

D R A F T

APPENDIX D

SUMMARIES OF SELECTED LEE COUNTY DR/GR DOCUMENTS

DRAFT

Lee Comprehensive Plan Update

Item	Description	Sect / Page	Information from Report
1	Document Title		The Lee Plan 2005 Codification As Amended through December 2005
2	Author		Lee County
3	Date		December 2005
4	Sponsoring agency / publisher		Lee County, Southwest Florida, Department of Community Development, Division of Planning
5	Purpose of study or document		N/A
6	Relevance to DR/GR lands in southeast Lee County		See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C
7	Summary of report content		REVIEWED FOR THE BACKGROUND INFORMATION INCLUDED IN APPENDICES B AND C OF THIS REPORT
7 a.	General information and overall content		N/A
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		N/A
7 c.	Useful maps and overlays		N/A
7 d.	Relevant results and conclusions		N/A
8	Summary of report strengths and weaknesses		N/A
8 a.	Evaluation of study approach and conduct		N/A

DRAFT

8 c.	Extent to which report is “up to date”		N/A
8 d.	Completeness / data gaps / remaining information needs		N/A
	Relationship to, and consistency with, other studies / reports		N/A

DRAFT

Lee County Groundwater Resource and Mining Study

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover/pg 1	Lee County Groundwater Resource and Mining Study - Draft for Peer Review (also reviewed: Peer Review Comment Response to the June 2005 Draft of the Lee County Groundwater Resource and Mining Study, August 2006)
2	Author	Cover/pg 2	Greg F. Rawl, PG, Michael Voorhees, PhD, PE
3	Date	Cover/pg 1	June 2005
4	Sponsoring agency / publisher	Cover/pg 1	Lee County CN-03-16
5	Purpose of study or document	II - Scope of Work/ pg 1 (for Items 1 - 4) Item 5: last sentence in Section III, Background	<p>1) Groundwater: first phase of process to evaluate/assess groundwater resources.</p> <p>2) Mining: evaluate/assess the location and quality of mineral resources, current capacity of approved mining activities, future need for mining material, effects of mining on water resources and water budget.</p> <p>3) Mapping: map surface water flow ways for all of Lee County to aid in review of sensitive environmental areas.</p> <p>4) Provide Background information that will be used for the next phase(s) of the study that will assess the resource in a planning and land use context.</p> <p>5) Future Land Use Decisions/Groundwater Model: use an existing database model (Viewlog) to create a new groundwater model to be used/integrated into the future land use decision-making process.</p> <ul style="list-style-type: none"> • Asses the distribution of recharge and develop a detailed groundwater budget for the county. • Determine the impact of projected 2025 public water supply pumpage. • Estimate the groundwater flow to tide; including the Caloosahatchee and coastlines.

DRAFT

			<ul style="list-style-type: none"> Estimate effects of mining on the county groundwater.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)	All	<p>High Relevance: report covers all of Lee County, but the emphasis is on the southern DR/GR lands.</p> <p>"The goal of this study is to develop a sound, scientifically-based platform from which to base future land use decisions, in particular those decisions related to the DR/GR land use classification, as well as mining activities." (Section II, page 1, paragraph 1).</p>
7	Summary of report content		
7a	General information and overall content	<p>III and IV</p> <p>V</p> <p>VI</p>	<ul style="list-style-type: none"> Description of DR/GR designation and regulatory background information: Department of Community Affairs Governance, Groundwater Rules and Regulations, Mining Rules and Regulations and Lee County Master Mitigation Plan. Overview of topography, pre-existing/current land use conditions (just a narrative, no facts or numbers), watershed map, portion of a flow ways map– (1)Hydrologic alteration (Cape Coral – fresh/salt water interface & Lehigh Acres - lower water table in a high recharge area). (2)Major watersheds, wetlands, outstanding waters, flow ways – updated in this study. Description of the geology/hydrogeology of Lee County and the database used to construct hydrogeologic conceptual and numerical model, maps and cross sections showing hydrogeologic units and properties. Used Viewlog (EarthFX) and 1,080 wells from a previous WRS report and 629 new wells from other sources for aquifer/aquitard elevation/thickness & EarthFX hydrogeologic parameter database (hydraulic conductivity and leakance). Description of the three main aquifers in the area: Surficial, Intermediate and Floridan.

		<p>VII</p>	<ul style="list-style-type: none"> • Description of water levels and numerical groundwater model. • Groundwater Elevation database, using 550 wells, was created for the calibration of the groundwater model and to evaluate boundary conditions (wet - median of May 1996-2003 & dry - median of October 1996-2003 for Surficial Aquifer: Holocene/Pliocene & Ochopee and Intermediate: Sandstone & Mid-Hawthorn aquifers) – Conclusion: Historical groundwater elevation decline. • Groundwater Flow Model – MODFLOW 2000: <ol style="list-style-type: none"> (1) Model discretization: 564 rows x 480 columns, 500 ft x 500 ft. & 5 aquifers. (2) Recharge: Rainfall was evaluated using PRISM model (Daly2004). (http://www.ocs.oregonstate.edu/prism/index.phtml) and Land Cover using SFWMD Feasibility Study geographical information systems Year 2000 coverage; evapotranspiration & net recharge dry/wet. (3) Mine borrow pits were determined from the 2002 Aerial Photo & mine penetration from the mine database; pits were modeled as ponds with high storage & hydraulic conductivity. (4) Canals were modeled as drains. Aquifer penetration and conductance was computed based on the SFWMD Southwest Florida Feasibility Study canal geographical information systems data (5) Public and industrial pumpage is based on SFWMD permits, actual pumpage and utilities data. A future 2025 scenario was run. Aquifer Storage and Recovery were also included. (6) Model boundary conditions: constant head (7) Optimization - MODFLOW 2000 modified Gauss-Newton optimization method for boundary conditions, hydraulic conductivity, storage and leakance & global optimization (Floudas 2001) for net recharge. (8) Calibration Statistics – Residuals 0 to 11 feet - Needs to include
--	--	------------	--

DRAFT

			<p>room mean square error.</p> <p>(9) Transient calibration (1/2000 to 1/2002) – wet/dry graphs.</p> <p>(10) Groundwater fluxes and contours</p> <p>(11) Groundwater flow to tide: Northern Gulf Coast, Southern Gulf Coast, Caloosahatchee River mouth and inland.</p> <p>(12) Canal drawdown impact</p> <p>(13) Water budget</p> <p>(14) 2025 simulation with projected flows, pumping, dry season = 53% of annual total and wet season 45% of annual total.</p> <p>(15) Conclusions and recommendations</p> <ul style="list-style-type: none">- extensive use of SFWMD, United States Geological Survey & NOAA data- detailed MODFLOW model for Lee County- calibrated model <p>• Description of mining practices, existing and potential mines, possible demand for rock, possible quantities of rock available.</p> <ul style="list-style-type: none">- rock mined in southwest Florida is an economically important commodity;- 9 mines operating in Lee County in 2004;- rock material is removed above the water table, and then below the water table; materials removed below the water table are allowed to drain so much of the excavated water is returned to the aquifer;- most of the inventoried borrow pits in Lee County were never permitted;- in all 329 excavations were inventoried that encompassed 5,544 acres (1.1 % of the entire county);- potential mineable materials were estimated using the Viewlog database; estimates within the DR/GR only were 29,050 acres, 892 million cubic yards of overburden, and
--	--	--	--

DRAFT

		VIII	<p>2,676 million cubic yards of rock</p> <ul style="list-style-type: none">- annual sale of rock materials mined in Lee County are estimated to range from \$40 million to \$80 million (and these could be underestimates);- Section F, page 85 presents a “Mining Impact Analysis”, but this is largely a conceptual discussion with essentially no calculations or quantitative analyses of the potential impacts <ul style="list-style-type: none">• The report (p. 88) states that, because of the complex geology of the aquifers, the wellfield protection zones that have been used since 1989 to regulate land uses in the vicinity of Lee County potable well fields may no longer be valid. • The first half of the Groundwater Conclusions is more of a summary of the report than actual conclusions; other conclusions in this section include:<ul style="list-style-type: none">- “Net recharge to the water table is affected by a number of factors, anthropogenic factors such as irrigation increase net recharge, however in most cases this is artificial because of on-site groundwater withdrawals to facilitate the irrigation”- Regional net recharge to the water table is most significant in southeastern Lee County;- Mining-related recharge losses are no more significant than losses from lakes, reservoirs, wetlands and melaleuca;- Major water level declines in the Sandstone and Mid-Hawthorne aquifers have occurred in the last 10 to 15 years;- Surface water drainage features (e.g. canals) have significantly impacted groundwater levels in many areas of Lee County. • The mining conclusions states that mining can have both positive and negative effects on the water resources of Lee County, but does not elaborate.
--	--	------	---

DRAFT

		IX	<ul style="list-style-type: none">• The report contains recommendations for future or additional work hydrologic data collection work, and recommendations for mine design and mining regulation. It does not contain recommendations for land use decisions.
7 b	Specific relevant data (e.g. water quality sampling for	VI	<ul style="list-style-type: none">• Geologic cross-sections (A-A' to F-F' with G-G' missing).• Aquifer properties – hydraulic conductivity and leakance (only

DRAFT

	specific dates, water level data, etc.)	VII	<p>interpolated contours not actual values).</p> <ul style="list-style-type: none"> • Water-level elevation contours, surface elevation maps for the different aquifers, changes in the water level elevations for the different aquifers, recharge maps and tables. • Pumping rates – current and projected in 2025 (Table VII -1 through 2). • Hydrogeologic property multipliers – multipliers used to change the data from Viewlog to the calibrated model parameter values (Table VII-4 through 6). • Projected Recharge (Table VII-11). • Modeled water budgets (Tables VII-15 through 17). Additional information is needed in the water budget to calculate mass balance for the model; it is difficult to calculate with these tables. • Former, existing and potential mine locations.
7 c	Useful maps and overlays		<ul style="list-style-type: none"> • Flow ways map - only a portion of a flow ways map is included in report, would have to obtain full map from another source. • Existing and potential mine locations. • Net annual recharge to water table map - would have to be created from the information in the report or obtained from another source; however the data may not be defensible and therefore this map may not be useful. • Generalized geologic and hydrologic units (Fig. VI-1). Along with site cross-sections (Figs VI-14 through 21) show the geology.

DRAFT

			<ul style="list-style-type: none"> • 2-D maps with aquifer thickness. • 2-D hydrogeologic property maps – hydraulic conductivity & leakance (Figs VI-22 through 35). Control data points used to interpolate the distribution of the hydrogeologic properties are not indicated. • Groundwater elevation contour maps (Figs VII-1 through 8).
7 d	Relevant results and conclusions	VII, IX, X	<p>The report's conclusions are summarized under item 7a above.</p> <p>One of the primary conclusions is that recharge is related to land cover (e.g., urban, agricultural, open water). The report concludes that a significant amount of Lee County recharge is occurring on DR/GR lands, and offers the following recommendations:</p> <ol style="list-style-type: none"> 1. Add more monitoring wells to the DR/GR lands. 2. Upgrade monitoring wells that go dry in the dry season. 3. Further study of roles that land use and impervious surfaces play on the hydrologic system. 4. More geologic logs to determine a better understanding of the lithology. 5. Lee County should continue to optimize its water storage for groundwater recharge purposes.
8	Summary of report strengths and weaknesses		<p>Strengths:</p> <ul style="list-style-type: none"> • Good compilation of a lot of hydrogeologic data for the county. • Maps of recharge showing importance of DR/GR lands as a groundwater resource. <p>Weaknesses:</p> <ul style="list-style-type: none"> • The report in its current form and in the absence of other information may not form an adequate basis for future land use decisions because there are no evaluations, analyses, conclusions or recommendations regarding the potential impacts (positive or negative) that future land use within DR/GR could have on the groundwater resources.

DRAFT

			<ul style="list-style-type: none">• Recharge is quantified based on land cover, but the logic behind the recharge rates may be flawed or confusing. For example, the highest recharge rates are assigned to agricultural land, where "...anthropogenic factors such as irrigation increase net recharge, however in most cases this is artificial because of on-site groundwater withdrawals to facilitate the irrigation." (Section IX, Conclusions, bullet item 6). A clear distinction should be made between recharge at the land surface and net recharge to the aquifer.• Well locations and information from wells used for the report are unclear.• The database used to build the conceptual and numerical hydrogeologic models has not undergone a QA/QC process and therefore the quality of the models could be questioned.• The reference section is incomplete. For example, there are no citations for the database used and the citation for the PRISM model is incorrect (the citation is for data generated by the model, but not the model itself).• Much of the modeling is dependent upon rainfall information developed by the PRISM model. However, it is unclear whether the authors used data generated by the author of the PRISM model or generated from their own PRISM model evaluations. Better description of recharge determination - specifically how recharge was determined for each land use; description and justification for using Restrepo et al., 1992. Recharge is a key point to the report and needs to be described in detail.• Graphs of water levels vs. time are not completely discussed. For example, the discussion of Figure VII-9 examines only an apparent downward trend in water levels. However, there are periods of stable water levels and periods of increasing water levels shown on that graph that are not discussed. The interpretations of water level trends may be biased toward a focus on decreasing water level trends.• It is unclear if the report has examined all of the water table aquifer
--	--	--	---

DRAFT

			<p>hydrographs and the trends that those hydrographs may show.</p> <ul style="list-style-type: none"> • Missing CSM and optimization results: mainly the information regarding the sensitivity to the recharge and the mass balance. • The report contains numerous modeling maps but no detailed information for the discrete points used for interpolation and discussions. • Does not discuss existing regional or Lee County ground water models (e.g. Bower, Adams, and Restrepo, 1990), how well this model compares with those existing models. • Problems with mass balance as calculated from Tables VII-15 through 17. • Hydraulic conductivity, leakance and storage maps should show control points (locations; values) for data are that were used to determine maps; figures of typical semi-variograms would be helpful because plots (VI-22 through 35) show indication that Kriging was performed outside of the range - circles around assumed data points and average values (sill) elsewhere. These plots could be made more defensible by providing a detailed explanation of the method (i.e. data point locations and a plot or table of semi-variogram values).
8 a	Evaluation of study approach and conduct		<ul style="list-style-type: none"> • Data QA/QC methods are not described, data evaluations seem incomplete (e.g., interpretations of hydrographs), citations are possibly inaccurate or missing, and the evaluations of recharge are possibly confusing. • Additionally, the report, in and of itself, does not meet its goal of developing "...a sound, scientifically-based platform from which to base future land use decisions, in particular those decisions related to the DR/GR land use classification...", although it may be one step in that process.
8 b	Extent to which report is "up to date"		<ul style="list-style-type: none"> • The report appears to be reasonably up to date (i.e., the most recent data are no older than 2 to 3 years old), and a sufficient historical data range appears to have been used. Current data evaluation and models

DRAFT

			are utilized.
8 c	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> • The report is incomplete since it does not achieve its stated goal. • Many of the figures could benefit from consistent color schemes so that evaluations of the data presented can be more easily made. • Data QA/QC needs to be performed. • A re-evaluation of recharge rates is required in the agriculture land cover areas to account for the effects of irrigation by on-site wells (and possible re-working of the computer model). • Presentation and evaluation of additional hydrographs would be beneficial to better describe the trends in water levels in the water-table aquifer. There may be hydrographs that show stable or increasing trends, but these are not presented or discussed. This would permit an evaluation of whether the report may be biased toward emphasizing declining trends. • This document does not consider the effects of mining on the range of ecological resources that exist within the DR/GR such as wildlife and important habitats.
8 d	Relationship to, and consistency with, other studies / reports		<ul style="list-style-type: none"> • This could be considered a complementary report to the Bonita Springs DR/GR report.
8 e	Addition comments, concerns, or requests		<p>A number of items would facilitate a more in-depth review of the groundwater model presented in this report, including:</p> <ul style="list-style-type: none"> • A concise description and diagram of the Hydrogeologic Conceptual Site Model (CSM) for this portion of Lee County. • 2-D map depicting model boundary conditions. • Description of the model generated plots, or tables with actual measured values (hydro-stratigraphy) and map/table with the model layers. Maps/Tables with the values of the discrete points used for interpolations. • Sensitivity analysis results of the model for input parameters such as hydraulic conductivity and recharge, both in terms of calibration and

DRAFT

			<p>model mass balance.</p> <ul style="list-style-type: none">• Description of what was optimized and perhaps a plot of change in parameters with iteration and residuals in the optimization.• Electronic model input and output files for a more complete review.
--	--	--	---

Lee County Master Mitigation Plan (LMMP)

Item	Description	Sect / Page	Information from Report
1	Document Title		Lee County Master Mitigation Plan (LMMP) (Environmental Quality Investment and Growth Mitigation Strategic Plan)
2	Author		Lee County
3	Date		August 9, 2004
4	Sponsoring agency / publisher		Lee County, Southwest Florida Regional Planning Council
5	Purpose of study or document		
6	Relevance to DR/GR lands in southeast Lee County		See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendices B and C
7	Summary of report content		REVIEWED FOR THE BACKGROUND INFORMATION INCLUDED IN APPENDICES B AND C OF THIS REPORT
7 a.	General information and overall content		N/A
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		N/A
7 c.	Useful maps and overlays		N/A
7 d.	Relevant results and conclusions		N/A
8	Summary of report strengths and weaknesses		N/A
8 a.	Evaluation of study approach and conduct		N/A

DRAFT

8 b.	Extent to which report is “up to date”		N/A
8 c.	Completeness / data gaps / remaining information needs		N/A
8 d.	Relationship to, and consistency with, other studies / reports		N/A

DRAFT

Lee County Water Resources Management Project

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover	Lee County Water Resources Management Project
2	Author	Cover	James M. Montgomery, Consulting Engineers, Inc. Lake Worth, FL 33461
3	Date	Cover	October 5, 1988
4	Sponsoring agency / publisher	Cover	Lee County Board of County Commissioners
5	Purpose of study or document	Summary and Conclusions pg 1	"...examine future water demands and the potential water availability within the county. ...[the report contains] recommendations for land use and water resources strategies which assure wetlands protection, and the availability, quality, and potential safe yield of water for the future."
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C.)	All	High Relevance: the report covers all of Lee County.
7	Summary of report content		
7 a.	General information and overall content	All	Identification and mapping of the upper aquifers in Lee County. Determination of water budgets, aquifer storage and safe yields. Identification of aquifer recharge areas and potential well fields. Strategies for the protection of groundwater resources and wetlands. Water use projections and conservation strategies.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data,	Chapter 2 Chapter 3 Chapter 4	Identification and mapping of aquifer units. Safe yield criteria, recharge areas, water budgets for the aquifers. Identification of potential new water supply areas, quantification of aquifer

DRAFT

	etc.)		storage.
7 c.	Useful maps and overlays		<p>Maps showing aquifer storage (the importance here is that the DR/GR contains significant amounts of groundwater storage for the county): Figures 4-5, 4-7, 4-9, 4-11, 4-13, 4-15, 4-17, 4-19, 4-21.</p> <p>Maps showing groundwater flow (the importance here is the possible maintenance of fresh water flows to the estuaries): Figures 4-50 - 4-51.</p> <p>Plate 11: shows thick portions of Water Table Aquifer are within the DR/GR.</p> <p>Plate 15: shows thick portions of Tamiami Aquifer are within the DR/GR.</p> <p>Plate 19: shows thick portions of Sandstone Aquifer are within the DR/GR.</p> <p>Plate 23: shows thick portions of Mid-Hawthorn Aquifer are within the DR/GR.</p> <p>Plates 79, 80, 81: Recharge areas for the Water Table, Lower Tamiami, and Sandstone Aquifers (recharge occurs within the DR/GR).</p> <p>Plates 83, 84, 85: Potential wellfields (some of these areas may already be developed as wellfields).</p>
7 d.	Relevant results and conclusions		<p>Realistic quantification of aquifer recharge and storage and excellent criteria for the protection of the resources. There are a number of maps that show important groundwater resources that are within the DR/GR area.</p> <p>The potential development of water supplies near wetland resources must be evaluated on a case by case basis and through the use of computer modeling. Water resources should be actively managed with an awareness of aquifer storage during the wet and dry seasons. Water withdrawals could be possible near wetlands if properly managed.</p>
8	Summary of report strengths and weaknesses:		<p>Strengths: Comprehensive compilation of hydrogeologic data for the county with well-described Quality Assurance/Quality Control procedures.</p> <p>From the report: "Well logs were obtained from the Fort Myers office of the U.S. Geological Survey, the Florida Geological Survey, the South Florida Water Management District and numerous consultant reports. Although there are extensive data for wells throughout Lee County, not all contain the detail and accuracy necessary for correlation purposes. Therefore, each well on file was evaluated for its reliability before it was used for correlation. The</p>

DRAFT

			<p>references used for evaluation of lithologic data are presented in Appendix B.</p> <p>Before any data were entered into the final Symphony database they were thoroughly checked for accuracy. With respect to the lithologic data, corrections were made regarding the reasonableness of lithologic definition, mathematical accuracy and typographical errors. A review of the initial hydrogeologic unit database developed by James M. Montgomery, Consulting Engineers, Inc. (JMM) was made by a review team consisting of JMM, South Florida Water Management District and Lee County personnel.</p> <p>The initial database consisted of lithologic picks from 256 wells to define the hydrogeologic framework. These data were submitted to the South Florida Water Management District and Lee County staffs for review which resulted in the deletion of 60 wells and the introduction of 18 additional wells for a total of 214 wells."</p> <p>Also from the report: "253 water level/water quality wells were considered for the data base. Of these, 14 were rejected because the data indicate that they are screened in more than one aquifer and 11 were rejected because the well construction data were incomplete, leaving a total of 217 wells. Of these, 13 did not have the data to indicate that they were screened in only a single aquifer, but based on experience and recommendation by South Florida Water Management District personnel they were included. Two wells had no water level or water quality data, 30 had no water level data, ten had no wet season water level data, one had no dry season water level data and seven had no water quality data. A complete summation of the Water Level/Water Quality wells is shown in Table 2-1 and rejected wells along with the reasons for rejection are presented in Appendix C."</p> <p>Additional data Quality Assurance/Quality Control methods are described in Chapter 2 of the report.</p>
--	--	--	--

DRAFT

		<p>Realistic and scientifically defensible conclusions, recommendations, and quantification of aquifer parameters (e.g., recharge). These conclusions include (from the report): "Ground water resource availability was evaluated on a qualitative basis by examining ground water storage, ground water recharge, well hydrograph declines, chloride increases in monitoring wells and sea level rise due to the greenhouse effect. Based on the amount of water in storage, the Water Table aquifer in conjunction with the Lower Tamiami aquifer and the Lower Hawthorn aquifer and possibly the Suwanee aquifer are the major potential sources of water supply to Lee County. Quantification of the amount of storage in both the Mid-Hawthorn and Sandstone aquifers also shows that these aquifers are more limited in the amount of water they contain. These two aquifers should be utilized primarily as sources of water for domestic (in-house) usage beyond the range of public water supply distribution systems or for small water supply systems. Future withdrawals from these aquifers should not involve irrigation uses. Water in storage is not entirely usable. Use of water from the Water Table aquifer is limited to a fraction of the water in storage by adverse impacts on wetlands and by the amount which is subject to recharge. The use of water in other aquifers is limited by factors including wetland impacts, impacts on other users, water quality degradation, recharge from lateral inflow and leakage and saltwater intrusion."</p> <p>Additional conclusions are presented in Chapter 4 of the report.</p> <p>Strategies are presented for the protection of groundwater and wetland resources and water conservation. From the report: "In summary, the strategy recommended for Lee County for recharge area protection is to protect both the quantity and quality of water undergoing recharge. Recharge quantity is protected primarily through existing regulatory programs which protect ground water usage, drainage, and wetlands. Existing water use regulatory programs will require development of "cumulative impact models" by the South Florida Water Management District to protect recharge areas."</p>
--	--	--

DRAFT

			<p>Also from the report: "Wetlands can be protected in either of two ways: first, through regulation of development and, second, purchase of lands." Chapter 4 of the report provides additional details.</p> <p>Weaknesses: some of the data are out of date.</p>
8 a.	Evaluation of study approach and conduct		This report is a scientifically defensible hydrogeologic evaluation/report. It also presents qualitative and quantitative aquifer parameters (e.g., aquifer storage).
8 b.	Extent to which report is "up to date"		<p>There has been about a 10 year period from the time this report was compiled to the present date. There have likely been a number of additional wells drilled and tested that could be incorporated into this report's data base. There is also another 10 years of rainfall and water level data that have been collected.</p> <p>Some of the water use projections may be outdated.</p>
8 c.	Completeness / data gaps / remaining information needs		Report is substantially complete with respect to hydrologic resources. However, this document does not consider the effects of mining on the range of ecological resources that exist within the DR/GR such as wildlife and important habitats.
8 d.	Relationship to, and consistency with, other studies / reports		This report could be viewed as the first of two phases, with the Rawl and Voorhees (2005) report being considered the second phase.

