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Tyndall Air Force Base

Bay County, Florida
CERCLIS #FL1570024124

■ Site Exposure Potential

Tyndall Air Force Base occupies 11,650 ha at the end of a 26-km peninsula in Bay County, western Florida (Figure 1). The site is surrounded by East Bay, St. Andrew Bay, St. Andrew Sound, and the Gulf of Mexico.

Tyndall Air Force Base is an Air Combat Command facility activated in 1941. Many operations at the site involved the use of hazardous substances. Of the 29 CERCLA sites identified during the base-wide Installation Restoration Program (IRP), 16 require further action (Rust E&I 1997). EPA and Florida DEP approved determinations of no further action for the

remaining 13 CERCLA sites. Table 1 describes the 16 sites requiring further action; Figure 1 shows their locations.

Tyndall Air Force Base was added to the National Priorities List based on the presence of DDT and its breakdown products in sediments of Shoal Point Bayou, also known as Fred Bayou (EPA 1995). The bayou, designated Site OT-29, is next to the Old Pesticide Building, where DDT and other pesticides were stored, and possibly discarded. Documentation for the start of DDT use at the base has not been found. About 80 drums containing approximately 45 metric tons of DDT were removed from the Old Pesticide

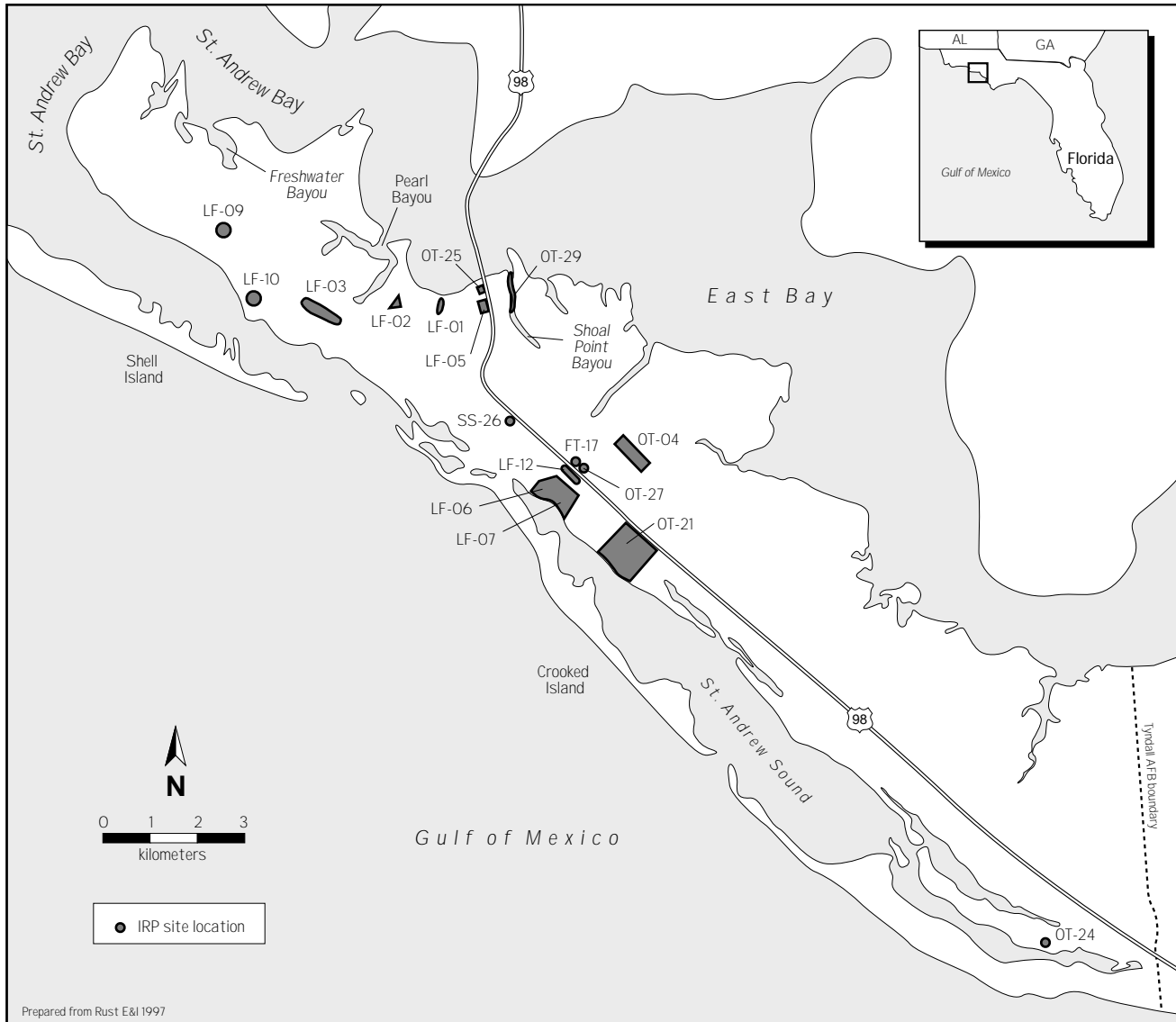


Figure 1. Location of Tyndall Air Force Base and IRP sites in Bay County, Florida.

Building in the mid-1970s. An unspecified number of these drums were leaking. Somewhat later, the Old Pesticide Building either burned down or was demolished, and the remaining debris was buried on the facility at an unspecified location (EPA 1995). DDT also may have been discarded in two landfills on the facility; the 6000

Area Landfill (Site LF-05) and a waste disposal area near the sewage treatment plant (Site LF-06; EPA 1995).

Surface water runoff and groundwater discharge are potential contaminant migration pathways to NOAA trust resources. The topography of

Table 1. Sixteen CERCLA sites at Tyndall Air Force Base requiring further action.

IRP Number	Description	Disposed Materials	Date of Operation	Site Status
LF-01	Wherry Landfill	General refuse and mess hall waste landfill.	1943-1948	SI Required
LF-02	Sabre Drive Landfill	General refuse landfill.	1943-1965	SI Required
