level waste storage areas was discussed. What is the anticipated date for submission of the ERP permit for the waste storage areas? Will the facilities be enclosed or unenclosed? FDEP-Siting requests that Progress Energy provide the applicable NRC requirements for the construction and monitoring of such facilities as well as confirmation of Progress Energy's intent to comply with those regulations.**

   Progress Energy does not expect to need to construct any new or expanded onsite low-level nuclear waste storage areas as a result of the CR3 Uprate Project, therefore, an ERP permit is not required. In the event a new waste storage area is required to accommodate storage of the steam generator components associated with the steam generator replacement project, the appropriate permits and agency authorizations will be acquired, separate from this certification process.

   Applicable NRC low-level waste regulations are found in 10 CFR 61. Florida is an Agreement State with the NRC and the Florida Department of Health regulates low level wastes under an agreement with the NRC and pursuant to NRC-approved state regulations in Chapter 404, Florida Statutes and Rule Chapter 64E-5, F.A.C. As such, Progress Energy complies with these state regulations.

3. **The application states that spent fuel will continue to be stored in the NRC approved storage areas. Are these areas fuel pools? Are there also dry cask storage areas on site? Please provide a brief description of the storage areas, including size. Explain why these storage areas do not require any state or local permits? Does Progress Energy anticipate the need to construct additional spent fuel storage areas?**

   Spent Fuel from the CR3 reactor will continue to be stored in the existing NRC-licensed spent fuel pools. There are two such pools with sufficient storage capacity to maintain a full core reserve through 2013. At that time it will be necessary to either begin shipping spent fuel to a permanent repository or to provide additional storage. If and when Progress Energy finds it necessary to augment site storage with dry cask storage it will likely require necessary approvals under the requested CR3 SCA as well as NRC approvals. There are no dry cask storage facilities at the site currently.

4. **The Department is certifying Unit 3, a 1,080 MW nuclear unit. As such, all permitting activities associated with a certified unit are handled under the certification process. Please explain the relevance that the steam generator replacement project (SGRP) is**

being addressed by Progress Energy separately from the uprate project undergoing the certification process, since the entire Unit 3 will ultimately be certified. Please explain what components make up the "once-through" steam generator described in the application on page 3-2. If the steam generator was not being replaced due to degradation, would it be capable of accommodating the planned ultimate power increase to 1080 MW? Please supply the nameplate ratings of the existing and new steam generators. Have there been &y other changes/upgrades to the existing steam generator?

The replacement of the existing steam generators is an otherwise necessary maintenance activity that is completely unrelated to the requested power increase. The steam generator replacement does not increase the unit's steam electric generating capacity under section 403.506, F.S. The later uprate project will result in such an increase in steam electric generating capacity due to an increase in the maximum electrical generator rating. The steam generator project will be undertaken regardless of the CR3 Uprate Project addressed in the SCA, and will occur before commencement of construction for the CR3 Uprate Project. The steam generator project will require development of new onsite lay down areas for construction materials. Thus, since the steam generator replacement project is a separate required project, Progress Energy will seek ERP permits for the laydown area separate from the pending site certification application. These laydown areas will generally be common to all the units on the site and not singularly associated with CR3. They will not be part of the permanent certified site for the CR3. The necessary permits associated with lay-down and pre-fabrication areas are therefore being pursued separately.

Both the existing and replacement once through stream generators are very large single-pass, tube-and-shell heat exchangers. They transfer heat from the Reactor Coolant System to the main steam system which in-turn transports the energy to the turbines which drive the electrical generator converting a portion of the energy to electrical power. Both the existing and replacement steam generators are designed for the current power level but can be qualified to the higher power levels without physical modifications.

CR3 was initially licensed to operate at a maximum of 2,452 megawatts-thermal. In 1981, the NRC approved operation of CR3 at up to 2,544 MWth. On June 5, 2002, Florida Power submitted a License Amendment Request seeking NRC approval to operate at a power level of 2,568 MWth. The letter accompanying the request noted that this was a "stretch uprate" involving changes in set points, and would not have a significant effect on health, safety, or the environment. On December 6, 2002, NRC approved the request, noting that it would increase the generating capacity of the plant by 0.9 percent, from 895 megawatts electric to 903 megawatts electric. The CR3 Final Safety Analysis Report (FSAR) is more specific, referring to the 903 MWe value as the plant's "maximum continuous gross electrical output." Progress Energy normally reports the plant's generating capacity as 838 MWe (net summer capacity), which is the amount of power actually supplied to the regional grid in summer, the time of peak demand. None of these changes nor those proposed in this project necessitated physical modifications to the steam generators

5. **On page 3-1 of the application included in a discussion of first phase occurrences, is the following language: "The existing steam turbine high-pressure rotor was designed in the 1960s and is a multi-piece assembly which causes more drag than current technology deems necessary. Progress Energy will replace the outdated rotor with current rotor**

blade technology. "However, on page 4-1, it is stated that Progress Energy will retrofit the high-pressure turbine during Phase 11. Please clarify what this means.

The two terms "replace" and "retrofit" describe the same activity. The low pressure steam turbine modifications can be described as either a replacement or an extensive retrofit. Significant portions of the steam turbines are being completely replaced, some slightly modified and the shell left essentially as-is.

6. **After consideration of items in question 4 above, please explain why Progress Energy intends to request authorization for site disturbance of those areas that will be used to support construction activities related to the SGRP and CR3 Uprate project through a separate ERP application.**

Certain of the activities to support replacement of the steam generators or unrelated activities may begin well before the power uprate, and are required regardless of the Uprate Project. Some of these activities require ERPs. The SCA process may not be completed in time to support these steam generator replacement activities. Other areas (involving areas common to the adjacent fossil sites or distant to CR3) will remain appropriately addressed by the ERPs.

7. **On page 3-2 of the-SCA, "Main step-up transformer replacement" is included in the list of "Other Onsite Projects not subject to this SCA." Provide the nameplate rating on the existing and new transformers. If there were no degradation of the existing transformer, would the transformer be capable of accommodating the planned ultimate power increase to 1080 MW?**

The current main step-up electrical transformers are rated for 320 kVA per phase and the replacements are rated for 400 kVA per phase. They are being replaced as a normal maintenance activity due to age related degradation that has already led to two in-service failures. The replacement transformers are being replaced in 2007. The replacement transformers were sized to support future uprates but are not funded, managed or designed as part of the uprate project. Further, these are well within the area proposed to be covered by the site certification and no ERPs were required to support their installation. They were addressed in the discussion simply for completeness.

8. **Please provide an estimate of the annual CO_2 emissions associated with Unit 3 as a certified 1080 MW nuclear unit.**

The increased generation of electricity at the CR3 site does not produce any greenhouse gases including CO_2. While the uprate project and proposed additional cooling towers, referred to as the South Cooling Towers (SCT) will result in an increase in air emissions for particulate matter (PM), other combustion-related air emissions, including emissions of CO_2, will not be affected. There will be no additional fuel combustion sources (e.g., additional diesel generator capacity) or increase in existing fuel firing capability associated with this proposed project.

2.0 FLORIDA DEPARTMENT OF TRANSPORTATION

The Department will need the following additional information to evaluate the application:

1. **The impact of the construction workforce needs to be expanded to include all assumptions such as, will there be shifts, how many workers per shift, how many workers per car, volume by direction of travel, and anticipated method of conveyance.**

Response – The impact of construction workforce activities were assumed for the future conditions, such as direction of travel, number of workers per car, and number of shifts per day from a trip generation survey performed at the existing facility as part of the data collection process, and the existing trip characteristics were assumed for future conditions.

The workforce includes both engineering and technical staff, as well as field construction workers. During peak periods all of these workers are scheduled for split shifts (typically 10 or 12 hours, seven days a week with different days off). Thus, the total work force is never on site (or arriving) at the same time. Further, different work start times are used to spread out the impact at all the potential congestion points.

As discussed from our meeting, the applicant will provide mitigation for the construction activity as needed so that the demand of these vehicles can be controlled with little impact to the typical operation to U.S. Highway 19. The applicant already plans to take these measures as needed to deal with congestion at its Access Control Points leading onto the nuclear site and into the nuclear facility. These travel demand measures include:

- Utilizing Citrus County Sheriff Officers to monitor the intersection of U.S. Highway 19 and Power Line Road for major activities.
- Staging construction vehicles so that they do not all arrive to the facility at the same time, and to help spread out the peak influx of vehicles at the facility
- Coordinate construction and outage events so that they are scheduled at different times.

Quantitatively, the following traffic demand management strategies will be implemented to control the arrival/departure of site traffic:

- Approximately five to six out of every seven employees are expected on-site every day during outages; i.e., approximately 80 percent of the workers are expected to arrive on a typical day.
- The employee arrival will be split as 60/40 between days and nights; i.e., approximately 60 percent of the employees will arrive in the AM Peak Hour.
- Also, the peak traffic would be spread out over two hours as opposed to one hour; i.e. only 50 percent of the total peak hour traffic will arrive in the actual peak hour.

It should be noted that the total volumes in the June 2007 traffic study assumed a very conservative, worse case scenario where all construction activities would be occurring simultaneously in the year 2009 for the CR3, CR 4, CR 5 and SGRP (Stream Generator Replacement Project) projects. This scenario would not feasibly occur. More typical employment data expected at the facility for the peak hour has been incorporated into the analysis, which is enclosed with the revised Traffic Study (Appendix B).

2. **Analysis using highway capacity software to identify anticipated operational changes needed on U.S. 19 such as turn lanes, storage bays, signal timing, and related analysis for these items.**

   Response - The requested analysis is provided in HCS for the greatest volume scenario, which is the Temporary 2009 Build Scenario. The original analysis was performed in Synchro 7 in accordance to the methodologies contained in the Highway Capacity Manual (HCM) 2000, consistent with HCS software. Turn lane and signal timing information is provided.

   It should be noted that the existing traffic signal performs on an isolated, actuated timing plan with a variable cycle length. Currently, the northbound left turn operates as a protected-permitted movement with large gaps available from the minor southbound volume.

3. **Expansion of the impact of the trucks expected daily to include a description of the truck traffic population and frequency of arrival.**

   Response – Please refer to the response provided for Comment 1 above. Additionally, the trip generation survey performed for this facility identified the trip rates per hour for trucks. Therefore, the impact of the expected trucks was incorporated for population and frequency of travel.

4. **It is noted there are some discrepancies in the data and some inappropriate methodologies used. The following issues should be clarified:**

   4a. The traffic impact should be evaluated using peak hour directional standards, rather than two-way volume measurements.

   Response – Comment noted. The two-way volume standards were applied originally to represent a more conservative service volume capacity for study area determination. It should be noted that this does not change the Level of Service associated with the project results because the Level of Service was evaluated using more detailed computer software consistent with the HCM.

   4b. There are discrepancies in the volume data which need to be clarified. For example, Table 4.6.2-1 indicates that peak hour project volume on U.S. 19 will be 655; however, Figure 4.6.2-1 indicates there will be 966 northbound left turns and another 461 southbound right turns at the intersection of Power Line Road and U.S. 19.

   Response - The volume of 655 reflects the Year 2009 volumes from the project facility on the U.S. Highway 19 roadway south of Power Line Road. These volumes correspond with Figure 3.

   The volume of 966 northbound left turns and 461 southbound right turns from Figure 6 reflect a 2009 temporary, total traffic condition.

   It should be noted that the total volumes in the June 2007 traffic study assumed a very conservative, worse case scenario where all construction activities would be occurring simultaneously in the year 2009 for the CR3, CR4, CR5 and SGRP (Stream Generator Replacement Project) projects. This scenario would not feasibly occur. More typical

employment data expected at the facility for the peak hour has been incorporated into the analysis, which is enclosed with this letter.

3.0 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Ownership Or Legal Control

The Water Use Permit (WUP) Basis of Review (B.O.R.), Section 2.1 (1) states Applicants must demonstrate ownership or legal control of all property on which pumps, wells, diversions or other water withdrawal facilities are or will be located.

Progress Energy currently operates its CR3 under a SWFWMD-issued individual water use permit, Permit No. 204695.03. See SCA Appendix 10.4.1. That permit was issued on October 27, 1997 and Progress Energy is seeking renewal of that permit. That permit authorizes a daily average allocation of 1,000,000 gpd which is used to meet the combined non-cooling water needs of the existing Crystal River Units 1, 2 and 3. (Crystal River Units 4 and 5 operate under a separate water use allocation granted pursuant to a Power Plant Site Certification for those two units.) CR3 receives its water needs from the existing common SWFWMD-permitted wellfield and a common onsite process water treatment facility that serves Units 1, 2, and 3. Progress Energy is not requesting any increase in the SWFWMD-permitted allocations for Units 1, 2 and 3, and does not propose to increase or change the non-cooling water uses for CR3 after the Uprate Project. Progress Energy proposes to maintain that water supply arrangement for CR Units 1, 2 and 3 in the future following certification of the CR3 Uprate Project and to continue to obtain the non-cooling water needs for CR3 under the existing individual water use permit and from the common water treatment facility. The District should address any questions regarding the WUP for CR 1, 2 and 3 in the on going permit renewal application.

1. **Please provide a copy of the Applicant's Warranty Deed for all parcels on which pumps, wells, diversions or other water withdrawal facilities are or will be located. Reference Rule 40D- 2.1 01, F.A.C.**

A copy of the deed in enclosed in Appendix C. Please see water use application 20004695.004 for further information.

Withdrawal Points And Quantities

Water Use Permit 20004695.003 currently includes 5 wells which supply water to Units 1, 2, and 3. The Site Certification Application states that 3 of the wells supply water to an existing water treatment plant and that Unit 3 receives and meters its supply from the treatment plant. For site certification, the quantities associated with Unit 3 will need to be separated from the water use permit quantities.

CR3 receives its water needs from the existing common SWFWMD-permitted wellfield and an onsite process water treatment facility that serves Units 1, 2 and 3. The wellfield and supply wells are uncertified, common facilities authorized to serve Units 1, 2 and 3. The WUP for CR 1, 2 and 3 is currently on going permit renewal. Water supplied to Unit 3 comes from a common facility; therefore, separation of the water use is not applicable.

2. **Please assert whether or not one or more specific wells will be designated to supply water for Unit 3 and if so, identify the well(s).**

No specific wells can or will be designated to supply water to CR3. Units 1, 2, and 3 use a common system to supply water. The South Plant is identified as Units 1 and 2 and water use data is not available split between the two units since they use common systems. Unit 3 Nuclear Plant purchases water from the water plant. South Plant use and CR3 Nuclear Plant use data is shown in the Table 6.

3. **Please provide several years of historical water use and a table listing the quantities needed for each unit (l, 2, and 3).**

   Historical water use data is not maintained for an individual unit. Water is pumped to a uncertified, common water treatment plant where it is supplied to all 3 units on an on demand basis.

4. **Please provide adequate information showing the distribution and use (water balance) of water from each well (PW-1A, PW-16, SPWS, SPW-4, and SPW-5).**

   There is no PW-16 associated with the CR 1, 2, and 3 WUP. This information is included in the current WUP renewal application. Please see the water balance diagrams in Appendix C.

5. **Please discuss the alternative power generation plans for when Unit 3 is being worked on. Will the work on Unit 3 result in any increase in water use for other units at the facility or at some other location in the District?**

   The CR3 uprate project will occur during scheduled routine maintenance and refueling outages. These outages are carefully scheduled such that any replacement power needs can be obtained from existing Progress Energy units or purchased from other utilities. All units at the facility will operate within permitted limits. There will be no new demand for water caused by the CR3 Uprate Project.

<u>Flow Model Simulations and Impact Analysis</u>

The District will need an impact analysis for reasonable assurance that the proposed project meets all substantive conditions for water use. The impact analysis should include analysis for the potential effects on nearby wetlands and nearby well owners. The applicant could use a finite-difference ground-water model (MODFLOW). The applicant may want to consider using the District-Wide Regulation Model- Version 2 (DWRM2) to create a focus model of the area and account for simulation of the possible effects on wetlands and/or nearby wells but model modification or a separate analysis would be needed to determine these effects. To acquire the latest version of this model, please contact Robert Peterson at (352) 796-7211, Extension, 2035.

6. **Please provide an impact analysis for the projected use. Please supply the MODFLOW input and output data files for the models submitted with the WUP application. The input and output data files should be submitted in digital formats. Please include files compatible with Groundwater Vistas. Model impact report guidelines are available from the Southwest Florida Water Management District.**

As part of its 1997 water use permit renewal, Progress Energy provided SWFWMD with an impact analysis for the authorized water allocation. That impact analysis demonstrated that there would be no adverse impact from the currently permitted withdrawals, including those for CR 3, and that the proposed water use met all of the District's water use permitting criteria. Progress Energy has recently submitted its water use permit renewal application to SWFWMD, Number 4695, which will contain a demonstration that the currently permitted allocation does not have an adverse impact and continues to meet the District's permitting criteria. Therefore, Progress Energy believes that since an impact analysis will be submitted as part of the separate water use permit renewal application, that it is unnecessary to separately submit such an analysis at this time for the CR 1, 2, and 3 permitted withdrawals.

Conditions For Issuance

In order to obtain authorization for the consumptive use of water pursuant to Part II of Chapter 373, F.S., an applicant must demonstrate that the water use is reasonable and beneficial, is consistent with the public interest, and will not interfere with any existing legal use of water. This must be accomplished by the applicant providing reasonable assurances on both an individual and cumulative basis, that the water use satisfies items (a) through (n) stated in Rule 40D-2.301 (I), F.A.C. The information submitted with the application did not include sufficient evidence to provide reasonable assurances of compliance with the permit issuance criteria. Rule 40D-2.301(3), F.A.C. states, 'Standards and criteria set forth in the "Basis of Review for Water Use Permit Applications" identified in Rule 40D-2.091, F.A.C. shall be used to provide the reasonable assurances required in Rule 40D-2.301 (I), F.A.C.

7. **Please provide reasonable assurance as to how each of the conditions for issuance set forth in Rule 40D-2.301(l)(a) through (n), F.AC. will be met, on both an individual and cumulative basis. Please refer to the performance standards set forth in Chapter 4 of the B.O.R. for Water Use Permit applications. Reference Rule 4OD-2.301, F.A.C.**

Response: Progress Energy is not seeking any change to the existing WUP. There will be no impact to the permitted withdrawal quantity as a result of the uprate project. Please see water use application 20004695.004 for further information.

4.0 FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

The uprate project would modify the existing Crystal River Unit 3 complex to meet increased flow/intake requirements from the intake canal. The proposed modifications will require both additional flows from the intake canal while being augmented by recirculated water discharged into the intake canal; this increased flow would be accompanied by increased flow velocities over the intake screens.

Our primary concern is over the continued or increased impingement and entrainment of estuarine organisms due to the increased flow velocities at the intake screens. However, as noted in Section 5.1.2, Volume 1 of the application documents, Progress Energy Florida is in the process of quantifying baseline aquatic impingement and entrainment impacts at the Crystal River complex. Further, Progress Energy Florida intends to submit the data with an evaluation of impacts and identify measures to reduce impacts during the National Pollutant Discharge Elimination System (NPDES) permit renewal in 2009. Our Division of Marine Fisheries Management will be most interested in these data and results. We will review the information associated with the NPDES permit application and provide additional comments at that time.

Comment Acknowledged.

5.0 WITHLACOOCHEE REGIONAL PLANNING COUNCIL

Natural Resources – Air Quality

Under 1977 Clean Air Act Amendments, Citrus County classifies as a Class II area, and the Chassahowitzka National Wilderness Area classifies as a Class I Area. Because natural resources in the vicinity of the Crystal River Energy complex (CREC) have excellent ambient air quality, any new source of regulated emissions could have an adverse effect on these natural systems. Goal 4.14 and Policy 4.1.4.4, fro the (SRPP), provide general guidance on how to proceed.

Goal 4.1.4 **Maintain the region's concentrations of all air pollutants for which standards have been established at levels less than the maximum allowed by state and federal standards**

Policy 4.1.4.4 **Consider the cumulative effects of development on air quality during project review; implement mitigation measures where needed to avoid a deterioration of ambient air.**

The comment is acknowledged. Federal and state air regulatory requirements for a new source of air pollution are discussed in the air permit application that is presented in Appendix 10.1.5 of the SCA. The applicability of these regulations, including effects on ambient air quality, to the proposed modifications at the Crystal River Energy Complex are discussed in each respective section of the air application. These regulations must be satisfied before the proposed Project can be approved.

Transport – Roadway Level of Service (LOS)

The traffic impact survey accompanying the application indicates temporary construction traffic will adversely affect roadway level of service (LOS) for U.S.-19 during construction. The survey estimates level of service (LOS) D and C for peak hour AM traffic flow during 2009 and 2011, respectively. These levels of service are inconsistent with adopted levels of service for this road. The owner/developer should consider what mitigation actions might best be taken to maintain roadway (LOS) consistent with existing levels of service.

As a regionally significant roadway, US-19 is subject to guidance by (SRPP) policies and goals.

Policy 5.5.1 **Levels of service for regionally significant roadways should be consistent with Florida Department of Transportation (FDOT) recommended Levels of Service requirements.**

Policy 5.5.9 **Coordinate land use plans and transportation planning efforts to ensure that land use decisions and transportation improvements are complementary.**

Comment acknowledged.

Economic Development

Residual heat from the power generation process could have economic use. If explored, heat output from the plant could serve as input for other industry. WRPC staff encourage the owner/developer to investigate such possibilities. Such an approach would air efficient use of surplus energy, while facilitating new industry and markets. The (SRPP) supports such an innovative approach.

Policy 4.15.1 Use renewable (residual) energy sources whenever feasible

Policy 2.3.10 Increase intra-regional cooperation in attraction/expansion of industry dependent upon close proximity to one another or actual co-location.

Policy 2.3.7 Increase coordinated economic development activity through partnerships among education, businesses, industries, agriculture and the arts.

Comment acknowledged.