DRAFT

Engineering Analysis for Properties Designated Within the City of Bonita Springs as “Density Reduction/Groundwater Resource”

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover	Engineering Analysis for Properties Designated Within the City of Bonita Springs as "Density Reduction/Groundwater Resource" (DR/GR) - DRAFT
2	Author	Cover	Greg F. Rawl, P.G. R.M. Edenfield, P.E., Environmental Consulting and Technology, Inc. Paul Sebert, AICP, EMS Scientists Engineers Planners
3	Date	Cover	July 2005
4	Sponsoring agency / publisher	Cover	City of Bonita Springs, 9101 Bonita Beach Road, Bonita Springs FL, 34135
5	Purpose of study or document	Introduction	<p>"...in 2003 the City [of Bonita Springs] authorized a comprehensive study to asses the current land uses, groundwater resource, surface water resources and other natural resources within that portion of the City east of I-75 and north of Bonita Beach Road." (pg 3)</p> <p>"This report provides analysis of the existing land uses within the Study Area and specifically the basis of the most prominent category therein, the DR/GR designation, through the process of data collection, technical quantitative and qualitative analysis, and the development and evaluation of alternative land use scenarios. A comprehensive analysis of all of the factors will help guide the City with recommendations on future land use decisions. This report is the result of these analyses, and documents the findings." (pg 6)</p>
6	Relevance to DR/GR lands in southeast Lee County	All	High Relevance: The majority of the Study Area is within the DR/GR boundaries. The Study Area includes the southwest portion of the DR/GR. (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)

DRAFT

		<p>Section III/ p 8</p> <p>Section IV/ p 31</p>	<p>A summary of regulatory issues, including a list of regulatory agencies and their roles in wetland regulation is provided (p. 11). Specific attention is given to the Florida Department of Environmental Protection-implemented Total Maximum Daily Loads Program. According to a Water Quality Assessment Report issued by Florida Department of Environmental Protection in 2003, waters within the Study Area have been designated as either impaired (total maximum daily loads will be developed) or as needing further monitoring to determine status. The Imperial River was identified as impaired for both Dissolved Oxygen and nutrients (total phosphorus and total nitrogen). Florida Department of Environmental Protection is projecting the development of a total maximum daily loads for dissolved oxygen, total nitrogen, and total phosphorus to be completed in 2007. As part of the total maximum daily loads process, the Estero Bay Nutrient Management Partnership has proposed a study of Best Management Procedures to improve the water quality of discharge into the Estero Bay. At the time this document was prepared, the SFWMD was also developing new rules regarding certain best management procedures and water treatment facilities within the Study Area and the larger southwest Florida Basin.</p> <p>A study of plant and animal species federally or state listed as endangered or threatened was also conducted. No specific locations of listed animal species sitings were documented during the field visit. Potential habitat for listed species and land uses were noted and used in preparation of Figures. Species listed as threatened, endangered, or of special concern by federal or state agencies and have the possibility of occurrence within the DR/GR area (based on potentially suitable habitat) are: Big cypress fox squirrel, Florida black bear, Florida panther, American alligator, Eastern indigo snake, gopher tortoise, gopher frog, Bachman's warbler (during migration - very low probability due to rarity of this species), bald eagle, black-crowned night heron, crested caracara (very low probability due to lack of contiguous</p>
--	--	---	---

DRAFT

			<p>habitat), Florida sandhill crane (very low probability due to lack of contiguous habitat), Florida snail kite, Kirtland's warbler (during migration - very low probability due to rarity of this species), red-cockaded woodpecker, roseate spoonbill, snowy egret, tricolored heron, white ibis, and wood stork. The only listed plant species is the beautiful pawpaw, a low-growing shrub found only in open pine flatwoods that contain dwarf oak and wiregrass in the understory. Study methods included a review of existing literature, regulatory agency coordination, and field assessments, all conducted during a one-week survey in December 2003. The study was conducted at the level of providing planning information but does not provide the level of intensity that would be required for a presence/absence type survey.</p> <p>Existing Land Use – Natural lands and wetlands are not discussed in this section because they were covered in Sections I-III.</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	<p>Sections V, VI, VII</p> <p>V</p>	<ul style="list-style-type: none"> • Geologic and hydrogeologic cross sections, maps showing water levels in the different aquifers, some water quality information presented. • Groundwater Flow Model – MODFLOW 2000: <ol style="list-style-type: none"> (1) Model discretization: 564 rows x 480 columns, 500 ft x 500 ft. & 5 aquifers. (2) Recharge: Rainfall was evaluated using PRISM model (Daly2004). (http://www.ocs.oregonstate.edu/prism/index.phtml) and Land Cover using SFWMD Feasibility Study geographical information systems Year 2000 coverage → evapotranspiration & Net Recharge dry/wet. (3) Mine borrow pits were determined from the 2002 Aerial Photo & mine penetration from the mine database → Modeled as ponds with high storage & hydraulic conductivity. (4) Canals were modeled as drains. Aquifer penetration and conductance was computed based on the SFWMD Southwest Florida

DRAFT

		IX	<p>Feasibility Study canal geographical information systems data</p> <p>(5) Public and industrial pumpage is based on SFWMD permits, actual pumpage and utilities data. Aquifer Storage and Recovery were also included.</p> <p>(6) Model boundary conditions: constant head</p> <p>(7) Optimization - MODFLOW 2000 modified Gauss-Newton optimization method for boundary conditions, hydraulic conductivity, storage and leakage & global optimization (Floudas 2001) for net recharge.</p> <p>(8) Calibration Statistics – Residuals 0 to 11 feet - Needs to include room mean square error.</p> <p>(9) Transient calibration (1/2000 to 1/2002) – wet/dry graphs.</p> <p>(10) Groundwater fluxes and contours</p> <p>(11) Groundwater flow to tide: Northern Gulf Coast, Southern Gulf Coast, Caloosahatchee River mouth and inland.</p> <p>(12) Canal drawdown impact</p> <p>(13) Water budget.</p> <p>(14) Conclusions and recommendations</p> <ul style="list-style-type: none"> - extensive use of SFWMD, United States Geological Survey & NOAA data - detailed MODFLOW model for Lee County - calibrated model <p>• XPSWMM model – The model was a modified version of the existing South Lee County Stormwater model. This model was acquired from its developer: Johnson Engineering, Inc.</p> <p>(1) This model incorporates the XPSWMM runoff block or module which “generates surface and subsurface runoff based on rainfall hyetographs, antecedent conditions, land use, soil characteristics and topography,” (pg 88).</p> <p>(2) This model incorporates the XPSWMM extran block which is a hydraulic flow routing model for open channel or closed conduit</p>
--	--	----	--

DRAFT

			<p>systems,” (pg 88).</p> <p>(3) The National Resources Conservation Service Unit Hydrograph methodology was used to determine the rainfall/runoff relationship.</p> <p>(4) The authors modified the model with updated information.</p> <p>(5) Calibration was not conducted because calibration was conducted by Johnson Engineering, Inc in their development of the model.</p> <p>(6) The XPSWMM model was used to calculate water quality results.</p>
7 c.	Useful maps and overlays		<p>Maps are well done but contain only a small portion of the DR/GR. Probably maps from the Rawl Mining Study would be more useful to include as overlays.</p> <p>Figure 7- Composite Map of the Estero Bay Planning Unit – It would be helpful to see if a map like this could be prepared that shows the whole DR/GR.</p>
7 d.	Relevant results and conclusions	Section III P 10	<p>Overall: The use of best management practices for surface water management can lead to minimizing the potential impacts to surface water bodies, receiving waters (Estero Bay), and may improve recharge quality and quantity. Low density residential development appears to have the least impacts to the ecosystem.</p> <p>Specific comments:</p> <p>The wetland and non-wetland surface water features identified within the Study Area include cypress dome and slough systems (FLUCFCS 621), cypress-pine-cabbage palm (FLUCFCS 624), open water (FLUCFCS 500), streams and waterways (FLUCFCS 510), and lakes (FLUCFCS 520). The wetlands appear to have “diminished functional value” based on the Wetlands Rapid Assessment Procedure. No follow-up information was included on how this assessment method was used or what numerical scores</p>

DRAFT

		<p>Section III P 18</p>	<p>were assigned to these wetlands. Hydrologic alterations such as ditch construction; tree harvesting; fire suppression; livestock grazing; and invasion by exotic species are listed as the main reasons for reduced quality of the wetlands. During field observations it was noted that most of the wetlands are hydrologically impaired due to residential development, agriculture, and surface mining. Existing vegetation is disturbed and invasive plant species are common throughout many of the wetlands within the study area. Based on these observations it was suggested that opportunities for ecosystem restoration projects exist in this area.</p> <p>Existing land uses are listed and discussed. Of interest from an ecological standpoint is the presence of pine flatwoods (FLUCFCS 411) and areas dominated by melaleuca (FLUCFS 424). Pine flatwoods, an upland vegetation community, in conjunction with other habitat types such as cypress-pine-cabbage palm wetlands, also identified within the Study Area, are a part of the historic landscape mosaic and are considered to be critically important to many species of wildlife. The authors do not discuss what might have existed historically within the melaleuca-infested portions of the project area. Melaleuca-infested uplands that were historically pine flatwoods present an opportunity for upland restoration or enhancement. Plant and animal species federally or state listed as threatened or endangered are identified in terms of possibility of occurrence based on potentially suitable habitat. Site-specific data were discussed for the Florida black bear and Florida panther. No black bear siting are reported within the study area. Text indicates no Florida Fish and Wildlife Conservation Commission-designated strategic habitat conservation area for the black bear within the study boundaries. This does not agree with Figure 8 A - Bear Location Map. It appears that the overlay for the Florida panther was used for this map rather than the Florida black bear data. Based on road kill data (1972-2000) and radio-collar telemetry data (1981-2001), three Florida panther sitings occurred within the project area between 1998 and 2002. An additional nine reports were made within one mile outside the project boundaries (and</p>
--	--	-----------------------------	---

DRAFT

			<p>within the DR/GR area). Figure 8-B shows that there is extensive Florida Fish and Wildlife Conservation Commission-designated strategic habitat conservation area within the study area and the DR/GR area. No information is provided regarding the date of the Florida Fish and Wildlife Conservation Commission-designated strategic habitat conservation area maps (Figures 8 A and 8 B). These are updated periodically and the most recent version should be used for any map overlays.</p>
		Section III P 21	<p>The authors recommend that extensive areas of impaired wetland habitat could be restored through such activities as re-establishment of appropriate hydrology through construction of ditch blocks and installation of additional culverts beneath roads, and enhancement of existing vegetation through the removal of exotic species, planting of native species, and reestablishment of natural fire regime.</p>
		Section XI P 117	<p>Recommendations – A discussion of reasoning and issues surrounding each recommendation is included. Those relevant to natural resource issues within the DR/GR are listed here:</p> <ul style="list-style-type: none">- #1 - The City of Bonita Springs should take a proactive role in the development of best management procedures for utilization within the watershed to improve water quality discharging into the Estero Bay.- # 3 – The City of Bonita Springs should adopt a numerical standard for nutrients and pollutants of concern.- #4 – The City of Bonita Springs should evaluate opportunities to implement water quality treatment systems within the DR/GR area to improve the quality of surface water discharges.- #10 – Require periodic updates of the Wellfield Protection Ordinance.- #11 – Allow for Individual Comprehensive Plan Amendments for DR/GR Land Use Category parcels upon demonstration by the applicant of compliance with proposed Comprehensive Plan policy

DRAFT

			16.1.15. -
8	Summary of report strengths and weaknesses		<p>Strengths:</p> <ul style="list-style-type: none"> • Appears to be a reasonably comprehensive record of current data. • Contains general overview of natural resources within the City of Bonita Springs. <p>Weaknesses:</p> <ul style="list-style-type: none"> • Limited in terms of geographical extent and detail provided regarding ecological issues. • Some references and citations are missing and conclusions are drawn from some of the missing references. • Recharge estimates may be flawed in that the estimates do not account for induced recharge around well fields and recycling of water on agricultural lands. • Appears to base conclusions and recommendations more on a common-sense approach to management of the DR/GR land (i.e., low density and the use of best management practices will decrease the potential impacts to the resources) than on in-depth quantitative evaluations and analyses. <p>Groundwater Model</p> <ul style="list-style-type: none"> • Missing conceptual site model and optimization results: mainly the information regarding the sensitivity to the recharge and the mass balance. • Does not discuss existing regional or Lee County ground water models (e.g. Bower, Adams, and Restrepo, 1990). <p>XPSWMM Model</p> <ul style="list-style-type: none"> • Does not appear that any checks were made on the calibration of the model. Could the author's recreate Johnson Environmental, Inc.'s

DRAFT

			<p>results?</p> <ul style="list-style-type: none"> • No discussion of how modifications to the existent model changes results.
8 a.	Evaluation of study approach and conduct		<p>Habitat enhancement and restoration suggestions are useful. The types of habitats within the Study Area have been impacted throughout the region and are of critical importance to a variety of plant and animal species. (See FWS Multi Species Recovery Plan, “Ecological Communities” section). Although creation of these habitat types has not been successful, restoration and enhancement of degraded habitat can work well at a cost well below that of many wetland creation projects.</p> <p>Wetland, existing land use, and wildlife information is presented at general landscape level and should not be used to determine the presence or absence of community types or wildlife or plant species on a given parcel of land. Field surveys and observations required for determinations on that scale are highly time and money intensive and are beyond the scope of this report. The discussion of plant and animal species is generally in agreement with other sources reviewed for the DR/GR study, but does not contain the level of detail found in other sources such as the 951 Environmental Reports and the State of Florida “Closing the Gaps” study.</p> <p>List of recommendations pertains mostly to water-quality and comprehensive plan land-use issues. The information presented in Section III lends itself to suggestions regarding mitigation and land preservation policies (some of which are suggested within this summary) but no follow-up in the form of specific recommendations in Section XI was included. Recommendation #11 - Individual Comprehensive Plan Amendments for DR/GR Land Use Category lacked discussion of possible impacts to existing environmental resources and water quality and how these might be addressed.</p> <p>In general the report provides accurate but sometimes incomplete information.</p>

DRAFT

8 b.	Extent to which report is “up to date”		<p>Hydrologic data are up to date (as of about 2005).</p> <p>Information regarding land cover and wildlife is changing constantly. For wildlife species, it is important to contact an agency such as the Florida Fish and Wildlife Conservation Commission (FWC) or the US Fish and Wildlife Service that maintains a database that is updated continually.</p>
8 c.	Completeness / data gaps / remaining information needs		<p>Overall:</p> <ul style="list-style-type: none"> • Reasonably complete. No real data gaps, but additional studies are recommended. <p>Groundwater model:</p> <ul style="list-style-type: none"> • Modeled water budgets. Additional information is needed in the water budget to calculate mass balance for the model; it is difficult to calculate with these tables. • No plots or figures of properties used in the modeling: hydraulic conductivity, leakance, and storage. • This document does not consider the effects of mining on the range of ecological resources that exist within the DR/GR such as wildlife and important habitats. <p>XPSWMM</p> <ul style="list-style-type: none"> • Does not appear that any checks were made on the calibration of the model. Could the author’s recreate Johnson Environmental, Inc.’s results? • No discussion of how modifications to the existent model changes results. • No mass balance tables are reported or listed.
8 d.	Relationship to, and consistency with, other studies / reports		<p>Complimentary document to the Rawl groundwater resources and mining report.</p>

DRAFT

Estero Bay State of the Bay Report

Item	Description	Sect / Page	Information from Report
1	Document Title		Estero Bay State of the Bay Report
2	Author		The Estero Bay Agency for Bay Management
3	Date		January 2000
4	Sponsoring agency / publisher		Southwest Florida Regional Planning Council 4980 Bayline Drive, 4 th Floor North Fort Myers, FL 33917-3909 941-656-7720
5	Purpose of study or document		A summary of issues surrounding Estero Bay and its watershed, written with the intent of informing the general public on these issues
6	Relevance to DR/GR lands in southeast Lee County		The entire DR/GR is within the study area. Issues discussed are pertinent to DR/GR lands. (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)
7	Summary of report content		
7 a.	General information and overall content	The Bay – An Overview Florida’s First Aquatic Preserve P 12	Much of the document includes background and historical information regarding the Estero Bay watershed as a whole. Estero River, Halfway Creek, Spring Creek, Imperial River, Hendry Creek, and Mullock Creek (some of the water bodies that drain water from the DR/GR to the Estero Bay Aquatic preserve) are discussed in general terms (p 5). Land uses, including agriculture and mining, are summarized (p 11). The changes over time in Florida’s stewardship ethic are discussed in terms of the creation of the Estero Bay and ongoing efforts to preserve the wetlands and other important habitats surrounding the Estero Bay.

DRAFT

		<p>Education: Who is Doing What? P 14</p> <p>Outdoor Activity on Estero Bay P 16</p> <p>Population P 19</p> <p>Water Quantity, Quality, and Timing P 21</p> <p>Wildlife and Habitat P 22</p>	<p>Includes a summary of public and privately run education programs within the Estero Bay watershed.</p> <p>Includes a discussion of the importance of the area in terms of human uses such as recreation, boating, fishing, and hunting.</p> <p>A discussion of projected population pressures that may exist in the area in the future up to the year 2020.</p> <p>Includes a good summary, in layman’s terms, of hydrological alterations, such as increased development, wetland loss, water control structures, and draw down from agriculture, landscaping, and potable water within the area and their effect of the ecology and on human uses of the area such as tourism and agriculture. Surges in freshwater resulting from impacts to historic sheetflow are hard to predict due to wide variations in rainfall and result in degraded water quality, freshwater pulses into the estuary, and flooding. It is noted that water inflows to the Estero Bay from groundwater are unknown. Data collected by Estero Bay Marine Laboratory indicate that dissolved oxygen levels are often below the state standard of 4 mg/Liter in many locations within the area, including the Estero River. It is noted that inadequate data regarding hydroperiods have been collected to date.</p> <p>A good discussion of the variety of taxa found within the watershed, including discussion of non-listed species. Includes discussions of reptiles, amphibians and invertebrates that is often lacking in wildlife studies in</p>
--	--	--	---

DRAFT

		<p>Issues of Special Concern P 30</p> <p>Management Initiatives: Groups and Organizations P 39</p>	<p>addition to a discussion of mammals, neotropical migrants, shore birds, and wading birds. The discussion of wide-ranging species, such as the Florida panther and the Florida black bear, is not as in-depth as some other sources but does give an overview of this issue that is very relevant to decisions regarding land use within the DR/GR.</p> <p>It is noted that very little information regarding freshwater and land invertebrates is available with the exception of mosquitoes, butterflies, damselflies, apple snails, and crayfish. Other invertebrates can be important in terms of providing food sources for many other taxa and in terms of providing information regarding long-term water quality conditions.</p> <p>Includes summaries of many issues relevant to the DR/GR area including Outstanding Florida Waters, environmentally sensitive lands (riverine systems, interior wetlands, rare habitats, uplands), state and federal listed wildlife species (including the Florida mastiff bat, an animal that may occur within the geographical area and habitat types found within the DR/GR but not often listed as a species of concern in discussions of wildlife within the area), exotic animals and plants, and the flooding events of the summer of 1995 (including mention of the South Lee County Watershed Study). Issues within this section are discussed in narrative form only.</p> <p>A discussion of public entities with direct or indirect management missions within the Estero Bay watershed. Agencies relevant to the DR/GR area include the South Florida Ecosystem Restoration Task Force, the Governor’s Commission for a Sustainable South Florida, the Governor’s Commission for the Everglades, Conservation 2020, Preservation 2000, Charlotte Harbor National Estuary Program, Florida Department of Environmental Protection Ecosystem Management Areas, Estero Bay Watershed Assessment, the Central and Southern Florida Flood Control District Restudy, and the U.S. Army Corps of Engineers Environmental Impact Study.</p>
--	--	--	---

DRAFT

7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		No specific data are presented
7 c.	Useful maps and overlays		<p>Estero Bay Drainage Basin c. 1997 (from Lee County, Univ. of Florida, and FWC imagery) – shows basin boundaries, land uses. Best depiction of streams and rivers draining from the DR/GR.</p> <p>Estero Bay Watershed Land Conservation/Preservation Strategy Map (includes entire DR/GR area). Comprehensive list of sources that includes lands recommended for preservation. Could be useful if an updated version is available.</p>
7 d.	Relevant results and conclusions	Water Quantity, Quality and Timing P 22	Authors recommend that a watershed model including the parameters of cumulative effects of control structures in canals, rivers and creeks; wetland loss; projected land use; and water demand should be developed.
8	Summary of report strengths and weaknesses		<p>Good general overview of the Estero Bay Watershed.</p> <p>Often does not contain information on a level specific enough to be used directly for DR/GR issues.</p> <p>Listed Species section lacks a discussion of plant species.</p>
8 a.	Evaluation of study approach and conduct		
8 b.	Extent to which report is “up to date”		<p>General information regarding history and issues is timely.</p> <p>Principles of the Estero Bay Agency for Bay Management have been updated and are summarized in the 2004 update.</p>
8 c.	Completeness / data gaps / remaining information needs		Authors note need for more information regarding hydroperiods, groundwater influence, and freshwater invertebrate species.