LF-03	Beacon Beach Road Landfill	General refuse landfill.	1952-1965	SI Required
OT-04	Southeast Runway Extension Burial Site	Containers, drums, batteries, and parts.	1945-1965	RI Required
LF-05	6000 Area Landfill	Containers, drums, batteries, and parts.	1945-1965	RI Required
LF-06	Sewage Plant Vicinity Landfill	Main sanitary landfill. Also concrete-encased asbestos, wrecked drones, and receptacles containing waste oils and solvents.	1965-1973	RI Required
LF-07	Spray Field Vicinity Landfill	Main sanitary landfill. Also, other unidentified materials.	1973-1977	RI Required
LF-09	Capehart Burial Site	Buried rubble and burned debris from about 40 houses destroyed in the 1962 tornado.	1962	SI Required
LF-10	Capehart Marina Rubble Storage	Concrete rubble stored above ground.	1962	SI Required
LF-12	Highway 98 Burial Site	Building rubble and debris from burial of demolished base housing.	1960s	SI Required
FT-17	Highway 98 Fire Training Area	Waste petroleum, oil, and lubricants stored in two 20,000-gallon tanks and later burned in the burn pit area. Leaks from stored PCB transformers.	1952-1968	RI/FS In Progress
OT-21	Explosive Ordnance Range Burn/Burial Pits Site	Buried residue from incineration or detonation of unused ordnance.	1950s-1980s	IRA In Progress
OT-24	9700 Area Batch Asphalt Plant	Asphalt production waste.	1975-1988	RI Required
OT-25	Small Arms Repair Area	Waste paints and solvents poured into an open pit and then covered with soil.	1965-1972	RI Required
SS-26	Vehicle Maintenance Area	Two 10,000-gallon fuel USTs, hazardous waste accumulation area, waste oil tank, and oil/water separators. Small spills associated with normal vehicle maintenance.	1950s-present	RI/FS In Progress
OT-29	Shoal Point Bayou	DDT and breakdown products in bayou sediments.	1970s	RI/FS In Progress
IRA:	Interim Remedial Action			
RI:	Remedial Investigation			
SI:	Site Investigation			

Tyndall Air Force Base is relatively flat with a maximum elevation of approximately 9 m. No detailed information on surface water flow from each of the sites was available. In general, runoff from areas on the north side of U.S. Highway 98 flows into East Bay and St. Andrew Bay, and runoff from the south and west sides of U.S. Highway 98 flows into St. Andrew Sound, St. Andrew Bay, and the Gulf of Mexico (CH2M Hill 1981).

