

Review of Proposed Class II Disposal Wells and Operations  
Permit Applications in Big Cypress National Preserve

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## **About PSE Healthy Energy**

Physicians, Scientists, and Engineers for Healthy Energy (PSE Healthy Energy) is a multidisciplinary, non-profit energy science and policy research institute that studies the way energy production and use impact public health and the environment.

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## **About the Authors**

Dr. DiGiulio is a senior research scientist at Physicians, Scientists, and Engineers (PSE) for Healthy Energy and an affiliate at the Department of Civil, Environmental, and Architectural Engineering at the University of Colorado. Dr. DiGiulio completed a B.S. in environmental engineering at Temple University, a M.S. in environmental science at Drexel University, and a Ph.D. in soil, water, and environmental science at the University of Arizona. During his 31 years with the U.S. Environmental Protection Agency (EPA), he conducted research on gas flow-based subsurface remediation (soil vacuum extraction, bioventing), groundwater sampling methodology, soil-gas sampling methodology, gas permeability testing, intrusion of subsurface vapors into indoor air (vapor intrusion), subsurface methane and carbon dioxide migration (stray gas), and solute transport of contaminants in soil and groundwater including that associated with hydraulic fracturing and pits used to dispose oil and gas waste. He assisted in development of EPA's original guidance on vapor intrusion and the EPA's Class VI Rule on geologic sequestration of carbon dioxide. While with the EPA, he routinely provided technical assistance to EPA regional offices and assisted in numerous enforcement actions. The focus of his current work is on understanding environmental impact from oil and gas development in the United States and abroad, especially in regard to surface and groundwater resources. He has served as an expert witness in litigation relevant to oil and gas development, has testified before State oil and gas commissions on proposed regulation, and has testified before Congress on the impact of oil and gas development on water resources.

Dr. Tisherman completed a B.A. in Environmental Studies from Connecticut College in 2013 and will receive her Ph.D. in Geology and Environmental Science at the University of Pittsburgh in 2022. Her dissertation focused on the transport and fate of trace metal-contaminated sediments. Specifically, her research focused on the mobilization of contaminated sediments from mining, oil and gas production, and agriculture in the US and in China. Through her research, Dr. Tisherman has worked to create a chemical framework that differentiates between various sources of oil and gas water contamination. Prior to graduate school, Dr. Tisherman researched the impacts of unconventional drilling on surface water in Chengdu, China as a U.S. Fulbright Scholar. Her current work is on the water impacts from produced water from oil and gas activities.

## Background

Burnett Oil Company (“Burnett Oil”) submitted an operations permit application to the National Park Service (NPS) seeking authorization for new proposed oil drilling and production operations in two locations, Nobles Grade and Tamiami Prospects, in the Florida Everglades’ Big Cypress National Preserve (preserve). In addition, Burnett Oil submitted two Class II injection well construction permit applications to the U.S. Environmental Protection Agency (EPA). The purpose of these permit applications is to create two new locations in the preserve where Burnett Oil would conduct oil drilling and production and inject the produced water within the same well pad locations. While oil drilling has occurred in Big Cypress National Preserve since at least the 1970’s (Thornberry-Ehrlich, 2005), water contamination from leaks and spills has already adversely impacted the preserve (Fleshler, 2015). The introduction of two new oil drilling and associated wastewater disposal locations raises concerns about future, additional soil, surface water, and groundwater contamination.

PSE Healthy Energy was asked by the Natural Resources Defense Council (NRDC) and the Environmental Integrity Project (EIP) to provide an evaluation of the two Class II injection well permit applications and the NPS operations permit application on the potential impacts of the proposed new oil drilling operations on water resources. Our preliminary evaluation of the operations permit application, two Class II injection permit applications, and relevant published literature indicated that Burnett Oil proposes to follow federal, state, and NPS regulations, generally. However, there are a few points of concern in Burnett Oil’s permit applications, including that baseline soil and water samples should be collected, and that the NPS regulations prohibit oil and gas activities in wetlands. In this report, we provide two tables, one table comparing NPS and state of Florida regulations with Burnett Oil’s operations permit application, and one table comparing federal regulations with the company’s Class II injection well permit applications. The comparison to federal and state regulations provides a basis for analysis of potential pathways for soil, surface water, and groundwater contamination.

## Methods

The basis of this review are the current Florida regulations on oil and gas resources, NPS regulations on oil and gas activities, and federal underground injection control (UIC) regulations (downloaded on November 16, 2021). Additionally, we have extracted information from relevant literature to support several recommendations (these references are provided at the end of this document). The oil and gas operation permit regulations and UIC regulations we used in our review of Burnett Oil’s proposed drilling and disposal operations are outlined below:

1. Code of Federal Regulations Title 40 Part 144—Underground Injection Control Program. Dated July 7, 2014 (*40 C.F.R. § 144* (2014))
2. Code of Federal Regulations Title 40 Part 146—Underground Injection Control Program: Criteria and Standards. Dated July 7, 2014 (*40 C.F.R. § 146* (2014))
3. Code of Federal Regulations Title 40 Part 147—State, Tribal, and EPA-Administered Underground Injection Control Programs. Dated July 7, 2014 (*40 C.F.R. § 147* (2014))
4. Code of Federal Regulations Title 36 Part 9 Subpart B - Non-Federal Oil and Gas Rights. Dated January 3, 2017 (*36 C.F.R. § 9* (2017))
5. Florida Administrative Code Title 62C (2013)

## Discussion

### *Operations Permit Application*

Burnett Oil’s operations permit application for the proposed new oil drilling and production at the Nobles Grade and Tamiami Prospects in Big Cypress National Preserve was evaluated to determine compliance with National Park Service oil and gas regulations (36 C.F.R. § 9 (2017)), also known as the “9B rules”) and Florida oil and gas program regulations (Florida Administrative Code Title 62C (2013)). Burnett Oil has not yet submitted an oil and gas permit application to the state oil and gas regulator, the Florida Department of Environmental Protection (DEP). The purpose of this comparison is to determine whether Burnett Oil’s proposed new drilling operations are in compliance with federal and state regulations, with particular attention to potential pathways for soil, surface water, and groundwater contamination. The comparison in the table below indicates whether Burnett Oil’s operations permit application appears to comply with Florida and/or federal regulations based on the information we have received as of the date of this report, and also indicates whether it appears that it does not comply:

	<b>National Park Service Regulations (36 C.F.R. § 9 Subpart B)</b>	<b>Florida Administrative Code Chapter 62C</b>	<b>Appears In Compliance?</b>	<b>Notes from Operations Permit Application</b>
<i>Definitions</i>	<b>9.40 Contaminating Substance</b> - This includes, but is not limited to, explosives, radioactive materials, brine waters, formation waters, petroleum products, petroleum by-products, and chemical compounds used for drilling, production, processing, well testing, well completion, and well servicing	No definition provided	Yes (36 C.F.R. § 9.40)	Produced water is considered a contaminating substance in National Parks.
	<b>9.40 Usable water</b> - Usable water means an aquifer or its portion that: (1) Supplies any public water system; or contains a sufficient quantity of ground water to supply a public water system and either: (A) Currently supplies drinking water for human consumption; or (B) Contains fewer than 10,000 mg/l total dissolved solids; and (2) Is not an exempted aquifer	<b>Freshwater</b> - any surface or groundwaters of the State whole total dissolved solids content is less than 1,000 mg/L	Yes (36 C.F.R. § 9.40)	The term usable water is used in the permit.
<i>Use of Water</i>	<b>9.83 (e) (1)</b> The source, quantity, access route, and transportation/conveyance method for all water to be used in access road and pad construction, well drilling, stimulation, and production; and <b>(2)</b> Estimations of any anticipated wastewater volumes generated and how they will be managed throughout stages of the operation.	Florida Administrative Code Chapter 62C does not specify regulations on the source of water. Consumptive use of water is regulated by the South Florida Water Management District in this region, pursuant to Chapter 373, Florida Statutes, and would need to permit any industrial uses of water associated with new oil production.	Yes (36 C.F.R. § 9.83)	

	<b>National Park Service Regulations (36 C.F.R. § 9 Subpart B)</b>	<b>Florida Administrative Code Chapter 62C</b>	<b>Appears In Compliance?</b>	<b>Notes from Operations Permit Application</b>
<i>Maps</i>	<p><b>9.84 (a)</b> Must submit to-scale maps of boundaries in relation to the National Preserve; natural features (streams, lakes, ponds, wetlands, seepage areas, springs, shallow water aquifers, topographic relief, and areas we have indicated to you as environmental sensitive); existing roads, trails, railroad tracks, pads, and other disturbed areas; existing structures (buildings, pipelines, oil and gas wells, freshwater wells, electrical lines, and utility lines).</p> <p><b>9.84 (c)</b> For any new surface disturbances: (1) Maps depicting the proposed area of operations, boundaries of new surface disturbances and proposed access routes; (2) Maps depicting the proposed location of all support facilities, including those for transportation, sanitation, occupation, staging areas, fuel dumps, refueling areas, loading docks, water supplies, and disposal facilities; (3) The methods and diagrams, including cross-sections, of any proposed pad construction, road construction, cut-and-fill areas, and surface maintenance, including erosion control;</p>	Maps are not mentioned in the Florida Administrative Code Chapter 62C	Yes (36 C.F.R. § 9.84(a) and (c))	
<i>Geologic Conditions</i>	<p><b>9.84 (b)</b> Depth and names of usable water, brine, and hydrocarbon, geothermal, or other mineral-bearing zones; potential hazards: abnormal pressure zones, lost circulation zones, hydrogen sulfide gas, or karst formations; nature, extent, and depth (if known) of near-surface bedrock fracturing or jointing relative to proposed cemented surface casing-set depth and any open annular interval proposed in well design</p>	<p><b>Rule 62C-26.004(6)(d), Florida Administrative Code:</b> All interpreted geologic data shall be signed by a geologist licensed under Chapter 492, Florida Statutes</p>	Yes (36 C.F.R. § 9.84(b) and Rule 62C-26.004(6)(d), Florida Administrative Code)	

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
Potential Impacts and Specific Rules for Big Cypress National Preserve	<p><b>9.111</b> You must not conduct operations within 500 feet of surface water, including an intermittent or ephemeral watercourse, or wetland; within 500 feet of the mean high tide line; or within 500 feet of any structure or facility used by the NPS for interpretation, public recreation, or administration. The Superintendent may increase or decrease this distance consistent with the need to protect federally owned or administered lands, water, or resources of System units, visitor uses or experiences, or visitor or employee health and safety while ensuring that you have reasonable access to your non-Federal oil and gas rights. Measurements for purposes are by horizontal distance.</p>	<p><b>Rule 62C-30.005(1), Florida Administrative Code:</b> The Department shall evaluate each application to drill and visit each proposed access route and drilling site in the Big Cypress Watershed to ensure that the exploration and production activities will cause no permanent adverse impact on the water resources and sheet flow of the area, or on the vegetation or the wildlife of the area, with special emphasis on rare and endangered species.</p> <p><b>Rule 62C-30.005(2), Florida Administrative Code:</b> Roads, including road extensions. 1. No road construction or improvement shall begin prior to obtaining a permit to drill. 2. Existing roads shall be used wherever feasible. 3. Existing roads, if improved, or new roads where constructed, shall be from trucked-in fill material or from material taken from approved borrow pits. There shall be no parallel borrow canals along roads. 4. All roads shall be culverted and maintained to prevent degradation by industry vehicles. The size and number of culverts shall be determined so that the natural flow of water is not impeded, and the resource is protected.... 7. All roads shall follow the best practical route suited to protect the natural environment. Where feasible, roads and road extensions should follow existing woods roads. 8. Roads shall be constructed to avoid serious damage or enduring scars to land and wildlife, and to avoid obstructing the natural movement of water and wildlife.</p>	No (36 C.F.R. § 9.111)	<p><i>XI.N.D/XI.T.D. "The primary effect would be the filling of 12.09 acres (Nobles Grade) and 6.85 (Tamiami) of wetland areas to accommodate the wellpad, access road, and loading facility.... Road and pad construction will require the removal of vegetation (primarily dwarf cypress trees and wetland groundcover) ...There likely will be temporary direct effects related to temporary wetland impacts for turnaround areas during road construction, water turbidity in construction areas (contained by silt fencing)."</i></p> <p>Burnett Oil Company proposes to construct and operate new oil drilling operations in the Tamiami and Nobles Grade Prospects in Big Cypress National Preserve in approximately 19 acres of wetlands, which is prohibited by 36 C.F.R. § 9.111.</p>

<p><i>Potential Impacts and Specific Rules for Big Cypress National Preserve (continued)</i></p>	<p><b>9.85 (e)</b> Discussion of: <b>(1)</b> Any anticipated impacts that you cannot mitigate; and <b>(2)</b> All alternative technologically feasible, least damaging methods of operations, their costs, and their environmental effects</p>	<p><b>Rule 62C-30.005(2)(a)(11), Florida Administrative Code:</b> Access corridors and drilling pads shall not be constructed into or through sensitive resources such as cypress-mixed forest swamps, hardwood hammocks, mangrove forests, archeological sites, native ceremonial grounds, and those zones which are documented and/or confirmed by the Florida Game and Fresh Water Fish Commission as areas of high-level Florida panther activity unless reasonable and prudent alternatives are not available.</p>	<p>No (Rule 62C-30.005(2), Florida Administrative Code)</p>	<p>Cypress trees and wetland groundcover would be removed, and Florida regulations state that oil drilling activities should not be constructed in these areas (Rule 62C-30.005(2)(a)(11), Florida Administrative Code). Both proposed new oil drilling sites are located within endangered Florida panther habitat and the habitats of other protected species (e.g., Florida bonneted bat) (Florida Fish and Wildlife Conservation Commission, 2018) (Rule 62C-30.005(2)(b), Florida Administrative Code). New pipelines would be constructed to transport oil from tank battery to the loading facility and these pipelines need automatic shut-down valves (Rule 62C-30.005(2)(c), Florida Administrative Code).</p>
		<p><b>Rule 62C-30.005(2)(b), Florida Administrative Code:</b> Drilling sites shall be located to minimize negative impacts on the vegetation and wildlife, including rare and endangered species, and the surface water resources.... Every effort shall be made to limit the impact upon the environment of the Big Cypress Watershed by using areas covered by prairies, limited forest growth, grazing, farming, or cleared lands where practical.</p>		
		<p><b>Rule 62C-30.005(2)(c), Florida Administrative Code:</b> Production. 1. ...All transportation of oil in the Big Cypress National Preserve and wetlands within the Big Cypress Watershed shall be by pipeline. 2. If the oil from a producing well is to be removed by pipeline, the pipeline shall be equipped with automatic shut-down valves. All storage and loading facilities shall be located within impervious dikes as required by subsection <b>62C-28.004(4), F.A.C.</b> 3. All flowlines and utilities shall be contained within the rights- of-way secured for road construction.</p>		