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TABLES

TABLE 1
Average Monthly Temperatures
(Pre and Post-Uprate Conditions)

	Pre-Uprate Condition			Post-Uprate Condition	
Month	Intake Temperature	Plant Discharge Temperature	Cooling Tower Cold Water Temperature	Blended Intake and Cooling Tower Cold Water Temperature	Difference Between Blended and Original Intake Temperature
January	59.9	77.3	64.9	60.5	0.6
February	60.7	78.1	66.2	61.4	0.6
March	66.9	84.2	71.5	67.4	0.5
April	72.7	90.1	75.7	73.1	0.4
May	79.6	94.6	80.4	79.7	0.1
June	85.2	100.2	84.8	85.1	0.0
July	87.0	102.1	86.1	86.9	-0.1
August	87.0	102.1	86.2	86.9	-0.1
September	83.0	98.0	84.9	83.2	0.2
October	77.4	92.4	81.1	77.8	0.4
November	68.3	85.7	74.8	69.1	0.8
December	60.7	78.0	66.7	61.4	0.7

TABLE 2
Maximum (Peak) Monthly Temperatures
(Pre and Post-Uprate Conditions)

Month	Intake Temperature	Plant Discharge Temperature	Cooling Tower Cold Water Temperature	Blended Intake and Cooling Tower Cold Water Temperature	Difference Between Blended and Original Intake Temperature
January	69.5	86.9	78.3	70.5	1.0
February	66.6	84.0	76.6	67.8	1.2
March	73.4	90.8	81.3	74.3	0.9
April	81.7	99.1	84.3	82.0	0.3
May	87.4	102.4	87.4	87.4	0.0
June	90.7	105.7	89.2	90.5	-0.2
July	90.8	105.8	89.8	90.7	-0.1
August	90.8	105.8	89.7	90.7	-0.1
September	88.4	103.4	89.0	88.5	0.1
October	84.6	99.6	87.2	84.9	0.3
November	80.4	97.8	85.6	81.0	0.6
December	71.0	88.4	80.1	72.1	1.1

TABLE 3
Average Monthly Discharte Temperatures
(Pre and Post-Uprate Condtions)

	Pre-Uprate Conditons		Post-Uprate Condition		
Month	Existing Plant Discharge Temperature	Existing Discharge Canal Exit Temperature with HCT*	Uprated Plant Discharge Temperature	Uprated Discharge Canal Exit Temperature with HCT	Difference Between Uprated and Original Discharge Canal Exit Temperature*
January**	79.6	79.6	77.3	77.3	-2.3
February**	80.4	80.4	78.1	78.1	-2.3
March**	86.6	86.6	84.2	84.2	-2.3
April**	92.4	92.4	90.1	90.1	-2.3
May	96.3	86.0	94.6	85.8	-0.2
June	101.9	91.3	100.2	90.6	-0.7
July	103.8	92.6	102.1	92.1	-0.5
August	103.8	92.7	102.1	92.2	-0.5
September	99.7	90.5	98.0	89.9	-0.6
October**	94.1	94.1	92.4	92.4	-1.7
November**	88.0	88.0	85.7	85.7	-2.3
December**	80.4	80.4	78.0	78.0	-2.3

* Assuming All HCT cells operating except when none are needed
** No Supplemental Cooling Needed to meet temperature limits

TABLE 4
Maximum (Peak) Monthly Discharge Temperatures
(Pre and Post-Uprate Conditions)

	Pre-Uprate Condition		Post-Uprate Condintion		
Month	Existing Plant Discharge Temperature	Existing Discharge Canal Exit Temperature with HCT*	Uprated Plant Discharge Temperature	Uprated Discharge Canal Exit Temperature with HCT	Difference Between Uprated and Original Discharge Canal Exit Temperature*
January	89.19	89.2	86.87	86.9	-2.3
February	86.29	86.3	83.97	84.0	-2.3
March	93.09	93.1	90.77	90.8	-2.3
April	101.39	88.7	99.07	88.6	-0.1
May	104.14	93.5	102.43	93.1	-0.4
June	107.44	95.9	105.73	95.5	-0.4
July	107.54	96.2	105.83	95.9	-0.3
August	107.54	96.1	105.83	95.8	-0.3
September	105.14	94.9	103.43	94.5	-0.4
October	101.34	92.5	99.63	91.9	-0.6
November	100.09	89.4	97.77	89.1	-0.3
December	90.69	90.7	88.37	88.4	-2.3

* Assuming All HCT cells operating

TABLE 5
Average Heat Load Conditions Exiting the Discharge Canal
(Pre and Post-Uprate Conditions)

	Pre-Uprate Condition		Post-Uprate Condition		
Month	Intake Temperature	Existing Discharge Canal Exit Temperature	Uprated Discharge Canal Exit Temperature	Existing Discharge Canal Exit Billion Btu/Hour (Average Conditions)	Uprated Discharge Canal Exit Billion Btu/hour (Average Conditions)
January	59.9	79.6	77.3	10.927	9.607
February	60.7	80.4	78.1	10.925	9.605
March	66.9	86.6	84.2	10.929	9.608
April	72.7	92.4	90.1	10.927	9.607
May	79.6	86.0	85.8	4.208	4.043
June	85.2	91.3	90.6	3.993	3.557
July	87.0	92.6	92.1	3.665	3.327
August	87.0	92.7	92.2	3.708	3.368
September	83.0	90.5	89.9	4.894	4.489
October	77.4	94.1	92.4	10.944	9.798
November	68.3	88.0	85.7	10.925	9.605
December	60.7	80.4	78.0	10.929	9.608

Existing Discharge Canal Exit Flow Rate =	1,308,027	gpm May - Oct
Uprated Discharge Canal Exit Flow Rate =	1,304,271	gpm May - Oct
Existing Discharge Canal Exit Flow Rate =	1,110,319	gpm Nov - Apr
Uprated Discharge Canal Exit Flow Rate =	1,106,563	gpm Nov - Apr

TABLE 6
Maximum Heat Load Exiting the Discharge Canal
(Pre and Post-Uprate Conditions)

	Pre-Uprate Condition		Post Up-rate Conditon		
Month	Intake Temperature	Existing Discharge Canal Exit Temperature with HCT*	Anticipated Uprated Discharge Canal Exit Temperature with HCT	Existing Discharge Canal Exit Billion Btu/Hour (Maximum	Anticipated Uprated Discharge Canal Exit Billion Btu/hour (Maximum
January	69.5	89.2	86.9	10.9267	9.6067
February	66.6	86.3	84.0	10.9267	9.6067
March	73.4	93.1	90.8	10.9267	9.6067
April	81.7	**88.7**	**88.6**	3.8846	3.8161
May	87.4	93.5	93.1	3.9792	3.7055
June	90.7	95.9	95.5	3.3788	3.0975
July	90.8	96.2	95.9	3.5074	3.3001
August	90.8	96.1	95.8	3.4645	3.2596
September	88.4	94.9	94.5	4.2365	3.9487
October	84.6	92.5	91.9	5.1800	4.7593
November	80.4	**89.4**	**89.1**	4.9944	4.8116
December	71.0	90.7	88.4	10.9267	9.6067

Existing Discharge Canal Exit Flow Rate = 1,308,027 gpm May - Oct
Uprated Discharge Canal Exit Flow Rate = 1,304,271 gpm May - Oct
Existing Discharge Canal Exit Flow Rate = 1,110,319 gpm Nov - Apr
Uprated Discharge Canal Exit Flow Rate = 1,106,563 gpm Nov - Apr

TABLE 7
Monthly Water Usage for Units 1, 2, and 3

Monthly Usage (gallons)

Month	Year	Days/Mo	South (U1&2)	CR3 Usage
January	2004	31	20,195,200	10,911,600
February	2004	29	17,627,400	8,943,800
March	2004	31	19,871,100	9,826,000
April	2004	30	20,140,200	10,480,200
May	2004	31	19,620,300	10,918,800
June	2004	30	22,408,100	11,116,000
July	2004	31	25,341,800	12,124,520
August	2004	31	23,154,100	12,018,800
September	2004	30	17,165,200	11,133,600
October	2004	31	18,115,000	11,059,000
November	2004	30	22,644,800	11,048,600
December	2004	31	19,123,100	11,085,600
January	2005	31	23,855,400	9,906,976
February	2005	28	21,732,100	9,641,470
March	2005	31	22,549,800	11,082,770
April	2005	30	21,518,300	10,541,200
May	2005	31	23,156,900	11,779,200
June	2005	30	23,991,500	11,937,200
July	2005	31	24,023,600	12,228,200
August	2005	31	21,016,715	10,594,000
September	2005	30	17,359,200	11,007,000
October	2005	31	20,312,285	11,298,000
November	2005	30	17,372,900	10,816,000
December	2005	31	19,195,000	11,821,600
January	2006	31	22,387,500	11,531,800
February	2006	28	18,871,100	10,369,830
March	2006	31	18,495,500	10,322,000
April	2006	30	21,231,200	10,802,400
May	2006	31	20,475,100	10,984,128
June	2006	30	19,926,000	11,582,960
July	2006	31	22,324,400	12,571,000
August	2006	31	22,614,200	12,793,958
September	2006	30	22,182,800	12,540,000
October	2006	31	24,390,900	12,148,200
November	2006	30	21,137,200	12,205,400
December	2006	31	22,384,000	13,012,760
January	2007	31	22,831,300	12,718,790
February	2007	28	19,198,600	9,478,350
March	2007	31	19,198,600	12,266,800
April	2007	30	21,840,100	11,648,470
May	2007	31	20,491,100	12,797,920
June	2007	30	22,216,600	9,670,800

FIGURES

FIGURE 1
Average Intake Monthly Temperatures
(Pre and Post-Uprate Conditions)

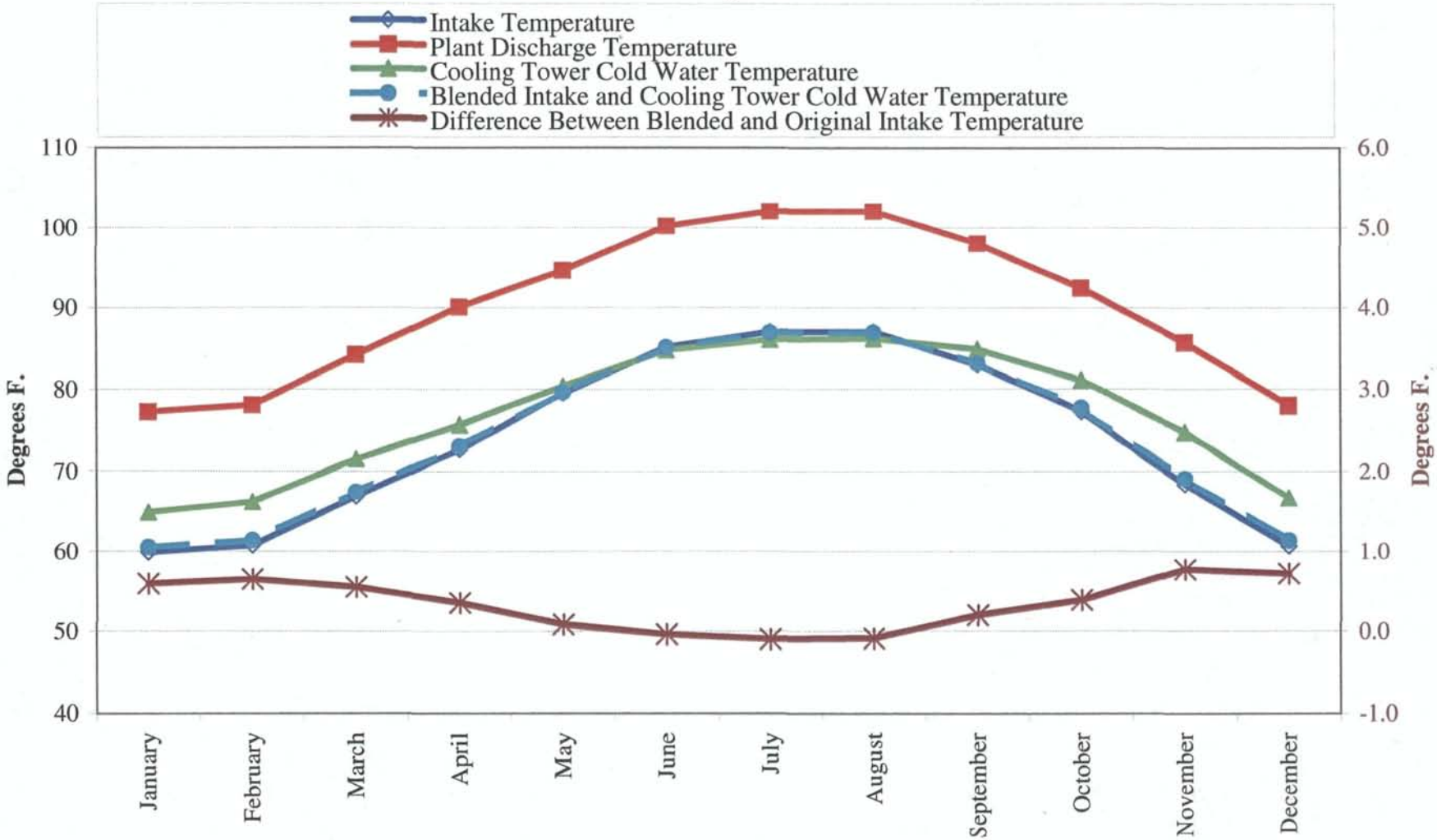


FIGURE 2
Maximum (Peak) Intake Monthly Temperatures
(Pre and Post-Uprate Conditions)

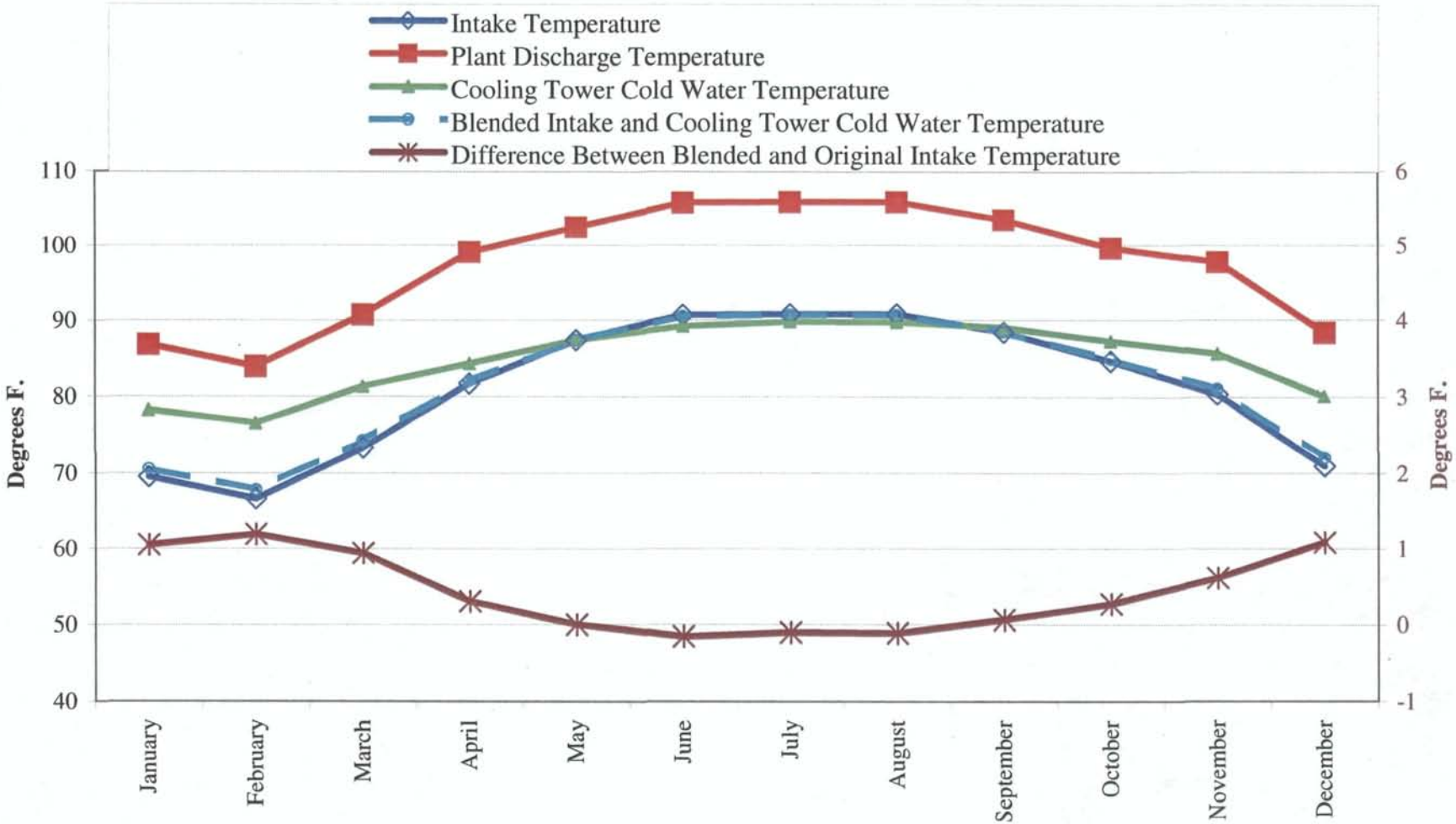


FIGURE 3
Average Monthly Discharge Temperatures
(Pre and Post-Uprate Conditions)

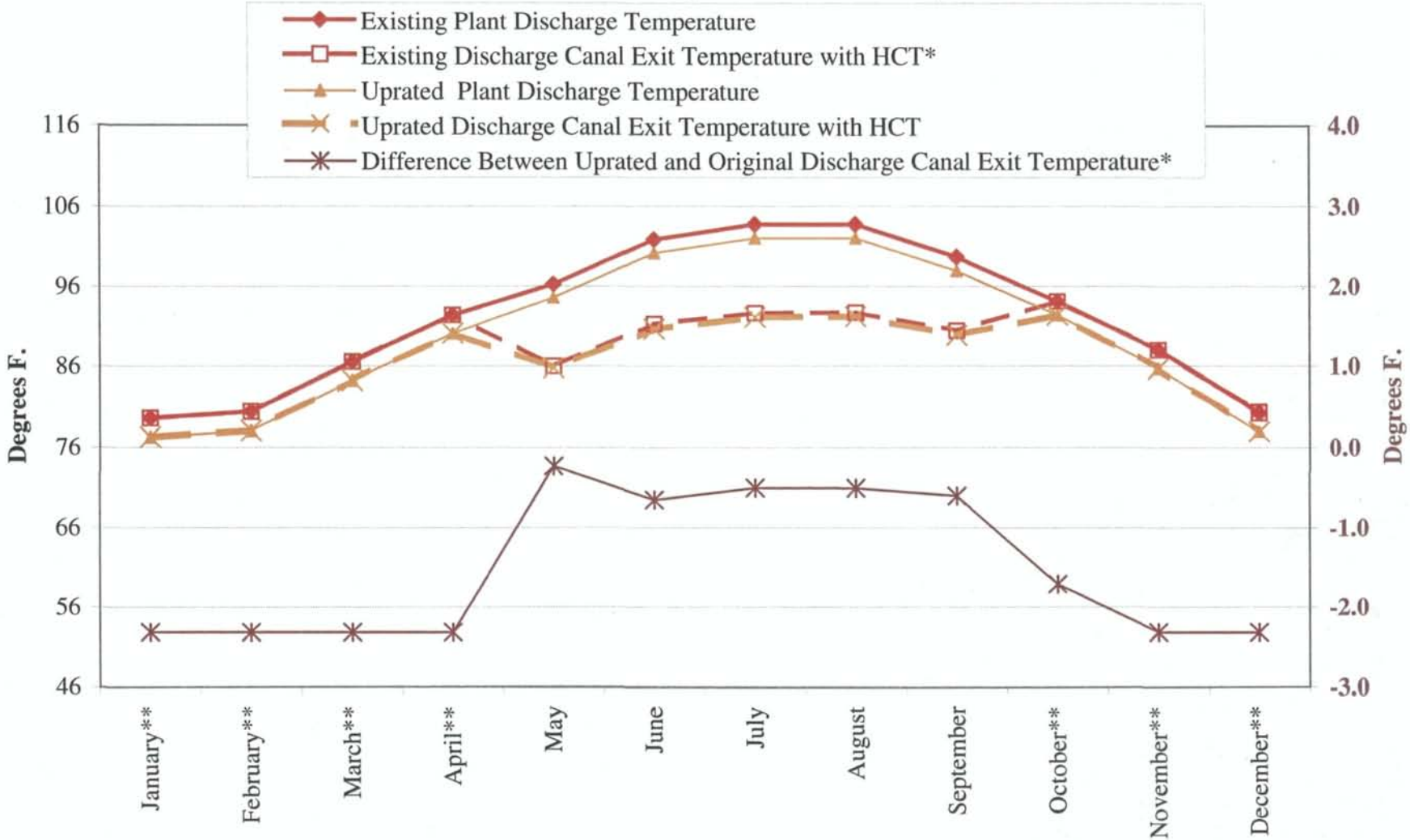


FIGURE 4
Maximum (Peak) Monthly Discharge Temperatures
(Pre and Post-Uprate Conditions)

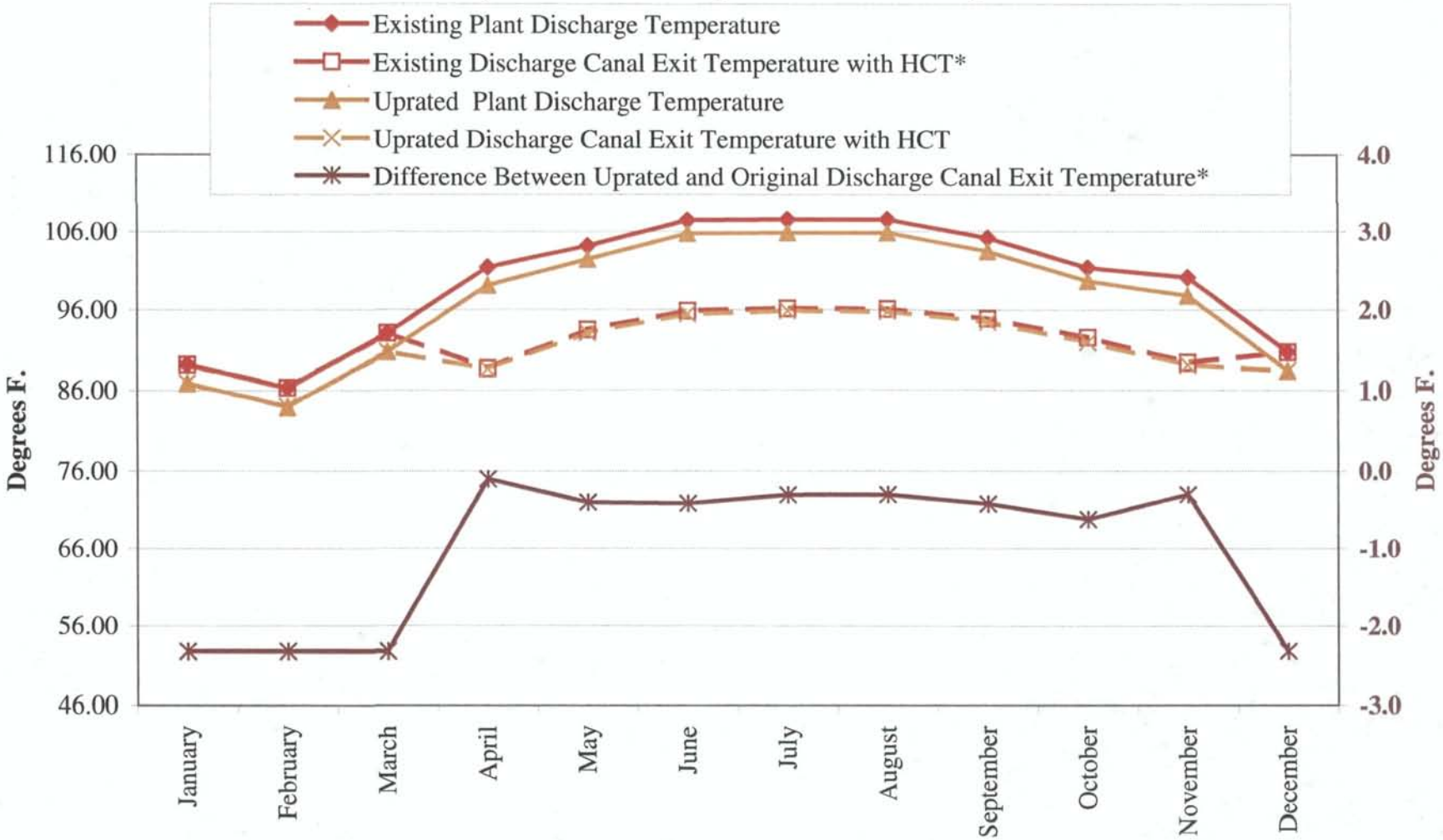


FIGURE 5
Average Heat Load Exiting the Discharge Canal
(Pre and Post-Uprate Conditions)