The surficial aquifer near the base is composed of highly transmissive, well-sorted, fine- to medium-grained sands, extending to 34 m deep, where clayey-sand strata are encountered (Rust E&I 1997). No information was available regarding the continuity of this unit. Groundwater depths typically range from 0.3 to 0.9 m bgs. The water table is relatively flat throughout Tyndall Air Force Base, but fluctuates up to 1.5 m in response to seasonal rainfall and tidal cycles. A groundwater divide beneath Highway 98 separates areal flows to the northeast and southwest, but shallow groundwater flows toward nearby bayous, streams, and ditches. The surficial aquifer is the principal concern with regard to contaminant transport because it is both highly permeable and shallow (Rust E&I 1997).

■ NOAA Trust Resources and Habitats

The primary habitats of concern to NOAA are surface water and bottom substrates of the St. Andrew Bay estuary, of which East Bay, St.

Andrew Bay, and St. Andrew Sound are next to the base. Of particular concern are several tidal bayous and associated wetlands that receive drainage from the base. The Gulf of Mexico lies beyond St. Andrew Bay and St. Andrew Sound. The many estuarine fish and invertebrates that use the embayments and nearshore Gulf are the resources of concern to NOAA. Table 2 lists those species most abundant in the area.

East Bay and St. Andrew Bay are protected, shallow embayments generally less than 15 m deep with moderate salinities of 20 to 30 ppt. Shoal Point Bayou, Pearl Bayou, and Freshwater Bayou, which drain from Tyndall Air Force Base into East Bay, range from less than 1 m deep to 4 m deep, with highly variable salinities depending upon precipitation and runoff. St. Andrew Sound is predominantly shallow, with a maximum depth of 10 m, and more marine salinities of 32-35 ppt (USGS 1982a; USGS 1982b; Schafer 1997).

Sediments in the estuary range from fine sands to silts. Quartz sand sediments predominate next to the beach and dune areas of St. Andrew Sound and lower St. Andrew Bay. Sandy silts to silts predominate in East Bay, particularly in Shoal Point Bayou (Rust E&I 1993; Schafer 1997). There are large salt-marsh wetlands, dominated by *Spartina* spp., along the East Bay shore of the base (CH2M Hill 1981).

Over 120 species of finfish and invertebrates have been reported in the St. Andrew Bay estuary near the base (Geraghty & Miller, 1991). Table 2

Table 2. NOAA trust species that use the St. Andrew Bay estuary next to Tyndall Air Force Base.

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
<u>MARINE/ESTUARINE FISH</u>						
Atlantic croaker	<i>Micropogonias undulatus</i>		♦	♦		♦
Bay anchovy	<i>Anchoa mitchilli</i>	♦	♦	♦		
Blue runner	<i>Caranx crysos</i>		♦	♦		♦
Bluefish	<i>Pomatomus saltatrix</i>		♦	♦		♦
Code goby	<i>Gobiosoma robustum</i>	♦	♦	♦		
Gulf flounder	<i>Paralichthys albigutta</i>		♦	♦		♦
Gulf menhaden	<i>Brevoortia patronus</i>		♦	♦		
Hardhead catfish	<i>Arius felis</i>	♦	♦	♦		
Pinfish	<i>Lagodon rhomboides</i>		♦	♦		
Red drum	<i>Sciaenops ocellatus</i>		♦	♦		♦
Sand seatrout	<i>Cynoscion arenarius</i>		♦	♦		♦
Sheepshead minnow	<i>Cyprinodon variegatus</i>	♦	♦	♦		
Silver perch	<i>Bairdiella chysoura</i>	♦	♦	♦		
Silversides	<i>Menidia spp</i>	♦	♦	♦		
Spanish mackerel	<i>Scomberomorus maculatus</i>		♦	♦		♦
Spot	<i>Leiostomus xanthurus</i>		♦	♦		♦
Spotted seatrout	<i>Cynoscion nebulosus</i>		♦	♦		♦
Striped mullet	<i>Mugil cephalus</i>		♦	♦		♦
<u>INVERTEBRATE SPECIES</u>						
Bay scallop	<i>Argopecten irradians</i>	♦	♦	♦	♦	♦
Bay squid	<i>Lolliguncula brevis</i>	♦	♦	♦		
Blue crab	<i>Callinectes sapidus</i>	♦	♦	♦	♦	♦
Brown shrimp	<i>Penaeus aztecus</i>		♦	♦	♦	♦
Eastern oyster	<i>Crassostrea virginica</i>	♦	♦	♦	♦	♦
Grass shrimp	<i>Palaemonetes pugio</i>	♦	♦	♦		
Pink shrimp	<i>Penaeus duorum</i>		♦	♦	♦	♦