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
<i>Current Environmental Conditions</i>	<b>9.85 (a)</b> Description of the natural and cultural resource conditions from your reconnaissance surveys or other sources collected for your proposed area of operations. The Superintendent may require baseline soil, surface water, or groundwater testing	<b>Rule 62C-27.001(3)(b), Florida Administrative Code:</b> Water Quality Analysis. If necessary to determine the depth to the base of the deepest underground source of drinking water (USDW), the Department shall require resistivity and porosity logs be run before setting surface casing and a representative water sample taken immediately after drilling out of the surface casing.	Yes (36 C.F.R. § 9.85 and Rule 62C-27.001(3)(b), Florida Administrative Code)	The operations permit application specifies that Burnett Oil would work with NPS to determine the soil sample protocol and the specific chemical analysis to be performed as part of the baselines soil chemistry characterization ( <b>XI.N.A.2, XI.T.A.4</b> ). Surface water quality from a nearby location ( <b>XI.N.A.4, XI.T.A.4</b> ) is provided but we recommend that Burnett Oil submit a plan for baseline surface and shallow groundwater quality testing and monitoring prior to the sampling that would be conducted during oil operations ( <b>Appendix A - Proposed Scope of Work 2</b> ).
<i>Spill Control and Emergency Preparedness Plan</i>	<b>9.86.</b> Your reporting procedures in the event of a spill, fire, or accident; Identification of contaminating or toxic substances expected to be used within your area of operations; Identification of abnormal pressure, temperature, toxic gases or substances, or other hazardous conditions expected to be encountered during operations; Measures (e.g., procedures, facility design, equipment) to minimize risks to human health and safety and the environment; List of equipment and methods for containment and cleanup of contaminating substances. A storm water drainage plan and actions intended to mitigate storm water runoff	<b>Rule 62C-28.004(2), Florida Administrative Code:</b> The Spill Prevention and Clean Up Plan shall: identify each potential spill source, outline protective measures taken to avoid a spill, list and show location of equipment to be used in an emergency, and specify what action has been planned to remove each such spill. Equipment necessary to rapidly control spills and to comply with SPCP's shall be maintained readily available at all times. <b>Rule 62C-28.004(7), Florida Administrative Code:</b> Immediate corrective action shall be taken in accordance with the operator's SPCP...If a minor spill or a spill of undetermined size occurs adjacent/beneath permanent structures...and complete excavation is not practical, the Department shall require that the site be monitored for possible ground water contamination. Monitoring includes installation and periodic sampling of monitor wells and/or surface water bodies. If levels of hydrocarbons or dissolved chlorides occur above background levels, continued monitoring/site clean up will be required.	No (36 C.F.R. § 9.86)	The components and amounts of the acid maintenance application should be listed due to the high concentrations of chemical additives.

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
<i>General Facility Design and Management</i>	<b>9.111 (c)</b> You must install and maintain secondary containment materials and structures for all equipment and facilities using or storing contaminating substances. The containment system must be sufficiently impervious to prevent discharge and must have sufficient storage capacity to contain, at a minimum, the largest potential spill incident	<b>Rule 62C-28.004 (4), Florida Administrative Code:</b> All new tank batteries and those renovated subsequent to this rule shall be constructed upon pads certified by a registered professional engineer to be relatively impermeable to hydrocarbon and saltwater spills. These pads shall be surrounded by dikes or fire walls of sufficient size and strength to contain twice the volume of the largest storage tank within the diked area. The containment pads shall be sloped so as to drain surface fluids away from storage tanks and shall be kept clean and free of liquids. Drain lines with locked valves shall be installed through the fire walls at the lowest point of the containment facility but fluids may be drained only in accordance with NPDES and other permits and these rules.	Yes (36 C.F.R. § 9.111 and Rule 62C-28.004 (4) Florida Administrative Code)	
	<b>9.111 (d)</b> You must keep temporarily stored waste in the smallest feasible area, and confine in a manner appropriate to prevent escape as a result of percolation, rain, high water, or other causes. You must regularly remove waste from the System unit and dispose of it in a lawful manner. Nothing in this subpart affects the application of the regulations found at 36 CFR part 6.			
<i>Blowout Prevention Equipment</i>	<b>9.118(a)(4)</b> You must design, implement, and maintain integrated casing, cementing, drilling fluid, completion, stimulation, and blowout prevention programs. <b>9.118 (a)(d)</b> You must design, implement, and maintain a blowout prevention program <b>9.88 (h)</b> The minimum specifications for pressure control equipment function, and pressure testing frequency, and the blowout preventer stack arrangement;	<b>Rule 62C-27.006, Florida Administrative Code:</b> Blowout preventers and related well control equipment shall be installed, used, and tested in a manner necessary to prevent blowouts. Prior to drilling below the surface casing, blowout prevention equipment shall be installed and maintained ready for use until drilling operations are completed	No (36 C.F.R. § 9.118(a)(4) and Rule 62C-27.006 Florida Administrative Code)	Blowout prevention would not be installed while drilling the surface hole even though previous drilling in the area found abnormally low pressure in the Sunniland Formation (Hughes Eastern Petroleum, n.d.). Previous permit applications have suggested using blowout preventers (Erwin 1982).
<i>Drilling Depth</i>	<b>9.88 (c)</b> The drilling program, including hole size for each section and the directional program; <b>(d)</b> Proposed drilling depth and the estimated depths and names of usable water, brine, hydrocarbon, geothermal, or other mineral-bearing zones	Florida Administrative Code Chapter 62C does not have regulations on drilling depth	No (36 C.F.R. § 9.88)	<b>V.N.B.6/V.T.B.6</b> Drilling depths and hole size are specified, however, the depths of brine, hydrocarbon, geothermal, or other mineral-bearing zones are not mentioned in Burnett Oil's operations permit application.