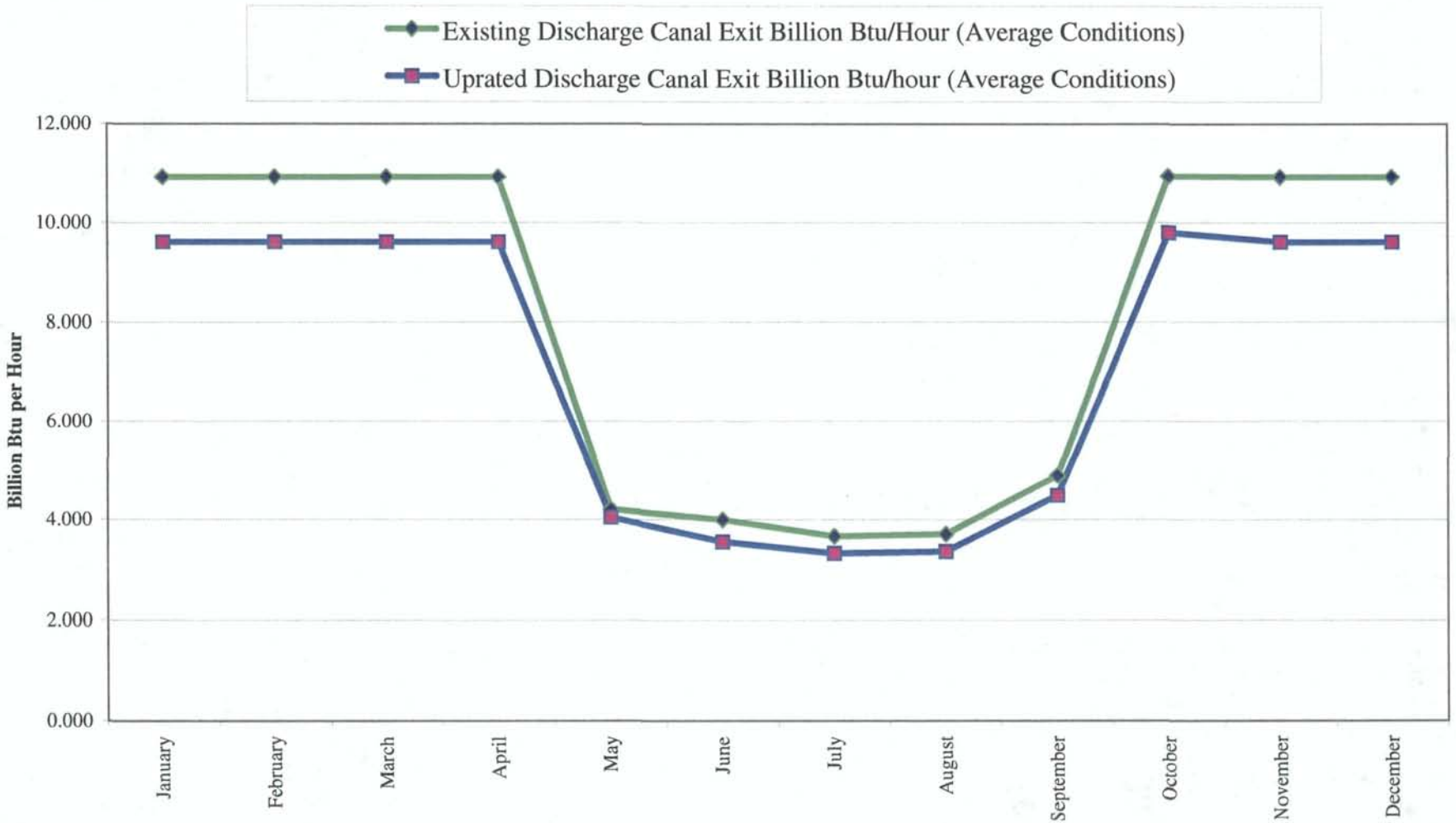


FIGURE 6
Maximum Heat Load Exiting the Discharge Canal
(Pre and Post-Uprate Conditions)

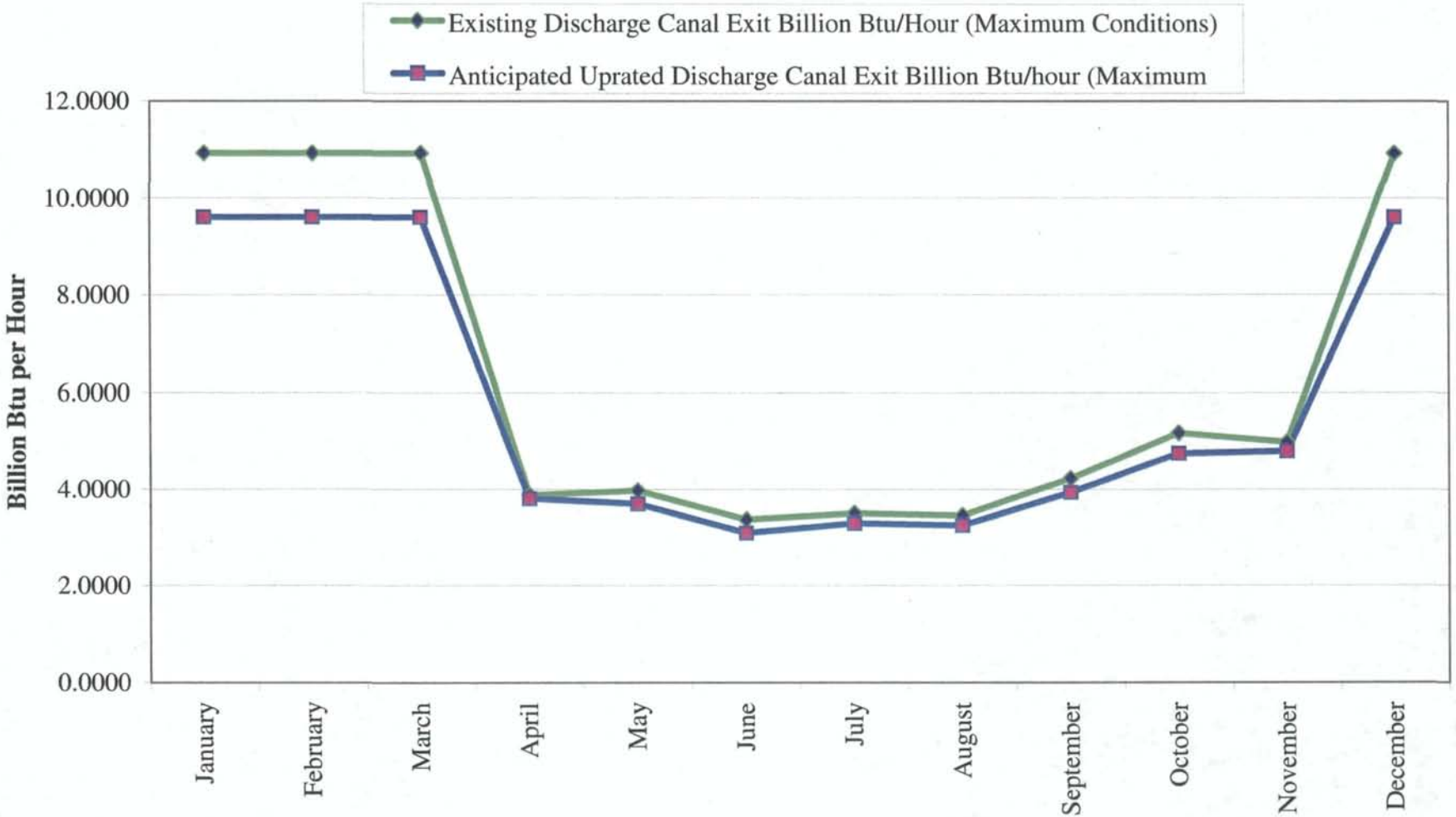
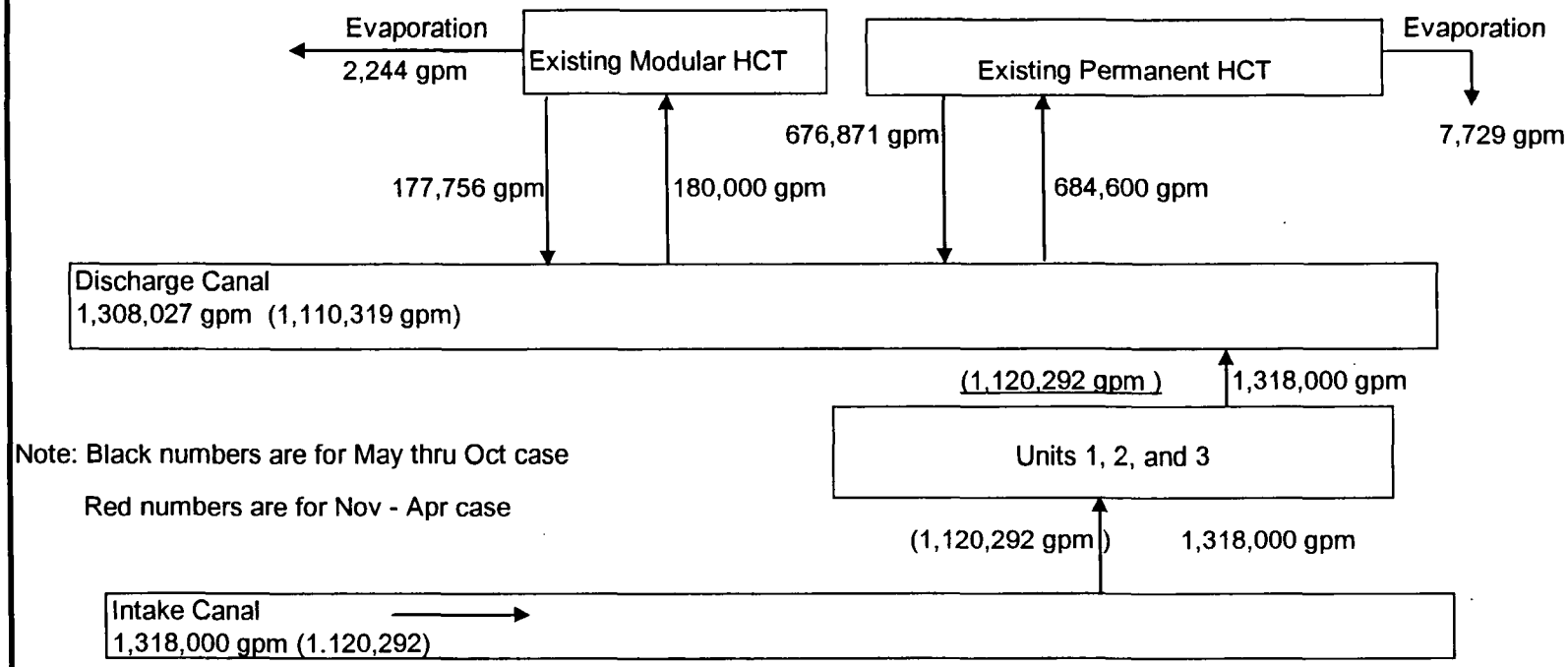


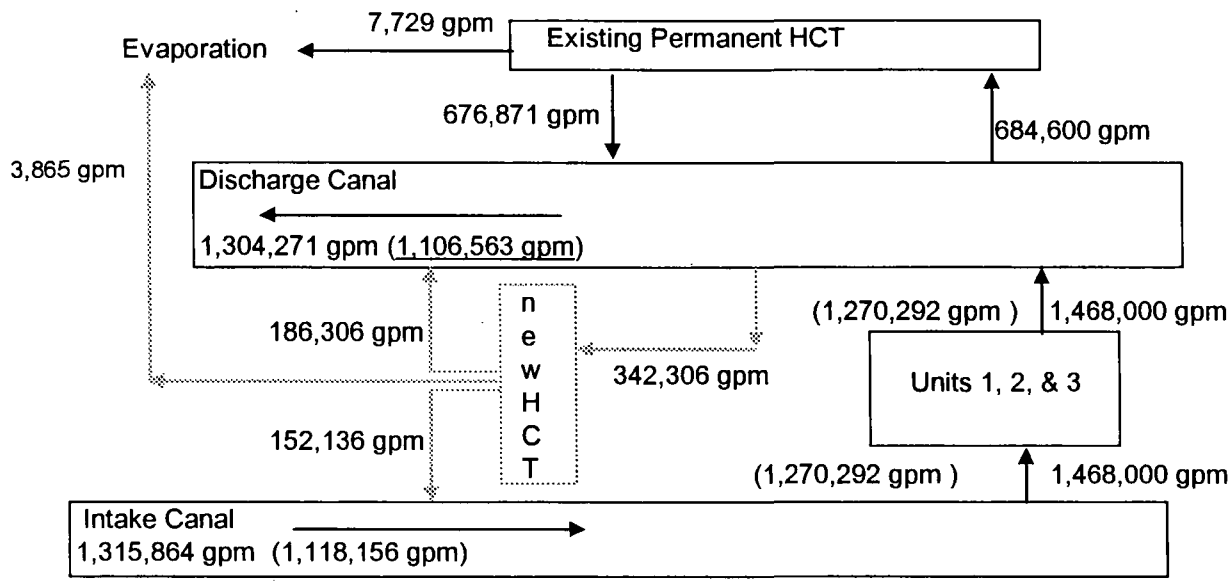
FIGURE 7
Pre-Uprate Circulating Water Flow Rates



Note: Black numbers are for May thru Oct case

Red numbers are for Nov - Apr case

FIGURE 8
Post-Uprate Circulating Water Flow Rates



Green indicates added with uprate

Red indicates during period of Nov - Apr

Black indicates during period May - Oct

APPENDIX A

OVERVIEW OF FLOW REDUCTION TECHNOLOGIES

EPA Cooling Water Intake Symposium
Washington, DC May 6-7, 2003

AN OVERVIEW OF FLOW REDUCTION TECHNOLOGIES

Presented by: Reed Super
Senior Attorney, Riverkeeper, Inc., Garrison, NY 10524
845-424-4149 rsuper@riverkeeper.org www.riverkeeper.org

Outline

- Why Reduce Flow?
- Flow Reduction Technologies
- Issues in Flow Reduction
- Cooling System/Flow/Impact Relationship
- Power Plant Examples and Illustrations

  -New Plant

  -Replacement Plant

  -Flow Reduction vs. AFB

  -Cooling Towers vs. Variable Speed Pumps

Why Reduce Flow?

- Drastic reductions in I+E (~95%)
- Guaranteed reductions (no reliability issues)
- Facilitates lower velocity and better screens
- Reduces or eliminates thermal impacts
- Allows use of municipal H_2O or effluent
- Allows siting away from wetlands, coasts

Flow Reduction Technologies

- Once-Through to Closed-Cycle Wet (96%)
- Closed-Cycle Wet to Dry Cooling (97-100%)
- Repowering (add Combustion Turbine) (33%)
- Variable Speed Pumps (% varies; note baseline)
- Changing Source Water (100%)
- Seasonal Outages (% varies)
- Combination of the Above

Issues in Flow Reduction

- Level of Reduction in Flow (and I+E)
- Relative Effectiveness
- Technical Feasibility
- Effect on Plant Efficiency (Energy Penalty)
- Cost to Plant Owner and Rate-Payer

Flow/Impingement Relationship

Great Lakes: $I = 1.7023V^{1.778}$

Pisces (2002) using data from Kelso (1979)

Other Fresh Water: $I = 6 \times 10^{-8}V^{3.1444}$

Pisces (2002)

Ocean and Estuary: $I = 0.1704V^{1.5943}$

Pisces (2002)

All Waters: $I = 0.4719V^{1.8699}$

Pisces (2002)

I is # of fish impinged/yr

V is volume in cu/ft per sec

Flow/Entrainment Relationship

Fresh Water: $En = 2E + 07V^{0.1924}$

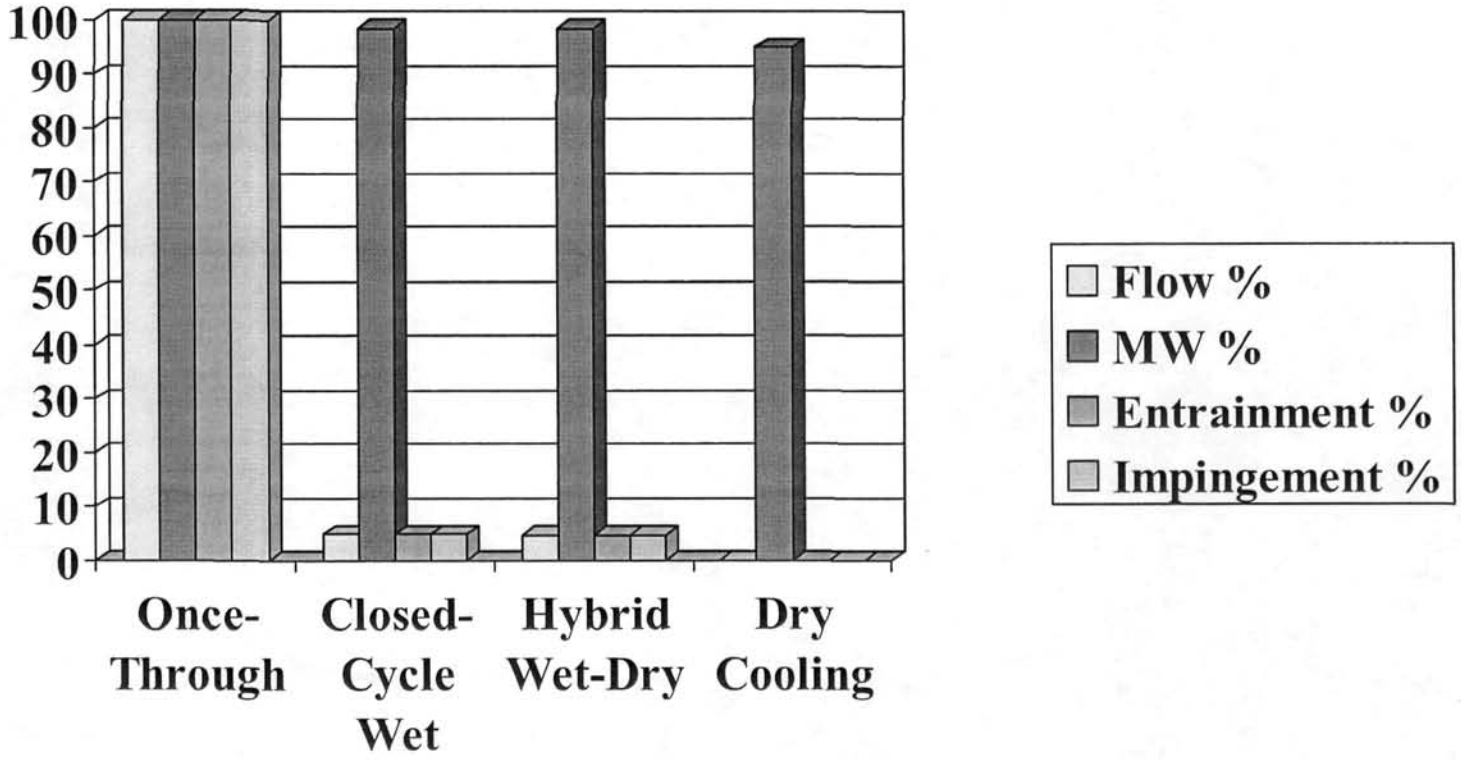
Pisces (2002)

Ocean and Estuary: $En = 457475V^{1.1405}$

Pisces (2002)

En is # of fish entrained/yr **V** is volume in cu/ft per sec

Cooling Systems, Flow, and E+I



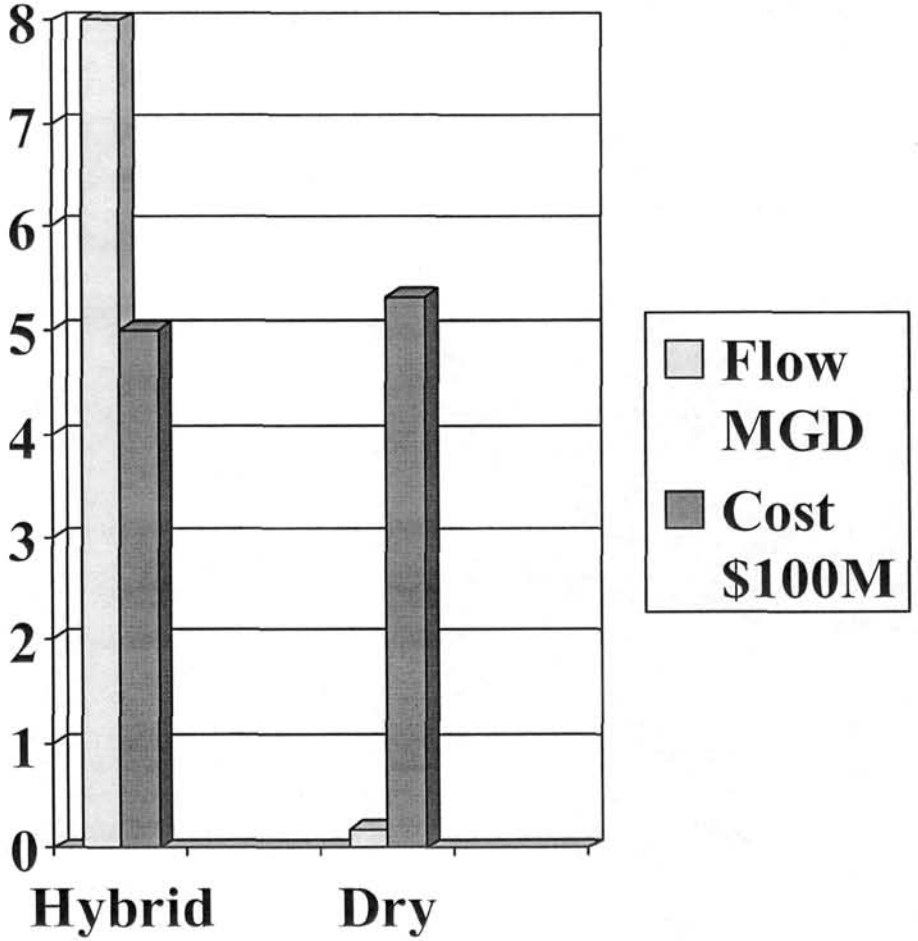
Flow Reduction at New Plant
Hybrid Cooling vs. Dry Cooling (Athens, NY)