presents the NOAA trust species considered abundant in the estuary. The smaller species of fish, such as bay anchovy, code goby, sheepshead minnow, silversides, and silver perch, spend their entire lives within the estuary. Most of the other fish found in the bay spawn in coastal areas and

use East Bay, St. Andrew Bay, and St. Andrew Sound as juvenile nurseries. Non-spawning adults use the estuary seasonally (Nelson et al. 1992).

Both adult and juvenile blue crab are highly abundant in the St. Andrew Bay estuary. Crab mate in low-salinity areas, such as the bayous of East Bay. After mating, the males remain in low-salinity waters, while the females migrate to undiluted seawater zones to brood eggs. Larvae are released in areas of undiluted marine salinities. The planktonic larvae are subsequently transported back into the estuary, where they settle to the bottom and metamorphose.

Grass shrimp, an abundant nearshore species, spend their entire life within the estuary, in salt marshes and oyster reef habitats. Brown and pink shrimp are also abundant, particularly the juvenile stages. Adults use the estuary seasonally. Although not as abundant, eastern oyster and bay scallop also use the estuary (Nelson et al. 1992).

There are two federally threatened or endangered sea turtles near the base. The federally threatened Atlantic loggerhead sea turtle (*Caretta caretta*) and the endangered green sea turtle (*Chelonia mydas*) use the coastal waters of St. Andrews Bay and St. Andrew Sound seasonally (CH2M Hill 1981).

There are both commercial and recreational fisheries for finfish, blue crab, oyster, and scallop in East Bay, St. Andrew Bay, and St. Andrew Sound (Schafer 1997). In 1993, Tyndall Air Force Base posted a catch-and-release advisory for Shoal Point Bayou (EPA 1995). East Bay, along the northeast boundary of Tyndall Air Force Base, is classified by the State of Florida as Class II water, designated for shellfish propagation and

harvesting. The waters at the northwest end of the base are a designated Aquatic Preserve. The rest of the estuary around the base is designated Class III waters for recreation and propagation of fish and wildlife (Geraghty and Miller 1991).

■ Site-Related Contamination

Site OT-29, Shoal Point Bayou, is the only active CERCLA site for which data were available for comparison with NOAA screening guidelines. At Site OT-29, elevated concentrations of DDT and its breakdown products have been measured in sediment and surface water. DDT contamination in Shoal Point Bayou was first observed in 1985 during area-wide sediment sampling conducted by the U.S. Fish and Wildlife Service (EPA 1995). One sediment sample composited from five cores taken along the centerline of Shoal Point Bayou contained substantially higher concentrations of DDT (4400 µg/kg) and its breakdown products, DDE and DDD, than did any of the other 36 sediment samples collected throughout the St. Andrew Bay estuarine complex.

In 1990, the U.S. Fish and Wildlife Service collected an additional 28 sediment samples from Shoal Point Bayou to follow up on the 1985 sediment sampling (Brim 1990). DDT and/or its breakdown products were detected in 54% of the samples at a detection limit of 97 µg/kg, considerably higher than the ERL of 1.58 µg/

kg. Measured concentrations ranged from 100 to 1300 µg/kg of DDT and metabolites in Shoal Point Bayou sediments.

In 1992, groundwater samples were collected from six on-site monitoring wells and analyzed for DDT and its breakdown products. None of these pesticides was detected, but the detection limit of 0.1 µg/L was two orders of magnitude higher than the marine chronic AWQC of 0.001 µg/L. Ten soil samples were collected in 1993 and analyzed for pesticides (USACE 1993; EPA 1995). In addition to DDT and its breakdown products, elevated concentrations of chlordane were detected. Table 3 shows maximum concentrations in soil. Screening guidelines for pesticides in soil have not been developed.