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code 62C	Appears In Compliance?	Notes from Operations Permit Application
Mud Program	9.88 (e) The types and characteristics of proposed mud systems, 9.118 (a) (1) You must use containerized mud circulation systems for operations	<b>Rule 62C-27.001 (4), Florida Administrative Code:</b> Need mud tanks of sufficient size, no earthen mud pits. <b>Rule 62C-27.001 (1), Florida Administrative Code:</b> Necessary mud testing equipment and mud volume measuring devices shall be maintained at all times, and mud tests shall be performed frequently and recorded in the driller's log.	No (36 C.F.R. § 9.88(e))	<i>V.N.B. 7/V.T.B. 7 - Drill cuttings will be taken to an off-site facility.</i> While Appendix A Exhibit V.B.1.7. provides some characteristics of the drilling mud, the chemical characteristics, including solvents, are not listed, and should be included in Burnett Oil's operations permit application
Well Casing	9.90 (b) For production operations, you must submit the size, grade, weight, and setting depth of all casing and tubing strings; cementing history; type and size of packers and subsurface flow control devices; top and bottom depths of each completed interval; and method of completion;	<p><b>Rule 62C-27.005, Florida Administrative Code:</b> All casing shall be new pipe or reconditioned so as to be equivalent to new pipe.</p> <p><b>Rule 62C-27.005 (1), Florida Administrative Code:</b> Surface casing. set below the deepest USDW and cemented to the surface, an 11,000-13,000 foot well has a surface casing minimum of 3,000 feet.</p> <p><b>Rule 62C-27.005 (2), Florida Administrative Code:</b> Intermediate Casing. set and cemented in accordance with generally accepted industry standards and practices.</p> <p><b>Rule 62C-27.005 (3), Florida Administrative Code:</b> Production/Injection Casing. set and cemented in accordance with generally accepted industry standards and practices. However, a sufficient quantity of cement to fill the annular space at least 1,500 feet above the uppermost producible hydrocarbon zone must be used. When a liner is used as production casing, the testing of the seal between the liner top and next larger string shall be conducted as in the case of intermediate liners.</p>	No (Rule 62C-27.005 (1), Florida Administrative Code)	<p><i>V.N.B.8/V.T.B.8 - "The 13-3/8" surface casing will be set below the Oldsmar top to cover all freshwater strata (2,250'). The first intermediate string (9-5/8") will be set just below the Borelis base to cover the Boulder zone (4,000'). Approximately 1500' of the bottom of the 9-5/8" intermediate string will be externally coated to protect against potential corrosion that could be encountered from contact with the Boulder disposal zone. The 7" second intermediate casing will be set just a few feet within the Lake Trafford anhydrite (11,300'). The 5-1/2" UFJ liner will be set from TD to 500' above the 7" casing shoe (11,600')."</i></p> <p>Surface casing does not go to 3,000 ft for an 11,000 ft well as specified in the Florida regulations.</p>

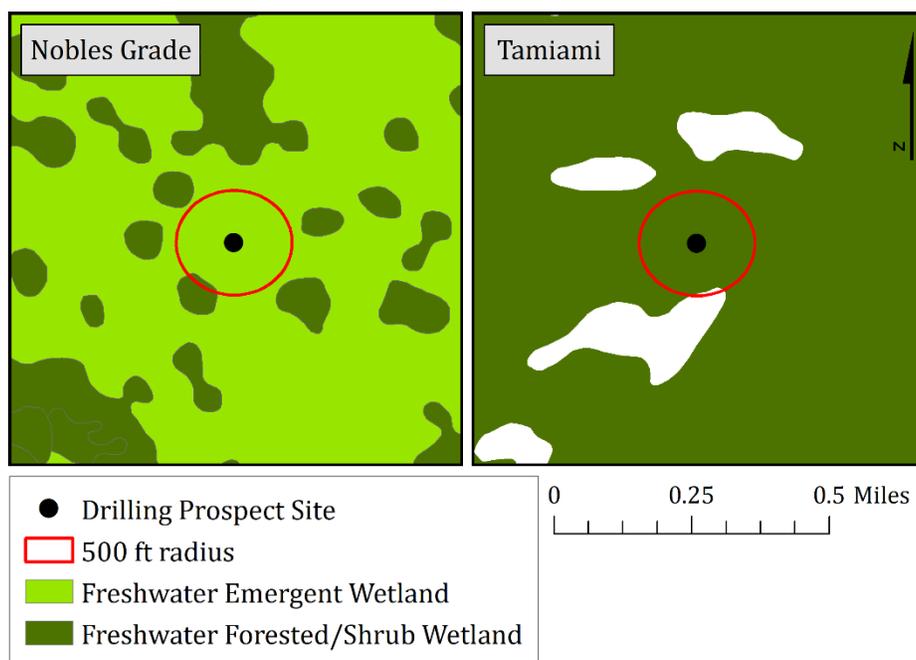
	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
<i>Wellhead Equipment</i>	36 C.F.R. § 9 Subpart B does not specifically reference wellhead equipment.	<b>Rule 62C-28.001, Florida Administrative Code:</b> All completed wells shall be equipped with casingheads, wellhead fittings, valves and connections with a rated working-pressure equal to or greater than the shut-in pressure to which they will normally be subjected. Connections and valves shall be designed and installed to permit fluid to be pumped between any two strings of casing, except between conductor and surface casing. In wells with a surface pressure in excess of five thousand pounds per square inch a master valve shall be installed below the production tee and another above or across it. Prior to placing the well in service all wellhead connections shall be tested to the rated test pressure of the assembly. Pressure sensors, safety valves, and casingheads.	Yes (Rule 62C-28.001, Florida Administrative Code)	
<i>Cementing Program</i>	<b>9.88 (g)</b> The cementing program, including downhole location of any stage equipment, cement types, volumes, and additives to be used, and a description of pressure tests and cement verification techniques used that will be run to evaluate cement placement and integrity;	<b>Rule 62C-26.003(5), Florida Administrative Code:</b> class of cement to be used, cement additives, cement quantity, intended interval to be cemented.	Yes (36 C.F.R. § 9.88(g) and Rule 62C-26.003 (5) Florida Administrative Code)	
<i>Pressure Test</i>	<b>9.90 (d)</b> For production operations, you must submit the minimum specifications for pressure-control equipment, function, and pressure-testing frequency.	<b>Rule 62C-27.005(4), Florida Administrative Code:</b> Pressure Test. The minimum surface test pressure for each casing string: Surface: 1,000 psi. Intermediate, Liner, and Production: 1,500 or 0.2 psi/ft of depth. Tubing and Packer: 1,000 or 0.2 psi/ft of depth. These pressure tests shall be thirty minutes long and shall have no more than a 10 percent pressure drop. If there is an indication of a leak, necessary remedial measures will be taken, and the casing retested. All pressure tests will be recorded in the driller's log and may be witnessed by an agent of the Department.	Yes (36 C.F.R. § 9.90(d) and Rule 62C-27.005 (4) Florida Administrative Code)	