PROPOSED

- Hybrid Cooling
- 4.53-8 MGD

APPROVED / BUILT

- Dry Cooling
- 0.18 MGD



Flow Reduction at Replacement Plant (Morro Bay, CA)

Existing 1954 plant: 1000 MW, gas, 707 (387) MGD

ONCE-THROUGH

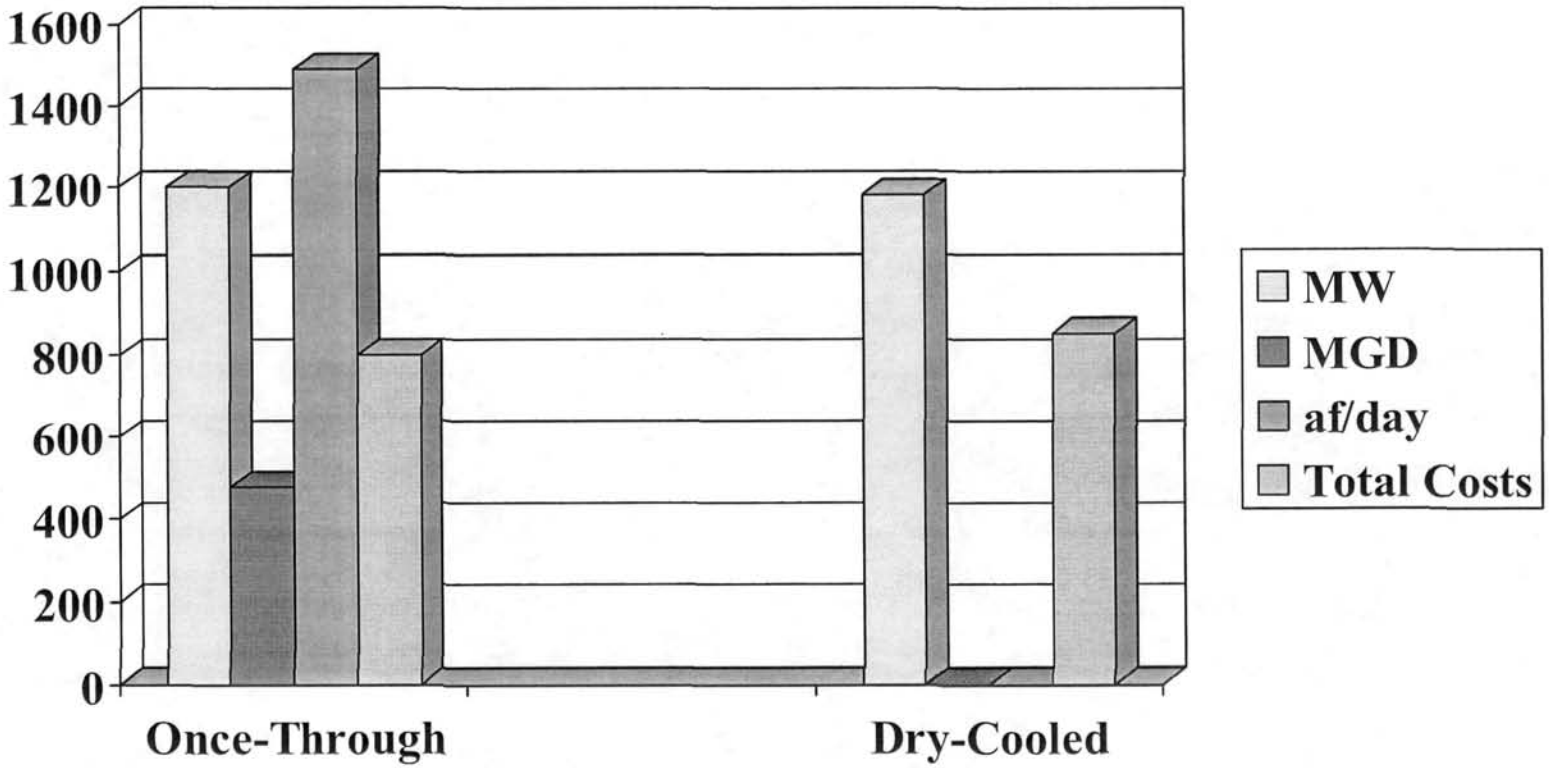
- 1200 MW
- 475 MGD
- 1489 af/day (62%)
- CMR 17-33% 20-37%
- Cost: $800M

DRY-COOLED

- 1200 MW
- 0 MGD (muni source)
- 0 af/day (0%)
- CMR 0%
- Cost: $852M
- Energy Penalty: 1.5%

Flow Reduction at Replacement Plant

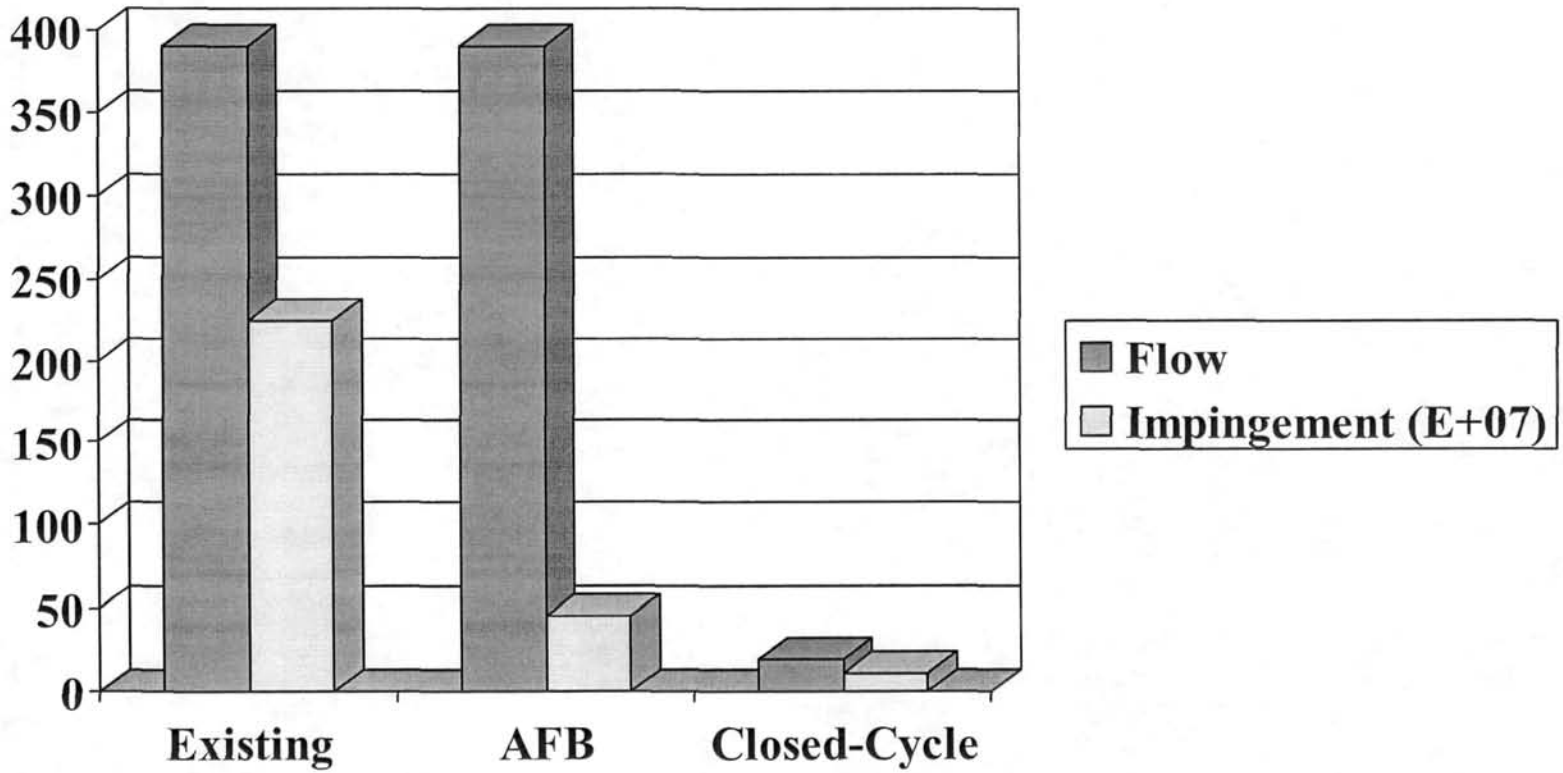
Once-Through vs. Dry Cooling (Morro Bay, CA)



Comparison of Technology Types

Flow Reduction vs. Barrier Filters

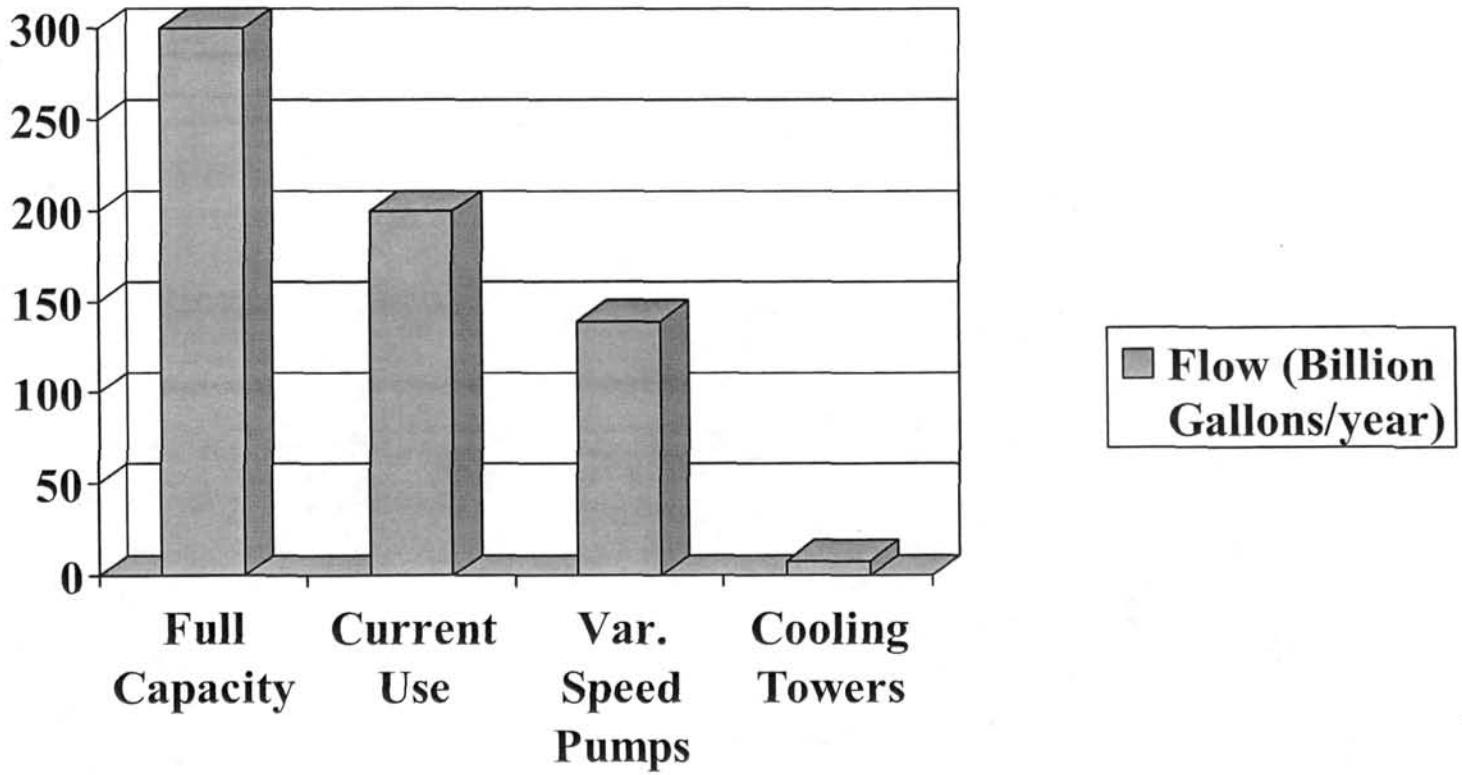
An Illustration



Comparison of Flow Reduction Methods

Variable Speed Pumps vs. Cooling Towers

An Illustration (Current Use as Baseline)



A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms

APPENDIX B

TRAFFIC IMPACT STUDY (REVISED)

TRAFFIC IMPACT STUDY

PROGRESS ENERGY UPRATE
CRYSTAL RIVER ENERGY COMPLEX
Citrus County, Florida

Trans Associates

400 North Tampa Street
Suite 1140
Tampa, FL 33602
Ph: 813-386-3630
Fax: 813-386-3635

Submitted To:
FLORIDA DEPARTMENT OF TRANSPORTATION

Prepared For:
Progress Energy

REVISED

August 13, 2007

GOLAS00-07219

TRAFFIC IMPACT STUDY

PROGRESS ENERGY UPRATE
CRYSTAL RIVER ENERGY COMPLEX
Citrus County, Florida

Trans Associates
400 North Tampa Street
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TRAFFIC IMPACT STUDY
PROGRESS ENERGY UPRATE
CRYSTAL RIVER ENERGY COMPLEX
Citrus County, Florida

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INTRODUCTION

Trans Associates (TA) has completed a traffic impact study for the proposed capacity expansion of the existing Unit 3 at Crystal River Energy Complex (CREC) located on West Power Line Road approximately 3.7 miles west of US-19/US -98 in Citrus County, Florida. The CR3 Uprate project represents a modernization of the facility to allow it to produce additional electricity. The purpose of this study is to identify the potential traffic impacts from the construction and operation of the proposed expansion and to identify any necessary mitigation measures that will provide satisfactory access to the site while maintaining acceptable traffic operations within the study area.

The following sections of this report detail the methodology, project description, data collection of existing conditions, site traffic generation and distribution, existing and projected traffic volumes, traffic analysis, and conclusions/recommendations.

METHODOLOGY

The current traffic impact study report has been updated after the FDOT sufficiency comments dated July 11, 2007. The Progress Energy CR3 Uprate Project traffic impact study is prepared consistent with the Florida Department of Transportation study requirements towards the proposed full build-out year of 2012. The traffic impact study encompasses the following study elements:

- *Trip Generation*
- Transportation Study Impact Area
- *Existing Conditions*
- Background/Vested Traffic Projections
- Project Traffic Assignment
- Total Traffic Volumes and Conditions
- Report Documentation

PROJECT DESCRIPTION/DATA COLLECTION/EXISTING CONDITIONS

Project Description

As shown in **Figure 1**, the site is located on West Power Line Road approximately 3.7 miles west of US-19/US-98 in Citrus County, Florida. The Crystal River Energy Center (CREC) site currently has 1,400 employees and generates 125 daily truck trips. The numbers of employees, construction crews, and truck traffic is expected to vary between 2007 and 2011. At the conclusion of the Uprate project in 2012, no additional employees are anticipated.

Table 1 summarizes the anticipated variation in employment and truck traffic between 2007 – 2012. The 2009 represents the peak year. In 2009, 600 temporary employees are expected for the construction of the Crystal River Clean Air Project (CRCA) for Units 4 and 5 at the site along with 800 each required for construction associated with the CR3 Steam Generator Replacement Project and the normal refueling outage and 650 involved in the construction of the Power Upgrade project all of which are only during portions of the 3rd and 4th quarters. An additional 200 daily construction truck trips are also anticipated during the 2009 year. Therefore, for approximately between one-two months in 2009, the Crystal River Energy Complex (CREC) may have a combined daily total of 1,400

employees, 2,850 construction employees, 125 daily truck trips, and 200 daily construction truck trips spread over different shifts.

After completion of the Uprate project, the CREC will have a total of 1,400 permanent employees and 285 daily truck trips. The additional 160 truck trips projected are part of the CR4 and 5 Operations and are not part of the new CR3 Uprate project trips. These truck trips have been considered as background traffic for this analysis.

The following traffic demand management strategies will be implemented by Progress Energy to control the arrival/departure of the CREC site traffic:

- Utilizing Citrus County Sheriff Officers to monitor the intersection of US 19 & Power Line Road for major activities.
- Staging construction vehicles so that they do not all arrive to the facility at the same time, and to help spread out the peak influx of vehicles at the facility
- Coordinate construction and outage events so that they are scheduled at different times.

Quantitatively, the following traffic demand management strategies will be implemented to control the arrival/departure of site traffic:

- Approximately 5-6 of 7 every employee are expected on-site every day during outages; i.e., approximately 80% of the workers are expected to arrive on a typical day.
- The employee arrival will be split as 60/40 between days and nights; i.e., approximately 60% of the employees will arrive in the AM Peak Hour.
- Also, the peak traffic would be spread out over two hours as opposed to one hour; i.e. only 50% of the total peak hour traffic will arrive in the actual peak hour.

After combining the above three strategies, the net additional employee will be reduced to 24% (0.80*0.60*0.50 = 0.24) of the total additional employees. Therefore, 684 net, additional construction employees and 200 additional daily construction truck trips can be expected peak temporary condition in the year 2009. Traffic analyses have been performed for both the 2009 and the 2012 scenarios. The 2009 year represents the highest volume for traffic from the CREC, and the build-out (operational) year is 2012.

N SCALE: N.T.S.	Trans Associates Transportation Solutions for Today and Tomorrow Park Tower Suite 1140 /400 North Tampa Street Tampa, Florida 33602 /(813) 386-3630	PROJECT NO. GOLA500-07199 PROJECT: Progress Energy Uprate TITLE: Proposed Site Location	FIGURE 1 D.B. N.A.S. C.B. N.A.S. REV. 08/13/07

TABLE 1

CREC EMPLOYEE DATA
(Permanent and Temporary)

	2007	2008	2009	2010	2011	2012
Existing project Information						
CREC	1,400	1,400	1,400	1,400	1,400	1,400
CR3 Refueling Outages[1]	800	--	800	--	800	--
CRCA Construction[2]	600	600	600	--	--	--
CR 4 and 5 Operations[3]	125	125	125	285	285	285
SGRP[4]	--	--	800	--	--	--
CR3 Uprate Project Information						
Uprate Projects	305	400	650	405	580	--
Uprate Project (construction trucks)[5]	--	--	200	200	200	--

1. *Employees anticipated onsite during 4Q only.*
2. *Construction employees associated with Clean Air Project (Icon, 2006).*
3. *Truck trips associated with operation of the CR 4 and 5.*
4. *Construction employees associated with Steam Generator Replacement Project during 3 and 4 Q only.*
5. *Construction trucks do not operate/arrive during outage periods.*

West Power Line Road is a two lane east-west roadway and provides the only public roadway access to the site. Thus, the traffic on West Power Line Road comes primarily to/from the CREC. Therefore, the site provides a good opportunity to obtain a trip generation rate for the existing CREC.

Data Collection

The intersection of US-19/US-98 & West Power Line Road has been studied as part of this traffic impact study in accordance with the Florida Department of Transportation requirements. Moreover, the US-19/US-98 roadway segment north and south of the US-19/US-98 & West Power Line Road intersection has also been studied for project impact.

A.M. as well as P.M. Peak Hour analysis has been conducted as part of the traffic impact study. Manual turning movement counts were performed at the existing study intersection for a three hour duration during a typical weekday between the hours of 6:00 – 9:00 A.M. and 3:00 - 6:00 P.M.

The raw turning movement counts were then multiplied by the FDOT seasonal adjustment factor. The seasonal adjustment factor as obtained from 2005 Florida Traffic Information System (FTIS) CD for the week when the count was performed is 1.03. The intersection peak hour (four consecutive 15-minute periods comprising the highest volume) as determined by the traffic counts occurred between 6:15 – 7:15 in the A.M. and between 4:45 – 5:45 in the

P.M. The 2007 existing peak hour traffic volumes are presented in **Figure 2** for the A.M. and P.M. peak hours. The manual turning movement counts are included in **Appendix A**.

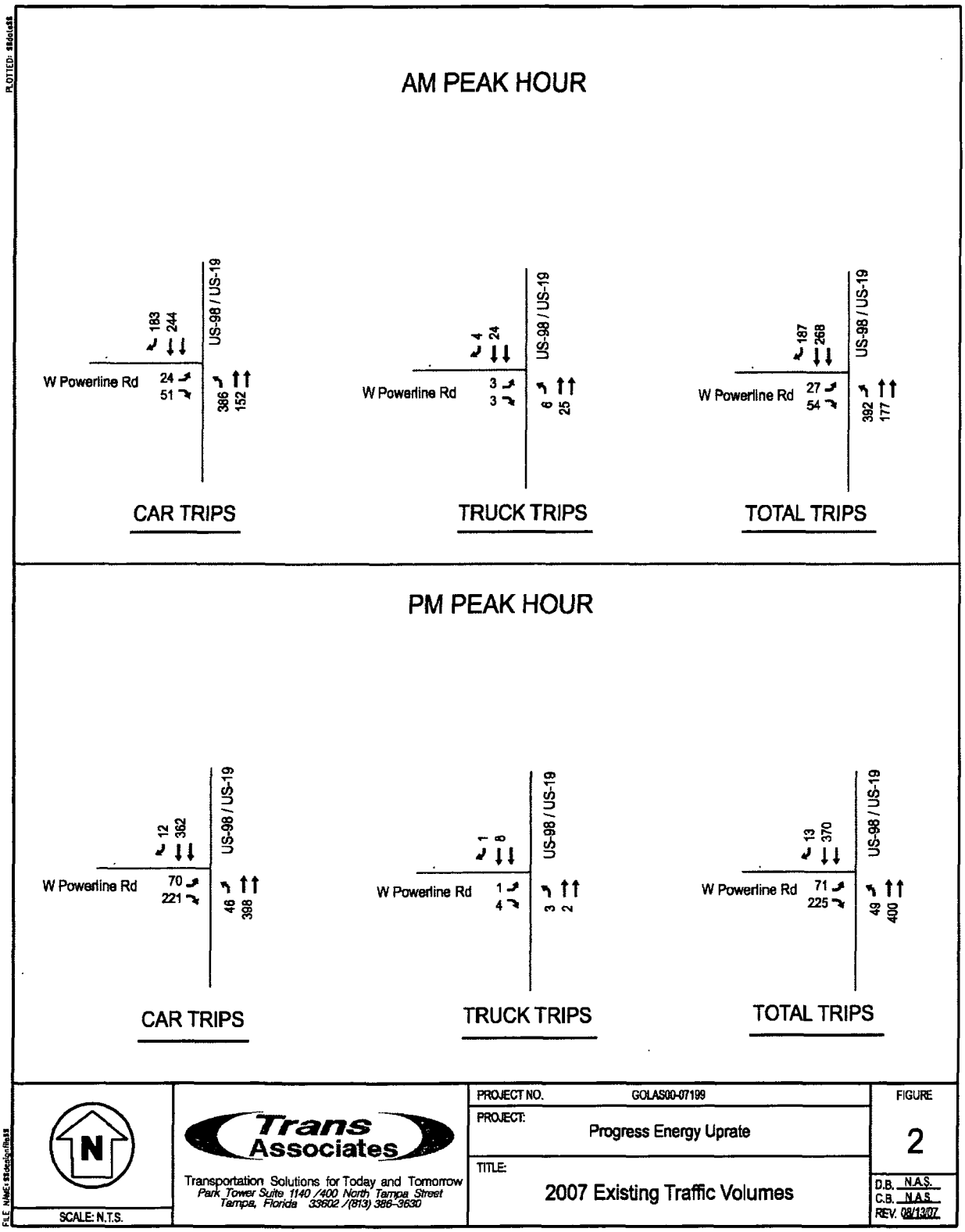
Existing Conditions

A field reconnaissance of the study area was conducted to obtain information on lane configurations, posted speed limits, traffic signal timings, and other pertinent features. The following provides a brief description of the study area roadways.