DRAFT

8 d.	Relationship to, and consistency with, other studies / reports		<p>General conceptual agreement between principles/recommendations between Estero Bay Agency and Charlotte Harbor National Estuary Program. The need for a better understanding and documentation of cumulative impacts and an overall water budget for the area are noted in other studies and reports.</p> <p>More complete list of wildlife taxa and species than included in many other reports. However, little detail is given to discussion of any particular species.</p>
------	--	--	---

DRAFT

Estero Bay State of the Bay Update

Item	Description	Sect / Page	Information from Report
1	Document Title		Estero Bay State of the Bay Update
2	Author		The Estero Bay Agency for Bay Management
3	Date		May 25, 2004
4	Sponsoring agency / publisher		Southwest Florida Regional Planning Council 4980 Bayline Drive, 4 th Floor North Fort Myers, FL 33917-3909 941-656-7720
5	Purpose of study or document		Provides an update to 2000 State of the Bay Report. To report on water quality status and trends and wildlife status and trends within the Estero Bay and associated watershed.
6	Relevance to DR/GR lands in southeast Lee County		The entire DR/GR is within the study area. Issues discussed are pertinent to DR/GR lands and receiving water bodies. (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)
7	Summary of report content		
7 a.	General information and overall content	Introduction p 1 Water Quality p 7 Hydrology p 45	Summarizes revised Principles of the Estero Bay Agency on Bay Management (see Findings/Recommendations) Discussion of water quality status and trends. (All trends and data mentioned in section 7a are discussed in section 7d.) All data are from Florida Department of Environmental Protection. No further information regarding data sources, locations, or quality control is provided. Hydrology in terms of tributary flows is also presented. United States

DRAFT

		Wildlife p 50 Social p 60	Geological Survey data from 1988-2000 are presented in graphical form. No statistical analyses are presented here, however, the data do appear to support the assertion that sharp peaks during rain events are becoming larger and more frequent. Trends in wildlife utilization are discussed. Data sources are not listed. Other factors considered in this report were population (p 60), recreational uses (p 62), and building permits issued from 1992-2002 by Lee County (p 63).
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Florida Department of Environmental Protection water quality data and wildlife trends data
7 c.	Useful maps and overlays	Water Quality p 8	Estero Verified 2002 303d. Includes South Florida Water Management District sub-basin boundaries. From Charlotte Harbor National Estuary Program, Southwest Florida Regional Planning Council, Florida Department of Environmental Protection, South Florida Water Management District. Based on 2001 data
7 d.	Relevant results and conclusions	Introduction p 1	From the Principles of the Estero Bay Agency on Bay Management, adopted May 13, 2002, only the ones most clearly applicable to a variety of DR/GR area issues are listed below): <ul style="list-style-type: none"> - I.C. All rezoning requests will be critically evaluated to ensure protection of water quality, rare and unique habitats, listed wildlife, and ecosystem functions. - I.D. Variances from environmental regulations and deviations from development standards will be the exception, not the rule. - II – Uplands, Headwaters, and Isolated Wetlands (Section II - Uplands, Headwaters, and Isolated Wetlands, contains a 2-page list of recommendations, all of which are pertinent to the DR/GR area. They include recommendations regarding land management and acquisition, vegetation (mostly pertaining to planting of native vegetation, eradication of invasive vegetation, and the importance of

DRAFT

			<p>faster passage of water, resulting in increased floods and extended droughts; reducing catch of important indicator species, including mullet and blue crab; causing decreases in wildlife dependent upon interior habitats of the basin (including the DR/GR); and decreasing water quality within the Estero Bay and its tributaries, especially for dissolved oxygen, nutrients, and turbidity.</p> <ul style="list-style-type: none"> - Florida Department of Environmental Protection water quality standards were not met in 2001 for the freshwater portion of Spring Creek for dissolved oxygen and the freshwater portion of Imperial River for fecal coliform. The majority of the DR/GR area is impaired for dissolved oxygen based on 2001 data. There is also an area in the southern part of the DR/GR that is impaired for chlorophyll-a and copper based on 2001 data. Each parameter is briefly discussed in terms of ecological significance and Florida Department of Environmental Protection state standards. Graphical results for each parameter measured over a period of 3-12 years are shown. Summaries are presented on a basin-wide basis and are therefore difficult to relate to the specific area within the DR/GR. - There is a need for a nutrient management partnership to address declines of these parameters. - Landscape-scale growth management and planning is crucial to maintaining clean water, natural hydrology, and fish and wildlife resources. The Lee County Master Mitigation Plan is identified as a good example of an integrated plan that addresses a variety of issues.
8	Summary of report strengths and weaknesses		<p>Good discussion of trends (as summarized in section 7d) and status of many factors pertinent to DR/GR area, including recommendations regarding the findings.</p> <p>Often does not contain information on a level specific enough to be used directly for DR/GR issues.</p> <p>Listed Species section lacks a discussion of plant species.</p> <p>Information regarding data source, documentation, and quality control is</p>

DRAFT

			<p>often incomplete or lacking. This information is likely available but may not have been included in the report since it might not be helpful to target audience.</p> <p>Organization is somewhat hard to follow. Findings and recommendations sections are interspersed with results sections.</p>
8 a.	Evaluation of study approach and conduct		This study was designed as an overall review of status and trends for use by a lay person. Therefore, information regarding study approach and conduct are often not included.
8 b.	Extent to which report is “up to date”		Water quality and wildlife data should be updated to determine continuing trends. Subsequent State of the Bay reports are anticipated.
8 c.	Completeness / data gaps / remaining information needs		This report is intended as a broad overview of trends and therefore does not include information regarding all water quality, hydrology, or plant and animal issues relevant to the DR/GR. Water quality measurements and wildlife species reported here are a small subset of those that have been documented in the DR/GR area. The information reported here reflects an overall characterization of trends throughout the entire watershed rather than an attempt to catalog data specific to the DR/GR area.
8 d.	Relationship to, and consistency with, other studies / reports		Overall water quality, hydrology, and wildlife summaries appear to be in concurrence with other studies in terms of negative effects of increases in population and land conversion having negative effects on water quality, hydrology and wildlife utilization, as discussed in section 7d above. Water quality information is hard to compare because the data used are a subset of that discussed in other studies.

Lower Charlotte Harbor Reconnaissance Report

Item	Description	Sect / Page	Information from Report
1	Document Title		Lower Charlotte Harbor Reconnaissance Report
2	Author		Charlotte Harbor National Estuary Program
3	Date		December 19, 2005
4	Sponsoring agency / publisher		Charlotte Harbor National Estuary Program 1926 Victoria Avenue Fort Myers, FL 33901 239-338-2556 www.charlotteharbornep.org and Stormwater Management Division South Florida Water Management District Fort Myers, FL 33091 www.sfwmd.gov
5	Purpose of study or document		To review and summarize existing information about the Lower Charlotte Harbor system in accordance with the Surface Water Improvement and Management (SWIM) program authorized by the State of Florida (F.S. 373.453). This document will be used by the SFWMD to develop the SWIM plan including a list of actions to be implemented to maintain and improve the water body.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and		The study area is large in comparison with the DR/GR area and therefore conclusions regarding status and trends discuss basins as a whole rather than the DR/GR lands. The DR/GR is located mostly within the Estero Bay Basin. Some of the

DRAFT

	Environmental Issues in Appendix C)		<p>eastern portions of the DR/GR are located within the Trafford Basin. Based on data collected during the 1995 flooding of the area it was determined that the Trafford Basin flows west into Estero Bay depending on the amount of rainfall. Water quality and trends data are not presented for the Trafford Basin portion of the DR/GR lands within this report, however.</p> <p>Digitized maps in Section 4 – listed in “Maps and Overlays” – could be especially useful in further development of the Lee County Master Mitigation Plan</p>
7	Summary of report content		
7 a.	General information and overall content	<p>Section 1/p 1 Section 2/p 3</p> <p>p 30</p> <p>Section 3 p 31</p>	<p>Introduction – describes the SWIM program</p> <p>Lower Charlotte Harbor Water Body System – Summary of basin boundaries, physiographic areas, and human history of the region. Includes a discussion of conditions that have led to the need for restoration. Major stressors relevant to DR/GR issues include altered hydrology; changes in water quality; habitat loss, alteration, and fragmentation; exotic plant and animal infestation; human use; and altered fire regime. Several conceptual models designed to illustrate these stressors (conditions that have led to the need for restoration) and the results of these stressors are presented.</p> <p>Also includes an in-depth summary of governmental agencies with jurisdiction within the study area. Table 6 is a list of implementation partners for the SWIM plan, including non-governmental organizations.</p> <p>Programmatic Context – Lists other coordinated restoration and projects being implemented within the study area. Programs relevant to the DR/GR area include: Comprehensive Everglades Restoration Plan, Southwest Florida Feasibility Study, Southwest Florida Restoration Coordination Team, Charlotte Harbor National Estuary Program, South Florida Multi-Species Recovery Plan, Southwest Florida Environmental Impact Statement, Aquatic Preserves Program, Outstanding Florida Waters, Charlotte Harbor Management Plan, Estero Bay Agency on Bay Management, Estero Bay and Watershed Assessment, South Lee County Watershed Plan, Lee County</p>

		<p>Section 4 p 42</p> <p>Section 5 p 61</p>	<p>Master Mitigation Plan, Southwest Florida Resource Conservation and Development Council, Inc. and the Corkscrew Regional Ecosystem Watershed Trust. A summary of the lead entity(ies), goals, and a Web site are included in each summary. Many of these programs have produced documentation that is also being reviewed as a part of the DR/GR study.</p> <p>Geographic Analysis – Includes soil map, soil drainage characteristics, pre-development, current, and proposed land cover and land use, percentages of impervious cover, conservation lands, conservation easements, Strategic Habitat Conservation Areas, Florida Greenways and Trails conservation opportunities, and land identified for potential future acquisition.</p> <p>Water Quality Status and Trends – Provides a summary of water quality monitoring being conducted by numerous agencies and volunteer organizations. Summaries include geographical locations of data, testing parameters, level to which data are comprehensive, and often associated Web sites. No discussion of quality control or data reliability are included. The most up-to-date compilation of existing testing is a study conducted in 2004 for the Southwest Florida Feasibility study completed by TetraTech with the assistance of Janicki Environmental, Inc, entitled “Compilation, Evaluation, and Archiving of Existing Water Quality Data for Southwest Florida.” A discussion of impaired waters and their classification is included. The Florida Department of Environmental Protection 303(d) list of impaired waters was approved by the EPA in 1998 and is based on “existing, readily available data or best professional judgment”. No further details regarding data source(s) for this list are provided. A Florida Department of Environmental Protection integrated assessment of categories is included. The majority of the DR/GR area is listed as Category 5 – Water quality standard not attained; water quality impaired and requires total maximum daily loads; verified list and 303(d) list.</p>
--	--	---	--

		<p>p 73</p> <p>p 81-82</p> <p>Section 6 p 90</p> <p>Section 7 p 106</p>	<p>A map depicting verified impairments (based on Florida Department of Environmental Protection list) shows much of the DR/GR area to be impaired for chlorophyll-a and dissolved oxygen.</p> <p>Trends based on the water quality summary conducted in 2004 by TetraTech are presented as maps of the study area. It is difficult to interpret the data for relevance within the DR/GR area due to the scale of the maps presented. However, it appears that negative trends for dissolved oxygen and biological oxygen demand and positive trends for total phosphorus may exist within the DR/GR. The authors do not discuss possible interpretations of these results. The 2004 report also identified data gaps. These are not discussed. National Pollutant Discharge Elimination System permits, brownfield data (a brownfield is an existing commercial or industrial site that has been abandoned or is underused due to public health and environmental hazards), and domestic and industrial wastewater generating facilities were identified as sources of pollution. All these sources but brownfields were identified within the DR/GR area.</p> <p>Existing Hydrology and Hydraulics Plans – Includes summary of regional hydrologic and hydraulic studies. Most of these are presented in tabular form. A table of identified project needs within the study area is also included.</p> <p>A list of recommendations for projects within the Estero Bay published by the Southwest Florida Watershed Council is provided at the end of Section 6.</p> <p>Existing Management Actions – Includes summaries of some of the Everglades Restoration projects, Lee County and City of Bonita Springs capital improvement programs, and 2004 Restoration projects tracked by Charlotte Harbor National Estuary Program. Information regarding lands in stewardship and 2004 acquisition lands is also provided in tabular form.</p>
--	--	--	--

DRAFT

		Section 8 p 119	Water Resources Management Issues of Concern – This section is a summary of issues that need to be addressed within the study area. Research needs pertinent to the DR/GR area include study of assimilative capacities within each basin, establishment of minimum freshwater flows needed to maintain estuarine health, establishment of sub-regional water and nutrient budgets, and further study on the importance and ecology of ephemeral wetlands. Area-wide restoration needs are also included. Those relevant to the DR/GR area are listed in the Lee County Master Mitigation Plan.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Includes a summary of many existing water quality data sources.
7 c.	Useful maps and overlays		See below.
7 d.	Relevant results and conclusions		The Lower Charlotte Harbor is an area that has experienced widespread growth in recent years. This growth is projected to continue into the foreseeable future. The study area is also subject to many layers of government regulation. There are a number of existing programs currently being implemented by a variety of federal, state, regional, and local agencies and non-profit organizations within the study area to evaluate and manage the impacts of growth through research, planning, and regulatory measures. It is important that a concerted effort be made to coordinate these programs in order to maximize efficiency and reduce overlap. The DR/GR and the water bodies into which this area discharges have been listed by the Florida Department of Environmental Protection as an area where water quality standards are not attained
8	Summary of report strengths and weaknesses		Background information is extensive and provides good context in terms of regulatory and natural-resource issues.
8 a.	Evaluation of study approach and conduct		Information presented in Section 7 – Existing Management Actions – would be more useful in the form of a map of geographical extents of these projects. More information regarding which water quality data were used for the referenced summary studies would have made evaluation of these studies

DRAFT

			more accurate.
8 b.	Extent to which report is “up to date”		Water Quality data are not up-to-date in terms of current trends.
8 c.	Completeness / data gaps / remaining information needs		Likely includes only a small subset of all water quality monitoring data for the DR/GR area. Water quality data were collected from a large geographical area and therefore did not include a focused attempt to document all water quality data and sampling stations within the DR/GR area and receiving tributaries. A small portion in the eastern part of the DR/GR is not represented in this report.
8 d.	Relationship to, and consistency with, other studies / reports		Consistent with other studies in terms of projected future growth, existence of water quality impairments within the Estero Bay basin, and general restoration needs.

Maps and Figures

Page	Fig.	Title	DR/GR issues	Comments
42	Fig 19	Drainage Characteristics of Soils		For all maps within this document: Includes only Estero Bay Basin, not Trafford or West Caloosahatchee portions of DR/GR.
55	Fig 26	Lands in Conservation	Conservation Lands Under Public Ownership	Probably most up-to-date and comprehensive map in list of literature reviewed.
56	Fig. 27	Conservation Easements		Important in terms of linking protected land parcels.
58	Fig. 29	Florida Greenways and Trails Program Conservation/Ecological Opportunities	Greenways	
58	Fig. 30	Identified Lands for Potential Future Acquisition	Proposed Acquisition Lands	
68	Fig. 34	Florida Department of Environmental Protection Integrated Assessment	Impaired Areas	From Florida Department of Environmental Protection

DRAFT

69	Fig. 35	Designated Uses	State Water Classifications	From Florida Department of Environmental Protection
73	Fig. 39	Estero Verified Impairments	Impaired Areas	From Florida Department of Environmental Protection
81	Fig. 43	Dissolved Oxygen and Bio-Chemical Oxygen Demand Trends	Water Quality	From TetraTech/Janicki Env't. Inc. June 2004 Report
81	Fig. 44	Turbidity and Total Suspended Solids Trends	Water Quality	From TetraTech/Janicki Env't. Inc. June 2004 Report
82	Fig. 45	Nutrient Trends	Water Quality	From TetraTech/Janicki Env't. Inc. June 2004 Report
84	Fig. 46	Known Outfalls (NDPES permits)	Water Quality	From Lee County, Charlotte Harbor National Estuary Program, and U.S. Census Bureau
86	Fig. 48	Wastewater Generating Facilities National Pollutant Discharge Elimination System Status	Water Quality	From Florida Department of Environmental Protection, Charlotte Harbor NEP, and U.S. Census Bureau
86	Fig. 49	Domestic Wastewater Generating Facilities	Water Quality	From Florida Department of Environmental Protection, Charlotte Harbor National Estuary Program, and U.S. Census Bureau

DRAFT

Water Quality Data Analysis and Report for the Charlotte Harbor National Estuary

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover	Water Quality Data Analysis And Report For The Charlotte Harbor National Estuary Program
2	Author	Cover	David Wade Anthony Janicki Susan Janicki Michele Winowitch Janicki Environmental, Inc. 1155 Eden Isle Drive NE St. Petersburg, FL 33704
3	Date	Cover	August 27, 2003
4	Sponsoring agency / publisher	Cover	Charlotte Harbor National Estuary Program 4980 Bayline Drive, 4 th Floor North Fort Myers, FL 33917 239-995-1777 http://www.chnep.org/info/wq/water_quality_data_analysis.htm
5	Purpose of study or document	1.0 (1-2)	The document was to provide information needed to : <ul style="list-style-type: none">- Prioritize areas of the estuary for improvements- Identify conditions that threaten habitats or provide opportunities for habitat enhancement- Identify water quality responses to sources of pollution in support of source reduction efforts- Identify impacts to freshwater inflows and salinity regimes- Provide background scientific results for incorporation into public education materials

DRAFT

		1.0 (1-2)	<ul style="list-style-type: none"> - Provide a statistical framework for future monitoring of the effectiveness of management actions <p>Specifically the project was to:</p> <ol style="list-style-type: none"> 1. Compile initial data sets for surface and groundwater quality, hydrology, and rainfall 2. Survey regional experts to identify potential data sources that were not captured in Objective 1 3. Review the data and identify the datasets that meet the project criteria for availability, documentation of metadata, and quality control 4. Prepare a summary of the datasets that meet the project criteria and will be used in the analysis of water quality status and trends 5. Conduct analyses of temporal water quality variations (changes and trends) in the study area 6. Conduct analyses of existing water quality conditions in the study area <p>Prepare a final report summarizing the project results.</p>
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		Most of the DR/GR area is within the study area. The easternmost part of the DR/GR is not within the Estero Bay basin and is not included in this report. The study area is relatively large compared to the DR/GR area. Very few sampling stations are within the DR/GR. More sampling stations were located along the tributary creeks into which the DR/GR lands drain. However, these creeks are located at the southernmost part of the study area and are not as well-represented as many of the other water bodies.
7	Summary of report content		NOTE: Ann Ertman reviewed sections 1, 2.4, 6, 7; supplemental data collection and quality control information; Andrew Miller & Gregory Nelson reviewed relevant portions (i.e., Estero Bay information) of Chapters 1, 2, 6, 7.
7 a.	General information and overall content	Technical Mem. Section 3.0,	A separate technical memorandum dated April 24, 2002 includes a summary of data sources and requirements. These requirements included availability in electronic format, sufficient metadata including a description of collection