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
<i>Logging, Coring, and Testing</i>	<b>9.88 (i)</b> The proposed logging, coring, and testing programs;	Florida Administrative Code Chapter 62C does not have regulations for logging, coring, and testing	Yes (36 C.F.R. § 9.88(i))	
<i>Reclamation Plan</i>	<p><b>9.116</b> Clean up and remove any released contaminating substances; you must perform partial reclamation of areas no longer necessary to conduct operations. You must begin final reclamation as soon as possible but no later than 6 months after you complete your permitted operations;</p> <p><b>9.116 (d)</b>You must complete reclamation by: plugging all wells; removing all above-ground structures including roads; removing or neutralizing any contaminating substances; reestablishing or providing conditions for natural re-establishment of vegetative communities; grading to reasonable conform to preexisting elevations of contours; reporting pre-disturbance hydrologic movement and functionality; restoring using native soil material; ensure reclaimed areas do not interfere with visitor use; meeting conditions compatible with the management objectives of park</p>	<p><b>Rule 62C-29.009(2)(d)(2), Florida Administrative Code:</b> The operator shall remove all waste, debris, and equipment and shall restore the site as necessary to prevent erosion, invasion of exotic species, interruption of sheetwater flow or other similar impacts. Land drilling sites and access roads shall be restored to the approximate original contour of the surface and revegetated with native vegetation.</p>	No (36 C.F.R. § 9.116)	Burnett Oil’s operations permit application does not specify that constructed roads would be removed and returned to preexisting conditions. Additionally, Burnett Oil has not provided a restoration plan that includes required topographic elevations, plant species for replanting and planting specifications, or maintenance and monitoring, including exotic and nuisance vegetation control.

	National Park Service Regulations (36 C.F.R. § 9 Subpart B)	Florida Administrative Code Chapter 62C	Appears In Compliance?	Notes from Operations Permit Application
Plugging and Abandonment	<p><b>9.170</b> you must plug your well when any of the following occurs: (a) Your drilling operations have ended and you have taken no further action to produce the well within 60 days; (b) Your well, which has been completed for production operations, has no measurable production quantities for 12 consecutive months; or (c) The period approved in your operations permit to maintain your well in shut-in status has expired.</p>	<p><b>Rule 62C-29.009, Florida Administrative Code:</b> Cement plugs shall be placed in uncased portions of wells as necessary to prevent the migration of formation fluids from one zone to another:</p> <ol style="list-style-type: none"> <li>1. All nonproductive intervals containing shows of hydrocarbons shall be isolated from the wellbore by placing a minimum cement plug of 200 feet in length across the showing interval. Such plugs shall extend from 100 feet below to 100 feet above the show and shall be verified by either tagging with 15,000 pounds of drill stem weight or pumping sufficient excess cement to guarantee proper placement.</li> <li>2. All nonproductive intervals which are or have been productive within 5 miles of the well being plugged shall be isolated and verified in accordance with subparagraph (a)1., above.</li> <li>3. All flows of saltwater requiring 12 or more pounds per gallon to control shall be isolated as in subparagraph (a)1., above, and the plugs verified by tagging with 15,000 pounds of drill stem weight.</li> <li>4. Underground Sources of Drinking Water (USDW) shall be isolated from adjoining saline zones by a minimum cement plug of 400 feet extending from 200 feet below to 200 feet above the base of the USDW. Such plugs shall be verified by tagging with sufficient drill stem weight to guarantee proper placement of the plug.</li> </ol>	No (Rule 62C-29.009, Florida Administrative Code)	<p><i>V.II.N.A/V.II.T.A "Where possible, casing will be cut above the known top of cement and pulled. Existing perforations will be isolated with a plug set within 100 feet of the top perforation .... Most cement plugs will be balanced plugs, spotted through tubing. An outline of the potential plug types:</i></p> <ul style="list-style-type: none"> <li>• CIBP + 50' cement plug above perforated interval(s).</li> <li>• 100' cement plugs centered across all casing shoes.</li> <li>• 100' cement plug centered on liner top.</li> <li>• 100' cement plugs centered across all casing cuts. If casing cannot be pulled from that depth, a packer or retainer will be used to squeeze cement behind pipe through the cut. Any plugs above that where casing is not recoverable will utilize the perforate and squeeze technique.</li> <li>• 100' (min.) cement plugs will be spotted throughout surface casing interval to cover any water bearing zones that are identified during the initial drilling process.</li> <li>• 100' cement surface plug will be spotted, and wellhead will be cut off 4' below ground level. A steel plate will be welded on to surface casing 4' below ground level and will be marked with the well name." <p>Rule 62C-29.009, Florida Administrative Code requires 200' around the base of the USDW to isolate from adjoining saline zones. The Plugging and Abandonment Plans for Burnett Oil's proposed Nobles Grade and Tamiami Prospects do not specify 200' of cement around base of USDW.</p> </li></ul>

### ***Operations Permit Application Summary of Concerns***

Burnett Oil’s operations permit application proposes oil drilling in two new prospects – Tamiami and Nobles Grade – which are located within wetlands in Big Cypress National Preserve. According to 36 C.F.R. § 9.111, “you must not conduct operations within 500 feet of surface water, including an intermittent or ephemeral watercourse, or wetland.” Both prospects are in located within wetlands (U.S. Fish and Wildlife Service, 2021), therefore, Burnett Oil should not be permitted to conduct new oil development operations at either of the proposed prospect sites (Figure 1). Approximately 19 acres of wetland would be disturbed, and dwarf cypress trees and wetland ground cover would be removed. These activities fail to comply with NPS regulations and would destroy wetlands and fragment wildlife habitat.



*Figure 1. According to the national wetlands inventory data, the two proposed new oil drilling prospect sites are in wetlands (U.S. Fish and Wildlife Service, 2021)*

However, in the event the National Park Service issues an operations permit to Burnett Oil despite its adverse impact on wetlands in the Preserve, it must require Burnett Oil to conduct baseline soil, surface water, and groundwater sampling prior to the start of construction or operations. Spills and leaks have already occurred in the existing Raccoon Point oil development facility in the preserve (Fleshler, 2015; Stechman, 2007a), and are expected to occur at the proposed new oil drilling prospects. Additional information on previous spills and leaks is provided in the *Overall Concerns for Proposed Oil & Gas Activities* section of this report. During routine monitoring, or, if there is a potential leak/spill, samples should be compared to the baseline samples to determine whether there are adverse environmental impacts resulting from any new oil drilling operations permitted.

In Burnett Oil’s proposed Spill Control and Emergency Preparedness Plan, the chemical additives to the acid maintenance application should be listed. Acid maintenance is a cleanout process that removes scale

on well surfaces. Burnett Oil alleges that it does not plan to stimulate the Sunniland formation through hydraulic fracturing. However, acid maintenance would be pumped at a pressure below formation fracture gradient to remove scale and damages. Unlike hydraulic fracturing where chemicals make up ~0.5% of the fluid, the acidizing chemicals can make up to 6% of the fluid for acid maintenance (Abdullah et al., 2016). The acid maintenance technique involves numerous additives, and if spilled, the additives need to be known to properly treat the impacted area (Abdullah et al., 2016).