US-19 / US-98 is a state maintained, northbound-southbound principal rural arterial. Within the study area the roadway has a posted speed limit of 60 miles per hour (mph). At the intersection with West Power Line Road, the US 19/US-98 northbound approach consists of one exclusive left turn lane, and two through lanes. The southbound approach consists of two through lanes and one dedicated right turn lane. The traffic signal control at the intersection with West Power Line Road is actuated-uncoordinated with a variable cycle length.

West Power Line Road is an eastbound-westbound roadway and is used for access to and from the existing power plant. Within the study area West Power Line Road has a 55 mph posted speed limit. At the intersection with US-19/US-98, the West Power Line Road eastbound approach consists of one left turn lane and one right turn lane. The traffic signal control at the intersection with US-19/US-98 is actuated-uncoordinated with a variable cycle length.

It was observed during data collection that approximately half of the eastbound right turning vehicles made a right turn on red as large gaps in southbound traffic on US-19/US-98 are available. The intersection is designed as a three leg approach intersection.


AM PEAK HOUR
US-98 / US-19
W Powerline Rd
183
244
24
51
386
152
CAR TRIPS
4
24
3
3
6
25
TRUCK TRIPS
187
268
27
54
392
177
TOTAL TRIPS
PM PEAK HOUR
12
362
70
221
46
398
CAR TRIPS
1
8
1
4
3
2
TRUCK TRIPS
13
370
71
225
49
400
TOTAL TRIPS
N
SCALE: N.T.S.
Trans Associates
Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 366-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2007 Existing Traffic Volumes
FIGURE 2
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07

SITE TRAFFIC GENERATION AND DISTRIBUTION

Vehicle Trip Generation

As per the *Trip Generation, 7th Edition*, published by the Institute of Transportation Engineers (ITE), none of the available land use categories accurately describe the characteristics of an energy plant. Thus, trip generation rates based on the existing traffic and number of employees was used for the current analysis. As presented in the report titled *"Progress Energy Crystal River Energy Complex: Traffic Access Analysis Clean Air Project"* prepared in April 2006, the site currently has 1,400 employees. The total peak hour passenger car trips obtained from field data collection were divided by the total number of employees (1,400) to obtain the passenger car trip generation rates which were used to forecast the total number of passenger car trips resulting from the proposed expansion. In addition, the total peak hour truck trips obtained from field data collection were divided by the total number of daily truck trips (125) to obtain the truck trip generation rates which were used to forecast the total number of truck trips resulting from the proposed increase in truck activity. A summary of the existing and future trip generation calculations are presented in **Table 2**.

After completion of the Uprate project, the CREC will have a total of 1,400 permanent employees and 285 daily truck trips. The additional 160 truck trips projected as part of the CR4 and 5 Operations are not part of the new CR3 Uprate project trips and are considered background traffic for this analysis. Therefore, for the 2012 buildout conditions, no additional, new external site-generated trips are projected from the CR3 Uprate as compared to the 2007 existing conditions.

TABLE 2: TRIP GENERATION SUMMARY

TIME PERIOD	Existing Passenger Car Trips (1,400 employees)		Trip Rates (trips/employee)		2009 Additional CR3 Project Generated Trips (684 net, additional construction employees compared to existing conditions)		2012 Additional CR3 Project Generated Trips (No additional employees compared to existing conditions)	
	Entering	*Exiting*	*Entering*	*Exiting*	*Entering*	*Exiting*	*Entering*	*Exiting*
A.M. PEAK HOUR	569	75	0.406	0.054	278	37	--	--
P.M. PEAK HOUR	58	291	0.041	0.208	28	142	--	--
TIME PERIOD	**Existing Truck Trips** (125 daily truck trips)		**Trip Rates** (trips/daily truck trips)		**2009 Additional CR3 Project Generated Trips** (200 new additional daily construction truck trips)		**2012 Additional Project Generated Background Trips for CR 4 & 5** (160 additional truck trips)*	
	Entering	*Exiting*	*Entering*	*Exiting*	*Entering*	*Exiting*	*Entering*	*Exiting*
A.M. PEAK HOUR	10	6	0.080	0.048	16	10	13	8
P.M. PEAK HOUR	4	5	0.032	0.040	6	8	5	6
TOTAL A.M. PEAK HOUR	579	81	--	--	294	47	13	8
TOTAL P.M. PEAK HOUR	62	296	--	--	34	150	5	6

*Note: The 160 additional truck trips for CR4 & 5 were included in the 2012 background traffic volumes. These trips are not associated with the CR3 Uprate project.

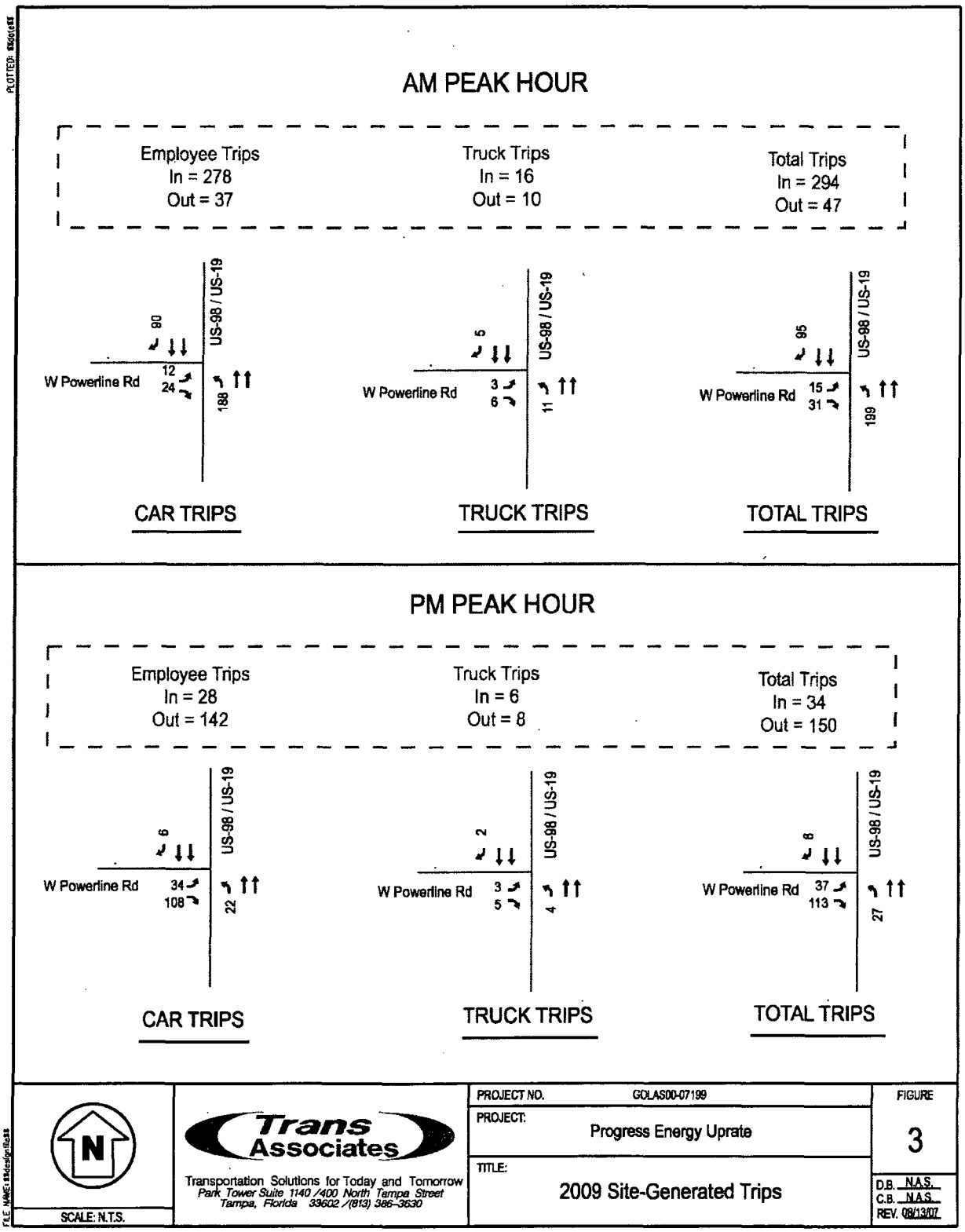
Site Traffic Distribution

The arrival/departure distribution of the project site traffic was based on the existing traffic volumes of the study area. The new project traffic arriving/departing has been distributed as follows:

TABLE 3: TOTAL PROJECT TRAFFIC ARRIVAL / DEPARTURE PATTERN

To/From	A.M. Peak Hour		P.M. Peak Hour	
	Arriving	*Departing*	*Arriving*	*Departing*
South on US-19/US-98	67.7%	66.7%	79.0%	76.0%
North on US-19/US-98	32.3%	33.3%	21.0%	24.0%
Total	100.0%	100.0%	100.0%	100.0%

The net external site generated trips are presented in **Figures 3**.


AM PEAK HOUR
Employee Trips
In = 278
Out = 37
Truck Trips
In = 16
Out = 10
Total Trips
In = 294
Out = 47
US-98 / US-19
W Powerline Rd
80
12
24
188
CAR TRIPS
5
3
6
11
TRUCK TRIPS
95
15
31
199
TOTAL TRIPS
PM PEAK HOUR
Employee Trips
In = 28
Out = 142
Truck Trips
In = 6
Out = 8
Total Trips
In = 34
Out = 150
6
34
108
22
CAR TRIPS
2
3
5
4
TRUCK TRIPS
8
37
113
27
TOTAL TRIPS
N
SCALE: N.T.S.
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Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 386-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2009 Site-Generated Trips
FIGURE 3
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07

PROJECTED TRAFFIC VOLUMES

Traffic volumes were projected for the 2012 full build-out year and also during the 2009 when additional construction traffic is present. Existing 2007 traffic volumes were increased using a linear 3.1 percent annual growth rate, which was calculated based upon the previous five years (2002 – 2006) annual average daily traffic (AADT) volumes for the US-19/US-98. Data to identify the existing 2006 AADT came from the FDOT Central Office while historical AADT's were obtained from the most recent edition of the Florida DOT Florida Traffic Information (FTI) CD for counter #0250 located at SR55/US19, North of CR488/Dunnellon Rd in Citrus County. Background growth rate calculations are included in **Appendix B.**

2009 No Build Traffic Volumes

The 2009 no build (without project traffic) traffic volumes, shown in **Figure 4**, were derived by applying the aforementioned growth rate of 3.1% per year compounded to the 2007 existing traffic volumes (Figure 2).

2012 No Build Traffic Volumes

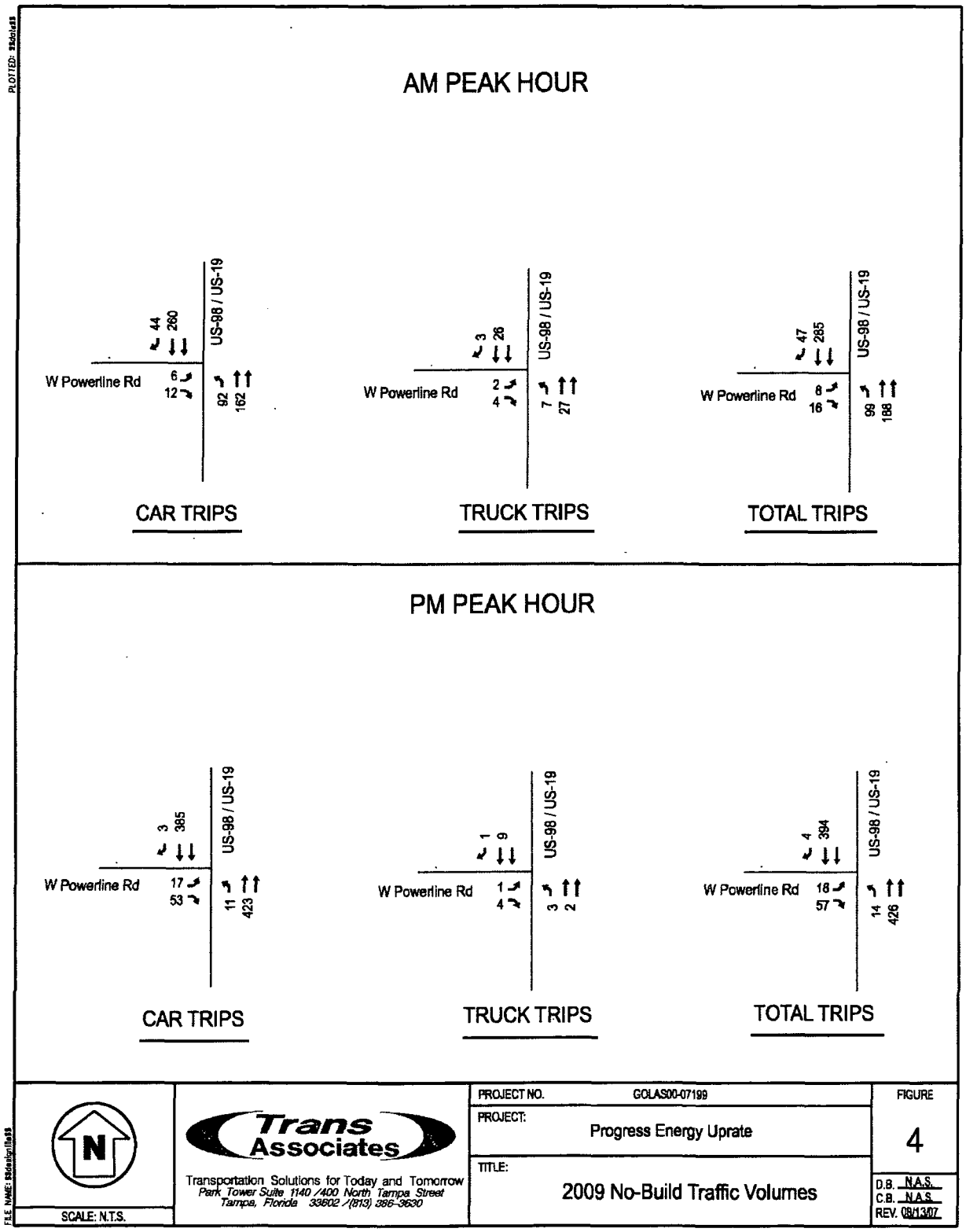
The 2012 no build (without project traffic) traffic volumes, shown in **Figure 5**, were derived by applying the aforementioned growth rate of 3.1% per year compounded to the 2007 existing traffic volumes and adding the trips from the construction of the already approved CR4 and 5 operations (Figure 2).

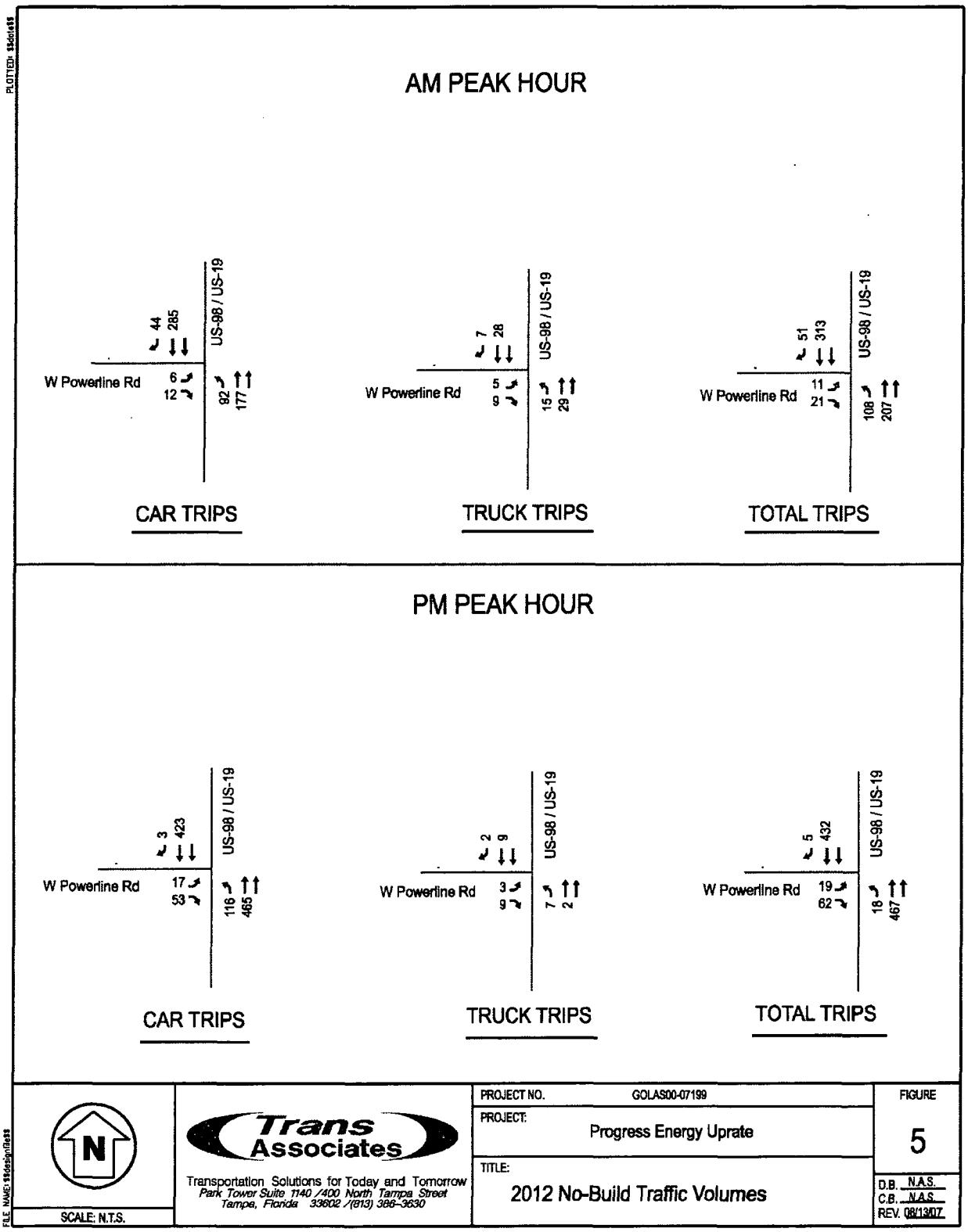
2009 Build Traffic Volumes

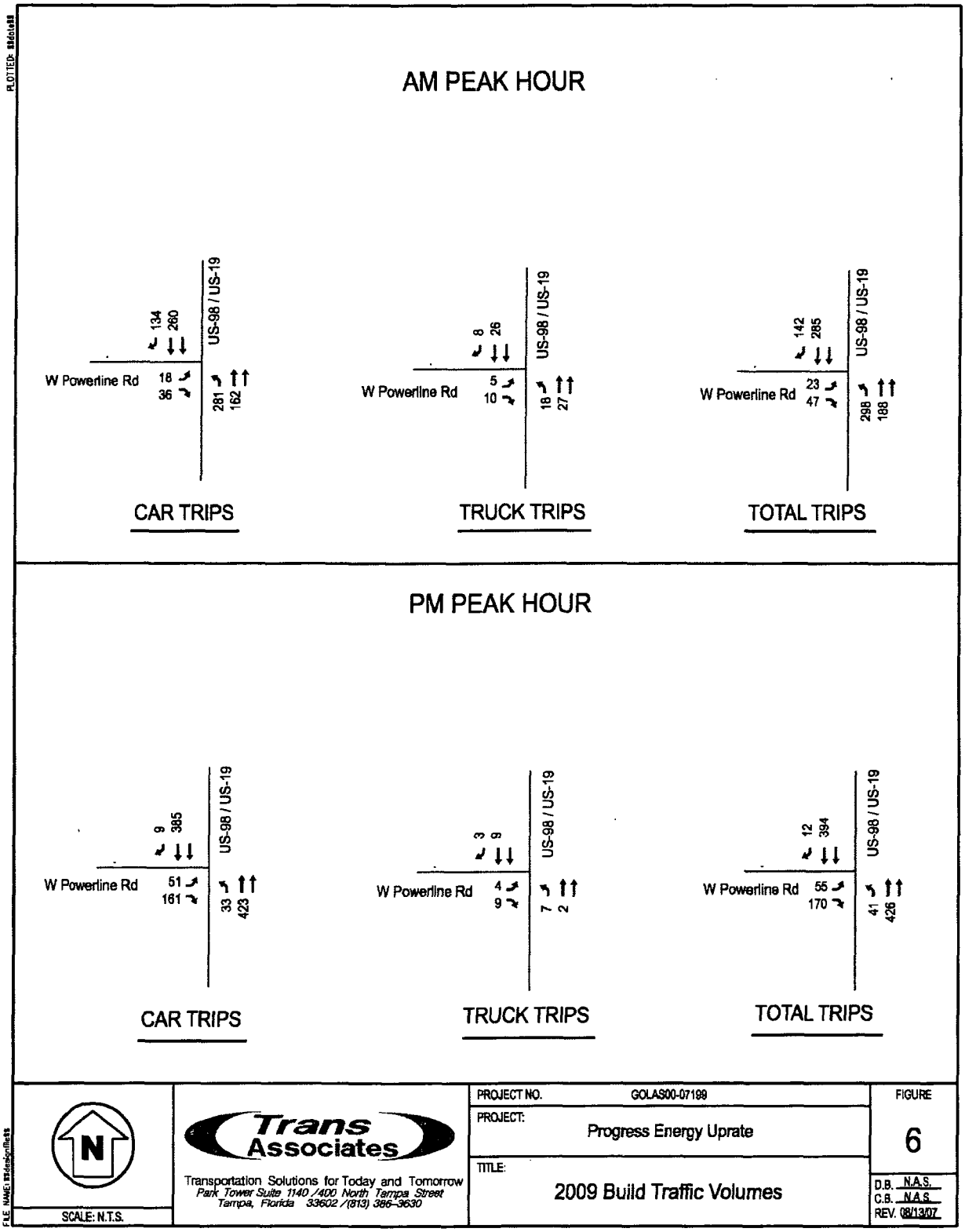
The 2009 build (with project traffic) traffic volumes, shown in **Figure 6**, were derived by adding the 2009 Progress Energy Uprate project generated trips (Figure 3) to the 2009 no build traffic volumes (Figure 4).