DRAFT

		Attachments A, B, C	<p>techniques, quantification limits, and sample locations, and sufficient data to be compatible with statistical techniques (e.g. has sufficient time span of data collection). Data from SFWMD, Florida Department of Environmental Protection 305b program, Lee County, Fisheries Independent Monitoring Program, and Charlotte Harbor Fisheries Volunteer Monitoring Network were used.</p> <p>This memorandum also includes reasons for selecting the Kendall-Tau statistical methods.</p>
		Ch 1	Introduction, project scope.
		Introduction 1-5	<p>A list of water quality parameters is included in Table 1. Parameters that have not met state standards within the DR/GR and receiving water bodies include dissolved oxygen and nutrients (measured for this study in the form of chlorophyll-a, total nitrogen, total Kjeldahl nitrogen, total nitrate and nitrite nitrogen, orthophosphate, and total Phosphorus).</p> <p>Copper is one parameter identified as an impairment within the DR/GR area that is not included in this study.</p>
		Ch 2	"This methods section describes the methods used to analyze the data with respect to rainfall trends, stream flow trends, groundwater quality spatial trends and status, and surface water quality trends and status."
		Chapter 2 (2-2)	<p>Presents the methods used to analyze the collected data.</p> <p>Rainfall statistical analysis – used the Kendal Tau approach on precipitation data. Throughout the study, when calculating the Kendal Tau statistic, software from the EPA laboratory in the Corvallis, Oregon was used. The specific process for evaluating rainfall:</p> <ol style="list-style-type: none"> 1) Plot a time series of the raw data 2) The time series is averaged to monthly values 3) Correlation is determined to months prior up to 15 months 4) Determination of whether seasonality exists. 5) Autocorrelation

DRAFT

			<ul style="list-style-type: none"> a) Remove seasonal trends b) Check to see if there is correlation with the 1 and 2 month lags 6) Compile results in a table.
		(2-7 through 2-9)	<ul style="list-style-type: none"> - Stream Flow Trend Methods – 32 Indexes of Hydrologic Alterations are calculated. Trends are determined by; <ul style="list-style-type: none"> 1) Indexes of Hydrologic Alterations values are calculated for each year for each gage. 2) Trend tests are conducted for each Indexes of Hydrologic Alterations metric and for each gage. Indexes of Hydrologic Alterations statistics were not tested for trends because less than 20 years of Indexes of Hydrologic Alterations data were available. 3) Indexes of Hydrologic Alterations parameters are tested for trends and compiled by gage into summary tables.
		(2-10)	<ul style="list-style-type: none"> - Flow Duration Curves were constructed for each gage and compared across three relevant periods of record: <ul style="list-style-type: none"> 1) Stream flow gage period of record 2) Water quality trend analysis period of record 3) Current status
		(2-11)	<ul style="list-style-type: none"> - Groundwater quality methods were compared by aquifer and by parameter Indexes of Hydrologic Alterations. “The data were compared by ranking the basins according to drinking water exceedances, ranking the values, and preparing synoptic trend maps.” (2-11)
		Sect 2-4, p. 2-12	Status and trend analysis for surface water data is described. Trends analyses were conducted for surface and bottom values separately using seasonal Kendall Tau methods. Status testing was based on data collected between 1996 and 2000. Trend testing was based on data

DRAFT

			collected between 1998 and 2000. A minimum of 60 data points (e.g. 5 years of monthly data points) was required. Non-parametric tests were conducted if there were at least 30 points available. Example data tables and comparisons figures are included. These results were then compared to Florida Department of Environmental Protection water quality standards and EPA nutrient criteria.
		(2-16)	- Surface Water Quality Status Methods – existing nutrient concentrations were compared to predefined criteria to identify those portions of the study area that are in concordance with ecoregional nutrient criteria.
		Sect 3.0	Rainfall analysis
		Sect 4.0	Stream flow analysis
		Sect 5.0	Groundwater quality analysis
		Sect 6.0	Surface water quality analysis Surface Water Quality - summarizes results. Sections 6.6 – Estero River (p 6-23), 6.8 – Imperial River (p 6-25), 6.9 – Spring Creek (p 6-26), and probably 6.7 - Hendry Creek (p. 6-24) are the sections relevant to the DR/GR area. These water bodies drain water from the DR/GR into Estero Bay.
		Section 6.6 Page 6-23	Several stations within the Estero River were found to have significant trends in worsening water quality. These trends included increasing nitrate + nitrite, orthophosphate, and turbidity, and declining dissolved oxygen. Stations within this basin were ranked among the lowest with respect to dissolved oxygen values. Conditions were ranked as relatively good for chlorophyll-a, total suspended solids, and turbidity compared to other basins within the study area. These stations had frequent exceedances of dissolved oxygen, fecal

DRAFT

			<p>coliform, and ammonia standards. When compared to the Florida Department of Environmental Protection Impaired Water Rule, this basin was found to be acceptable in terms of fecal coliform and annual chlorophyll-a conditions but unacceptable in terms of dissolved oxygen and ammonia conditions.</p> <p>In comparison to EPA draft nutrient criteria, stations within the Estero River basin were found to exceed criteria for chlorophyll-a, nitrogen, and phosphorus.</p>
		<p>Section 6.8 P 6-25</p>	<p>Several stations within the Imperial River were found to have significant trends in worsening water quality. These trends included total suspended solids and turbidity, and declining dissolved oxygen. Stations within this basin were ranked among the highest with respect to nitrite + nitrate and fecal coliform values and the lowest with respect to dissolved oxygen values. Conditions were ranked as relatively good for chlorophyll-a, total suspended solids, and turbidity compared to other basins within the study area.</p> <p>These stations had frequent exceedances of dissolved oxygen, fecal coliform, and ammonia. When compared to the Florida Department of Environmental Protection Impaired Water Rule, this basin was found to be acceptable in terms of fecal coliform conditions but unacceptable in terms of dissolved oxygen, ammonia, and annual chlorophyll-a mean conditions.</p>
		<p>Section 6.9 P 6-26</p>	<p>Several stations within Spring Creek were found to have significant trends in worsening water quality. These trends included increasing orthophosphate, increasing turbidity, and decreasing dissolved oxygen. Turbidity was found to be increasing at one station. Stations within this basin were ranked among the lowest with respect to dissolved oxygen values but on a positive note were also ranked among the lowest for phosphorus, turbidity, ammonia, and total suspended solids.</p>

DRAFT

			<p>These stations had frequent exceedances of dissolved oxygen values. When compared to the Florida Department of Environmental Protection Impaired Water Rule, this basin was found to be acceptable in terms of fecal coliform and annual chlorophyll-a conditions but unacceptable in terms of dissolved oxygen and ammonia.</p> <p>In comparison to EPA draft nutrient criteria, stations within the Spring Creek basin were found to exceed criteria for all parameters except for turbidity.</p>
		Section 6.7 P 6-24	<p>Several stations within Hendry Creek were found to have significant trends in worsening water quality. These trends included increasing biochemical oxygen demand, fecal coliform, total suspended solids, turbidity, and decreasing dissolved oxygen. Stations within this basin were ranked high with respect to turbidity and total Kjeldahl nitrogen and low with respect to dissolved oxygen.</p> <p>These stations had frequent exceedances of dissolved oxygen values and fecal coliform standards. When compared to the Florida Department of Environmental Protection Impaired Water Rule, this basin was found to be unacceptable in terms of dissolved oxygen, ammonia, and annual chlorophyll-a conditions.</p> <p>In comparison to EPA draft nutrient criteria, stations within the Hendry Creek basin were found to exceed criteria for chlorophyll-a, nitrogen, and phosphorus.</p>
		Section 7 P 7-3	<p>Analysis of water quality data in relation to rainfall data indicate that water quality trends identified within this report have not been influenced greatly by short-term changes in rainfall.</p>

DRAFT

		P 7-5	<p>Results of this report can be used for the following:</p> <ul style="list-style-type: none"> - To prioritize areas for improvement. - To be overlaid with potential restoration, protection and enhancement areas to identify parameters that might compromise project success or provide opportunities for further enhancement. - To prioritize source reduction efforts. - To identify local impacts to estuaries. - To provide background material for educational materials. - To provide a statistical framework for future monitoring of the effectiveness of management efforts.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	Tech Memo	See Table 1-1, page 1-5, Attachment A, B, and C of April 24, 2002 Technical Memorandum
		Ch 6	Estero Bay tributaries show declining trends in water quality, especially for nutrients, dissolved oxygen, turbidity.
		Ch 7	"Many of the water quality changes in these areas were characterized as declining water quality. These results do not indicate directly that changes in stream flow were the primary reason for the changes in water quality, but the results do present a coincidence over the years of changes in stream flow timing and volume with changes in surface water quality. Other potential sources of surface water quality declines include increased pollutant loading from non-point sources in the watershed, point sources, and or atmospheric deposition."
7 c.	Useful maps and overlays		<ul style="list-style-type: none"> - The results of the analysis are presented in appendices. The appendices are in PDF format on a CD which can be searched for any

DRAFT

			<p>particular plot or table for a given basin, stream flow gage, aquifer, or for precipitation.</p> <ul style="list-style-type: none"> - Figure 1-2 shows the study area. - Figure 4-2 shows the study area and is a basin reference map. <p>Note - data are sparse within the southern DR/GR in many of the maps.</p>
		Technical Memorandum Attachment B	Charlotte Harbor Water Quality Study - DEP 305B Sampling Locations Estero Bay and Tributaries
		Fig 6-11	CHNEP Basins – Southern Coast – Surface – Specific Conductivity
		Fig 6-12	CHNEP Basins – Southern Coast – Bottom – Specific Conductivity
		Fig 6-14	CHNEP Basins – Southern Coast – Surface – Dissolved Oxygen
		Fig 6-15	CHNEP Basins – Southern Coast – Bottom – Dissolved Oxygen
		Fig 6-16	CHNEP Basins – Southern Coast – Surface – Biological Oxygen Demand
		Fig 6-17	CHNEP Basins – Southern Coast – Bottom – Biological Oxygen Demand
		Fig 6-20	CHNEP Basins – Southern Coast – Surface – Temperature
		Fig 6-21	CHNEP Basins – Southern Coast – Surface – Temperature
		Fig 6-23	CHNEP Basins – Southern Coast – Surface – Turbidity
		Fig 6-24	CHNEP Basins – Southern Coast – Surface – Turbidity
		Fig 6-32	CHNEP Basins – Southern Coast – Surface – chlorophyll-a (corrected)
		Fig 6-35	CHNEP Basins – Southern Coast – Surface – Nitrate + Nitrite
		Fig 6-36	CHNEP Basins – Southern Coast – Bottom – Nitrate + Nitrite
		Fig 6-39	CHNEP Basins – Southern Coast – Surface – Total Kjeldahl Nitrogen
		Fig 6-40	CHNEP Basins – Southern Coast – Bottom – Total Kjeldahl Nitrogen
		Fig 6-41	CHNEP Basins – Southern Coast – Surface – Total Nitrogen
		Fig 6-42	CHNEP Basins – Southern Coast – Bottom – Total Nitrogen
		Fig 6-45	CHNEP Basins – Southern Coast – Surface – Ammonia
		Fig 6-46	CHNEP Basins – Southern Coast – Bottom – Ammonia
		Fig 6-49	CHNEP Basins – Southern Coast – Surface – Total Phosphate
		Fig 6-50	CHNEP Basins – Southern Coast – Bottom – Total Phosphate

DRAFT

		Fig 6-51	CHNEP Basins – Southern Coast – Surface – Orthophosphate
		Fig 6-52	CHNEP Basins – Southern Coast – Bottom – Orthophosphate
		Fig 6-55	CHNEP Basins – Southern Coast – Surface – Sulfate
		Fig 6-58	CHNEP Basins – Southern Coast – Surface – Chloride
		Fig 6-62	CHNEP Basins – Southern Coast – Surface – Fecal Coliform
7 d.	Relevant results and conclusions		Can overlay maps of water quality and land use to possibly guide land use decisions.
		Sect 7.0	<ul style="list-style-type: none"> - There are significant trends toward increasing pollution in stream flow as seen in Kendal Tau testing of the data. - No trend in the rainfall data. Rainfall varied from year to year and was predictable throughout the year. Changes in water quality can not be attributed to changes in rainfall alone. - “With respect to regional changes in stream flow, the results indicate that many alterations to the hydrology have occurred in the tributaries of the Estero Bay watershed and Cape Coral peninsula, and the Upper Peace River.” (7-2) <ul style="list-style-type: none"> o There were Indexes of Hydrologic Alterations stream flow changes observed in the Cape Coral peninsula area and in the Estero Bay watershed; these locations also showed declining water quality. - There were not enough ground water samples to do large regional evaluations. There was however enough sampling to indicate problem areas – for instance the primary fluoride standard was frequently exceeded in the Floridan Aquifer in the Estero River portion of the Estero Bay basin, and in the Intermediate and Floridan Aquifers in the Matlacha Pass basin.
8	Summary of report strengths and weaknesses		<p>Strengths: Good statistical evaluations of data.</p> <p>Weaknesses: In general - there may be a data bias in that most of the data may have been collected in areas that have been impacted.</p> <p>Specific to the DR/GR - there are very few groundwater and surface water</p>

DRAFT

			<p>data points within the southern DR/GR.</p> <p>Strengths:</p> <ul style="list-style-type: none">- The authors are concise in describing their methods.- The methods are straightforward.- The report is organized to present how the data was organized and analyzed without bogging the reader down with all of the figures.- The report fulfills its objective in providing a dataset of water quality data.- Authors use established methods in analyzing the data. <p>Weaknesses:</p> <ul style="list-style-type: none">- The flow trend figures and precipitation figures in the appendices can be difficult to sort and search.- It is not apparent from the document how the database is/or will be updated and if and/or how the trends and statistics would be updated.- Because of the scope of the project, the number of data in the DR/GR may be limited. But the data available within and surrounding the DR/GR does show water quality changes. <p>Well-documented study of water quality status and trends. Information regarding data selection was helpful and could be followed for additional reports.</p> <p>The scale of the project is very large compared to the DR/GR so it is sometimes difficult to determine status and trends from maps. Limited information in terms of sampling stations regarding the DR/GR area is available. Additional information regarding sampling stations within the DR/GR area does exist and could be used for a study regarding a smaller geographical area.</p>

DRAFT

8 a.	Evaluation of study approach and conduct		<p>Good approach, however this document falls short for data points within the DR/GR. The Montgomery and Johnson Engineering reports show many more data points.</p> <p>Given the scope of the project, probably a reasonable approach for evaluating trends within a large area.</p>
8 b.	Extent to which report is “up to date”		<p>This study and many other water quality summaries and reports are based on data that are dated in terms of analysis of current trends. The Charlotte Harbor National Estuary Program has obtained a grant from the Environmental Protection Agency to undertake a study entitled “Growth Management Regulation, Public Investment and Resource Implications for the Estero Bay Watershed – Southwest Lee County, Florida”. This Estero Bay watershed project will be a comprehensive study and evaluation of the decision framework utilized by government and private entities for development, permitting activity and public investment. A summary of a more up-to-date body of water quality data will be a part of this project. The final report is due to be published in August of 2007.</p>
8 c.	Completeness / data gaps / remaining information needs		<p>Additional information regarding sampling stations within the DR/GR area does exist and could be used for a study regarding a smaller geographical area.</p>
8 d.	Relationship to, and consistency with, other studies / reports		<p>This report has likely been used as a reference for data for other reports.</p> <p>It is hard to compare directly to other water quality studies because a different data set is used. However, in terms of overall watershed trends and status, is consistent with other reports reviewed for the DR/GR study.</p>

DRAFT

How Much Is Enough? Landscape-Scale Conservation for the Florida Panther

Item	Description	Sect / Page	Information from Report
1	Document Title		How Much Is Enough? Landscape-Scale Conservation For The Florida Panther
2	Author		<ul style="list-style-type: none"> - Randy Kautz (Florida Fish and Wildlife Conservation Commission), Robert Kawula (Florida Fish and Wildlife Conservation Commission), Thomas Hctor (Univ. of Florida), Jane Comiskey (Univ. of Tennessee), Deborah Jansen (Big Cypress National Preserve), Dawn Jennings (U.S. Fish and Wildlife Service), John Kasbohm (U.S. Fish and Wildlife Service), Frank Mazzotti (Ft. Lauderdale Research and Education Center), Roy McBride (No affiliation information given), Larry Richardson (U.S. Fish and Wildlife Service), and Karen Root (Bowling Green State University) - All members of Florida panther sub-team of the Multi-species Ecosystem Recovery and Implementation Team (MERIT), a committee appointed by the USFWS in Vero Beach.
3	Date		2006
4	Sponsoring agency / publisher		Science Direct - Biological Conservation/ELSEVIER – www.elsevier.com
5	Purpose of study or document		To review and analyze existing information regarding Florida panther telemetry and habitat data to guide implementation of recovery actions for this species.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental		All DR/GR lands are within the study area. The majority of the DR/GR is within the “primary zone” for Florida panthers. The DR/GR lands also contain “secondary” Florida panther habitat.

DRAFT

	Issues in Appendix C.)		
7	Summary of report content		
7 a.	General information and overall content	Section 2/p. 119	<p>The authors used compositional and Euclidean distance analysis (two of many statistical techniques used to analyze data that include clustering and fragmentation issues) to identify regions of south Florida that are of value to support a self-sustaining population and create a model of important landscape components.</p> <p>The model was used in combination with radio telemetry data, home range overlaps, land use/land cover data, and satellite imagery.</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	p. 129	Table 4 – Estimated number of panthers that could be supported by the Primary, Secondary, and Dispersal zones in South Florida by ownership.
7 c.	Useful maps and overlays	<p>p. 120</p> <p>p. 121</p> <p>p. 124</p> <p>p. 127</p> <p>p. 128</p>	<ul style="list-style-type: none"> - Figure 1 - Study area and land cover (Water Management District aerial photography) - Figure 2 – Florida panther radio-telemetry data (Feb1981-March 2001). - Figure 3 – Least-cost paths most likely to be taken by Florida panthers dispersing out of south Florida. Based on analysis of impediments to Florida panther dispersal such as roadways. - Figure 4 – A model of landscape components significant to Florida panther conservation based on findings from Euclidean distance analyses. - Figure 5– Locations of Primary, Dispersal, and Secondary zones. Integrates information from Fig 4 into a connected landscape mosaic of cover types needed to support the Florida panther population.

DRAFT

7 d.	Relevant results and conclusions	<p>Sections 3 and 4</p> <p>Section 3/p. 126</p> <p>Section 4/p. 127</p> <p>Section 4/p. 129</p> <p>Figure 5/p. 128</p>	<ul style="list-style-type: none"> - The report confirmed previous findings of the importance of a large landscape mosaic, including forest patches, freshwater marsh, barren land, scrub, and open water to support a viable Florida panther population. Differing habitat types are important based on time of day, feeding, resting, and denning needs and can also change based on the age of an individual. Disturbed lands such as pastures and agricultural lands were also found to be present in the large landscapes that support Florida panthers. - Florida panther population appears to be increasing since early 1990. - The analyses showed that the smallest classes of forest patches were highest ranked within home ranges, contrary to previous studies indicating panthers avoid patches smaller than 500 hectares. Forest patches 2 hectares and up surrounded by 200 meters of non-urban buffers were found to be “significant landscape components”. - The majority of the Lee County DR/GR area is within the primary zone – identified as “essential to the long-term viability and survival of the Florida panther” or the secondary zone - areas that Florida panthers are not known to inhabit on a regular basis but which may be important to transient Florida panthers and have the potential to support an expanding population, especially if restoration/enhancement actions are implemented. The DR/GR also includes areas identified as “least-cost” paths most likely to be taken by Florida panthers dispersing out of South Florida. This dispersal could provide genetic intermixing between future sub-populations which could increase long-term species viability.
------	----------------------------------	--	--

DRAFT

		<p>Section 4/p. 129 and Section 5/p. 131</p> <p>Section 1/p. 119</p> <p>Section 5/p. 131</p> <p>Section 1/p. 119</p>	<ul style="list-style-type: none"> - The authors state that the existing habitats provide just enough space and habitat quality to support a Florida panther population that is “barely viable” –i.e. stable over the next 100 years as long as there is no habitat loss within this zone. - The first priority in terms of implementing the recovery of the Florida panther is to secure the existing South Florida population, including that found in the DR/GR area. - Recommend that assessments of potential impacts proposed within the Primary Zone should achieve no net loss of landscape function including reduction of aerial extent, degradation of habitat, further habitat fragmentation, or changes in land use moving along a gradient from natural conditions to pasture, to urban. - Habitat loss is identified as the greatest threat to the Florida panther.
8	Summary of report strengths and weaknesses		<p>The study was conducted by a wide range of experts within the field, including public agencies and academia. Published in a peer-reviewed, scientific journal. Analysis includes standard statistical techniques. Authors point out parts that are backed up by existing data vs. more speculative parts. Actual panther locations are based on radio telemetry data. This type of data generally includes daytime locations of Florida panthers which can result in underestimation of territory and tends to be biased toward forested areas where Florida panthers are more likely to rest during the day.</p>

DRAFT

8 a.	Evaluation of study approach and conduct		Use of telemetry data and Euclidean analysis are often used to study wildlife data. Telemetry data can be biased (see above), but overall conclusions regarding panther population are probably accurate.
8 b.	Extent to which report is “up to date”		Panther habitat maps have been revised as of February 2007. New maps are available from the US Fish and Wildlife Service Vero Beach office.
8 c.	Completeness / data gaps / remaining information needs		The model could be adjusted using existing infra-red observations of Florida panthers which include night observations.
8 d.	Relationship to, and consistency with, other studies / reports		This report is consistent with the other studies in terms of identifying important wildlife habitat and restoration/enhancement opportunities within the DR/GR lands, in terms of confirming the importance of a landscape-level habitat mosaic to wildlife, and in terms of identifying habitat loss as the greatest threat to the Florida panther. Primary and Secondary zones should be added to map overlays for the Lee County Master Mitigation Plan. Secondary zones represent potential restoration areas and Primary zones could be used for preservation in conjunction with restoration and/or enhancement of Secondary zones.