Burnett Oil fails to mention the abnormally low pressure of the Sunniland Formation in the drilling operations section of its operations permit application. Previous plans for oil and gas operations in the area stated that the low pressure of the formation requires blowout prevention equipment (Erwin, 1982). It is recommended that Burnett Oil updates its blowout prevention plan to include the installation of blowout prevention equipment inside the surface casing.

The proposed surface casing at both prospects is not set to 3,000 feet for an 11,000+ feet well as specified in the Florida regulations (Rule 62C-27.005(1), Florida Administrative Code). The surface casing would instead be set to 2250' and the bottom of the USDW is 2050' at the Nobles Grade Prospect, and to 2160' at the Tamiami Prospect. The surface casing should be set to 3,000 feet to comply with Rule 62C-27.005(1), Florida Administrative Code.

For plugging and abandonment of wells, Rule 62C-29.009 of the Florida Administrative Code requires 200 feet around the base of the underground source of drinking water (USDW). Burnett Oil's plugging and abandonment plan for its proposed new oil drilling wells does not have 200 feet around the base of the USDW, which could cause future fluid migration from saline zones into the USDW after the well is abandoned.

***Nobles Grade and Tamiami Prospect Underground Injection (UIC) Permit Applications***

Burnett Oil’s Class II underground injection (UIC) well permit applications for the Nobles Grade and Tamiami Prospects were compared to the federal regulations (40 C.F.R. § 144, 146, 147 (2014)). EPA Region 4 regulates Class II UIC wells in Florida. The purpose of this comparison is to determine if the proposed injection wells are in compliance with federal and state regulations, with particular attention to potential pathways for soil, surface water, and groundwater contamination. The comparison in the table below indicates whether Burnett Oil’s UIC permit applications appear to comply with federal regulations based on the information we have received as of the date of this report, and also indicates whether it appears that they do not comply:

	<b>40 C.F.R. § 144, 146, and 147 Summary</b>	<b>Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary</b>	<b>Appears In Compliance?</b>	<b>Notes</b>
<i>Aquifer Exemption</i>	<p><b>40 C.F.R. § 144.1(g)</b> Such aquifers are those which would otherwise qualify as “underground sources of drinking water” to be protected, but which have no real potential to be used as drinking water sources. Therefore, they are not USDWs. No aquifer is an exempted aquifer until it has been affirmatively designated under the procedures at § 144.7. Aquifers which do not fit the definition of “underground source of drinking water” are not “exempted aquifers.” They are simply not subject to the special protection afforded USDWs.</p> <p><b>40 C.F.R. § 146.4</b> An aquifer or a portion thereof which meets the criteria for an “underground source of drinking water” in §146.3 may be determined under §144.7 of this chapter to be an “exempted aquifer” for Class I– V wells if it meets the criteria in paragraphs (a) through (c) of this section.</p> <p>(a) It does not currently serve as a source of drinking water; and</p> <p>(b) It cannot now and will not in the future serve as a source of drinking water</p> <p>(c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.</p>	<p>An aquifer exemption is not required for both prospects. The Boulder Zone of the Eocene Oldsmar Formation is expected to have salinities greater than 10,000 ppm TDS in the area of the Nobles Grade Prospect site.</p>	<p>No (40 C.F.R. § 144.1(g))</p>	<p>The salinity of the aquifer should be proven before injection.</p>

	40 C.F.R. § 144, 146, and 147 Summary	Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary	Appears In Compliance?	Notes
<i>Zone of Endangering Influence</i>	<p><b>40 C.F.R. § 146.6</b> The area of review for each injection well or each field, project or area of the State shall be determined according to either paragraph (a) or (b) of this section. The Director may solicit input from the owners or operators of injection wells within the State as to which method is most appropriate for each geographic area or field.</p>	<p>Maximum injection rate is approximately 0.54 million gallons per day MGD. Per Title 40 CFR §144.6, this section estimates the area of review assuming homogeneous and isotropic conditions within the injection zone (Eocene Oldsmar Formation, specifically the Boulder Zone) and forty years of injection, which is the estimated lifespan of the prospect.</p> <p><math>V = \pi r^2 b n_e</math></p> <p>Where:  V: the volumetric extent of the injected fluids;  r: radius;  b: thickness of the productive portion of the injection zone (500 feet); and  n<sub>e</sub>: effective porosity (n<sub>e</sub> = 0.2 [maximum allowed by Florida Department of Environmental Protection])</p>	<p>No (40 C.F.R. § 146.6 (a)(2))</p>	<p>Using a volumetric equation instead of the modified this equation does not account for storativity, hydrostatic pressure, or hydraulic conductivity. The simple volume equation will not accurately calculate the zone of endangering influence.</p>
	<p><b>40 C.F.R. § 146.6 (a)(2)</b> Computation of the zone of endangering influence may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the injection well or pattern. The following modified Theis equation illustrates one form which the mathematical model may take</p>			
	<p><b>40 C.F.R. § 146.6 (b)</b> In the case of application(s) for well permit(s) under § 122.38 a fixed radius around the well of not less than one-fourth (1/4) mile may be used.</p> <p>In determining the fixed radius, the following factors shall be taken into consideration:  Chemistry of injected and formation fluids;  hydrogeology; population and groundwater use and dependence; and historical practices in the area.</p>			
	<p><b>40 C.F.R. § 146.6 (c)</b> If the area of review is determined by a mathematical model pursuant to paragraph (a) of this section, the permissible radius is the result of such calculation even if it is less than one-fourth (1/4) mile.</p>			

	40 C.F.R. § 144, 146, and 147 Summary	Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary	Appears In Compliance?	Notes
<i>Mechanical Integrity</i>	<p><b>40 C.F.R. § 146.8 (b)</b> One of the following methods must be used to evaluate the absence of significant leaks: (1) Following an initial pressure test, monitoring of the tubing-casing annulus pressure with sufficient frequency to be representative while maintaining an annulus pressure different from atmospheric pressure measured at the surface; (2) Pressure test with liquid or gas</p>	<p>Pressure test casing to 1,500 psi for thirty minutes.</p>	Yes	
	<p><b>40 C.F.R. § 146.8 (c)</b> One of the following methods must be used to determine the absence of significant fluid movement:            (1) The results of a temperature or noise log; or            (2) For Class II only, cementing records demonstrating the presence of adequate cement to prevent such migration;</p>	<p>During well construction, formation logging will be completed and will consist of well logging, borehole geophysics (caliper, gamma log, spontaneous potential logs, fluid resistivity logs, temperature logs, and cement bond logs) formation fluid sampling via swabbing, and step rate testing (SRT). This testing program will help identify potential injectivity, original formation pressure, lithologic make up, density, porosity, salinity, total dissolved solid (TDS), and fracture pressure.</p>		
<i>Plugging and Abandonment</i>	<p><b>40 C.F.R. § 146.10 (a)(1)</b> (1) Prior to abandoning Class I, II and III wells, the well shall be plugged with cement in a manner which will not allow the movement of fluids either into or between underground sources of drinking water. The Director may allow Class III wells to use other plugging materials if the Director is satisfied that such materials will prevent movement of fluids into or between underground sources of drinking water.</p>	<p>The proposed saltwater disposal well will be plugged and abandoned in accordance with the United States Environmental Protection Agency guidelines and requirements when its service life is over. The plugs will cement the entire wellbore from the injection zone to land surface.</p>	Yes	<p>Burnett Oil states that it will follow the federal guidelines.</p>
	<p><b>40 C.F.R. § 146.10 (a)(2)</b> Placement of the cement plugs shall be accomplished by one of the following: (i) The Balance method; (ii) The Dump Bailer method; (iii) The Two-Plug method; or (iv) An alternative method approved by the Director, which will reliably provide a comparable level of protection to USDW.</p>			