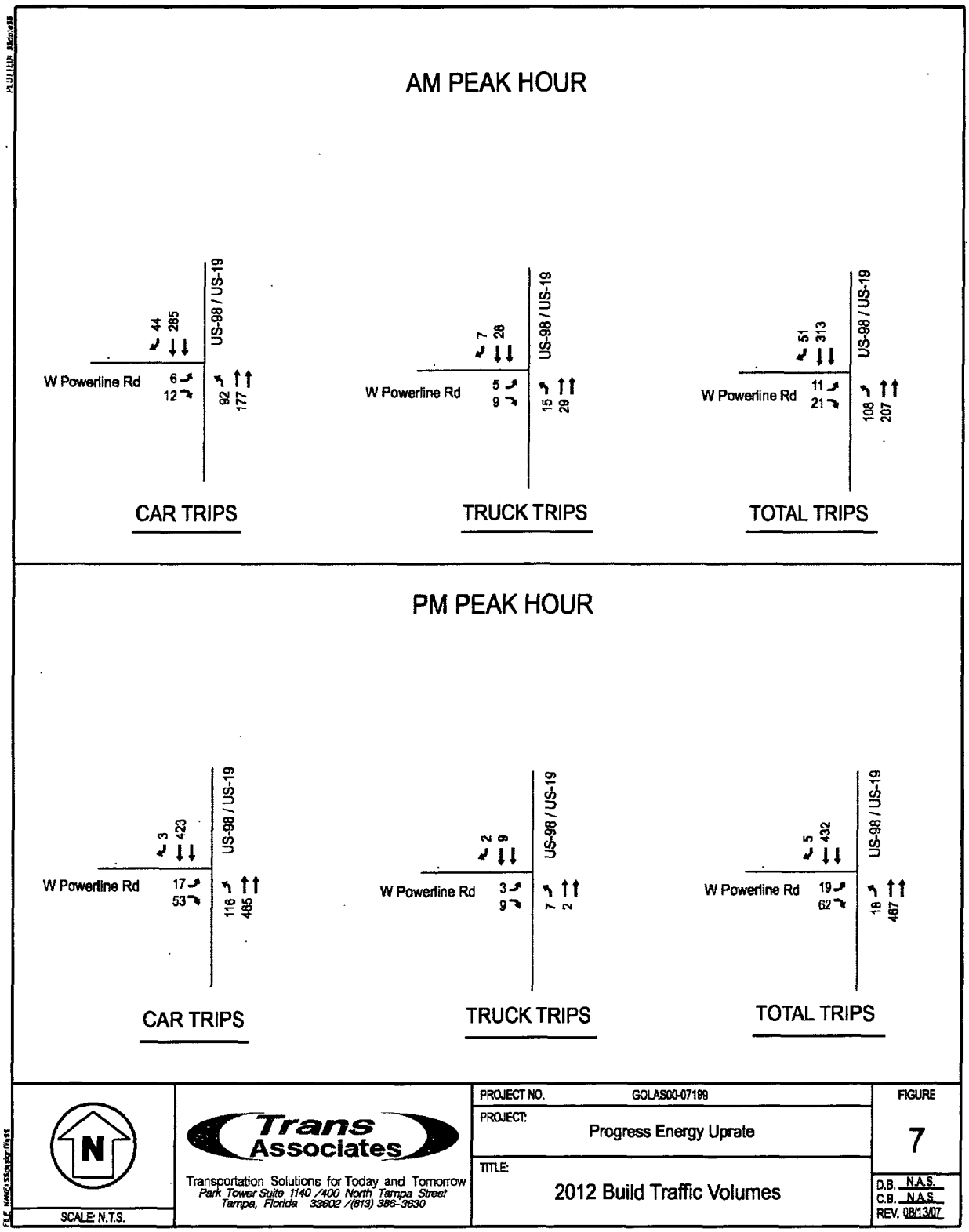
2012 Build Traffic Volumes

The 2012 build (with project traffic) traffic volumes, shown in **Figure 7,** result in the same traffic volumes as the 2012 No Build traffic volumes. This is due to the fact that after completion of the CR3 project, all temporary employees and construction employees will be gone, leaving only the original 1,400 permanent employees.


AM PEAK HOUR
US-98 / US-19
W Powerline Rd
44
260
6
12
92
162
CAR TRIPS
3
26
2
4
7
27
TRUCK TRIPS
47
285
8
16
99
188
TOTAL TRIPS
PM PEAK HOUR
3
385
17
53
11
423
CAR TRIPS
1
9
1
4
3
2
TRUCK TRIPS
4
394
18
57
14
426
TOTAL TRIPS
N
SCALE: N.T.S.
Trans Associates
Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 386-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2009 No-Build Traffic Volumes
FIGURE 4
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07


AM PEAK HOUR
US-98 / US-19
W Powerline Rd
44
285
6
12
92
177
CAR TRIPS
7
28
5
9
15
29
TRUCK TRIPS
51
313
11
21
108
207
TOTAL TRIPS
PM PEAK HOUR
3
423
17
53
116
465
CAR TRIPS
2
9
3
9
7
2
TRUCK TRIPS
5
432
19
62
18
467
TOTAL TRIPS
N
SCALE: N.T.S.
Trans Associates
Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 386-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2012 No-Build Traffic Volumes
FIGURE 5
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07


AM PEAK HOUR
US-98 / US-19
W Powerline Rd
134
260
18
36
281
162
CAR TRIPS
8
26
5
10
18
27
TRUCK TRIPS
142
285
23
47
298
188
TOTAL TRIPS
PM PEAK HOUR
9
385
51
161
33
423
CAR TRIPS
3
9
4
9
7
2
TRUCK TRIPS
12
394
55
170
41
426
TOTAL TRIPS
N
SCALE: N.T.S.
Trans Associates
Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 386-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2009 Build Traffic Volumes
FIGURE 6
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07


AM PEAK HOUR
US-98 / US-19
W Powerline Rd
44
285
6
12
92
177
CAR TRIPS
7
28
5
9
15
29
TRUCK TRIPS
51
313
11
21
108
207
TOTAL TRIPS
PM PEAK HOUR
3
423
17
53
116
485
CAR TRIPS
2
9
3
9
7
2
TRUCK TRIPS
5
432
19
62
18
467
TOTAL TRIPS
N
SCALE: N.T.S.
Trans Associates
Transportation Solutions for Today and Tomorrow
Park Tower Suite 1140 /400 North Tampa Street
Tampa, Florida 33602 /(813) 386-3630
PROJECT NO. GOLAS00-07199
PROJECT: Progress Energy Uprate
TITLE: 2012 Build Traffic Volumes
FIGURE 7
D.B. N.A.S.
C.B. N.A.S.
REV. 08/13/07

TRAFFIC ANALYSIS

The analyses performed included a capacity analysis of the study intersections, roadway capacity analysis, and turn lane length calculations at the US-19/US-98 & West Power Line Road intersection.

Intersection Capacity Analysis

Intersection capacity analyses were performed for the following five conditions:

- 2007 existing conditions
- 2009 no build conditions without project traffic
- 2012 no build conditions without project traffic
- 2009 build conditions with project traffic
- 2012 build conditions with project traffic

Levels of Service (LOS) were determined at the study intersections using the methodologies contained in the 2000 Highway Capacity Manual and the latest version of the supporting Highway Capacity Software (HCS+). LOS A through F are determined as a ranking system for the operations with LOS A representing short delays and LOS F representing long delays.

Table 4 summarizes the A.M. and P.M. peak hour LOS for the study intersection for each of the study conditions.

2007 Existing Conditions - Existing intersection geometry, traffic volumes (Figure 3), and signal timings (without optimization) were used for this analysis. The intersection is found to currently operate at LOS of B during the A.M. peak hour as well as during the P.M. peak hour. Moreover, all the movements are observed to operate at LOS D or better and at volume/capacity (v/c) ratio of less than 1.0 in both analysis periods. The LOS for each scenario is presented in Table 4. Capacity analysis printouts for the 2007 existing condition are included in Appendix C.

2009 No Build Conditions Without Proposed CR3 Uprate - Existing intersection geometry, signal timings, and the forecasted traffic volumes from Figure 4 were used for this analysis. As determined by the analyses performed, the intersection is projected to operate at LOS B during both the analysis scenarios. Moreover, all the movements are observed to operate at LOS D or better and v/c ratio of less than 1.0 in both analysis periods. The LOS for the 2009 no build conditions without the proposed project expansion are presented in Table 4. Capacity analysis printouts for the 2009 no build conditions are included in Appendix C.

2012 No Build Conditions Without Proposed CR3 Uprate - Existing intersection geometry, optimized signal timings, and the forecasted traffic volumes from Figure 5 were used for this analysis. The additional 160 truck trips projected as part of the CR4 and 5 Operations (which is already approved) were included in the 2012 No Build scenario traffic volumes since they are not part of the CR3 Uprate. As determined by the analyses performed, the intersection is projected to operate at LOS B during the A.M. peak hour as well as the P.M. peak hour. Moreover, all the movements are observed to operate at LOS D or better and have a v/c ratio of less than 1.0 in both analysis periods. The LOS for the 2012 no build conditions without the proposed project expansion are presented in Table 4. Capacity analysis printouts for the 2012 no build conditions are included in Appendix C.

2009 Build Conditions With Proposed CR3 Uprate – This condition represents the greatest demand at the signalized intersection, but also represents a temporary condition due to construction. 600 construction employees as part of the Crystal River Clean Air Project will be finishing up their work during this year. Moreover, 800 construction employees associated with the CR3 Steam Generator Replacement Project will occur only during the 3rd and 4th quarters of 2009 in addition to 800 employees due to the normal refueling outage scheduled for the year 2009. These conditions are expected for a one-two month duration in 2009. Existing intersection geometry, signal timings, and forecasted traffic volumes from Figure 6 were used for this analysis. As determined by the analyses performed, the intersection is projected to operate at LOS D during the A.M. peak hour as well as during the P.M. peak hour. Moreover, all the movements are observed to operate at LOS D or better in both analysis periods. Capacity analysis results are summarized in Table 4. Detailed HCS+ capacity analysis results for 2009 build conditions are provided in Appendix C.

2012 Build Conditions With Proposed CR3 Uprate – This condition represents the total build-out condition. Existing intersection geometry, signal timings, and forecasted traffic volumes from Figure 7 were used for this analysis. After completion of the Uprate project, the CREC will have a total of 1,400 permanent employees and 285 daily truck trips. The additional 160 truck trips are projected as part of the CR4 and 5 Operations (which is already approved). These truck trips, however, are not included in the new CR3 Uprate project trips and are considered background traffic (2012 No Build) for this analysis. Therefore, for the 2012 conditions, no new external site-generated trips are projected as compared to the 2007 existing conditions. As determined by the analyses performed, the intersection is projected to operate at LOS B during the A.M. peak hour as well as during the P.M. peak hour. Moreover, all the movements are observed to operate at LOS D or better and have a v/c less than1.0 in both analysis periods. Capacity analysis results are summarized in Table 4. Detailed HCS+ capacity analysis results for 2012 build conditions are provided in Appendix C.

TABLE 4: INTERSECTION CAPACITY ANALYSIS SUMMARY

US-19 / US-98 & W Power Line Rd				
	AM PEAK HOUR		PM PEAK HOUR	
	LOS	*Delay (sec)*	*LOS*	*Delay (sec)*
2007 Existing	B	18.8	B	14.4
2009 No-Build	B	17.7	B	13.7
2012 No- Build	B	18.4	B	13.9
2009 Build	B	18.1	B	14.4
2012 Build	B	18.4	B	13.9

Roadway Capacity Analysis

The identification of the peak hour site traffic impact to the study roadway network was completed following the LOS D capacity methodologies presented in Table 4-9 of the Florida Department of Transportation 2002 Q/LOS Manual. Trips generated by the project in the A.M. peak hour are expected to be more than the P.M. Peak Hour. Thus, the roadway capacity analysis has been based on the A.M. peak hour trips. In the future 2009 build scenario the Progress Energy CR3 Uprate project is anticipated to generate a total of 312 temporary trips to the roadway network in the A.M. peak hour. In the future 2012 full build-out scenario, the Progress Energy CR3 Uprate project is anticipated to be completed with no additional trips on the roadway network. Results of Progress Energy CR3 Uprate total project build-out impact on the peak direction study network is presented in **Table 5**.

TABLE 5: ROADWAY CAPACITY ANALYSIS SUMMARY

Road Name	From/To	Lanes	Peak Hour Directional Service Volume LOS D	2009 Peak Hour Directional Project Volume	2009 Temporary Percent Impact	2012 Peak Hour Directional Project Volume	2012 Percent Impact
US-19/US-98	Northbound	2	2,830	199	7.03%	0	0.00 %
	Southbound	2	2,830	95	3.36%	0	0.00%
West Power Line Road	Eastbound	1	650	340	52.31%	0	0.00%

(1) Level of Service D Capacity obtained from Table 4-9 of the Florida Department of Transportation 2002 Q/LOS Manual.
(2) 2009 represents a temporary condition expected to last one-two months.

According to the State of Florida Department of Transportation 2002 Quality/Level of Service Handbook, **Table 4-9**, a two lane divided uninterrupted flow highway for a LOS A has a peak hour one-way traffic volume of 940 vehicles. **Table 6** presents the directional traffic volumes for US-19/US-98 within the study area. As presented in **Table 6**, US-19/US-98 operates below the 940 directional peak hour traffic volume established by FDOT for a LOS A two lane divided uninterrupted flow highway.

TABLE 6: PEAK HOUR DIRECTIONAL TRAFFIC VOLUMES SUMMARY

US-19/US-98 at Power Line Road				
Scenario	Direction	FDOT Generalized LOS A Peak Hour Directional Traffic Volume	Peak Hour Directional Traffic Volume	
			AM PEAK HOUR	PM PEAK HOUR
2009 No-Build	Northbound	940	288	440
	Southbound	940	332	397
2012 No-Build	Northbound	940	314	485
	Southbound	940	364	437
2009 Build	Northbound	940	487	466
	Southbound	940	427	405
2012 Build	Northbound	940	314	485
	Southbound	940	364	437

Project Turn Lane Analysis

SimTraffic Traffic Simulation Software, Version 7, was utilized to determine the queue length of the eastbound right turn lane, southbound right turn lane and the northbound left turn lane at the US-19/US-98 & W Power Line Rd intersection. A summary of the queue lengths observed during the different analysis scenarios is presented in **Table 7.** SimTraffic analysis printout for the intersection of US-19/US-98 & W Power Line Rd is included in **Appendix D**.

TABLE 7: PROJECT TURN LANE ANALYSIS SUMMARY

QUEUE LENGTH (feet) US-19 / US-98 & W Power Line Rd						
	AM PEAK HOUR			PM PEAK HOUR		
	EBR	*NBL*	*SBR*	*EBR*	*NBL*	*SBR*
2007 Existing	37	272	104	67	83	28
2009 No-Build	40	100	38	42	51	3
2012 No-Build	47	125	46	59	66	7
2009 Build	48	246	88	64	79	22
2012 Build	46	125	49	59	66	7

CONCLUSIONS/RECOMMENDATIONS

The purpose of this study was to determine the traffic impacts associated with the proposed Progress Energy CR3 Uprate project and, if necessary, to develop mitigation measures providing satisfactory access to the site while maintaining acceptable traffic operations within the study area. The CR3 Uprate project represents a modernization of the existing CREC. The Progress Energy CR3 Uprate Traffic Impact Study is prepared consistent with the Florida Department of Transportation study requirements towards a proposed build-out year of 2012.

Results of the 2009 temporary construction build scenario represent the greatest demand. This is due to the expected construction activities associated with the CRCA, CR3, 4 and 5 projects, and represents a temporary condition. The 2009 capacity analyses demonstrate that the intersection is anticipated to perform at LOS B in both the A.M. peak hour and the P.M. peak hour. The sections of US-19/US-98 north and south of West Power Line Road are expected to operate at a LOS A. Due to the temporary and fluctuating conditions expected in 2009 Progress Energy will consider the following Travel Demand Management techniques to help facilitate peak operating conditions:

- Utilizing Citrus County Sheriff Officers to monitor the intersection of US 19 & Power Line Road for major activities.
- Staging construction vehicles so that they do not all arrive to the facility at the same time, and to help spread out the peak influx of vehicles at the facility
- Coordinate construction and outage events so that they are scheduled at different times.

Quantitatively, the following traffic demand management strategies will be implemented to control the arrival/departure of site traffic:

- Approximately 5-6 of 7 every employee are expected on-site every day during outages; i.e., approximately 80% of the workers are expected to arrive on a typical day.
- The employee arrival will be split as 60/40 between days and nights; i.e., approximately 60% of the additional employees will be arriving in the AM Peak Hour.
- Also, the peak traffic would be spread out over two hours as opposed to one; i.e. only 50% of the total peak hour traffic will arrive in the actual peak hour.

Results of the 2012 build scenario capacity analyses demonstrate that the intersection is anticipated to perform at a LOS B in the A.M. peak hour and the P.M. peak hour. The roadway segments of US-19/US-98 north and south of West Power Line Road are expected to operate at LOS A for the build-out condition. The CR3 Uprate project is expected to represent no additional trips upon project buildout and all roadway Level of Service conditions are expected to be maintained with the proposed project.

APPENDIX A
MANUAL TURNING MOVEMENT COUNTS

A.M. Peak Hour Total Traffic Volumes

Trans Associates Engineering Consultants, Inc.

Transportation Solutions for today and tomorrow

US-19 / US-98 & W Power Line Road
Crystal River, Florida
06:00 A.M. to 09:00 A.M.

File Name : 042507 6-9 am US19-98 & power line
Site Code : 00000003
Start Date : 4/25/2007
Page No : 1

Weather: Clear

Groups Printed- Trucks

	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Int. Total
Factor	1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		
06:00 AM	0	2	0	0	2	0	0	0	0	0	0	9	0	0	9	1	0	1	0	2	13
06:15 AM	0	6	2	0	8	0	0	0	0	0	0	6	0	0	6	0	0	3	0	3	17
06:30 AM	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
06:45 AM	0	7	1	1	9	0	0	0	0	0	1	9	0	0	10	0	0	0	0	0	19
Total	0	18	3	1	22	0	0	0	0	0	1	26	0	0	27	1	0	4	0	5	54
07:00 AM	0	8	0	0	8	0	0	0	0	0	5	8	0	0	13	3	0	0	0	3	24
07:15 AM	0	9	0	0	9	0	0	0	0	0	1	5	0	0	6	0	0	0	0	0	15
07:30 AM	0	3	1	1	5	0	0	0	0	0	2	10	0	0	12	0	0	0	0	0	17
07:45 AM	0	9	2	0	11	0	0	0	0	0	2	2	0	0	4	0	0	0	1	1	16
Total	0	29	3	1	33	0	0	0	0	0	10	25	0	0	35	3	0	0	1	4	72
08:00 AM	0	4	1	0	5	0	0	0	0	0	2	2	0	0	4	5	0	1	3	9	18
08:15 AM	0	5	0	0	5	0	0	0	0	0	0	5	0	0	5	2	0	1	1	4	14
08:30 AM	0	4	1	1	6	0	0	0	0	0	5	5	0	0	10	1	0	2	1	4	20
08:45 AM	0	4	0	0	4	0	0	0	0	0	2	6	0	0	8	2	0	0	1	3	15
Total	0	17	2	1	20	0	0	0	0	0	9	18	0	0	27	10	0	4	6	20	67
Grand Total	0	64	8	3	75	0	0	0	0	0	20	69	0	0	89	14	0	8	7	29	193
Apprch %	0	85.3	10.7	4		0	0	0	0		22.5	77.5	0	0		48.3	0	27.6	24.1		
Total %	0	33.2	4.1	1.6	38.9	0	0	0	0	0	10.4	35.8	0	0	46.1	7.3	0	4.1	3.6	15	

	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Left	Thru	Right	RTOR	App Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45 AM																					
06:45 AM	0	7	1	1	9	0	0	0	0	0	1	9	0	0	10	0	0	0	0	0	19
07:00 AM	0	8	0	0	8	0	0	0	0	0	5	8	0	0	13	3	0	0	0	3	24
07:15 AM	0	9	0	0	9	0	0	0	0	0	1	5	0	0	6	0	0	0	0	0	15
07:30 AM	0	3	1	1	5	0	0	0	0	0	2	10	0	0	12	0	0	0	0	0	17
Total Volume	0	27	2	2	31	0	0	0	0	0	9	32	0	0	41	3	0	0	0	3	75
% App. Total	0	87.1	6.5	6.5		0	0	0	0		22	78	0	0		100	0	0	0		
PHF	.000	.750	.500	.500	.861	.000	.000	.000	.000	.000	.450	.800	.000	.000	.788	.250	.000	.000	.000	.250	.781

P.M. Peak Hour Total Traffic Volumes

Trans Associates Engineering Consultants, Inc.

Transportation Solutions for today and tomorrow

US-19 / US-98 & W Power Line Road
Crystal River, Florida
03:00 P.M. to 06:00 P.M.