DRAFT

Closing the Gaps in Florida’s Wildlife Habitat Conservation System

Item	Description	Sect / Page	Information from Report
1	Document Title		Closing the Gaps in Florida’s Wildlife Habitat Conservation System
2	Author		James Cox, Randy Kautz, Maureen MacLaughlin, and Terry Gilbert Florida Fish and Wildlife Conservation Commission (Formerly Florida Game and Fresh Water Fish Commission)
3	Date		1994
4	Sponsoring agency / publisher		Florida Fish and Wildlife Conservation Commission – Florida Marine Research Institute – Florida DEP
5	Purpose of study or document		<ul style="list-style-type: none">- To assess the habitat conservation needs and identify lands that must be preserved to meet the long-term habitat needs of Florida’s flora and fauna using a focal species approach.- To identify areas important to several globally endangered species of plants and animals.- To identify regional areas of high biological diversity “hot spots”.- To focus on-going land conservation efforts where they will provide the most protection to Florida’s biodiversity.- To provide guidance to decision makers involved in public land acquisition, land use planning, development regulation, and other land conservation efforts.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental		The study area covers the entire state, including Lee County and the DR/GR lands. Data can be presented at a variety of scales, including county-level. Key issues addressed: vegetation communities, wetlands, invasive/exotic species, rare and unique uplands, native uplands, native vegetation communities, coastal and interior hammocks, rare and unique habitats,

DRAFT

	Issues in Appendix C.)		biodiversity “hot spots”, native wildlife habitat, migratory bird habitat, critical habitat for listed species, important plant habitats, endangered plant species habitat, conservation lands under public ownership.
7	Summary of report content		
7 a.	General information and overall content	<p>Section 1/p. 3</p> <p>Section 1.2/p. 4</p> <p>Section 2/p. 7</p>	<ul style="list-style-type: none"> - Section 1 - Introduction - includes a good general discussion of the importance of biodiversity in terms of economic factors, public opinion, and factors not as easy to quantify such as aesthetics (Section 1.1). Includes a list of factors contributing to loss of biodiversity (Section 1.2). Habitat loss, fragmentation, and land management practices are all discussed as important factors. - Section 2 describes objectives and overview of the report – Authors identified a set of 44 focal species to serve as “indicator” species of biological diversity in Florida. Key species were chosen based on the criteria that habitat affinities for these species could be estimated using satellite imagery, home ranges of the species were large and might therefore benefit species with smaller home range requirements, the species had close ties to specific rare plant communities, and extensive occurrence information existed for the species. The authors acknowledge that these criteria for choosing focal species will not result in a list of perfect indicators for all species in all habitat communities in Florida. Rather, it is presented as a data-driven approach to quantify the habitat needs of a majority of Florida’s rare species and natural communities in a way that focuses efforts and efficiently uses the resources available to government agencies. - In addition to the focal species, information regarding rare plants, invertebrates, and natural communities was assembled and used to identify additional Strategic Habitat Conservation Areas (SHCAs) to add to the minimum conservation measures outlined for focal species.

DRAFT

		Section 3/p. 11	<ul style="list-style-type: none">- Regional maps were developed to highlight additional areas of potential importance to expand upon the SHCAs.
		Section 4/p. 19	<ul style="list-style-type: none">- Section 3 – Development of GIS data sets – Maps are based on Landsat data compared to aerial photography and helicopter “field surveys” conducted on 2.72 million acres statewide. Subsequent field reports indicate 80-90% accuracy.
		Section 4/p. 19	<ul style="list-style-type: none">- Section 4 – Development of Information on Wildlife Species – provides details of how focal species were chosen. Detailed habitat maps were developed for each species through data documenting occurrences of focal species including Florida Natural Inventories (FNAI) data, Florida Fish and Wildlife Conservation Commission (FWC) data, and data collected by various researchers who specialize in the study of specific wildlife species (listed on p. 20). All data were entered in “point” format and Voronoi tessellation was used to determine where concentrations of these points occur. This technique is thought to be more objective and repeatable than less quantitative efforts to estimate clusters of points.
		Section 5/p. 23	<ul style="list-style-type: none">- Section 5 – Assessing Population Viability – Discussion of reasons populations go extinct - primarily environmental variability and inbreeding depression. Some species, such as red-cockaded woodpeckers and fox squirrels, require multiple large populations (200-300) to assure long-term viability. Others, such as the Florida panther and black bear, require smaller populations (100-150). It is noted that these are based on estimations and no number or habitat size will “guarantee” population stability.

DRAFT

		Section 6/p. 33	<ul style="list-style-type: none">- Section 6 - Identification of Gaps in Florida’s Wildlife Conservation Systems – General guidelines summarized in Section 5 are used to evaluate the effectiveness of existing conservation areas to provide adequate protection to Florida’s rare species. Target was set at a minimum of 10 conservation areas with sufficient habitat to support a viable population. Section includes in-depth discussion of how this target was chosen. Due to incomplete information regarding population and distribution for many species, indirect estimations based on existing research were made. These are discussed in detail.
		Section 6.2/p. 35	<ul style="list-style-type: none">- Evaluation criteria and potential habitat ranges for each focal species are also discussed in this section. Portions of the DR/GR area were identified as Strategic Habitat Conservation Areas (SHCAs - areas critically important to maintaining the core population of the species) for the Florida panther, the Florida black bear, the swallow-tailed kite, the Big Cypress fox squirrel, the snail kite, the limpkin, and 8 additional species of wading birds.
		Section 6.3 /p. 115	<ul style="list-style-type: none">- An abbreviated gap analysis was performed for other components of Florida’s biodiversity that could have been missed in the focal species analysis. These include areas supporting globally rare plant species, bat maternity areas, coastal communities, and 120 additional rare animal species (listed on Table 16, p. 122) to identify important conservation lands by overlaying potential habitat maps for individual species. These areas can then be compared to existing public lands to help show “hot spots” – areas important to the conservation of many species that are not currently within the system of public lands. A

DRAFT

			<p>detailed discussion of the theories involved is included in Section 6.3.4, p. 121. It appears Lee County contains numerous “hot spots,” including some that are important to 16-18 rare species of the 120 considered. It is difficult to determine the specific “hot spots” located within the DR/GR given the scale of the associated map included as part of the document. However, an up-to-date version of this map at a more useful scale can be obtained from the FWC.</p>
		Section 7/p. 137	<ul style="list-style-type: none">- Section 7- Closing the Gaps – includes a discussion of how information gathered and analyzed in the previous sections was combined to create a statewide composite map showing SHCAs for all species, species groups, and natural communities previously considered. This section is less relevant to areas on the scale of the DR/GR but does contain a discussion of other maps of natural resources.
		Section 8/p. 147	<ul style="list-style-type: none">- Section 8 – Identifying Regional Hot Spots – This section is intended to provide guidance to local governments interested in expanding on the goals outlined in the previous sections. A good discussion of the importance of conserving locally valuable resources is provided on p. 147.
		Section 8.1.7/p. 173	<ul style="list-style-type: none">- Section 8.1.7- Southwest Florida Region is the region in which the DR/GR is located. Much of the DR/GR contains hot spots of biological resources for 7 or more focal species. By comparison, other areas contain hot spots of biological resources for 3-4 or 5-6 focal species.

DRAFT

7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Statewide distributions of a number of wildlife species and important habitats.
7 c.	Useful maps and overlays		Maps and overlays regarding species distributions, strategic habitat conservation areas, conservation areas, and hot spots of biological resources in the Southwest Florida Region can be obtained from the Florida Fish and Wildlife Conservation Commission. Use of the maps should include a commitment to periodically update these data layers as additional information becomes available.
7 d.	Relevant results and conclusions	<p>Section 7, p. 140 and throughout</p> <p>Section 8,/p. 147, Section 7</p> <p>Section 7/p. 140</p>	<ul style="list-style-type: none"> - Existing conserved lands are not adequate to protect Florida’s biodiversity. - Future land acquisitions should target key areas identified in studies. These areas are available in regional scale and are updated periodically. Agencies wishing to use this information should contact the FWC for most up-to-date information. - Authors recommend that land identified as high priority can be most effectively protected through acquisition or through conservation easements and land-use agreements. Although outright acquisition is considered to be the best way to assure protection, it is noted that the area needed to sustain the populations of Florida panther and black bear alone would consume all the funds currently available for land acquisition.

DRAFT

		Section 7/p. 138	<ul style="list-style-type: none"> - Table 19, p. 138 is a summary of recommendations developed for each of the focal species.
		Section 2.6/p. 9 and throughout	<ul style="list-style-type: none"> - Authors stress that project maps are intended to guide land acquisition, land conservation, and land-use regulatory programs. These maps represent only a snapshot of Florida’s conservation needs at one point in time and therefore should not be incorporated into law or rule as “no development” zones. Rather, they should be used as layers of information in making regulatory, land-acquisition/management, and planning decisions. -
8	Summary of report strengths and weaknesses		<ul style="list-style-type: none"> - Overall useful discussion of many wildlife issues. Well-researched and documented way to focus scarce government resources in the area they are most needed (e.g. – prioritization of potential land acquisition parcels).. - Much of the wildlife occurrence data is based on individuals’ reports of wildlife sightings. This biases results toward more populated areas where more observers are likely to be. - Many maps within the document are out-of-date. Individuals wanting to use any data layers reported within this document should contact FWC directly to obtain most up-to-date versions.
8 a.	Evaluation of study approach and conduct		Very good concept, well-researched from a variety of sources in wildlife management and conservation biology.
8 b.	Extent to which report is “up to date”		Follow up data collected for 76 additional listed species by James A. Cox and Randy S. Kautz (Florida Fish and Wildlife Conservation Commission) in 2000 indicates that despite a lack of sufficient data for many of the originally selected 44 focal species, the original approach worked fairly well in its attempts to identify important habitats for rare and declining species statewide. No new SHCAs were identified in this follow-up work. It was also determined that the original economic analyses contained in “Closing the Gaps” was still valid. However, when the “hot spots” (areas of habitat

DRAFT

			and resource overlap for multiple species) were reanalyzed using more precise distributional and habitat information, it was found that the results were very different from the overlay maps developed in 1994. This sensitivity to the type of underlying data sets could be especially problematic when comparison of gap maps produced by different states is attempted. (Cox, J.A., and R.S. Kautz, 2000. Habitat Conservation Needs of Rare and Imperiled Wildlife in Florida. Office of Environmental Services, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.)
8 c.	Completeness / data gaps / remaining information needs		Much of the information presented within this report is based on documented occurrence records. This reflects the most accurate level of information available at a statewide scale, but is not considered to be comprehensive in terms of determining presence or absence of a given species on a given parcel of land.
8 d.	Relationship to, and consistency with, other studies / reports		Consistent with other studies in terms of identifying habitat loss as a major threat to a wide variety of plant and animal species and in terms of stating existing land within public conservation is not adequate to protect many wildlife species.

DRAFT

Southwest Florida Feasibility Study Scoping Meeting

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover/p.1	Southwest Florida Feasibility Study - Charlotte, Collier, Glades, Hendry, Lee, & Monroe Counties, Florida - Feasibility Scoping Meeting Documentation
2	Author	Cover/p.1	US Army Corps of Engineer (Corps) – Jacksonville District – South Atlantic Division
3	Date	Cover/p.1	November 2005
4	Sponsoring agency / publisher	Cover/p.1	South Florida Water Management District (SFWMD)
5	Purpose of study or document	Study Background/p.1	<ul style="list-style-type: none"> • Initiated in August 1999, as part of the Restudy reconnaissance and feasibility studies. • Has only a scoping phase (instead of another reconnaissance phase) to further identify water resources problems and opportunities, gather existing data, develop the scope and cost of the feasibility study, and execute a study cost-share agreement between the US Army Corps of Engineers and SFWMD. • Investigates water resources problems and opportunities in all or parts of Lee, Collier, Hendry, Glades, Charlotte, and Monroe counties. • Determines the feasibility of making structural, non-structural, and operational modifications and improvements in the region in the interest of environmental quality, water supply, and other purposes.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR	All	<ul style="list-style-type: none"> • Report covers all of Lee County; • Report presents: <ol style="list-style-type: none"> (1) <u>The comprehensive regional plan of action</u> to address the health of

DRAFT

	Environmentally Sensitive Resources and Environmental Issues in Appendix C.)		<p>aquatic and upland ecosystems; the quantity, quality, timing, and distribution of water flows; agricultural, environmental, and urban water supply; the sustainability of economic and natural resources; flood protection; fish and wildlife; biological diversity; and natural habitat.</p> <p>(2) <u>Selected models for hydrologic, water quality, salinity, and coastal mixing modeling purposes</u></p> <p>(3) <u>SWF species management measures</u></p> <p>Study covers a large area in comparison to the DR/GR lands so in terms of natural resources it can be difficult to evaluate the maps in terms of DR/GR area. For example, historic vegetation map is based on cell sizes of 20 acres.</p>
7	Summary of report content		
7 a	General information and overall content	<p>1</p> <p>2/p.7</p> <p>2/p.8</p>	<ul style="list-style-type: none"> • Description of the study authority and of the study area • Must evaluate alternatives in the context of future conditions “without and with a plan” – i.e., conditions in the planning area, in 2050, if no federal action is taken versus conditions if alternative plans are implemented. Should not evaluate based on “Before-and-after” – i.e., should not compare conditions that exist now to the conditions expected to exist in the future after they have been changed by a plan. • The benefit/impact analyses conducted at local and system-wide scale. Regional models will be used to assess impacts to overall system, while sub-regional models were used to assess impacts to the project area. • Planning horizon extends from 2015, the base year, to 2050, the end point. The period of economic analysis will be 50 years, and will cover:

DRAFT

		<p>2.2.1/p. 64</p> <p>2/p.66-p.74</p>	<ol style="list-style-type: none"> 2. Public and conservation lands, 3. Golf courses, 4. County future plans (population density estimates for 2025 and 2050), 5. Special areas, 6. Agriculture, 7. General Rules for Distributing Future Land Use, 8. Estimation of 2025 and 2050 Land Use, 9. Results of the Distribution of Future Land Use (Lee County – p.41). <p>– Pre-Development Conditions: vegetation – based on Natural Soils Landscape Position map (South Florida Water Management District 2001) corrected using historical aeriels and personal communication with individuals having long-term knowledge of the area. Final map is based on approx. 20 acre cell size – relatively large-scale in terms of DR/GR area.</p> <ul style="list-style-type: none"> ▪ Public Concerns – As part of the CERP goal to understand public concerns, a series of public workshops was conducted early in the planning process. Numerous public concerns relevant to the DR/GR lands were identified. • Water Shed Problems Matrices – Problems include increasing urbanization, land conversion, water quality degradation, habitat loss and fragmentation, hydrologic alterations, suppression of natural fire regimes, increased flooding/drought cycles, and invasion by exotic plant and animals. The conclusion is that under current conditions, historic functions of the area cannot be maintained. If no preventive measures are taken, the system will continue to decline. In addition, current degraded ecological
--	--	---------------------------------------	---

DRAFT

		<p>2/p. 74 - 2/p. 81 2/p.82 2/p. 84 3/ p. 88 & 3/p. 94</p>	<p>conditions will likely not be maintainable into the future without preventive measures.</p> <ul style="list-style-type: none"> • The Tidal Caloosahatchee watershed, the Freshwater Caloosahatchee watershed, The Estero Bay watershed and The Big Cypress watershed & details. Conclusions summarized in list form. • Restoration Opportunities: Restore and improve wildlife habitat; Improve water quality; Improve timing of water quantities; Reestablish seasonal water level fluctuation patterns. Numerous opportunities are identified within DR/GR lands. • Planning goals and objectives: Restore ecological values (including habitat heterogeneity, surface and ground water resources, and hydrologic linkages), maintain economic values and social well-being (including water supply, water quality, and flood control). • Plan Evaluation Strategy – Describes screening criteria used to rank management measures in terms of regional goals. • Formulation and Evaluation of Preliminary Plans: (1) More natural flows to the coast (i.e. aquifer storage and recovery (ASRs)); (2) Major freshwater wetlands / altered hydrology of freshwater wetlands and water bodies in Southwest Florida; (3) Sensitive lands (including landscape-level habitat integrity); (4) Watershed control (hydrating soil/raising water table); (5) Stormwater treatment; (6) Groundwater extraction; (7) Estuary; (8) Education – Best Management Practices; (9) Land use management – zoning,
--	--	--	--

DRAFT

			<p>Ecolab for in-stream processes in each of the four sub-regions.</p> <ul style="list-style-type: none">- The spreadsheet model to be used by the Southwest Florida Feasibility Study will be similar to the work done by Janicki Environmental, Inc. for the Florida Department of Environmental Protection report titled "Pollutant Loading and Abatement Analysis for the C-43 Basin", November 2002. The model uses a runoff coefficient based on land use and soils along with rainfall to determine loading rates for various constituents of interest including Total nitrogen (TN) and total phosphorus (TP). Attributes associated with land use needed to compute the loading rates include runoff coefficients and event mean concentrations (EMC).- The Watershed Management Model (WMM) was developed by Camp Dresser and McKee for the US Environmental Protection Agency to serve as a watershed water quality loading model to estimate seasonal and annual pollutant loads from non-point sources.- <u>Salinity and coastal mixing</u> for the Caloosahatchee Estuary and Estero Bay areas will be modeled using the CH3D hydrodynamic model developed by Dr. Peter Sheng.- Flow data from the MIKE SHE models will be used as inflow into the <u>hydrodynamic model</u>.- The modeling process will be considered final when flow and stage data (from the hydrologic models for inland habitat units) and salinity values (from the hydrodynamic model for coastal habitat units) will be used in the ecological models developed by Natural Systems Group, Frank Mazotti and Leonard
--	--	--	---

DRAFT

	<p>specific dates, water level data, etc.)</p>	<p>2/p.17</p> <p>2/p.18-19</p> <p>2/p.25-26</p> <p>2/p.44</p> <p>2/p.95</p> <p>2/p.99</p> <p>2/p.124</p>	<p>mean concentrations (EMCs) for specific land use types (Table 2).</p> <ul style="list-style-type: none"> • Table ranking of typical Total Nitrogen (TN) and Total Phosphorus (TP) loads in pounds/acre per year (Table 3). • Table of estimated annual runoff volumes, existing and future loads of total nitrogen and total phosphorus, change in total nitrogen and total phosphorus loads by basin and land use (Tables, 4, 5, 6 and 7). • Table with present/future water withdrawals for each county (Table 8 and 9) • Summary table of selected land use categories for 2000, 2025 and 2050 (Table 28) • Description of unnatural flows (Table 36) • Altered hydrology of freshwater wetlands and water bodies in Southwest Florida (Table 37) • Lee County Regional Restoration Coordination Team (RRCT) Database (Table 39) – Project title, justification and description – For example: <u>Agripartners</u> – Six square mile property, east of I-75, opposite the Brooks and is headwaters for Halfway Creek and habitat for Florida panther, wood stork, Eastern indigo snake (confirmed), black bear, Big Cypress fox squirrel, and all other listed wading birds – • Exotic removal / replant natives • Removal of hydrologic
--	--	--	--

DRAFT

		3/p.145 VI/p.160	<p>alterations, including unculverted power line road • Restoration of three borrow pits paralleling I-75.</p> <ul style="list-style-type: none"> • Model Type and Application (Table 40) • List of Future Milestones/Completion Dates
7 c	Useful maps and overlays	I/p.6 2/p.41 2/p.83 3/p.91 3/p92 3/p97 3/p107 3/p142	<ul style="list-style-type: none"> • Southwest Florida Feasibility Study study area boundary (Figure 1) • Lee County Future Land Use (Figure 5) • Potential Restoration Sites in Study Area (Figure 10) (could be helpful overlay for Lee County Master Mitigation Plan). • Species Richness (Figure 11) – Check with Florida Fish and Wildlife Conservation Commission (FWC) for updates • Biodiversity Hotspots (Figure 12) - Check with Florida Fish and Wildlife Conservation Commission for updates • Unnatural Flows to the Coast (Figure 13) • Southwest Florida Feasibility Study Restoration Projects – Phase I (Figure 14) (could be helpful overlay for Lee County Master Mitigation Plan). • Interactions between the hydrologic models and general applications (Figure 15)
7 d	Relevant results and conclusions	2	<ul style="list-style-type: none"> • Plan to review impacts of restoration projects – goals and objectives

DRAFT

		3 Appendix A 3/p. 107	<ul style="list-style-type: none"> • Detailed description of the models used to review alternative plans for restoration – feasibility studies • Detailed description of the SWF species management measures • Based on ranking of management measures, the DR/GR lands contain many potential restoration projects that rank “highest” in terms of benefits to environmental resources.
7 e	Findings/ Recommendations		<ul style="list-style-type: none"> • This report can be used as a model to plan DR/GR area changes, because it describes the steps and the methodologies necessary to quantify changes in an ecological system.
8	Summary of report strengths and weaknesses		<ul style="list-style-type: none"> • Overall useful discussion of water resources problems and opportunities in all or parts of Lee, Collier, Hendry, Glades, Charlotte, and Monroe counties. • Well-researched and documented way to determine the feasibility of making structural, non-structural, and operational modifications and improvements in the region in the interest of environmental quality, water supply, and other purposes. • Maps maybe out-of-date, since they are updated periodically. Individuals wanting to use any data layers reported within this document should contact South Florida Water Management District directly to obtain the most up-to-date versions.
8 a	Evaluation of study approach and conduct		<ul style="list-style-type: none"> • Good planning tool with modeling details and species management measures for specific counties • Good compilation of models, input data and expected results. • Includes measures of extent to which management tools contribute to landscape integrity. • Conducted on a regional scale, therefore better tool in terms of tracking landscape-scale changes and cumulative impacts than for