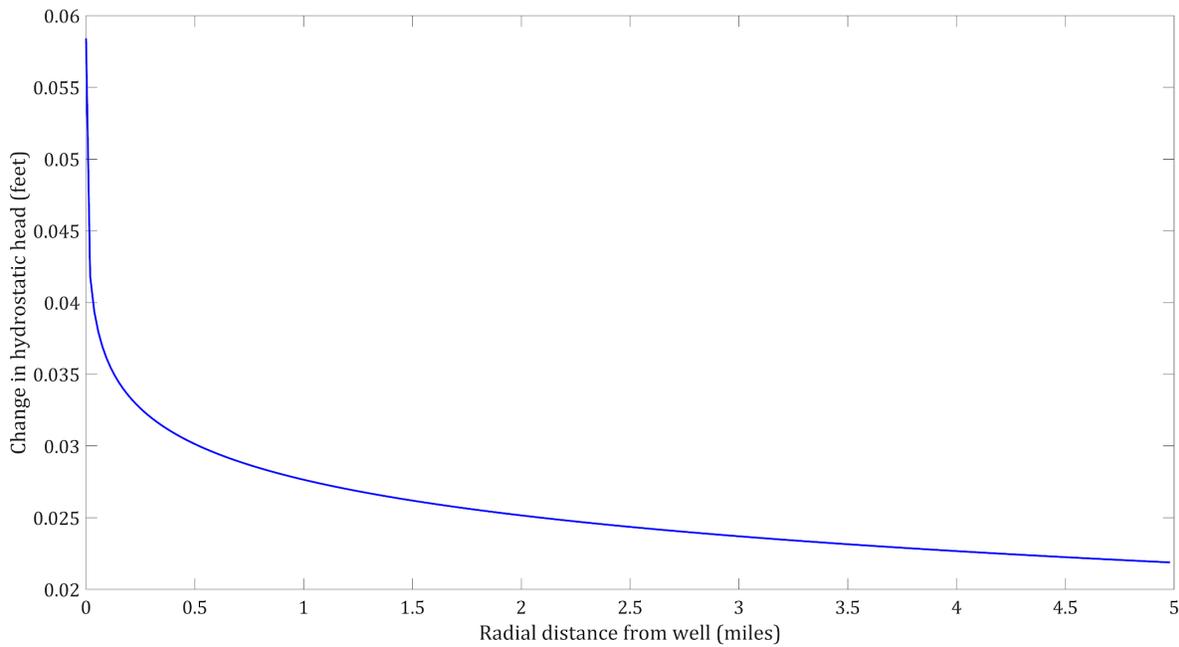
	40 C.F.R. § 144, 146, and 147 Summary	Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary	Appears In Compliance?	Notes
<i>Construction Requirements</i>	<p><b>40 C.F.R. § 146.22 (a)</b> All new Class II wells shall be sited in such a fashion that they inject into a formation which is separated from any USDW by a confining zone that is free of known open faults or fractures within the area of review</p>	<p>With Middle Confining Unit No. 2 confining the Boulder Zone and the proposed injection depth approximately 300 feet below the base of the underground source of drinking water, the proposed Nobles Grade Prospect saltwater disposal injection zone will consist of an open hole interval from approximately 2,350 to 2,850 feet below land surface.</p>	Yes	<p>The Middle Confining Unit No. 2 is of sufficient thickness in this area to confine the Boulder Zone (Reese &amp; Richardson, 2008). In addition, there is a 450 ft gap (Nobles Grade Prospect) and 340 ft gap (Tamiami Prospect) between the base of the USDW and the top of the lower Floridan aquifer (Williams &amp; Kuniansky, 2015).</p>
	<p><b>40 C.F.R. § 146.22 (f)</b> A descriptive report interpreting the results of that portion of logs and tests which specifically relate to (1) an USDW and the confining zone adjacent to it, and (2) the injection and adjacent formations shall be prepared by a knowledgeable log analyst and submitted to the director. At a minimum:</p> <p>(1) Deviation checks on all holes constructed  (2) Such other logs and tests may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. (i) For surface casing: (A) Electric and caliper logs before casing is installed; and (B) A cement bond, temperature, or density log after the casing is set and cemented. (ii) for intermediate/long strings of casing: (A) Electric porosity and gamma ray logs before the casing is installed; (B) Fracture finder logs; and (C) A cement bond, temperature, or density log after the casing is set and cemented</p>	<p>During well construction, formation logging will be completed and will consist of well logging, borehole geophysics (caliper, gamma log, spontaneous potential logs, fluid resistivity logs, temperature logs, and cement bond logs) formation fluid sampling via swabbing, and step rate testing (SRT). This testing program will help identify potential injectivity, original formation pressure, lithologic make up, density, porosity, salinity, total dissolved solid (TDS), and fracture pressure.</p>		
	<p><b>40 C.F.R. § 146.22 (f)</b> (1) Fluid pressure; (2) Estimated fracture pressure; (3) Physical and chemical characteristics of the injection zone.</p>			