File Name : 042407 3-6 PM US19-98 & Power Line Rd
Site Code : 00000001
Start Date : 4/24/2007
Page No : 1

Weather: Clear

Groups Printed- Cars - Trucks

	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Factor	1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		1.03	1.03	1.03	1.03		
03:00 PM	0	84	2	0	86	0	0	0	0	0	4	93	0	0	97	23	4	33	29	89	272
03:15 PM	0	102	2	0	104	1	0	0	0	1	2	106	3	0	111	21	0	40	35	96	312
03:30 PM	0	92	0	0	92	0	0	2	0	2	5	119	0	0	124	18	0	14	32	64	282
03:45 PM	1	92	2	1	96	0	0	0	0	0	4	107	0	0	111	8	0	13	12	33	240
Total	1	370	6	1	378	1	0	2	0	3	15	425	3	0	443	70	4	100	108	282	1106
04:00 PM	0	97	0	0	97	0	0	0	0	0	4	124	0	0	128	10	0	16	26	52	277
04:15 PM	0	81	0	0	81	1	0	0	0	1	8	106	0	0	114	6	0	21	12	39	235
04:30 PM	0	94	1	0	95	0	0	0	0	0	0	95	0	0	95	19	0	31	28	78	268
04:45 PM	0	99	2	0	101	0	0	0	0	0	12	97	0	0	109	8	0	18	35	61	271
Total	0	371	3	0	374	1	0	0	0	1	24	422	0	0	446	43	0	86	101	230	1051
05:00 PM	0	96	1	0	97	0	0	0	0	0	15	114	0	0	129	11	0	19	34	64	290
05:15 PM	0	80	4	0	84	0	0	0	0	0	16	101	0	0	117	29	0	44	22	95	296
05:30 PM	0	95	3	3	101	0	0	0	0	0	6	88	0	0	94	23	1	30	23	77	272
05:45 PM	0	80	2	1	83	0	0	0	0	0	6	87	0	0	93	8	0	10	21	39	215
Total	0	351	10	4	365	0	0	0	0	0	43	390	0	0	433	71	1	103	100	275	1073
Grand Total	1	1092	19	5	1117	2	0	2	0	4	82	1237	3	0	1322	184	5	289	309	787	3230
Apprch %	0.1	97.8	1.7	0.4		50	0	50	0		6.2	93.6	0.2	0		23.4	0.6	36.7	39.3		
Total %	0	33.8	0.6	0.2	34.6	0.1	0	0.1	0	0.1	2.5	38.3	0.1	0	40.9	5.7	0.2	8.9	9.6	24.4	
Cars	1	1059	15	5	1080	2	0	2	0	4	68	1214	3	0	1285	179	5	282	300	766	3135
% Cars	100	97	78.9	100	96.7	100	0	100	0	100	82.9	98.1	100	0	97.2	97.3	100	97.6	97.1	97.3	97.1
Trucks	0	33	4	0	37	0	0	0	0	0	14	23	0	0	37	5	0	7	9	21	95
% Trucks	0	3	21.1	0	3.3	0	0	0	0	0	17.1	1.9	0	0	2.8	2.7	0	2.4	2.9	2.7	2.9

	Southbound					Westbound					Northbound					Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	99	2	0	101	0	0	0	0	0	12	97	0	0	109	8	0	18	35	61	271
05:00 PM	0	96	1	0	97	0	0	0	0	0	15	114	0	0	129	11	0	19	34	64	290
05:15 PM	0	80	4	0	84	0	0	0	0	0	16	101	0	0	117	29	0	44	22	95	296
05:30 PM	0	95	3	3	101	0	0	0	0	0	6	88	0	0	94	23	1	30	23	77	272
Total Volume	0	370	10	3	383	0	0	0	0	0	49	400	0	0	449	71	1	111	114	297	1129
% App. Total	0	96.6	2.6	0.8		0	0	0	0		10.9	89.1	0	0		23.9	0.3	37.4	38.4		
PHF	.000	.934	.625	.250	.949	.000	.000	.000	.000	.000	.766	.877	.000	.000	.870	.612	.250	.631	.814	.782	.954
Cars	0	362	9	3	374	0	0	0	0	0	46	398	0	0	444	70	1	110	111	292	1110
% Cars	0	97.8	90.0	100	97.7	0	0	0	0	0	93.9	99.5	0	0	98.9	98.6	100	99.1	97.4	98.3	98.3
Trucks	0	8	1	0	9	0	0	0	0	0	3	2	0	0	5	1	0	1	3	5	19
% Trucks	0	2.2	10.0	0	2.3	0	0	0	0	0	6.1	0.5	0	0	1.1	1.4	0	0.9	2.6	1.7	1.7

APPENDIX B
BACKGROUND GROWTH RATE CALCULATION

GROWTH RATE CALCULATION

Year	AADT	Growth
2002	8,900	
2003	9,100	2.2%
2004	6,900	-24.2%
2005	10,100	46.4%
2006	8,900	-11.9%
Average		**3.1%**

*Traffic Count Site #0250 – SR 55/US 19, North of CR 488 / Dunellon Road

Growth Factor = (1 + 3.1 / 100)^5

= **1.165**

Source: 2006 Traffic Counts obtained from FDOT Central Office
2002 – 2005 Traffic Counts obtained from 2005 Florida Traffic Information System CD.

APPENDIX C
HCS+ CAPACITY ANALYSIS SUMMARY
2007 EXISTING

SHORT REPORT

General Information

Analyst NAS
Agency or Co. TA
Date Performed 08/13/2007
Time Period AM PEAK HOUR

Site Information

Intersection US19/98 & Powerline Rd
Area Type All other areas
Jurisdiction Citrus County
Analysis Year 2007 Existing

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	27		54				392	177			268	187
% Heavy Vehicles	11		6				2	14			9	2
PHF	0.71		0.71				0.84	0.84			0.82	0.82
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	22				0	0		0	0	99
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 13.0	G = 0.0	G = 0.0	G = 0.0	G = 48.0	G = 25.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	38		45				467	211			327	107
Lane Group Capacity	211		991				850	2475			830	396
v/c Ratio	0.18		0.05				0.55	0.09			0.39	0.27
Green Ratio	0.13		0.65				0.48	0.78			0.25	0.25
Uniform Delay d_1	38.8		6.3				18.4	2.6			31.2	30.2
Delay Factor k	0.11		0.11				0.15	0.11			0.11	0.11
Incremental Delay d_2	0.4		0.0				0.8	0.0			0.3	0.4
PF Factor	1.000		0.438				0.796	0.261			1.000	1.000
Control Delay	39.2		2.8				15.4	0.7			31.5	30.5
Lane Group LOS	D		A				B	A			C	C
Approach Delay	19.4						10.8			31.3		
Approach LOS	B						B			C		
Intersection Delay	18.8			Intersection LOS			B					

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SHORT REPORT

General Information

Analyst *NAS*
Agency or Co. *TA*
Date Performed *08/13/2007*
Time Period *PM PEAK HOUR*

Site Information

Intersection *US19/98 & Powerline Rd*
Area Type *All other areas*
Jurisdiction *Citrus County*
Analysis Year *2007 Existing*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	71		225				49	400			370	13
% Heavy Vehicles	1		2				6	1			2	8
PHF	0.78		0.78				0.87	0.87			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	114				0	0		0	0	3
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 33.0	G = 0.0	G = 0.0	G = 0.0	G = 16.0	G = 37.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	91		142				56	460			389	11
Lane Group Capacity	590		839				272	2078			1312	553
v/c Ratio	0.15		0.17				0.21	0.22			0.30	0.02
Green Ratio	0.33		0.53				0.16	0.58			0.37	0.37
Uniform Delay d_1	23.6		12.1				36.5	10.1			22.3	20.0
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.1		0.1				0.4	0.1			0.1	0.0
PF Factor	0.961		0.718				1.000	0.621			0.925	0.925
Control Delay	22.9		8.8				36.9	6.3			20.7	18.5
Lane Group LOS	C		A				D	A			C	B
Approach Delay	14.3						9.6			20.7		
Approach LOS	B						A			C		
Intersection Delay	14.4			Intersection LOS						B		

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HCS+ CAPACITY ANALYSIS SUMMARY
2009 NO-BUILD

SHORT REPORT

General Information

Analyst NAS
Agency or Co. TA
Date Performed 08/13/2007
Time Period AM PEAK HOUR

Site Information

Intersection US19/98 & Powerline Rd
Area Type All other areas
Jurisdiction Citrus County
Analysis Year 2009 No-Build

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	8		16				99	188			285	47
% Heavy Vehicles	25		25				7	14			9	7
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	7				0	0		0	0	23
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 13.0	G = 0.0	G = 0.0	G = 0.0	G = 48.0	G = 25.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	8		9				104	198			300	25
Lane Group Capacity	188		840				810	2475			830	649
v/c Ratio	0.04		0.01				0.13	0.08			0.36	0.04
Green Ratio	0.13		0.65				0.48	0.78			0.25	0.43
Uniform Delay d_1	38.1		6.2				14.4	2.6			30.9	16.5
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.1		0.0				0.1	0.0			0.3	0.0
PF Factor	1.000		0.438				0.796	0.261			1.000	0.861
Control Delay	38.1		2.7				11.5	0.7			31.2	14.2
Lane Group LOS	D		A				B	A			C	B
Approach Delay	19.4						4.4			29.9		
Approach LOS	B						A			C		
Intersection Delay	17.7			Intersection LOS						B		

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SHORT REPORT

General Information

Analyst *NAS*
Agency or Co. *TA*
Date Performed *08/13/2007*
Time Period *PM PEAK HOUR*

Site Information

Intersection *US19/98 & Powerline Rd*
Area Type *All other areas*
Jurisdiction *Citrus County*
Analysis Year *2009 No-Build*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	18		57				14	426			394	4
% Heavy Vehicles	7		7				22	1			2	22
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	28				0	0		0	0	2
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 33.0	G = 0.0	G = 0.0	G = 0.0	G = 16.0	G = 37.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	19		31				15	448			415	2
Lane Group Capacity	557		800				237	2078			1312	490
v/c Ratio	0.03		0.04				0.06	0.22			0.32	0.00
Green Ratio	0.33		0.53				0.16	0.58			0.37	0.37
Uniform Delay d_1	22.7		11.3				35.6	10.1			22.5	19.9
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.0		0.0				0.1	0.1			0.1	0.0
PF Factor	0.961		0.718				1.000	0.621			0.925	0.925
Control Delay	21.8		8.1				35.8	6.3			20.9	18.4
Lane Group LOS	C		A				D	A			C	B
Approach Delay	13.3						7.3			20.9		
Approach LOS	B						A			C		
Intersection Delay	13.7			Intersection LOS						B		

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HCS+ CAPACITY ANALYSIS SUMMARY
2012 NO-BUILD

SHORT REPORT

General Information

Analyst *NAS*
Agency or Co. *TA*
Date Performed *08/13/2007*
Time Period *AM PEAK HOUR*

Site Information

Intersection *US19/98 & Powerline Rd*
Area Type *All other areas*
Jurisdiction *Citrus County*
Analysis Year *2012 No-Build*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	11		21				108	207			313	51
% Heavy Vehicles	43		43				14	4			9	14
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	10				0	0		0	0	25
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 13.0	G = 0.0	G = 0.0	G = 0.0	G = 48.0	G = 25.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	12		12				114	218			329	27
Lane Group Capacity	164		734				760	2713			830	354
v/c Ratio	0.07		0.02				0.15	0.08			0.40	0.08
Green Ratio	0.13		0.65				0.48	0.78			0.25	0.25
Uniform Delay d_1	38.2		6.2				14.6	2.6			31.2	28.7
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.2		0.0				0.1	0.0			0.3	0.1
PF Factor	1.000		0.438				0.796	0.261			1.000	1.000
Control Delay	38.4		2.7				11.7	0.7			31.5	28.8
Lane Group LOS	D		A				B	A			C	C
Approach Delay	20.6						4.5			31.3		
Approach LOS	C						A			C		
Intersection Delay	18.4			Intersection LOS						B		

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SHORT REPORT

General Information		Site Information	
Analyst	NAS	Intersection	US19/98 & Powerline Rd
Agency or Co.	TA	Area Type	All other areas
Date Performed	08/13/2007	Jurisdiction	Citrus County
Time Period	PM PEAK HOUR	Analysis Year	2012 No-Build

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	19		62				18	467			432	5
% Heavy Vehicles	14		14				40	1			2	40
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	31				0	0		0	0	2
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 33.0	G = 0.0	G = 0.0	G = 0.0	G = 16.0	G = 37.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	20		33				19	492			455	3
Lane Group Capacity	522		751				206	2078			1312	427
v/c Ratio	0.04		0.04				0.09	0.24			0.35	0.01
Green Ratio	0.33		0.53				0.16	0.58			0.37	0.37
Uniform Delay d_1	22.7		11.3				35.8	10.2			22.8	19.9
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.0		0.0				0.2	0.1			0.2	0.0
PF Factor	0.961		0.718				1.000	0.621			0.925	0.925
Control Delay	21.9		8.1				36.0	6.4			21.2	18.4
Lane Group LOS	C		A				D	A			C	B
Approach Delay	13.3						7.5			21.2		
Approach LOS	B						A			C		
Intersection Delay	13.9			Intersection LOS						B		

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HCS+ CAPACITY ANALYSIS SUMMARY
2009 BUILD

SHORT REPORT

General Information

Analyst	*NAS*
Agency or Co.	*TA*
Date Performed	*08/13/2007*
Time Period	*AM PEAK HOUR*

Site Information

Intersection	*US19/98 & Powerline Rd*
Area Type	*All other areas*
Jurisdiction	*Citrus County*
Analysis Year	*2009 Build*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	23		47				298	188			285	142
% Heavy Vehicles	22		22				6	14			9	6
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	23				0	0		0	0	71
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 13.0	G = 0.0	G = 0.0	G = 0.0	G = 48.0	G = 25.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	24		25				314	198			300	75
Lane Group Capacity	192		861				817	2475			830	381
v/c Ratio	0.13		0.03				0.38	0.08			0.36	0.20
Green Ratio	0.13		0.65				0.48	0.78			0.25	0.25
Uniform Delay d_1	38.5		6.2				16.6	2.6			30.9	29.6
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.3		0.0				0.3	0.0			0.3	0.3
PF Factor	1.000		0.438				0.796	0.261			1.000	1.000
Control Delay	38.8		2.7				13.5	0.7			31.2	29.8
Lane Group LOS	D		A				B	A			C	C
Approach Delay	20.4						8.5			30.9		
Approach LOS	C						A			C		
Intersection Delay	18.1			Intersection LOS						B		

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SHORT REPORT

General Information

Analyst	*NAS*
Agency or Co.	*TA*
Date Performed	*08/13/2007*
Time Period	*PM PEAK HOUR*

Site Information

Intersection	*US19/98 & Powerline Rd*
Area Type	*All other areas*
Jurisdiction	*Citrus County*
Analysis Year	*2009 Build*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	55		170				41	426			394	12
% Heavy Vehicles	7		5				18	1			2	25
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	85				0	0		0	0	6
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 33.0	G = 0.0	G = 0.0	G = 0.0	G = 16.0	G = 37.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0
Duration of Analysis (hrs) = 0.25						Cycle Length C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	58		89				43	448			415	6
Lane Group Capacity	557		815				245	2078			1312	478
v/c Ratio	0.10		0.11				0.18	0.22			0.32	0.01
Green Ratio	0.33		0.53				0.16	0.58			0.37	0.37
Uniform Delay d_1	23.2		11.7				36.3	10.1			22.5	19.9
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.1		0.1				0.3	0.1			0.1	0.0
PF Factor	0.961		0.718				1.000	0.621			0.925	0.925
Control Delay	22.4		8.5				36.6	6.3			20.9	18.5
Lane Group LOS	C		A				D	A			C	B
Approach Delay	14.0						9.0			20.9		
Approach LOS	B						A			C		
Intersection Delay	14.4			Intersection LOS						B		

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HCS+ CAPACITY ANALYSIS SUMMARY
2012 BUILD

SHORT REPORT

General Information

Analyst	NAS
Agency or Co.	TA
Date Performed	08/13/2007
Time Period	AM PEAK HOUR

Site Information

Intersection	US19/98 & Powerline Rd
Area Type	All other areas
Jurisdiction	Citrus County
Analysis Year	2012 Build

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	11		21				108	207			313	51
% Heavy Vehicles	43		43				14	14			9	14
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	10				0	0		0	0	25
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 13.0	G = 0.0	G = 0.0	G = 0.0	G = 48.0	G = 25.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 100.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	12		12				114	218			329	27
Lane Group Capacity	164		734				760	2475			830	354
v/c Ratio	0.07		0.02				0.15	0.09			0.40	0.08
Green Ratio	0.13		0.65				0.48	0.78			0.25	0.25
Uniform Delay d_1	38.2		6.2				14.6	2.6			31.2	28.7
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.2		0.0				0.1	0.0			0.3	0.1
PF Factor	1.000		0.438				0.796	0.261			1.000	1.000
Control Delay	38.4		2.7				11.7	0.7			31.5	28.8
Lane Group LOS	D		A				B	A			C	C
Approach Delay	20.6						4.5			31.3		
Approach LOS	C						A			C		
Intersection Delay	18.4			Intersection LOS						B		

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SHORT REPORT

General Information		Site Information	
Analyst	NAS	Intersection	US19/98 & Powerline Rd
Agency or Co.	TA	Area Type	All other areas
Date Performed	08/13/2007	Jurisdiction	Citrus County
Time Period	PM Peak Hour	Analysis Year	2012 Build

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1		1				1	2			2	1
Lane Group	L		R				L	T			T	R
Volume (vph)	19		62				18	467			432	5
% Heavy Vehicles	14		14				40	1			2	40
PHF	0.95		0.95				0.95	0.95			0.95	0.95
Pretimed/Actuated (P/A)	A		A				A	A			A	A
Startup Lost Time	2.0		2.0				2.0	2.0			2.0	2.0
Extension of Effective Green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival Type	4		4				4	4			4	4
Unit Extension	3.0		3.0				3.0	3.0			3.0	3.0
Ped/Bike/RTOR Volume	0	0	31				0	0		0	0	2
Lane Width	12.0		12.0				12.0	12.0			12.0	12.0
Parking/Grade/Parking	N	0	N				N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0		0				0	0			0	0
Minimum Pedestrian Time		3.2						3.2			3.2	

Phasing	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 33.0	G = 0.0	G = 0.0	G = 0.0	G = 16.0	G = 37.0	G = 0.0	G = 0.0
	Y = 4	Y = 0	Y = 0	Y = 0	Y = 5	Y = 5	Y = 0	Y = 0
Duration of Analysis (hrs) = 0.25						Cycle Length C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	20		33				19	492			455	3
Lane Group Capacity	522		751				206	2078			1312	427
v/c Ratio	0.04		0.04				0.09	0.24			0.35	0.01
Green Ratio	0.33		0.53				0.16	0.58			0.37	0.37
Uniform Delay d_1	22.7		11.3				35.8	10.2			22.8	19.9
Delay Factor k	0.11		0.11				0.11	0.11			0.11	0.11
Incremental Delay d_2	0.0		0.0				0.2	0.1			0.2	0.0
PF Factor	0.961		0.718				1.000	0.621			0.925	0.925
Control Delay	21.9		8.1				36.0	6.4			21.2	18.4
Lane Group LOS	C		A				D	A			C	B
Approach Delay	13.3						7.5			21.2		
Approach LOS	B						A			C		
Intersection Delay	13.9			Intersection LOS						B		

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APPENDIX D
SIMTRAFFIC SIMULATION RESULTS
2007 EXISTING

Progress Energy CR3 Uprate Project
AM PEAK HOUR

2007 Existing
8/13/2007

Intersection: 2: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	71	49	270	290	115	116	129	138
Average Queue (ft)	21	15	173	32	11	42	52	52
95th Queue (ft)	53	37	272	190	62	88	105	104
Link Distance (ft)	274			329	329	351	351	
Upstream Blk Time (%)				0	0			
Queuing Penalty (veh)				0	0			
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)			3					
Queuing Penalty (veh)			2					

Progress Energy CR3 Uprate Project
PM PEAK HOUR

2007 Existing
8/13/2007

Intersection: 7: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	97	97	97	68	79	86	88	44
Average Queue (ft)	40	37	40	17	31	32	41	6
95th Queue (ft)	79	67	83	50	68	73	79	28
Link Distance (ft)	289			366	366	296	296	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

SIMTRAFFIC SIMULATION RESULTS
2009 NO-BUILD

Progress Energy CR3 Uprate Project
AM PEAK HOUR

2009 No-Build
8/13/2007

Intersection: 2: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	59	63	112	20	47	62	80	54
Average Queue (ft)	9	12	58	1	5	18	36	10
95th Queue (ft)	37	40	100	11	27	53	74	38
Link Distance (ft)	274			329	329	351	351	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

Progress Energy CR3 Uprate Project
PM PEAK HOUR

2009 No-Build
8/13/2007

Intersection: 7: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	50	44	64	35	75	62	73	4
Average Queue (ft)	13	21	16	7	18	16	24	0
95th Queue (ft)	39	42	51	29	52	47	59	3
Link Distance (ft)	289			366	366	296	296	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

NAS
TA

SimTraffic Report
Page 1

SIMTRAFFIC SIMULATION RESULTS
2012 No-Build

Progress Energy CR3 Uprate Project
AM PEAK HOUR

2012 No-Build
8/13/2007

Intersection: 2: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	67	59	168	26	67	64	102	64
Average Queue (ft)	12	14	64	2	9	22	36	14
95th Queue (ft)	43	47	125	13	40	57	81	46
Link Distance (ft)	274			329	329	351	351	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

NAS
TA

SimTraffic Report
Page 1

Trans Associates

Progress Energy CR3 Uprate Project
PM PEAK HOUR

2012 No-Build
8/13/2007

Intersection: 7: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	62	82	86	59	70	68	76	15
Average Queue (ft)	18	26	24	13	26	22	31	0
95th Queue (ft)	49	59	66	42	64	56	68	7
Link Distance (ft)	289			366	366	296	296	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

SIMTRAFFIC SIMULATION RESULTS
2009 BUILD

Progress Energy CR3 Uprate Project
AM PEAK HOUR

2009 Build
8/13/2007

Intersection: 2: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	71	63	273	297	157	95	121	119
Average Queue (ft)	17	19	146	19	13	40	54	41
95th Queue (ft)	51	48	246	141	80	79	96	88
Link Distance (ft)	274			329	329	351	351	
Upstream Blk Time (%)				0	0			
Queuing Penalty (veh)				0	0			
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)			1					
Queuing Penalty (veh)			1					

Progress Energy CR3 Uprate Project
PM PEAK HOUR

2009 Build
8/13/2007

Intersection: 7: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	93	94	98	64	92	105	117	43
Average Queue (ft)	37	34	37	17	33	34	43	3
95th Queue (ft)	75	64	79	49	75	76	89	22
Link Distance (ft)	289			366	366	296	296	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

SIMTRAFFIC SIMULATION RESULTS
2012 BUILD

Progress Energy CR3 Uprate Project
AM PEAK HOUR

2012 Build
8/13/2007

Intersection: 2: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	67	59	167	26	68	68	74	68
Average Queue (ft)	12	14	65	2	8	23	26	15
95th Queue (ft)	44	46	125	14	38	59	62	49
Link Distance (ft)	274			329	329	351	351	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

Progress Energy CR3 Uprate Project
PM PEAK HOUR

2012 Build
8/13/2007

Intersection: 7: Power Line Rd & US-19/US-98

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	62	82	86	59	70	68	76	15
Average Queue (ft)	18	26	24	13	26	22	31	0
95th Queue (ft)	49	59	66	42	64	56	68	7
Link Distance (ft)	289			366	366	296	296	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200	250					200
Storage Blk Time (%)								
Queuing Penalty (veh)								

APPENDIX C

PROGRESS ENERGY FLORIDA

WARRANTY DEED

FORM 113 FLORIDA Warranty Deed (Fr Corp.) 237 TUTBLANX REGISTERED U.S. PAT. OFFICE Tuttle Law Print, Publishers, Rutland, Vt.