DRAFT

			review of specific parcels of land within the DR/GR area.
8 b	Extent to which report is “up to date”		<ul style="list-style-type: none"> • The report is up to date (i.e., the most recent data are no older than 2 to 3 years old), and a sufficient historical data range appears to have been used. Current data evaluation and models are utilized. ▪ “Hot spot” GIS coverage based on Florida Fish and Wildlife Conservation Commission “Closing the Gaps” study (1994) is used as a scoring criterion for prioritization of projects. These maps are being updated continually and the most up-to-date versions should be obtained directly from Florida Fish and Wildlife Conservation Commission for future rankings. ○ It is noted that assumptions must be made in terms of future land use and water use information. As more information becomes available the models could be updated to provide more accurate forecasts.
8 c	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> • The report is complete and achieves its stated goal. • A more complete review of the modeling analyses described in this report would require the input/output files for each analysis of interest.
8 d	Relationship to, and consistency with, other studies / reports		<ul style="list-style-type: none"> • This study summarizes restoration plans and the methodologies to achieve them and evaluate their implications. It may overlap information in other CERP reports. • The Southwest Florida Feasibility Study Listed Species Measures uses as source the South Florida Multi-Species Recovery Plan and Florida Fish and Wildlife Conservation Commission guidelines, Federally Listed Species, Species Level and Habitat Level Recovery Actions. • Due to differences in terminology, it is difficult to compare hydrologic information (hydroperiod and inundation ranges) of ecological communities reported in this study to that reported in the South Lee County Watershed Plan. They appear to be relatively comparable, although deviations in terms of maximum or minimum

DRAFT

			<p>hydroperiod and inundation depths vary somewhat.</p> <ul style="list-style-type: none">• Identifies similar public concerns and regional watershed problems noted in the Estero Bay State of the Bay Report and the Lower Charlotte Harbor Reconnaissance Report. Conclusions regarding lack of maintainability of a range of ecological functions are also in agreement with other reports/documents.
--	--	--	---

Caloosahatchee Estuary and Charlotte Harbor Conceptual Model

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover/p.1	Caloosahatchee Estuary and Charlotte Harbor Conceptual Model
2	Author	Cover/p.1	Tomma Barnes, South Florida Water Management District Mark Salvato, U.S. Fish & Wildlife Service
3	Date	Cover/p.1	May 22, 2006
4	Sponsoring agency / publisher		South Florida Water Management District (SFWMD)
5	Purpose of study or document	B. Introduction/ p.1	<ul style="list-style-type: none"> • Describe study area to understand how this system responds to stressors in order to be able to provide a basis for well-informed management decisions.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)	All	<ul style="list-style-type: none"> • Report covers Caloosahatchee River watershed, which includes portion of Lee County. • Descriptive. Useful as literature review (11 pages of references)
7	Summary of report content		
7 a	General information and overall content	B/p.1 C/p.2	<ul style="list-style-type: none"> • Description of the study area • <u>External Drivers.</u> <ul style="list-style-type: none"> ○ Water Management (WM) – WM practices have resulted in habitat alterations, causing large fluctuations in the volume, timing and frequency of freshwater inflow to the estuary and on the ecology of the system through salinity zonation. (Salinity zonation represents a natural characteristic of a water body which is used to divide the estuarine and inshore coastal waters. Salinity zonation based on the NOAA National Estuarine Inventory

DRAFT

			<p>classifies the water bodies in: Tidal Fresh Zone (0-0.5), Mixing Zone (0.5-25) and Seawater Zone (>25). Salinity zones are interpolated using annual average values over the water column for each sampling station.)</p> <ul style="list-style-type: none"> ○ Natural Phenomenon – sea level rise ○ Growth and Development – C-43 canal
		C/p.3	<ul style="list-style-type: none"> ● <u>Ecological Stressors</u> (1) Altered hydrology & freshwater flow (2) Habitat alteration and loss (3) Changes in water quality & increased sediment contaminants and (4) Boating and fishing pressure.
		D/p.4	<ul style="list-style-type: none"> ● <u>Ecological attributes identified as indicators of biological/ecological stress:</u> (1) Submerged aquatic vegetation community structure, and function, (Number, diversity, dispersion, and their impact on ecological conditions.) (2) Oyster bar community structure, and function, (3) Mesohaline benthic community structure and function, (4) Fisheries community structure and function, (5) Manatee demographics, (6) Shoreline community structure and function, (7) Algal blooms community structure & function, (8) Wading birds community structure & function.
		E/p.8	<ul style="list-style-type: none"> ● <u>Ecological Effects</u> (1) Loss of shoreline habitat and function, (2) Altered salinity regime, (3) Increased manatee mortality, (4) Decrease of submerged aquatic vegetation, (5) Increased nutrients & contaminants, (6) Changes in sediment, (7) Decrease of fish populations.
		F/p.13	<ul style="list-style-type: none"> ● <u>Research Questions</u> (1) Relationship of water management practices to estuarine protection and restoration. (2) Relationship of manatee

DRAFT

		<p>G/p.13</p> <p>H/p.14</p>	<p>mortality to red tide (3) Relationship of blue crab fishery to temperature, salinity and other water quality parameters. (4) Relationship of mollusk populations and fish recruitment to submerged aquatic vegetation and salinity. (5) Relationship of current and historical submerged aquatic vegetation coverage to potential distribution.</p> <ul style="list-style-type: none"> • <u>Hydrological Performance Measures</u> – Reader is directed to an addendum of the Southwest Florida Feasibility Study • <u>Ecological Performance Measures</u> <ol style="list-style-type: none"> 1. <u>Submerged aquatic vegetation structure and function</u> – needs to be increased by achieving proper salinity range 2. <u>Oyster bar, community structure and function</u> – needs to be increased by achieving proper salinity range (see Salinity Envelope under Hydrologic Performance Measures). 3. <u>Mesohaline benthic community structure and function</u> – needs to be increased by achieving proper salinity ranges for these freshwater species of clam. 4. <u>Fisheries community structure and function</u> - The target is to restore assemblages with abundance, taxonomic composition (Pertaining to, or involving, taxonomy, or the laws and principles of classification; classificatory), diversity and representation of life stages characteristic of targeted salinity regimes for each estuary. 5. <u>Manatee demographics</u> – achieved by maintaining and enhancing current habitat and foraging areas for manatees in the estuaries and canals to promote species recovery. 6. <u>Algal Blooms Community Structure & Function</u> – The performance measures are algal bloom frequency, duration, identity, concentration and negative effects.
--	--	-----------------------------	---

DRAFT

		H/p.15	<p>7. <u>Wading Bird Community Structure & Function</u> –The performance measures for are wading bird foraging and nesting surveys.</p> <ul style="list-style-type: none"> • <u>Baseline Conditions and Drivers for Water Quality in the Caloosahatchee Estuary and Lower Charlotte Harbor</u> – Water Quality Assessments (Table 1 – p.20 – 1998-2003 models summaries - 2003 Tetra Tech, Inc. results are missing). • Florida Department of Environmental Protection classified three water bodies in the Caloosahatchee Estuary and Lower Charlotte Harbor as potentially impaired based on chlorophyll-a, dissolved oxygen (dissolved oxygen), fecal coliform, copper, lead, and or biology.
		I/p.21	<ul style="list-style-type: none"> • <u>Linkage Between Water Quality and Attributes</u> - This section examines how deviations, from a defined baseline, in the chemical and physical parameters measuring water quality, stress the ecological system by affecting the health and distribution of the indicators that describe the system’s attributes.
		p. 37	<ul style="list-style-type: none"> • <u>Southwest Florida Feasibility Study - Caloosahatchee Estuary Hydrologic Evaluation Performance Measures</u> – Presents S-79, Shell Point, and San Carlos Bay <u>Freshwater Inflow limitations to maintain salinity in the targeted ranges.</u>
7 b	Specific relevant data (e.g. water quality sampling for specific dates, water level data,	I/p.20	<ul style="list-style-type: none"> • Summary of findings of water quality assessments in the Caloosahatchee Estuary, San Carlos Bay, Pine Island Sound and Matlacha Pass (Table 1).

DRAFT

	etc.)		
7 c	Useful maps and overlays	I/p.6	<ul style="list-style-type: none"> No map of the study area is included in this document.
7 d	Relevant results and conclusions		<ul style="list-style-type: none"> Presents inflow limitations in the C-45 canal to maintain salinity within required levels for ecological restoration.
7 e	Findings/ Recommendations		<ul style="list-style-type: none"> Add a map of the Conceptual Ecological Model area. Revise Table 1 to either delete last column or populate it with the missing information.
8	Summary of report strengths and weaknesses		
8 a	Evaluation of study approach and conduct		<ul style="list-style-type: none"> Good descriptive document for Caloosahatchee Estuary Good summary of the flow restrictions to the Caloosahatchee Estuary with the purpose of restoring the salinity along its longitudinal axis required to support naturally occurring conditions for estuarine biota (estuarine biota is the total collection of organisms of an estuary) by using the following methods: (1) reduction of wet season high flow from the watershed, capturing and storing this water, and then releasing it during the dry season in a more environmentally sensitive and beneficial manner to estuarine resources, and (2) reducing discharges from Lake Okeechobee to the Caloosahatchee Estuary.
8 b	Extent to which report is “up to date”		<ul style="list-style-type: none"> The report is up to date (i.e., the most recent data are no older than 2 to 3 years old), and a sufficient historical data range appears to have been used. Current data evaluation and models are utilized.
8 c	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> The report is complete and achieves its stated goal. Missing a map of the conceptual model area. Missing 2003 Tetra Tech, Inc. results (Table 1 – p.20)
8 d	Relationship to, and consistency with, other studies / reports		<ul style="list-style-type: none"> This study summarizes numerous existent documents to describe and evaluate the ecological problems and presents the summary form of the Caloosahatchee Estuary and Charlotte Harbor Conceptual Ecological Model.

Big Cypress Basin Conceptual Ecological Model

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover/p.1	Big Cypress Basin Conceptual Ecological Model
2	Author	Cover/p.1	Art Roybal, U.S. Fish and Wildlife Service
3	Date	Cover/p.1	May 22, 2006
4	Sponsoring agency / publisher		South Florida Water Management District (SFWMD)
5	Purpose of study or document	2. Introduction/ p.1	<ul style="list-style-type: none"> Describe study area to understand how this system responds to stressors in order to be able to provide a basis for well-informed management decisions.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)	All	<ul style="list-style-type: none"> Report covers Big Cypress region, which includes a portion of Lee County. Descriptive. Useful as literature review (5 pages of references)
7	Summary of report content		
7 a	General information and overall content	2/p.1 3/p.2	<ul style="list-style-type: none"> Description of the study area – comparable to the freshwater Everglades in terms of natural community diversity, although the Big Cypress communities are primarily forested and tend to form more of a mosaic. <u>External Drivers and Ecological Stressors</u> <ul style="list-style-type: none"> Development for agricultural and residential use. Changes in land use associated with agricultural and residential development not only cause habitat loss on the affected lands, but fragmentation of the habitat mosaic

DRAFT

		3/p.4	<ul style="list-style-type: none"> • Water Quality – Baseline Conditions <ul style="list-style-type: none"> ○ Florida Department of Environmental Protection indicates that three water bodies influencing water quality within the Big Cypress Swamp are potentially impaired for dissolved oxygen, fish consumption (for mercury), cadmium, and copper in the Tamiami Trail; dissolved oxygen and nutrients in the L28 Interceptor, and dissolved oxygen in the L28 Gap.
		3/p.4	<ul style="list-style-type: none"> • Water Quality of Site Specific Areas within the Big Cypress Basin – L28 Drainage, Barron River Canal, Lake Trafford, and Southern Golden Gate Estates.
		4/p.5	<ul style="list-style-type: none"> • <u>Ecological attributes identified as indicators of biological/ecological stress</u> - Attributes are the biological indicators or components of natural systems, which are representative of the overall ecological conditions of the system. Attributes typically are populations, species, guilds, communities or processes. Attributes (also known as indicators or endpoints) are selected to represent the known or hypothesized effects of the stressors (e.g., numbers of nesting wading birds), and the elements of the systems that have important human values (e.g., endangered species, sports fishing). For the Big Cypress region they are: (1) Vegetation community gradients and habitat mosaic (vegetation community gradients represents vegetation spatial distribution changes from a zone to another. Habitat mosaic represents areas where many species live and grow, in a scattered pattern.), (2) Breeding birds (including red-cockaded woodpecker), (3) Aquatic fauna, (4) Wood stork & wading birds, (5) Florida panther and prey.
		5/p.12	<ul style="list-style-type: none"> • <u>Ecological Effects</u> - Ecological effects are the biological responses caused by the stressors. They are critical linkages between stressors and attributes. For the Big Cypress region they are:

DRAFT

		<p>p. 15</p>	<ul style="list-style-type: none"> – <u>For Vegetation Community Gradients and Habitat Mosaic:</u> (1) Relationship of vegetation to reduced hydrologic regime, (2) Relationship of vegetation to habitat loss and fragmentation, (3) Relationship of vegetation to exotic plant invasion, (4) Relationship of vegetation to exotic hog impacts, (5) Relationship of vegetation to fire, (6) Relationship of vegetation to nutrient inputs. – <u>For Wetland Aquatic Fauna:</u> (1) Relationship of aquatic fauna populations to habitat loss, (2) Relationship of marsh fish populations to hydroperiod, (3) Relationship of marsh fish populations to exotic fishes, (4) Macroinvertebrate and herpetofauna populations: controlling variables and functional importance (5) Relationship of the health of aquatic fauna to environmental contaminants. – <u>For Wood Stork & Wading Birds:</u> (1) Relationship of wood stork nesting to density, size structure and seasonal concentration of marsh fish populations – <u>For Florida Panther:</u> (1) Relationship of Florida panther population to habitat loss and fragmentation and (2) Relationship of Florida panther health to bioaccumulation of environmental contaminants. <p><u>Florida Panther</u> Discusses relationship of Florida panther population to habitat loss and fragmentation. States with a high level of certainty that it is well established that habitat loss and fragmentation are among the most important threats to persistence of Florida panthers (Maehr 1990; Maehr et al. 2002)</p> <p>Discusses relationship of Florida panther to bioaccumulation of environmental contaminants. States with a moderate level of certainty that there are a number of reasons for concern about contaminants and their potential effects on the</p>
--	--	--------------	--

DRAFT

		8/p.18	<ul style="list-style-type: none">• <u>Ecological Performance Measures</u> – Ecological performance measures were developed based primarily on attributes identified in the Big Cypress Conceptual Ecological Model. Some attributes were not included because there was not a clear relationship to restoration actions (i.e., black bear presence, distribution, and relative abundance, red-cockaded woodpecker nesting success, or panther habitat)
		9/p.18	<ul style="list-style-type: none">• <u>Water Quality Performance Measures</u> - The Southwest Florida Feasibility Study Water Quality Sub-team has developed two sets of performance measures:<ol style="list-style-type: none">1. Evaluation measures (Table 1 – p.19): Dissolved oxygen, salinity (PSU), turbidity, photosynthetically active radiation (PAR)/color, chlorophyll-a (Chl-a), total nitrogen, dissolved inorganic nitrogen (DIN), soluble reactive phosphorus (SRP), total phosphorus (TP).2. Assessment measures (Table 2 – p.20): Dissolved oxygen, specific conductance, turbidity/ total suspended solids / color, photosynthetically active radiation (PAR) / secchi disc depth, chlorophyll-a (Chl a), total nitrogen / ammonia nitrogen / total kjeldahl nitrogen / nitrate / nitrite / dissolved inorganic nitrogen, total phosphorus/ orthophosphate/soluble reactive phosphorus, chloride, sulfate, silica, pesticides and trace metals.
		10/p.21	<ul style="list-style-type: none">• Model Diagram

DRAFT

7 b	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		<ul style="list-style-type: none"> • Water quality evaluation and assessment constituent information (Tables 1 and 2).
7 c	Useful maps and overlays		<ul style="list-style-type: none"> • No map of the study area is included in this document.
7 d	Relevant results and conclusions		<ul style="list-style-type: none"> • Panther habitat was not included in the model as an attribute.
7 e	Findings/ Recommendations		<ul style="list-style-type: none"> • Add a map of the Conceptual Ecological Model area. • Add Conceptual Ecological Model results.
8	Summary of report strengths and weaknesses		
8 a	Evaluation of study approach and conduct		<ul style="list-style-type: none"> • Good descriptive document for Big Cypress region • Good summary of the constituents to be included for evaluation measures and assessment measures.
8 b	Extent to which report is “up to date”		<ul style="list-style-type: none"> • The report is up to date (i.e., the most recent data are no older than 2 to 3 years old), and a sufficient historical data appears to have been used. • Current data evaluation and models are utilized.
8 c	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> • The report is complete and achieves its stated goal to create a Conceptual Ecological Model to study. • Missing a map of the conceptual model area.
8 d	Relationship to, and consistency with, other studies / reports		<ul style="list-style-type: none"> • This study summarizes numerous existent documents to describe and evaluate the ecological problems.

DRAFT

Southwest Florida Feasibility Study Scoping Letter

Item	Description	Sect / Page	Information from Report
1	Document Title		Southwest Florida Feasibility Study Scoping Letter
2	Author		Marie G. Burns Chief, Environmental Branch
3	Date		April 27, 2006
4	Sponsoring agency / publisher		Department of the Army Jacksonville District Corps of Engineers P.O. Box 4970 Jacksonville, FL 32232-0019
5	Purpose of study or document		To announce the initiation of the U.S. Army Corps of Engineers Southwest Florida Study and to meet one of the requirements of NEPA to request public input to help the Corps formulate a plan for the Feasibility Study and to identify resources and impacts to those resources by the project.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		The Southwest Florida Feasibility Study study area covers approximately 4,300 square miles including all of Lee County (including DR/GR lands east of Interstate 75), as well as other nearby counties.
7	Summary of report content		
7 a.	General information and overall content		This open letter from the Army Corps is to inform the public that the Jacksonville District has initiated a Feasibility Study (FS) to address water resource problems in Southwest Florida, under the local sponsorship of the South Florida Water Management District. The objective of the study is to develop a comprehensive regional plan for addressing water resource problems and opportunities. The study will develop and evaluate alternative plans and recommendations for structural, non-structural, and operational

DRAFT

			<p>modifications and improvements in the region. The study will compile information on and consider a wide variety of environmental factors and issues including:</p> <ul style="list-style-type: none"> - restoration of estuarine, aquatic, wetland and upland ecosystems; - water flows; - future agricultural, environmental, and urban water demand and supply; socio-economic resources; aquifer recharge; - conversion of public conservation lands to water storage areas; - water quality; - impacts to the estuaries; - flood protection; - land acquisition; - fish and wildlife resources; - impacts to protected species; - cultural resources; - fragmentation and/or loss of habitat; - and other impacts identified as the study progresses.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		NA
7 c.	Useful maps and overlays		Map attached to memo showing the Southwest Florida Feasibility Study area.
7 d.	Relevant results and conclusions		NA
8	Summary of report strengths and weaknesses		NA
8 a.	Evaluation of study approach and conduct		NA
8 b.	Extent to which report is “up to date”		NA
8 c.	Completeness / data gaps / remaining information needs		NA

DRAFT

8 d.	Relationship to, and consistency with, other studies / reports		This letter announces the initiation of the U.S. Army Corps of Engineers Southwest Florida Feasibility Study, which represents a more recent and more localized phase (with respect to Lee County DR/GR lands) of the study described in the 1999 South Florida Feasibility Study report.
------	--	--	---

DRAFT

Southwest Florida Feasibility Study Component Location Map

Item	Description	Sect / Page	Information from Report
1	Document Title		Southwest Florida Feasibility Study Component Location Map
2	Author		US Army Corps of Engineers
3	Date		September 19, 2006
4	Sponsoring agency / publisher		Department of the Army Jacksonville District Corps of Engineers P.O. Box 4970 Jacksonville, FL 32232-0019
5	Purpose of study or document		Depict locations of Southwest Florida Feasibility Study components
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		The Southwest Florida Feasibility Study study area covers approximately 4,300 square miles including all of Lee County (including DR/GR lands east of Interstate 75), as well as other nearby counties. Yellow areas on this map show the location of Southwest Florida Feasibility Study components within the DR/GR lands of southeast Lee County.
7	Summary of report content		
7 a.	General information and overall content		Map showing location of Southwest Florida Feasibility Study components in southwest Florida including Lee County.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		NA
7 c.	Useful maps and overlays		This map is useful in depicting the location and geographic interrelationships of the planned components of the Southwest Florida Feasibility Study.
7 d.	Relevant results and conclusions		NA
8	Summary of report strengths		NA

DRAFT

	and weaknesses		
8 a.	Evaluation of study approach and conduct		NA
8 b.	Extent to which report is “up to date”		NA
8 c.	Completeness / data gaps / remaining information needs		NA
8 d.	Relationship to, and consistency with, other studies / reports		This map accompanies other Southwest Florida Feasibility Study documents that describe the FS study area and components.