A preliminary assessment/site investigation was completed for Site OT-29 in 1992 (Rust E&I 1993). Higher concentrations of DDD, DDE, and DDT were detected in sediment during this study than in any of the previous studies (Table 3). Of the seven sediment samples collected, one sample contained 1,000 to 12,000 µg/kg of DDT and breakdown products; five of the seven samples had concentrations ranging from 62 to 910 µg/kg; and in one sample concentrations were not detected above the detection limit of 26 µg/kg. Surface water samples were collected in 1992, but DDT and/or breakdown products were not detected at the detection limit of 0.1 µg/L, which is two orders of magnitude higher than the marine chronic AWQC of 0.001 µg/L.

Table 3. Maximum concentrations of pesticides in soil and sediment collected from Site OT-29 at Tyndall Air Force Base.

Contaminant	Soil (µg/kg)	Sediment (µg/kg)	
	1993 ^a	1992 ^b	ERL ^c
DDD	1,600	2,600	1.58 ^d
DDE	860	1,100	2.2
DDT	1,200	12,000	1.58 ^d
alpha Chlordane	14	NA	NA
gamma Chlordane	9.1	NA	NA
Technical Chlordane	4,200	NA	NA
NA:	Not analyzed		
a:	USACE 1993		
b:	Rust E&I 1993		
c:	Effects-range low concentration; the concentration representing the lowest 10-percentile value for the data in which effects were observed or predicted in studies compiled by Long et al. (1995).		
d:	ERL for total DDT.		

Summary

There are many potential hazardous waste areas at Tyndall Air Force Base although data from only OT-29, Shoal Point Bayou, were available for screening against NOAA guidelines. Very high concentrations of DDT and its breakdown products were detected in soil and sediment from the Shoal Point Bayou area. Concentrations in bayou sediment, four orders of magnitude higher than screening guidelines, threaten the many NOAA trust species that use the estuary surrounding Tyndall Air Force Base.

References

- Brim, M. 1990. Environmental contaminants evaluation; sediment DDT concentrations in Fred Bayou, St. Andrew Bay, Tyndall Air Force Base, Bay County, Florida. Panama City, Florida: U.S. Fish and Wildlife Service. 10 pp.
- CH2M Hill. 1981. Installation Restoration Program Records Search for Tyndall Air Force Base, Florida. Tyndall Air Force Base, Florida: Air Force Engineering and Services Center, Directorate of Environmental Planning.
- Geraghty and Miller, Inc. 1991. *Final Remedial Investigation report for Sites OT-4, LF-5, and OT-25, Tyndall Air Force Base, Florida*. Omaha: U.S. Army Corps of Engineers.
- Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management* 19(1): 81-97.
- Nelson, D.M., M.E. Monaco, C.D. Williams, T.E. Czaplá, M.E. Pattillo, L. Coston-Clements, L.R. Settle, and E.A. Irlandi. 1992. *Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Volume I: Data summaries*. Rockville, Maryland: NOAA/NOS Strategic Environmental Assessments Division. 273 pp.
- Rust Environment & Infrastructure (Rust E&I). 1993. *Final Preliminary Assessment/Site Investigation report, Shoal Point Bayou: Site 29, Tyndall Air Force Base, Florida*. Omaha: U.S. Army Corps of Engineers. 43 pp.
- Rust Environment & Infrastructure (Rust E&I). 1997. Management Action Plan, Tyndall Air Force Base, Florida. Brooks Air Force Base, Texas: Air Force Center for Environmental Excellence, Environmental Restoration Division.
- Schafer, R., Fisheries Biologist, National Marine Fisheries Service, Panama City, Florida, personal communication, July 22, 1997.
- U.S. Army Corps of Engineers (USACE). 1993. Test results from soil samples collected at Shoal Point Bayou on March 11, 1993 and analyzed by the Missouri River Division Laboratory. Omaha: U.S. Army Corps of Engineers.

U.S. Environmental Protection Agency (EPA).
1993. *Water quality criteria*. Washington, DC:
U.S. Environmental Protection Agency, Office of
Water, Health and Ecological Criteria Division.
294 pp.

U.S. Environmental Protection Agency (EPA).
1995. HRS Documentation Record, Tyndall Air
Force Base. Atlanta: U.S. EPA, Region IV.
43 pp.

U.S. Geological Survey (USGS) 1982a.
7.5 minute series orthophoto map (topographic/
bathymetric). Long Point, Florida.

U.S. Geological Survey (USGS) 1982b.
7.5 minute series orthophoto map (topographic/
bathymetric). Beacon Beach, Florida.