BOOK 147 PAGE 62

This Indenture,

Made this 23rd *day of* October *, A. D. 19* 63 *,*

Between HARBOND, INC.
a corporation existing under the laws of the State of Florida *,*
having its principal place of business in the County of Pinellas *and*
State of Florida *party of the first part, and*
FLORIDA POWER CORPORATION, 101 Fifth Street South, St. Petersburg, Florida, a corporation existing under the laws of the State of Florida, having its principal place of business in
~~of~~ *the County of* Pinellas *and State of* Florida
party of the second part.

Witnesseth, *That the said party of the first part, for and in consideration of the sum of* TEN DOLLARS ($10.00) AND OTHER VALUABLE CONSIDERATION ~~Dollars,~~ *to it in hand paid, the receipt whereof is hereby acknowledged, has granted, bargained, sold, aliened, remised, released, conveyed and confirmed, and by these presents doth grant, bargain, sell, alien, remise, release, convey and confirm unto the said party of the second part, and* its successors ~~heirs~~ *and assigns forever, all that certain parcel of land lying and being in the County of* Citrus *and State of Florida, more particularly described as follows:*

In Township 17 South, Range 16 East

S½ of Section 28; S½ of Section 29; Government Lots 6, 7, 8 and 9, Section 30; Government Lots 1 and 2, Section 31; All of Section 32; All of Section 33, EXCEPT SW¼ of NW¼ and NW¼ of SW¼; W½ and N½ of NE¼ of Section 34; and N½ of NW¼ of Section 35.

In Township 18 South, Range 16 East

W½ of Section 3; Government Lots 1 to 13, both inclusive, of Section 4.

Together with all riparian and littoral rights appertaining thereto and including all rights of accretion, alluvion and dereliction.

Subject to those certain Reservations contained in Deed No. 18642, from the Trustees of the Internal Improvement Fund of the State of Florida, to Hollins Wood, Inc., dated February 25, 1943 and filed for record June 13, 1945 in Deed Book 82, Pages 492 and 493, as Clerk's File No. 4531, Public Records of Citrus County, Florida, affecting Government Lots 6, 7, 8 and 9 of Section 30; Government Lots 1 and 2 of Section 31; the NW¼ of SE¼, the S½ of SE¼, and the W½ of Section 32; all being in Township 17 South, Range 16 East.

FILED NOV 25 PM 1:29 CLERK CIRCUIT COURT CITRUS COUNTY, FLA. FILE NO. 94276

Together *with all the tenements, hereditaments and appurtenances, with every privilege, right, title, interest and estate, reversion, remainder and easement thereto belonging or in anywise appertaining:*

To Have and to Hold *the same in fee simple forever.*
And the said party of the first part doth covenant with the said party of the second part that it is lawfully seized of the said premises; that they are free of all incumbrances, and that it has good right and lawful authority to sell the same; and the said party of the first part does hereby fully warrant the title to said land, and will defend the same against the lawful claims of all persons whomsoever.

In Witness Whereof, *the said party of the first part has caused these presents to be signed in its name by its President, and its corporate seal to be affixed, attested by its* Secretary *the day and year above written.*

(*Corporate Seal*)

Attest: _____ Secretary

HARBOND, INC.

By _____ *President.*

Signed, Sealed and Delivered in Our Presence:

_____

_____

State of Florida, BOOK 147 PAGE 63

County of Pinellas

I HEREBY CERTIFY, *That on this* 23rd *day of* October *A. D. 1963*, *before me personally appeared* MAURICE L. HOLLINS *and* P. F. THOMSON, *President and* Secretary *respectively of* HARBOND, INC., *a corporation under the laws of the State of* Florida, *to me known to be the persons described in and who executed the foregoing conveyance to*

FLORIDA POWER CORPORATION

and severally acknowledged the execution thereof to be their free act and deed as such officers, for the uses and purposes therein mentioned; and that they affixed thereto the official seal of said corporation, and the said instrument is the act and deed of said corporation.

WITNESS *my signature and official seal at* St. Petersburg *in the County of* Pinellas *and State of Florida, the day and year last aforesaid.*

My Commission Expires _____ *Notary Public*

Notary Public, State of Florida at Large
My Commission Expires Aug. 7, 1967
Bonded By American Surety Co. of N. Y.

Warranty Deed (1)

FROM CORPORATION

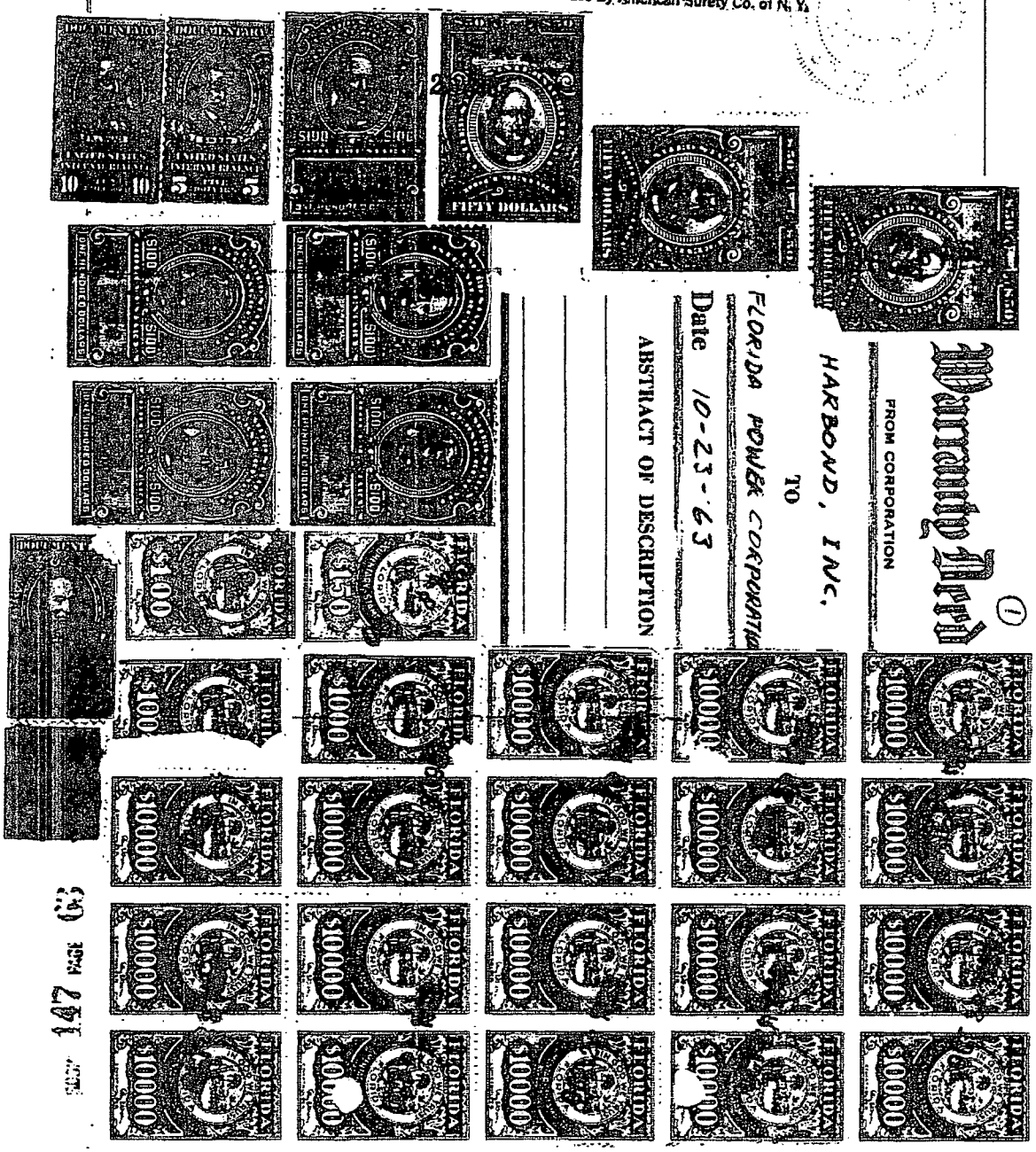
HARBOND, INC.

TO

FLORIDA POWER CORPORATION

Date 10-23-63

ABSTRACT OF DESCRIPTION



BOOK 147 PAGE 63

A 10% undivided interest was conveyed by Warranty Deed and ~~Bill of Sale~~, dated July 31, 1975, to the City of Alachua, ~~Florida, et al.~~; re-recorded in O. R. Book 407 at Page 812, on September 5, 1975, Public Records of Citrus County, Florida, and consisted of the following property:

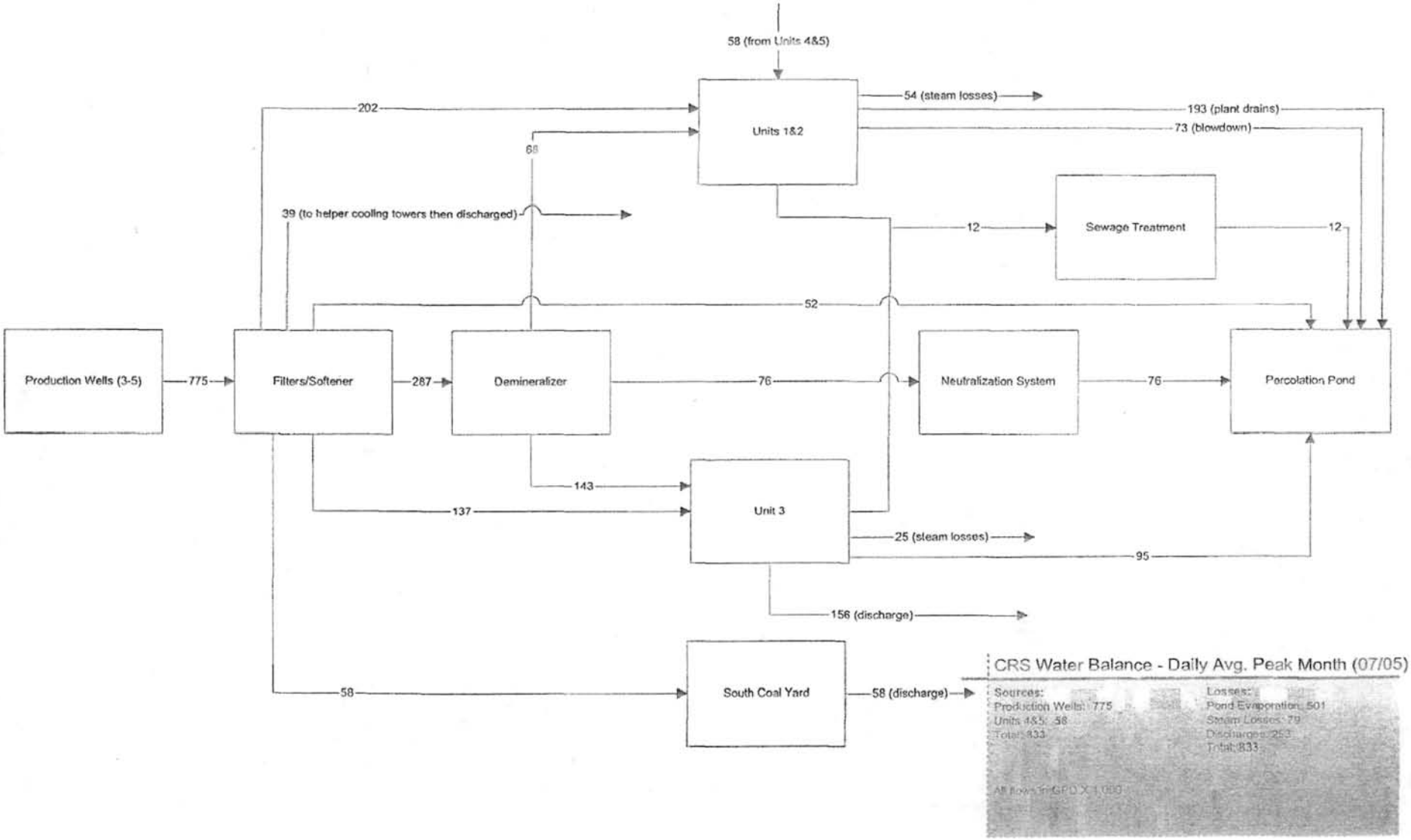
Commence at the Northwest corner of Section 33, Township 17 South, Range 16 East, Citrus County, Florida, said corner having plant coordinates of N 0+34.61 & E 0+36.85, and run S 00°58'04" E, along the West boundary of said Section 33, a distance of 1,254.79 feet; thence East, a distance of 1,456.95 feet to the Point of Beginning, said point having plant coordinates, S 12+20 & E 15+15; thence South, a distance of 63.98 feet; thence S 45°41'57" W, a distance of 201.91 feet; thence West, a distance of 436.50 feet to the Point of Curvature of a curve concave Southeasterly and having a radius of 134.0 feet; thence run 210.49 feet along the arc of said curve, a chord bearing and distance of S 45°00'00" W, 189.50 feet to the Point of Tangency; thence South, 757.33 feet; thence East, 484.00 feet; thence North, 137.83 feet; thence East, 66.00 feet to the Point of Curvature of a curve concave Northwesterly and having a radius of 147.43 feet; thence run 149.75 feet along the arc of said curve, a chord bearing and distance of N 60°54'14" E, 143.40 feet to the Point of Tangency; thence N 31°47'52" E, 87.01 feet to a curve concave Northerly and having a radius of 1183.72 feet; thence run 319.45 feet along the arc of said curve, a chord bearing and distance of N 73°50'37" E, 318.48 feet to the Point of Tangency; thence N 67°31'02" E, 481.14 feet to the Point of Curvature of a curve concave Southerly and having a radius of 676.78 feet; thence run 265.05 feet along the arc of said curve, a chord bearing and distance of N 78°43'36" E, 263.36 feet to the Point of Tangency; thence N 89°53'49" E, 200 feet; thence N 00°06'11" W, 80.00 feet; thence S 89°53'49" W, 200 feet to the Point of Curvature of a curve concave Southerly and having a radius of 756.78 feet; thence run 296.31 feet along the arc of said curve, a chord bearing and distance of S 78°43'36" W, 294.42 feet to the Point of Tangency; thence S 67°31'02" W, 481.14 feet to the Point of Curvature of a curve concave Northerly and having a radius of 1103.72 feet; thence run 241.24 feet along the arc of said curve, a chord bearing and distance of S 73°59'18" W, 240.76 feet; thence West, 150.57 feet; thence North, 204.70 feet; thence East, 60.00 feet; thence North, 161.00 feet; thence East, 437.55 feet; thence North, 353 feet; thence West, 397 feet to the Point of Beginning. Containing 18.86 acres, more or less.

NOTE: Bearings used in this description were established from plant base line bearings of true North and East.

APPENDIX D

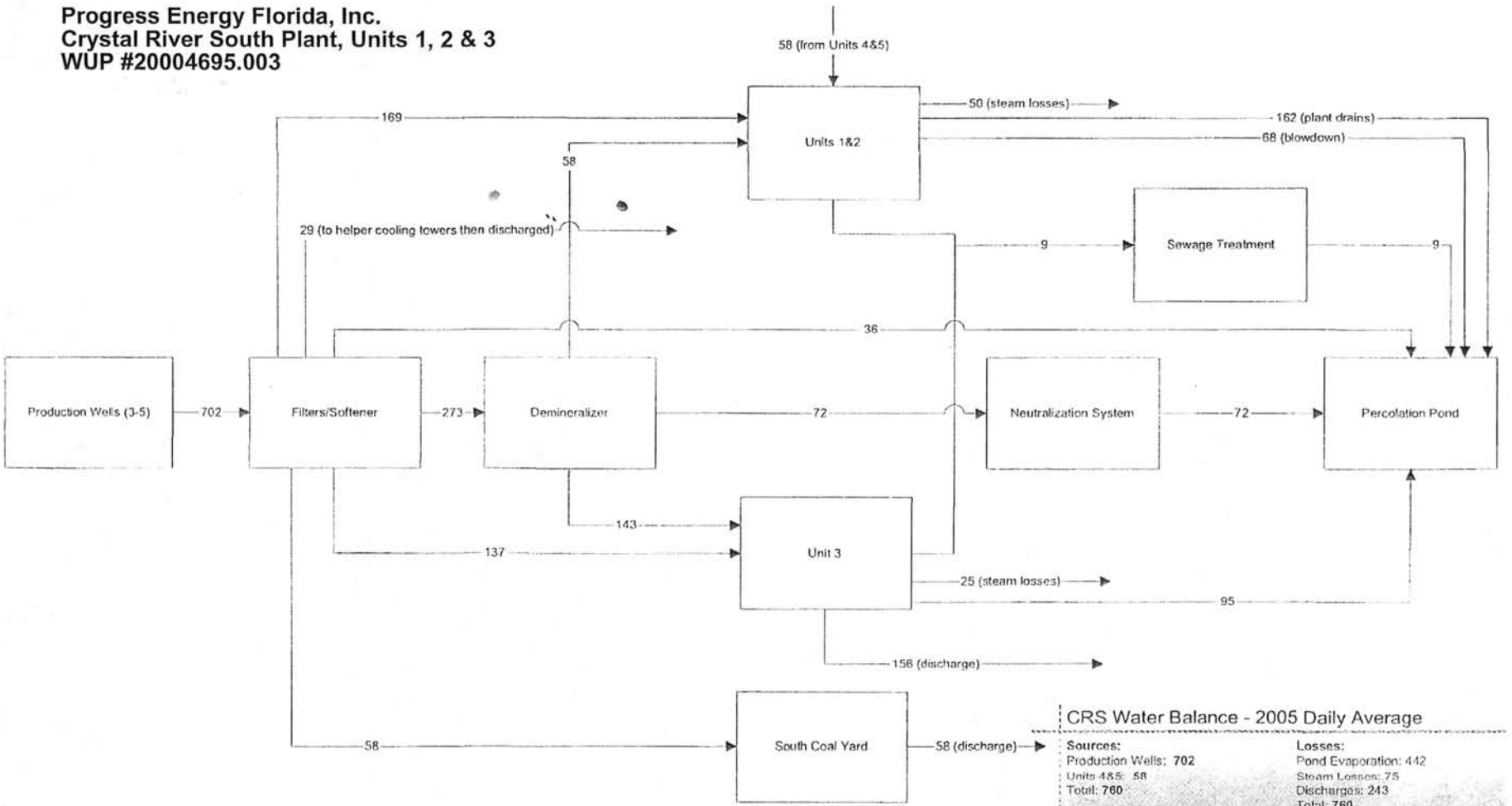
CRYSTAL RIVER UNITS 1, 2, AND 3
WATER BALANCES

Progress Energy Florida, Inc.
Crystal River South Plant, Units 1, 2 & 3
WUP #20004695.003

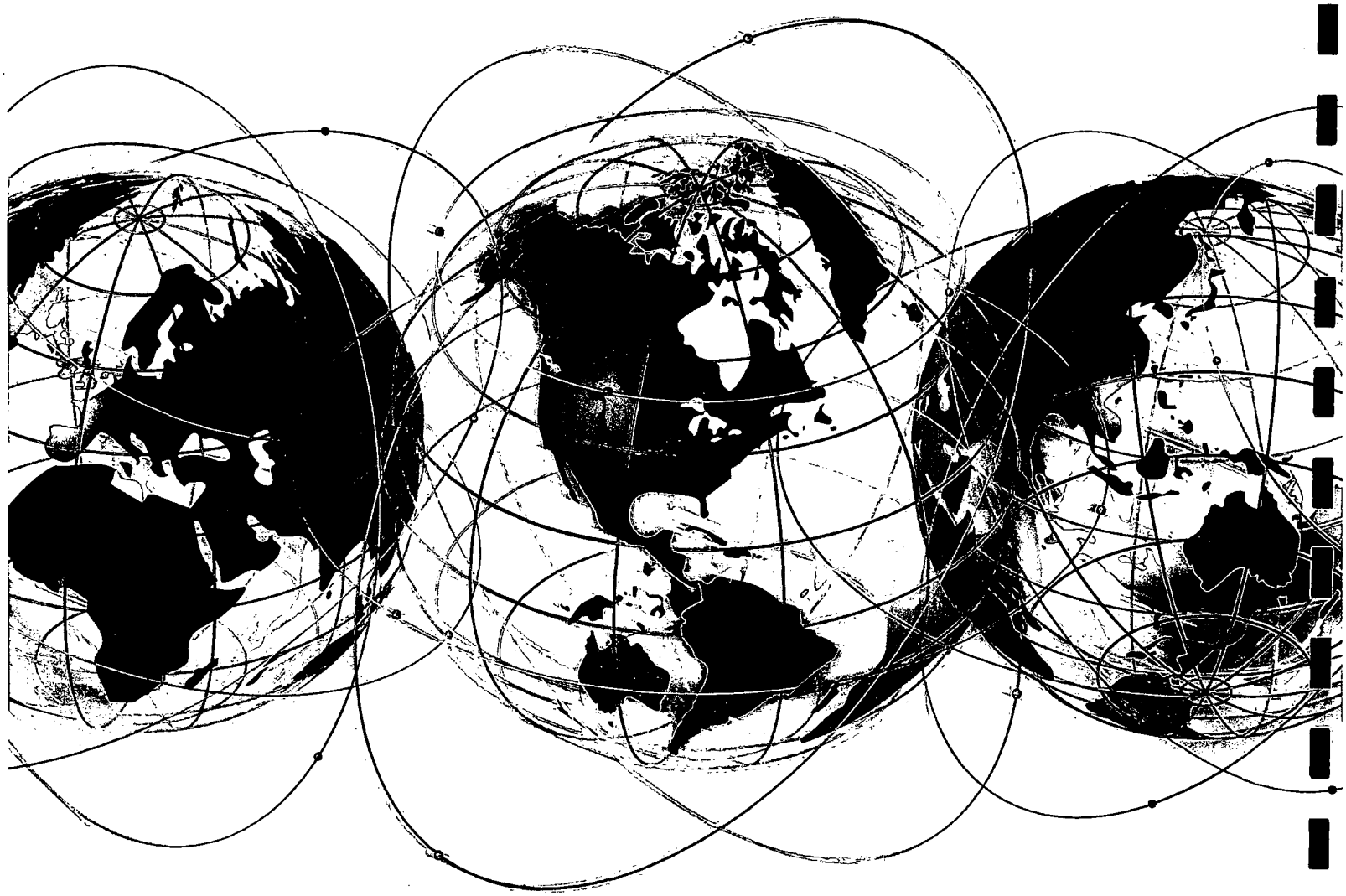


Supplemental Information
Water Balance Diagram
Peak Month Quantity

Progress Energy Florida, Inc.
Crystal River South Plant, Units 1, 2 & 3
WUP #20004695.003



Supplemental Information
Water Balance Diagram
Daily Average Quantity



Engineering Earth's Development

Preserving Earth's Integrity

Golder Associates

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