	40 C.F.R. § 144, 146, and 147 Summary	Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary	Appears In Compliance?	Notes
<i>Operating and monitoring requirements</i>	<p><b>40 C.F.R. § 146.23 (a)</b> (1) Injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In no case shall injection pressure cause the movement of injection or formation fluids into an underground source of drinking water.</p> <p>(i) Average and maximum daily rate and volume of fluids to be injected.</p> <p>(ii) Average and maximum injection pressure; and</p> <p>(iii) Source and an appropriate analysis of the chemical and physical characteristics of the injection fluid</p>	<p>Maximum Injection Rates: 0.54 million gallons per day; Average/Maximum Injection Pressures: 30 psi / 50 psi; and Annulus Pressure Range: 10 to 100 psi.</p> <p>MAIP = FP; <math>FP=(FG - (0.433 * (SG + 0.05))) * D</math></p> <p>FG: Fracture gradient of the injection zone in pounds per square inch/feet (psi/ft). The Applicant will perform a step rate test to determine the fracture gradient at the saltwater disposal well to calculate the final maximum allowable injection pressure.</p> <p>SG: Specific gravity, which is estimated to be greater than 1.0.</p> <p>D: True vertical depth in feet from land surface to the top of the open borehole at the base of the final casing.</p>	Yes	
	<p><b>40 C.F.R. § 146.23 (b)</b> Monitoring requirements:</p> <p>(1) Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics;</p> <p>(2) Observation of injection pressure, flow rate, and cumulative volume at least with the following frequencies:</p> <p>(i) Weekly for produced fluid disposal operations;</p> <p>(ii) Monthly for enhanced recovery operations;</p> <p>(iii) Daily during the injection of liquid hydrocarbons and injection for withdrawal of stored hydrocarbons; and</p> <p>(iv) Daily during the injection phase of cyclic steam operations</p> <p>And recording of one observation of injection pressure, flow rate and cumulative volume at reasonable intervals no greater than 30 days</p>	<p>Devices used to monitor and alarm for tank levels, injection pressures, and annulus pressures will be installed and monitored on a routine basis. Except for the tank monitors, the other monitors are located at the wellhead. The injection monitoring system also records injection rates, injection pressures, annular pressure, and volumes.</p> <p>A buried water flowline will transport fluids from the battery tank to the injection well less than 250 feet away. The Applicant plans to install monitoring equipment as required by the United States Environmental Protection Agency as well as telemetry equipment to monitor injection pressure, injection rate and casing pressure via the supervisory control and data acquisition (SCADA) system. Additionally, the well will be checked daily with rates and pressures recorded weekly at a minimum.</p>		
	<p><b>40 C.F.R. § 144.51(j)(1)</b> Monitoring and records. (1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.</p>			

	<b>40 C.F.R. § 144, 146, and 147 Summary</b>	<b>Nobles Grade and Tamiami Class II Injection Well Permit Applications Summary</b>	<b>Appears In Compliance?</b>	<b>Notes</b>
<i>Geologic Information</i>	<b>40 C.F.R. § 146.24 (a)(5)</b> Appropriate geological data on the injection zone and confining zone including lithologic description, geological name, thickness, and depth;	The permit applications describe the injection zone (Boulder Zone), confining zone (Middle Confining Unit No. 2 - Eocene Avon Park Formation), and bottom of the closest USDW.	Yes	
	<b>40 C.F.R. § 146.24 (a)(6)</b> Geologic name and depth to bottom of all underground sources of drinking water which may be affected by the injection;			

***Summary of Concerns for the Class II Underground Injection Well Permits***

In Burnett Oil’s Class II underground injection (UIC) well permit applications, the zone of endangering influence was calculated using a volumetric equation rather than a change in pressure equation. The volumetric equation does not consider hydraulic conductivity or the relationship of the injected area to the underground source of drinking water (USDW). The modified Theis equation is recommended in 40 C.F.R. § 146.6 to calculate the radius of endangering influence. Based on the high hydraulic conductivity of the Boulder zone, the change in hydrostatic head is not great enough to contaminate the USDW, so the chances of injected fluids migrating upwards into underground sources of drinking water appears to be low (Figure 2).



*Figure 2. Results of the Theis equation for the Boulder Zone. Change in hydrostatic head with increasing radius around Tamiami and Nobles Grade Prospect Class II Injection Wells.*

### ***Overall Concerns with Burnett Oil's Proposed Oil & Gas Development Activities***

The NPS regulations, specifically 36 C.F.R. § 9.111, prohibits oil and gas operations within 500 feet of a wetland. Both of Burnett Oil's proposed new oil development sites at the Nobles Grade and Tamiami Prospects are located in wetlands (Figure 1). Therefore, Burnett Oil's proposed new oil and gas development operations in Big Cypress National Preserve should not be permitted. Oil and gas activity in the preserve has already created a large environmental footprint (i.e., construction of roads, well pads, and other production facilities and Burnett Oil's damaging oil exploration activities in 2017-2018) (Quest Ecology Inc., 2018, 2019), and human activities in the preserve have deteriorated the freshwater wetland ecosystem (Thornberry-Ehrlich, 2008). Big Cypress National Preserve is one of the last functioning cypress wetlands, and Burnett Oil's proposed new road and well pad construction would further damage and fragment the landscape. This fragmentation and other activities associated with oil and gas production will disrupt sensitive and endangered species, such as the Florida panther, wood stork, and gopher tortoise (Russel, 2021; Quest Ecology Inc., 2018, 2016).

At the current oil development site in the preserve, Raccoon Point, there is improper maintenance, causing environmental impacts. Photographic documentation from 2006 shows pipes and joints with scale build up (1.5" thick in some cases) (Atwood, 2006). Corrosion caused the release of 2,000 gallons of wastewater mixed with oil in 2018 in Big Cypress National Preserve (Food & Water Watch, 2019). Based on a review of prior spills and leaks at Raccoon Point in the preserve, there will likely be future spills and leaks (e.g., produced water, wastewater, oil, etc.) from Burnett Oil's proposed new operations at the Nobles Grade and Tamiami Prospects.

As an example, the current oil development in Big Cypress National Preserve caused numerous leaks and spills in Bear Island and Raccoon Point (Stechman, 2007a, 2007b). Since 2011, eight spills have occurred within Big Cypress National Preserve where 630 gallons of oil and 18,228 gallons of "saltwater" were not recovered (Fleshler, 2015). Current oil and gas practices in the preserve are not adequately protecting water resources and the fragile ecosystem. Proposed new oil and gas activities at the Tamiami and Nobles Grade Prospects are also expected to cause leaks and spills, impacting surrounding soil, surface water, and groundwater.

In the event the National Park Service issues an operations permit, despite the expected adverse impact to wetland areas, it must require Burnett Oil to collect baseline soil, surface water, and groundwater sampling to assist in identifying when leaks and spills occur on site. Releases of produced water enrich sediments with various contaminants, such as organic compounds (Orem et al., 2017), trace metals (Oetjen et al., 2018), and/or radionuclides (Akob et al., 2016; Cozzarelli et al., 2017; McDevitt et al., 2019). Enriching soils in the wetland areas of Big Cypress National Preserve will be detrimental to the ecosystem. However, Burnett Oil's operations permit application does not specifically state that baseline water samples will be collected. We recommend that baseline soil, surface water, and groundwater samples are collected to help identify and mitigate future contamination from Burnett Oil's proposed oil development activities.

## **Concluding Recommendations**

- Oil and gas operations are prohibited within 500 feet of wetlands (36 C.F.R. § 9.111) and both the Nobles Grade and Tamiami Prospects are proposed to be located within wetlands. Therefore, Burnett Oil should not be permitted to conduct new oil development operations at either of the prospect sites.
- In the event the National Park Service issues an operations permit, baseline soil, groundwater, and surface water samples should be required. Baseline samples will provide background soil and water composition to identify future spills and leaks from Burnett Oil's proposed new oil development operations.
- Spills and leaks will likely occur at both of Burnett Oil's proposed new oil prospects based on the history of spills and leaks at existing oil production facilities at Raccoon Point and Bear Island in Big Cypress National Preserve. These spills and leaks adversely impact water resources and fragile ecosystems.

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