Comprehensive Everglades Restoration Plan (CERP)

Item	Description	Sect / Page	Information from Report
1	Document Title	Cover	Comprehensive Everglades Restoration Plan (CERP) System-wide Performance Measures
2	Author	Cover	CERP
3	Date	Cover	March 16, 2006
4	Sponsoring agency / publisher		Central And South Florida Project
5	Purpose of study or document	Executive Summary (ES-p.1) 1.0 (p.1-1)	This report identifies and documents the specific set of system-wide performance measures developed by the RECOVER technical teams to date, and reviews the processes for developing and revising performance measures. The report also describes the application of performance measures in CERP planning and some of the uncertainty associated with that application.
6	Relevance to DR/GR lands in southeast Lee County		Covers Caloosahatchee Basin (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)
7	Summary of report content		
7 a.	General information and overall content	1.0 (p.1-1) 2.0 (p.2-1) 2.0 (p.2-2)	This document identifies and describes the system-wide CERP performance measures. These measures are to be scientifically based using the best science and practices available. It is intended to be a “living” document where the performance measures are updated as science and practice improves. “Performance measures are planning tools used to determine the degree to which proposed alternative plans are likely to meet restoration objectives, or implemented plans have met restoration objectives.” “These land use and water management practices over the past 100 years have resulted in either loss or extensive alteration of the defining

Comprehensive Everglades Restoration Plan Performance Measures

DRAFT

			characteristics of South Florida's pre-drainage ecosystem.”
		3.0 (p.3-1)	<u>The performance measures were developed based on the Conceptual Ecological Model.</u> The Conceptual Ecological Model was developed based on <u>11 regional Conceptual Ecological Model</u> : Barnes 2005, Browder et al. 2005, Crigger et al. 2005, Davis et al. 2005a, 2005b, Duever 2005, Havens 2005, Ogden 2005, Rudnick et al. 2005, Sime 2005, VanArman et al. 2005.
		3.0 (p.3-1)	“These conceptual ecological models illustrate links among societal actions, environmental stressors and ecological responses, and provide a basis for developing and testing a set of causal hypotheses that best explain why natural systems in South Florida have been altered.”
		3.0 (p.3-1)	The <u>South Florida Conceptual Ecological Models were evaluated</u> to: <ul style="list-style-type: none"> • Illustrate ecological links between physical, chemical and biological elements in specific physiographic regions of South Florida. • Develop a suite of causal hypotheses linking the most important hydrological, physical and chemical stressors with major ecological effects as a basis for predicting responses to restoration projects. • Create a set of measurable indicators of success as a basis for evaluating and assessing how well projects meet broad, policy-level goals that have been established for the regional restoration program.
		3.0 (p.3-6)	The <u>performance measures were developed to meet the following criteria</u> : <ul style="list-style-type: none"> • The performance measure should change as a direct result of a CERP implementation. • The performance measure should be part of an ecological conceptual model or have regulatory basis. • The performance measure should be a strong indicator of ecosystem health or the ecosystem should be very sensitive to it. • The performance measure indicator should either be an indicator of 1)

**Comprehensive Everglades Restoration Plan
Performance Measures**

DRAFT

		<p>3.0 (p.3-3)</p>	<p>an important ecological process (e.g., food webs, energy transfer), 2) an important ecological structure (e.g., fragmentation, compartmentalization, succession, disturbance, biodiversity), or 3) an indicator of major environmental change (e.g., hydrology, fire, water quality).</p> <ul style="list-style-type: none"> • The performance measure indicator should be a regional indicator of CERP performance (versus a project-level measure). • The performance measure should provide information not provided by other performance measures being recommended for the physiographic region. • The performance measure indicator should be measurable or indirectly measured using surrogate indicators. • The performance measure should have a relatively strong degree of predictability. Changes in the performance measure resulting from CERP implementation should be easily distinguished from those contributed by other factors and a mechanism should be available to predict future performance for project planning purposes. • Consider if: (1) The species are state/federally listed threatened/endangered; (2) The species have high aesthetic value/public appreciation; (3) The species have an important recreational/commercial value <p>Presents <u>guidelines</u> to complete performance measure Documentation Sheets</p> <ul style="list-style-type: none"> • Title • Justification • Relationship to Conceptual Ecological Models and Adaptive Assessment Hypotheses • Restoration Expectation: (1) Predictive metric and target, which represent the desired restoration conditions obtained through modeling or other predictive methods; (2) Assessment parameter and target, which serve as the basis to assess responses monitored in the
--	--	--------------------	---

**Comprehensive Everglades Restoration Plan
Performance Measures**

DRAFT

		<p>3.0 (p.3-9)</p>	<p>field in natural and human systems following CERP implementation.</p> <ul style="list-style-type: none"> • Evaluation Application; (1) Evaluation protocol, which provides details regarding the predictive tool used to evaluate the performance measure, data, and additional post-processing methods; (2) Normalized performance output, which represent the numeric performance measure results, normalized and related to the desired restoration condition; (3) Model output; (4) Uncertainty. • Monitoring and Assessment Approach – specifies monitoring and assessment methods related to the performance measure indicator. • Future tool development needed to support performance measure • Additional notes • Information regarding working group members • Acceptance status. • References <p>Presents the <u>review process ten steps</u> - performance measures will be periodically added and refined by RECOVER’s Evaluation and Assessment Teams, as necessary, to incorporate new scientific information and as additional tools become available.</p> <ul style="list-style-type: none"> • Sub-team and module team revision and development of documentation sheet sections • Integration of documentation sheets • 45-day review • Review of comments received • Technical comments addressed • Performance measure working group addresses comments • 14-day review • Performance measure working group addresses comments • acceptance • Posting accepted documentation sheets
--	--	--------------------	---

DRAFT

		4.0 (p.4-1)	<p>Presents the <u>Simplified Conceptual Ecological Model</u> and performance measure Documentation Sheet</p> <ul style="list-style-type: none"> • The overviews focus on simplified Conceptual Ecological Model, which only include those stressors and attributes that will be influenced by CERP implementation. • The regions expected to be affected by CERP implementation, presented in Figure 12, are, for the most part, smaller than those of the Conceptual Ecological Model presented in Figure 9 • Simplified Conceptual Ecological Model were tailored to match the draft 2005 Assessment Strategy for the Monitoring and Assessment Plan (RECOVER 2005b) • The Total System presented here is derived from the Total System Conceptual Ecological Model manuscript recently published in Wetlands (Ogden et al. 2005b) • Performance measures have also been developed for <u>water supply and flood protection</u>, derived from Florida Statutes <p>Each overview is followed by the performance measure documentation sheets for the physiographic region and for water supply and flood protection</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	2.0 (p.2-3)	<p>A major premise of the restoration of Southern Florida is that it can return to pre-drainage characteristics through changes to:</p> <ul style="list-style-type: none"> • Regain lost storage capacity (quantity) • Restore water quality conditions (quality) • Improve timing and quantities of freshwater deliveries to estuaries (timing) • Restore more natural hydro patterns (distribution).
7 c.	Useful maps and overlays		<p>Figure 9 - Satellite image of physiographic regions in South Florida with 11 specific regional conceptual ecological models which have been developed for South Florida.</p> <p>Figure 11 - Performance measure review process</p> <p>Figure 12 – Boundaries of CERP regional modules</p>

**Comprehensive Everglades Restoration Plan
Performance Measures**

DRAFT

7 d.	Relevant results and conclusions		Important – methodology: application of performance measures in CERP planning Evaluation steps
8	Summary of report strengths and weaknesses		Conducted on a region wide scale, therefore better tool in terms of tracking landscape-scale changes and cumulative impacts than for review of specific parcels of land within the DR/GR area.
8 a.	Evaluation of study approach and conduct		Provides good conceptual framework for future research and monitoring within South Florida, including the DR/GR area.
8 b.	Extent to which report is “up to date”		The performance measures were developed based on the most up-to-date models available at the time. It is noted that this document will be updated “periodically” (the timeframe not specified) based on improvements in our basic understanding of the science.
8 c.	Completeness / data gaps / remaining information needs		Complete in terms of the stated goals.
8 d.	Relationship to, and consistency with, other studies / reports		Not directly comparable to many of the studies due to the large scale and conceptual nature of the study. Makes direct use of the Conceptual Ecological Models within the Southwest Florida Feasibility Study.

Greater Everglades Wetlands CEM

Item	Description	Sect / Page	Information from Report
1	Document Title	4.3-p.1	Greater Everglades Wetlands CEM
2	Author		CERP
3	Date		March 16, 2006
4	Sponsoring agency / publisher		South Florida Water Management District (SFWMD)
5	Purpose of study or document		Report “performance measures” that will be used to track the effects of the CERP on the Northern Estuaries”
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		The study reports on wetlands near Lake Okeechobee, which could influence the DR/GR lands. Some of the performance measures pertain to wetlands within the DR/GR lands and could be used to develop a conceptual model for use within the DR/GR area.
7	Summary of report content		Description of the various conceptual ecological models (CEMs) used for Everglades Wetlands to improve certain aspects of the study area using performance measures (PMs).
7 a.	General information and overall content	4.3-p1	<p>This report describes the various CEMs used by the CERP to describe the Greater Everglades Wetlands. The ecological models are:</p> <ul style="list-style-type: none"> • Integrated Hydrology and Water Quality • Coastal Transgression • Tidal Channel Characteristics • Coastal Salinity Gradients • Mangrove Forest Production, Organic Soil Accumulation, and Resilience • Ridge and Slough Landscape Dynamics • Plant Communities/Elevation Gradients • Predator-Prey Interactions of Wading Birds and Aquatic Fauna

DRAFT

			<p>Forage Base</p> <ul style="list-style-type: none"> • Linkage of Periphyton to Higher Trophic Levels • Everglades Crocodilian Populations <p>According to these conceptual models, CERP designed projects to improve certain aspects of the study area. These projects are evaluated using the PMs, as presented in Table 4.</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	4.3-p16	Table 4 – presents the 24 performance measures applicable to Greater Everglades Region.
7 c.	Useful maps and overlays	4.3-p.2	Figure 24 – presents the Boundary of Greater Everglades Wetlands within influence of CERP. This figure is useful since it shows this area in relation to the DR/GR lands.
7 d.	Relevant results and conclusions		<p>The conceptual models show the interaction of:</p> <ul style="list-style-type: none"> • Direct rainfall as primary water source on Greater Everglades wetlands. • Disturbance events: hurricanes, fires freezes on coastal areas. • Sea level/freshwater flow on tidal channel characteristics. • Sheet flow on coastal salinity gradients. • Sea level/freshwater flow & disturbance events: hurricanes, fires freezes on organic soil accumulation. • Sheet flow, eutrophication & nutrients dynamics and exotic plants on ridge and slough landscape dynamics, and plant communities/elevation gradients. • Hydroperiod & site nutrient state, drought severity, multi-year wet/dry cycles, dry season water level recession patterns and sub-lethal effects of toxins on predator-prey interactions. • Site nutrient state and hydroperiod & water depth patterns on linkage of periphyton. • Canal habitat, water depth patterns, estuarine freshwater flow & salinity and hydroperiod on everglades crocodilian population.

DRAFT

8	Summary of report strengths and weaknesses		<ul style="list-style-type: none"> - Overall useful summary of the Conceptual Ecological Models for the Everglades. - Maps maybe out-of-date, since they are updated periodically. Individuals wanting to use any data layers reported within this document should contact SWFMD directly to obtain the most up-to-date versions.
8 a.	Evaluation of study approach and conduct		<p>Appears to evaluate wetlands in terms of their contribution to overall landscape mosaic – important for most wetland systems.</p> <p>Possibly oversimplifies system to the extent that model robustness will be compromised.</p>
8 b.	Extent to which report is “up to date”		The conceptual models of this report are developed from recent, more detailed ecological models: Davis et al. 2005a, 2005b, Duever 2005, and Ogden 2005.
8 c.	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> • The report is complete and achieves its stated goal. • A more complete review of the modeling analyses described in this report would require the input/output files for each analysis of interest.
8 d.	Relationship to, and consistency with, other studies / reports		The water quality data of this study, along with the data presented by Janicki Environmental, Inc. in their Aug. 27, 2003 report, can be compared to future studies for environmental assessment.

DRAFT

Northern Estuaries Conceptual Model

Item	Description	Sect / Page	Information from Report
1	Document Title	4.2-1	Northern Estuaries Conceptual Model
2	Author		Comprehensive Everglades Restoration Plan (CERP)
3	Date		March 16, 2006
4	Sponsoring agency / publisher		South Florida Water Management District (SFWMD)
5	Purpose of study or document		Briefly describes the influence of water management practices on the northern estuaries within the CERP. Reports performance measures that will be used to track the effects of the CERP on the northern estuaries.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		One of the northern estuaries (the Caloosahatchee Estuary) lies within Lee County and is alongside the DR/GR lands.
7	Summary of report content		
7 a.	General information and overall content		<ul style="list-style-type: none"> • This report mentions briefly how water management practices affect: (1) oyster, (2) fish, (3) submerged aquatic vegetation, and (4) benthic infaunal communities. • “Water management practices cause significant volumes of fresh water over a short period of time to enter the estuaries resulting in a sudden drop in salinity,” (pg 4.2-3). The freshwater also carries large amounts of silt, clay and high organic content increasing muck. Water management practices affect the dissolved oxygen content of the estuaries. The change in salinity, development of “muck”, and high oxygen content negatively affect the oyster, fish, submerged aquatic vegetation, and benthic infaunal community. • CERP projects are designed to mitigate the effects of these “water

DRAFT

			management practices” and performance measures are presented to measure how CERP projects mitigate said effects.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Table 3 presents 17 Northern Estuary performance measures
7 c.	Useful maps and overlays		Figure 18 – Boundary of Northern Estuaries within Influence of the CERP along the Gulf Coast. This figure shows the location of the Caloosahatchee Estuary and its proximity to DR/GR lands.
7 d.	Relevant results and conclusions		The change in salinity, development of “muck”, and high oxygen content negatively affect the oyster, fish, submerged aquatic vegetation, and benthic infaunal communities of the northern estuaries.
8	Summary of report strengths and weaknesses		
8 a.	Evaluation of study approach and conduct		This is a brief summary of results or conclusions, the data or the calculated “performance measures” are not presented.
8 b.	Extent to which report is “up to date”		The author cites recent studies that were used to develop this report. Studies: Barnes 2005, Crigger et al. 2005, Sime 2005, and Van Arman et al. 2005.
8 c.	Completeness / data gaps / remaining information needs		This is a brief summary of results or conclusions, the data or the calculated “performance measures” are not presented.
8 d.	Relationship to, and consistency with, other studies / reports		The water quality data of this study, along with the data presented by Janicki Environmental in their Aug. 27, 2003 report, can be compared to future studies for environmental assessment.

NE-3 Caloosahatchee Estuary Salinity Envelope

Item	Description	Sect / Page	Information from Report
1	Document Title	1.0	NE-3 Caloosahatchee Estuary Salinity Envelope
2	Author		Comprehensive Everglades Restoration Plan (CERP)
3	Date	1.0	September 9, 2005
4	Sponsoring agency / publisher		N/A
5	Purpose of study or document		Describe the “performance measure” defined by the CERP for the Caloosahatchee Estuary or its salinity envelope.
6	Relevance to DR/GR lands in southeast Lee County		Proximity of the Caloosahatchee Estuary to DR/GR lands. (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)
7	Summary of report content		
7 a.	General information and overall content		<p>The report suggests controlling the inflow of the Caloosahatchee river into the Caloosahatchee Estuary. Controlling the inflow would control the salinity of the estuary and improve the ecology of the estuary. There are large discharges of freshwater into the estuary. These influxes can lower the salinity to levels harmful to “valued ecosystem components” (VECs) like the tape grass or American oyster. If 75% of inflows are within the 450 to 800 cubic feet per second range, the VECs will feel less of an effect.</p> <p>Based on recent studies, the report hypothesizes that by controlling the salinity, an improvement in VECs will be seen in the estuary. The report proposes to test this through monitoring of the VECs</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		N/A
7 c.	Useful maps and overlays		N/A

DRAFT

7 d.	Relevant results and conclusions		N/A
8	Summary of report strengths and weaknesses		Strengths: Report integrates recent studies into a hypothesis on how to improve the Caloosahatchee Estuary. Recommendations on how to monitor and evaluate the hypothesis are presented. Weaknesses: No alternatives evaluated would meet the target salinity envelope for the study. What would it take to get to that level?
8 a.	Evaluation of study approach and conduct		N/A
8 b.	Extent to which report is “up to date”		The report cites other studies performed within the last 5-15 years. I think that the report is still highly applicable, but could be updated.
8 c.	Completeness / data gaps / remaining information needs		N/A
8 d.	Relationship to, and consistency with, other studies / reports		The water quality data of this study, along with the data presented by Janicki Environmental in their Aug. 27, 2003 report can be compared to future studies for environmental assessment.

DRAFT

**NE-7 Caloosahatchee Estuary Nutrient (Total Phosphorous and Total Nitrogen)
Loading and Concentration**

Item	Description	Sect / Page	Information from Report
1	Document Title	1	NE-7 Caloosahatchee Estuary Nutrient (Total Phosphorus And Total Nitrogen) Loading and Concentration
2	Author		Comprehensive Everglades Restoration Plan (CERP)
3	Date	1	September 9, 2005
4	Sponsoring agency / publisher		CERP
5	Purpose of study or document		Describe the “performance measure” defined by the CERP for the Caloosahatchee Estuary nutrient and concentration.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)		The DR/GR lands lie just east of this study and can be affected by the water quality changes in the estuary and by the changes made to the tributaries to the estuary made by CERP.
7	Summary of report content		
7 a.	General information and overall content	2.0	This document gives the justification for using total phosphorus and total nitrogen as a performance measure of the effectiveness of CERP projects to improve the Caloosahatchee Estuary. Evaluation was done to determine target values of the estuary for both total phosphorus and total nitrogen.
		4.0	It is expected that by establishing the CERP recommended inflow distribution and with lower discharge variability water quality can be improved.
		4.1	CERP’s target is the reduction of both total phosphorus and total nitrogen loading concentrations by 28% in order to maintain the estuary total

DRAFT

		5.1	<p>phosphorus and total nitrogen concentrations near the “Natural Systems Model.” These target concentrations are 0.079 mg/l total phosphorus and 0.92 mg/l total nitrogen. Reported current conditions are 1.28 mg/l total nitrogen and 0.11 mg/l total phosphorus.</p> <p>The target will be assessed by determining how close each concentration approaches its respective target.</p>
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		N/A
7 c.	Useful maps and overlays		N/A
7 d.	Relevant results and conclusions		N/A
8	Summary of report strengths and weaknesses		N/A
8 a.	Evaluation of study approach and conduct		N/A
8 b.	Extent to which report is “up to date”		There are no data attached to the report showing how the CERP projects have influenced this performance measure.
8 c.	Completeness / data gaps / remaining information needs		See 8 b.
8 d.	Relationship to, and consistency with, other studies / reports		The water quality data of this study, along with the data presented by Janicki Environmental in their Aug. 27, 2003 report, can be compared to future studies for environmental assessment.

South Florida Multi-Species Recovery Plan

Item	Description	Sect / Page	Information from Report
1	Document Title		South Florida Multi-Species Recovery Plan
2	Author		U.S. Fish and Wildlife Service
3	Date		1999
4	Sponsoring agency / publisher		U.S. Fish and Wildlife Service
5	Purpose of study or document		To provide a plan to aid in the recovery of 68 listed (i.e. endangered, threatened, or species of special concern) plant and animal species (including State of Florida listed species) through the landscape-level restoration of natural ecological communities throughout South Florida in ways that will optimize benefits to the greatest number of species. To define recovery criteria, develop actions needed to achieve recovery plans, and estimate costs of recovery implementation.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C.)	Section 2/p. 2-6 Section 3	Study area is all of south Florida including Lee County. Most of the DR/GR lands are within the Caloosahatchee subregion as described on page 2-6. Key issues addressed are: vegetation communities, wetlands, invasive/exotic species, rare and unique uplands, native uplands, native vegetation communities, coastal and interior hammocks, rare and unique habitats, native wildlife habitat, migratory bird habitat, critical habitat for listed species, important plant habitats, endangered plant species habitat, conservation lands under public ownership.
7	Summary of report content		
7 a.	General information and overall content	Appendix A and B	- This study is based on input from a diverse team of government, conservation agency, industry, and academic members. Summaries of team members names and affiliations are provided in Appendices A and B.

DRAFT

		<p>Section 1/p. 1-1</p> <p>Section 2/p. 2-2 and 2-6</p> <p>Table 1/p. 2-12</p> <p>p. 2-11</p> <p>p. 2-15</p> <p>p. 2-17</p> <p>p. 2-18</p> <p>p. 2-41, Appendix F, G</p> <p>Section 3/p. 3-1</p>	<ul style="list-style-type: none"> - Section 1 – Introduction – defines terms and objectives, lists variables used to develop recovery criteria and discusses the application of these criteria. - Section 2 – The South Florida Ecosystem – defines watersheds and subregions of South Florida. The majority of the DR/GR lies within the area defined in this study as the Caloosahatchee River subregion. A small part of the southeastern-most DR/GR also lies within the Big Cypress subregion. - Includes a list of species of concern. - Discusses the importance of the region to migratory birds in terms of breeding areas and migratory “stopover” areas. - Discusses the importance of the region to wading bird populations. - Includes a section regarding the importance of estuarine areas, including Estero Bay, to fisheries resources and the economic relevance of these resources to humans. - Contains overview of South Florida economics and land use changes. - Contains a good overview of existing federal, state, local, and private conservation efforts and conservation lands and restoration organizations and efforts within South Florida. - Section 3 – The Ecological Communities – Provides a
--	--	--	---

DRAFT

			<p>community/ecosystem perspective for maintaining biodiversity. Community types relevant to the DR/GR area are mesic pine flatwoods, hydric pine flatwoods, pond swamps, seepage swamps, freshwater marshes/wet prairies, and possibly small areas of mesic temperate hammock and mangroves. These communities are discussed in terms of synonymy (including Florida Natural Area Inventory, Florida Land Use and Cover Classification System codes, and National Resources Conservation Service terminology), wildlife diversity, animals of special concern, vegetation composition, plants of special concern, ecology, soils, status and trends (including hydrologic alterations and water quality issues), susceptibility to exotic species, management issues, proposed restoration actions, and restoration techniques (if any are known). Both types of pine flatwoods appear to be most crucial to the highest variety of plant and animal species and also are some of the habitats least protected by existing law. Management and ecological issues relevant to most community types, including those occurring in the DR/GR, include the importance of protecting and maintaining large, intact, contiguous tracts of land as part of a landscape mosaic containing a variety of native habitats; the lack of adequate legal protection of lack of enforcement of existing protection laws; and the tendency for even small alterations in the landscape, such as deep ruts, tire tracks, any road or other linear structure above grade, etc. to have large potential to interrupt sheetflow and alter hydrology, therefore effecting vegetation structure, wildlife habitat, and susceptibility to exotic infestations. Even small hydrologic alterations were noted to have extensive effects on such wildlife taxa as wading birds, reptiles, amphibians, small mammals, and medium and large carnivores.</p> <p>- Section 3 lists other animal and plant species that are not among the 68 listed here yet are known to rely on the community types discussed in Section 3. It is difficult to determine if the plant species are found within the DR/GR or not.</p>
--	--	--	--

DRAFT

		<p>p. 3-597</p> <p>Section 4/p. 4-1</p>	<ul style="list-style-type: none"> - Although it may be difficult to integrate specific management requirements for each species into an overall land-use policy, the narrow foraging and habitat requirements of a variety of the species discussed makes it clear how even minor habitat and/or hydrologic alterations could have large impacts on many species of concern. - Section 3 also includes a brief discussion of the effects of water quality degradation on seagrass communities in estuarine habitat. - Section 4 – The Species – A compilation of 68 individual species accounts that summarize the biology, ecology, status, trends, management needs, and recovery needs of these species. Species which may be of concern to the DR/GR area summarized in this section are: Florida panther, bald eagle, Everglades snail kite, wood stork, red-cockaded woodpecker (possibly, although no known clusters are located within Lee County), and Eastern indigo snake, and possibly the beautiful pawpaw (a tree that occurs in pine flatwoods in Lee County, possibly not as far east as the DR/GR).
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)	Section 4	<ul style="list-style-type: none"> - Species-level habitat needs and ranges.
7 c.	Useful maps and overlays	<p>p. 2-60</p> <p>p. 3-198</p>	<ul style="list-style-type: none"> - Figure 9 – Existing Mitigation Service Areas (Federal) and Mitigation Banks in South Florida. - Figure 1 – The Distribution of Hydric and Mesic Pine Flatwoods in South Florida (from USGS-BRD 1996).

DRAFT

		p. 3-481	- Figure 1 – The Distribution of Forested Pond Swamps in South Florida (from USGS-BRD 1996).
		p. 3-501	- Figure 1 – The Distribution of Seepage Swamps in South Florida (from USGS-BRD 1996).
7 d.	Relevant results and conclusions	Section 2/p. 2-25	- Found that many listed species are habitat-limited. For these species, limiting factors are similar and include upland and wetland habitat loss, fragmentation, and degradation resulting from urbanization and other land use conversions; wetland drainage and alteration of hydrology; invasion of exotic species; fire suppression; soil subsidence; and increased levels of contamination. These are all issues pertinent to land use decisions within the DR/GR area and are discussed in greater detail in Section 2 of this document (p. 2-25).
		Section 1/p.1-16	- Reduction in habitat quality and quantity threaten South Florida wildlife species more than any other factor. - For some species, including the Florida panther, recovery will require more suitable habitat than currently exists.
		Section 5/p. 5-1	- Section 5 – Implementation – Summarizes plans to form the Multi-Species/Ecosystem Recovery Implementation Team (MERIT) to coordinate implementation of the Multi-Species Recovery Plan. This will be accomplished through an adaptive management approach focusing on multi-agency coordination.
8	Summary of report strengths and weaknesses		Extensive information regarding habitats and listed species and the effects of current management practices on these species. Status and trends reported are based on Landsat data (a series of satellites deployed to collect data regarding natural resources; often used to determine vegetation cover) and are probably not useful for areas on the scale of the

DRAFT

			<p>DR/GR as presented in this report. Status and trends information is of limited use to determine presence/absence on a specific parcel of land (small-scale resolution). The maps show general locations where species might occur, but at large-scale resolution (county level).</p> <p>Some of the species distribution data is also not defined at a sufficient scale to determine relevancy to the DR/GR.</p>
8 a.	Evaluation of study approach and conduct		<p>Comprehensive information regarding a range of species and habitats. The section regarding ecological communities is especially useful to evaluating landscape-level importance of many DR/GR habitats.</p>
8 b.	Extent to which report is “up to date”		<p>Wildlife distribution and conservation needs for all species are constantly undergoing updates and revisions. For example, the Florida panther habitat map and recovery plan have been recently revised (February 2007) and is available from the Vero Beach U.S. Fish and Wildlife Service office (Paul Souza or Allen Webb 772-562-3909).</p>
8 c.	Completeness / data gaps / remaining information needs		<p>Complete information regarding wildlife is not practicable to obtain. The “Ecological Communities” section contains discussions of how reasonable predictions can be made regarding wildlife species likely to utilize a given habitat in a given geographical location when more specific wildlife information is not available. Additional information regarding the accuracy of vegetation community-type mapping (especially for pine flatwoods communities) and the extent of exotic vegetation infestation for the entire DR/GR area would be useful for making these predictions.</p> <p>The report also included information regarding topics for which there is little information throughout South Florida, including the DR/GR area. One example is the lack of information regarding invertebrates in terms of species present and how each species interacts with other species in each ecological community.</p>
8 d.	Relationship to, and consistency with, other studies / reports		<p>Agrees with other studies regarding projected population and land use and the need to manage land use changes proactively.</p> <p>Agrees with other studies regarding the limiting effects of habitat loss</p>

DRAFT

			(including wetlands and uplands), fragmentation of habitat, and degradation of water quality on a wide variety of plant and animal taxa.
--	--	--	--

DRAFT

**County Road 951 Project Development and Environment Study Draft
Endangered Species Biological Assessment**

Item	Description	Sect / Page	Information from Report
1	Document Title		County Road 951 Project Development and Environment Study Draft Endangered Species Biological Assessment
2	Author		Quest Ecology, Inc. in association with Dyer, Riddle, Mills & Precourt, Inc.
3	Date		July 2006
4	Sponsoring agency / publisher		Lee County Department of Transportation
5	Purpose of study or document		<ul style="list-style-type: none">- To evaluate impacts of the proposed extension of County Road 951 on state and federally protected plant and animal species.- To aid in determining type, design, and location of the proposed extension.- To ensure the proposed actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat to such species.- To document environmental conditions of the study area and evaluate the project's potential impact to affect species listed as endangered, threatened, or of special concern to the U.S. Fish and Wildlife Service or the Florida Fish and Wildlife Conservation Commission
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C.)		The study area overlaps with the DR/GR. Contains southern portion of DR/GR lands.

DRAFT

7	Summary of report content		<ul style="list-style-type: none"> - This document discusses impacts of two Alignment Alternatives – referred to as #3 and #4. Alignment Alternative #3 involves running the proposed extension to the west and adjacent to Route 75 north of Bonita Springs. Alignment Alternative #4 involves running the proposed extension further east along an existing power line easement in this area. - Started review with section 5 - Wildlife Habitat. Previous sections 1-3 provide project history and alternatives analyses not directly applicable to DR/GR study. Section 4 – Existing Environmental Characteristics includes land use information similar to that which is reviewed in conjunction with the draft wetlands report for this project.
7 a.	General information and overall content	<p>Section 5.1/p. 5-1</p> <p>p. 5-2</p>	<ul style="list-style-type: none"> - Section 5.1- Wildlife and Habitat – literature reviews, agency data base reviews, agency coordination, previous studies and field reviews of the study area, soil surveys and aerial photography were used to identify target species and habitat types within and adjacent to the study area. A list of all agencies and databases used is included in Section 5.5.1, p. 5-1. Based on the results of these initial surveys, a preliminary list of potentially occurring species and a proposed field survey methodology were developed. These preliminary findings were further refined based on coordination with U.S. Fish and Wildlife Service and Florida Fish and Wildlife Commission. - A list of species conceded as present based on existing information included American alligator, eastern indigo snake, Florida panther, and Florida black bear. - Field surveys were based on methods described by Florida Fish and Wildlife Commission and included meandering pedestrian transects, roadside observations, vehicular transects, and aerial surveys, depending on target habitat and species type. Survey periods included morning and evening hours. Further details are provided in

DRAFT

			Section 5.2.2, p. 5-2.
7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Wildlife survey results, ground-truthed vegetation community information.
7 c.	Useful maps and overlays		Relevant maps and overlays consist of U.S. Fish and Wildlife Service and Florida Fish and Wildlife Commission data layers listed in other review items. (Strategic Habitat Conservation Areas and biodiversity "hot spots", discussed in "Closing the Gaps" report.)
7 d.	Relevant results and conclusions	<p>Section 6/p. 6-2</p> <p>p. 6-3</p> <p>p. 6-14</p> <p>Section 7/p. 7-1</p>	<ul style="list-style-type: none"> - Table 6-1, p. 6-2 summarizes listed wildlife species potentially occurring within the study area. - - Table 6-2, p. 6-3 summarizes rare plant species potentially occurring within the study area. - - Section 6 - provides further information on selected plant and animal species. - - Section 7.0– Analysis of Wildlife Habitat Impacts. Includes a summary of direct impacts (in acres) to wetlands, undeveloped upland habitats, and primary Florida panther habitat. Secondary impacts (in acres) are quantified for Primary Florida panther habitat only, although the report does state that secondary impacts to wetlands and undeveloped upland habitats are unavoidable. These secondary impacts include fragmentation of habitat, exposure of wildlife to vehicle collisions, and potential obstruction of water flow, which can result in alteration of water quality and natural hydroperiods. Alternative 3 would result in more direct impacts to wetlands, uplands, and Primary Florida panther habitat. Alternative 4 would result in 1,300 more acres of secondary impacts to Primary Florida

DRAFT

		Section 7.3/p. 7-3	<p>panther habitat, mostly due to habitat fragmentation and exposure to vehicle collisions.</p> <ul style="list-style-type: none">- Section 7.3 - Conceptual Mitigation – Mitigation requirements for impacts to wetlands and Florida panther habitat are discussed. Wetland impacts will be implemented through a combination of preservation, restoration, and enhancement as described in the Draft Lee County Master Mitigation Plan. Final amounts will be determined through coordination with the ACOE, U.S. Fish and Wildlife Service SFWMD, and Florida Fish and Wildlife Commission. The Uniform Wetland Assessment Methodology, a wetland assessment required under current state Environmental Resource Permitting rules, may be used to calculate amount of wetland mitigation to be implemented.- Mitigation for direct and secondary impact to Florida panther habitat will also be required. The U.S. Fish and Wildlife Service Panther Tool will be used to determine compensation need. This methodology consists of calculating functional units (FU) based on the acreage of proposed impact (A), multiplied by the habitat value (HV), multiplied by the base ratio (BR) of 2.5, then by the landscape multiplier (LM) of 1.0 (project in “primary” habitat, compensation in “primary” habitat). Based on this method and the proposed impacts determined for this study, an estimated 1,822 acres of preservation may be required for Alternative 3 and an estimated 3.847 acres of preservation may be required for Alternative 4. The final acreage will likely change somewhat based on the new Florida panther focus area map released by the U.S. Fish and Wildlife Service since this environmental assessment was conducted.
		Section 8/p. 8-1	<ul style="list-style-type: none">- Section 8.0– Conclusions and Commitments – Includes all listed species observed on site during surveys – Big Cypress fox squirrels, wood storks, gopher tortoises, and American alligators, and includes a discussion of other species that might possibly occur on the site and

DRAFT

			<p>potential impacts to wildlife observed or considered to be likely to occur.</p> <ul style="list-style-type: none"> - No federally listed plant species were observed. State-listed plant species observed were cinnamon fern, royal fern, bromeliads, giant wild pine, stiff-leaved wild pine, and inflated wild pine. - Agency correspondence relevant to DR/GR issues includes mostly Florida Fish and Wildlife Commission and U.S. Fish and Wildlife Service comments pertaining to listed wildlife species. It is suggested that the following species should also be considered to be likely to occur within the study area: swallow-tail kite, American crocodile, burrowing owl, red-cockaded woodpecker, and Florida mastiff bat. It is also suggested that the list of plant species included in Table 6-2 could be refined to include only those plant species that are found within habitat types observed within the study area.
8	Summary of report strengths and weaknesses		<ul style="list-style-type: none"> - The Uniform Wetland Assessment Methodology and the U.S. Fish and Wildlife Service Panther Tool were both referenced as possible ways to calculate mitigation requirements. Few details regarding use of the Uniform Wetland Assessment Methodology were included. - There was no mention of a methodology for assessing impacts to the Estero Bay Aquatic preserve, although it was acknowledged that impacts to this system (which lies downstream from the study area) may occur. - Some portions of the report discuss Alternatives 2, 3, and 4. Other parts discuss only Alternatives 3 and 4. The study area maps include only two proposed alignments. It would be helpful to include all three alternatives in the study area maps and all sections of text or to delete reference to Alternative 2. - A summary of the Uniform Wetland Assessment Methodology and the U.S. Fish and Wildlife Service Panther Tool on the level of the summary of the Wetland Rapid Assessment Procedure discussed in the wetlands evaluation of the 951 study would have been helpful in

DRAFT

			evaluation of this report.
8 a.	Evaluation of study approach and conduct		<ul style="list-style-type: none"> - The field survey methods used for the study were based on extensive agency coordination (see Appendix B – Agency Correspondence), and are based on industry standards. The fact that so few listed species were observed, even among those “conceded as present” indicates that direct observation of wildlife species during the restricted amount of time available for a standard survey may be an unreliable measure of wildlife presence. A literature search and habitat evaluations were used to compile a “likelihood of occurrence” list in accordance with industry standard methods for supplementing wildlife survey information.
8 b.	Extent to which report is “up to date”		Recent field surveys are up to date.
8 c.	Completeness / data gaps / remaining information needs		<ul style="list-style-type: none"> - Wildlife surveys and ground-truthing of habitat types reported in this document could be helpful when evaluating future land-use planning and regulatory decisions. This information was collected within the area in which proposed impacts from realignment of SR 951 may occur. Small-scale information at the level that reported in this document is not available for the entire DR/GR area. - Based on correspondence with state and federal wildlife agencies, additional species, such as the Florida mastiff bat, could use more discussion. Potential listed plant species section could also be refined.
8 d.	Relationship to, and consistency with, other studies / reports		<ul style="list-style-type: none"> - Difficult to compare due to differing scales on which data collection was based. No apparent discrepancies. - It is interesting to note that the U.S. Fish and Wildlife Service letter to the Department of Transportation regarding technical assistance on the Florida panther cites Kautz et. al, - “How Much Is Enough? Landscape-scale Conservation for the Florida Panther,” also reviewed for the DR/GR project, as the sole source of literature supporting the

DRAFT

			technical recommendations included in the letter.
--	--	--	---

DRAFT

County Road 951 Project Development and Environment Study – Draft Wetland Evaluation Report

Item	Description	Sect / Page	Information from Report
1	Document Title		County Road 951 Project Development and Environment Study - Draft Wetland Evaluation Report
2	Author		Dyer, Riddle, Mills & Precourt, Inc.
3	Date		July 2006
4	Sponsoring agency / publisher		Lee County Department of Transportation
5	Purpose of study or document		To evaluate impacts of the proposed extension of County Road 951 to wetlands. To aid in determining type, design, and location of the proposed extension.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C.)		Proposed road alignments are partially within DR/GR lands. The project area extends into the southern portion of the DR/GR.
7	Summary of report content		<ul style="list-style-type: none">- This document discusses impacts of two Alignment Alternatives – referred to as #3 and #4. Alignment Alternative #3 involves running the proposed extension to the west and adjacent to Route 75 north of Bonita Springs. Alignment Alternative #4 involves running the proposed extension further east along an existing power line easement in this area.- Started review with section 4- Existing environmental characteristics. Previous sections provide project history and alternatives analyses not directly applicable to DR/GR study.

DRAFT

7 a.	General information and overall content	Section 4/p. 12 p. 12 p. 17 p. 26 p. 30	<ul style="list-style-type: none"> - Section 4.1 - Existing Land Use – identified in field and digitized over aerial photography of the study area using ArcGIS 8.3 and 9.1. - Section 4.1.1 Vegetative Communities - Described for the project area based on Florida Land Use, Cover and Forms Classification System codes. - Section 4.2 – Future land use – subsection of land use described in Lee County Comprehensive Plan. Also includes a list of existing DRI’s and brief mention of cumulative effects of these DRI’s on Florida panther habitat and the Estero Bay Aquatic Preserve. - Section 4.3 – Natural and Biological Features – includes a brief discussion of listed species (to be discussed in Endangered Species Biological Assessment (ESBA) review), soil data, and floodplains and drainage. Figure 4-6 includes more detailed information. - Section 5.1- Wetlands Study Methodology – National Resources Conservation Service soils maps, National Wetlands Inventory mapping, U.S. Geological Survey maps, and site-specific aerial photography were used for initial identifications of wetlands within the project area. These locations were further identified in the field using the methods described in the US Army Corps of Engineers 1987 wetland delineation manual and the Florida DEP and Water Management District method described in “The Florida Wetlands Delineation Manual”. A functional assessment using the Wetlands Rapid Assessment Procedure (WRAP) (SWFMD, 1999), a method designed to aid in compliance of mitigation sites in South Florida, was performed on each wetland. Sizes of each wetland were calculated using ArcGIS 9.1 from the wetland delineations. Wetlands were identified using Florida Land Use, Cover and Forms
------	---	---	--

DRAFT

7 b.	Specific relevant data (e.g. water quality sampling for specific dates, water level data, etc.)		Wetland delineation, Wetland Rapid Assessment Procedure assessment
7 c.	Useful maps and overlays		<ul style="list-style-type: none"> - Figure 4-4 DR/GR Classification Map – in relation to Study Area and proposed alignments. - Figure 4-6: Drainage Map. Also includes existing waterways and flow-ways and proposed cross-drains and ponds. - Figure 5-1: Drainage Sub-basins within the Study Area (based on South Florida Water Management District data). - Figure 5-3: Wetland Location Map – based on aerial photography, National Resources Conservation Service data, National Wetlands Inventory data, and ground-truthing – includes wetlands Florida Land Use, Cover and Forms Classification System codes. - Figure 5-4: Wetland Rapid Assessment Procedure Location Map.
7 d.	Relevant results and conclusions	<p>Section 5/p. 30</p> <p>Section 6/p. 55</p>	<ul style="list-style-type: none"> - The study area consists of a mosaic of upland and wetland habitats including a variety of ecological communities. - Section 6.0 – Analysis of potential wetland impacts – construction of Alignment Alternative #3 will result in approximately 261.4 acres of direct wetlands impacts, construction of Alignment Alternative #4 will result in approximately 293.9 acres of direct wetland impacts. Direct impacts to each wetland type are reported by drainage sub-basin in Table 6-1, p. 56. An additional 32.4 acres of direct impacts associated with stormwater management facilities will result from either alternative. - The majority of the impacts for either alignment alternative are to “mixed forested deciduous/evergreen” - the canopy in this Florida Land Use, Cover and Forms Classification System type is a mixture of slash pine, cypress, and melaleuca. Alternative 3 involves 150.8

DRAFT

			<p>acres of direct impact to this habitat type vs. 115.3 acres for Alternative 4. There is also a small difference in impacts to cypress wetlands between the alternatives – Alignment 4 involves 15.6 acres of direct impacts to this habitat type vs. 13.7 for Alternative 3. The other habitat type with large amounts of proposed direct impacts is “exotic wetland hardwood” – canopy of mostly melaleuca. Both alternatives would involve 126.3 acres of direct impacts to this wetland type.</p> <ul style="list-style-type: none"> - A discussion of secondary and cumulative impacts is included but there is no discussion of quantification of these or if they will be greater for either alternative.
8	Summary of report strengths and weaknesses		<ul style="list-style-type: none"> - Extensive ground-truthing of land use, vegetation, extent and quality of wetlands, and habitat issues could be helpful when evaluating future land-use planning and regulatory decisions. - Figure 4-6: Drainage Map is referenced in the text of the document but not included in the List of Figures on p. iv. - It appears that some of the subject wetlands were assigned high numerical scores in comparison to the wetland descriptions included in the field notes. For example, wetland # 20 was given a score of 3 out of 3 for wetland canopy, but the canopy included 5% melaleuca in the canopy and strangler fig and Brazilian pepper (percentages not noted) in the subcanopy according to the notes section. The first descriptor in the Wetland Rapid Assessment Procedure for canopy/shrub layer to score a 3 is “no exotic species present”. - It would have been helpful to include information regarding the team conducting the Wetland Rapid Assessment Procedure in terms of background and training. - It would be helpful to include a summary of impacts to wetland function/value as well as a summary of wetland acreage impacts for each alternative.

DRAFT

8 a.	Evaluation of study approach and conduct		<ul style="list-style-type: none"> - Methods for identifying and delineating wetlands are consistent with industry standards and regulatory requirements. Wetland assessment methodology (Wetland Rapid Assessment Procedure) is a good way to evaluate many aspects of subject wetlands. - Wetland Rapid Assessment Procedure is not designed to measure the extent to which a given wetland parcel supports the larger landscape mosaic, an important natural resource consideration for all habitats within the DR/GR.
8 b.	Extent to which report is “up to date”		The report is based upon recent field surveys and is up to date.
8 c.	Completeness / data gaps / remaining information needs		Covers only part of the DR/GR area.
8 d.	Relationship to, and consistency with, other studies / reports		Consistent with vegetation types reported in other studies. Accurate on a smaller scale than the other studies due to on-the-ground wetland delineations. Information presented in this report and in the biological assessment for the CR 951 extension are a good example of how different ecological resources must sometimes be balanced when making regulatory and land use decisions.

DRAFT

		Executive Summary and I-A.4-1	<ul style="list-style-type: none"> • Provide basis for off-site mitigation opportunities. • Enhance natural system functions and values on publicly owned and conservation lands. • Coordinate with other regional studies (Estero Bay Project, Big Cypress Basin Watershed Plan)." • "This report identifies the improvements that can be made to protect the capacity of historic outfalls and includes the analysis of improvements to re-establish historic flows." <p>Major Tasks Undertaken as Part of Study/Document:</p> <ul style="list-style-type: none"> • Hydrologic/hydraulic model. • 1-foot contour topographic mapping of watershed. • Identification of entire watershed boundary. • Ecological assessment. • Evaluation of the overall water management system and its subsystems, their functions and operational constraints. • Presentation of alternatives to restore the watershed and outflows, including land purchases and projects.
6	Relevance to DR/GR lands in southeast Lee County (See list of DR/GR Environmentally Sensitive Resources and Environmental Issues in Appendix C)	All	High relevance. The majority of the DR/GR is within the study area. Specific data are gathered only for the southern part of the DR/GR (Transects 1 and 2).
7	Summary of report content		<p>Phase I: Hydrologic/Hydraulic Model Development</p> <p>Phase II. Ecological Assessment</p> <p>Phase III: Problem Identification & Plan Formulation and Amendments 1, 2, and 3</p>

