

APPENDICES

24. Appendix A: Entities Active in the Dickinson Bayou

Local

Bayou Preservation Association (BPA) is a citizens' group whose mission is to "protect and restore the richness and diversity of our waterways". BPA facilitates collaborative projects and public awareness about the region's streams and bayous in order to foster watershed management, conservation, and recreation along Houston's defining natural resource. (<http://www.bayoupreservation.org/>)

Dickinson Bayou Watershed Partnership The (Watershed Partnership) is a collaborative of stakeholders from state agencies, nonprofit organizations, civic groups, academic institutions, local governments, business and industry groups, and utilities. It is developing and implementing a watershed plan for the purposes of protecting, preserving, and restoring the quality of the Dickinson Bayou watershed and its communities. (www.dickinsonbayou.org)

Dickinson Bayou Watershed Steering Committee is a group formed by all the entities dealing with storm water removal in the Dickinson Bayou watershed. This group includes representatives from: Brazoria County, Brazoria County Conservation and Reclamation District #3, Brazoria County Drainage District #4, Galveston County, Galveston County Consolidated Drainage District, Galveston County Drainage District #1, Galveston County Drainage District #2, City of Alvin, City of Dickinson, City of Friendswood, City of League City, City of Manvel, City of Santa Fe, City of Texas City

Galveston Bay Area Master Naturalists. The Texas Master Naturalist program develops local teams of "master volunteers" to provide educational and outreach services aimed at the better management of natural resources and natural areas within their communities. The Texas Master Naturalist program is a partnership between the Texas Cooperative Extension Service, Texas Parks & Wildlife, and other local partners. (<http://www.gbamasternaturalist.org/>)

Galveston Bay Eco-Paddle Association (GBEPA) is a troop that surveys wildlife and habitat quality in the bay system, increases public awareness of the bay's natural resources, and records and monitors the effects of human impact on the bay's fragile eco-system. (<http://www.ecopaddle.org/>)

Galveston Bay Foundation (GBF) Restoration and conservation of valuable Galveston Bay habitats are primary activities of the Galveston Bay Foundation. Conservation of Bay resources ranges from smooth cordgrass planting to create marshes to woodland plantings, mitigation planning, and land acquisition. In all these activities, GBF relies on countless volunteer hours. Another priority, protecting wetlands through acquisition and management, will provide a legacy of productivity within the Bay for future generations. (www.galvbay.org)

Harris-Galveston Coastal Subsidence District (HGCS) was created by the Texas legislature in 1975. It acts as a groundwater district for this region, and has developed and

implemented a plan to regulate groundwater withdrawal and encourage the use of alternate sources, such as surface water. This regulation of ground water pumping has helped to significantly slow subsidence in the Armand Bayou area, one of the major contributing factors of habitat loss and degradation in the watershed. HGSCD provides extensive water conservation educational materials. (<http://www.subsidence.org>)

Houston Advance Research Center (HARC) is a 501(c)(3) not-for-profit organization based in The Woodlands, Texas dedicated to improving human and ecosystem well-being through the application of sustainability science and principles of sustainable development. (<http://www.harc.edu/>)

Houston Audubon Society is a nonprofit organization that promotes the conservation and appreciation of birds and wildlife habitat. Houston Audubon acquires and maintains critical habitat as bird sanctuaries. It conducts education programs and field trips for children and adults. It readily offers its expertise to efforts to promote conservation of birds and their habitats. (<http://www.houstonaudubon.org/>)

Houston-Galveston Area Council is an association of counties, cities, and school districts in the Gulf Coast Planning Region. It is involved with community and environmental planning, land use planning, air and water quality, and quality of life issues throughout the Houston-Galveston area. (<http://www.h-gac.com/>)

Keep Dickinson Beautiful (KDB) works to create partnerships to make Dickinson a cleaner, more beautiful place to live, work and play, and to preserve our heritage of tall Pines, natural beauty and rich culture. (<http://www.ci.dickinson.tx.us/dbweb/intro.html>)

Legacy Land Trust (LLT) is the principal land trust operating in the area. LLT will provide assistance in obtaining conservation easements, and can act as holder of an easement. In some cases, LLT may actually accept title to the land. (<http://www.legacylandtrust.org/>)

Texas Coastal Watershed Program (Texas Sea Grant Program /Texas AgriLife Extension Service) County and marine agents associated with the AgriLife Extension Service program of both Texas Sea Grant (TSG) and Texas AgriLife Extension Service (TAES) are active in the Armand Bayou area and available to assist with a variety of water quality education programs and demonstrations in the watershed. The Texas Coastal Watershed Program (TCWP) is a regional program of TSG and TAES and has an active watershed education program in the area. (<http://www.urban-nature.org>)

The Trust for Public Land (TPL) works with local communities to develop and implement projects to meet parks and open space needs. TPL also provides assistance through their legal and real estate specialists to help locate and finance public green space. In the Houston-Galveston region, TPL is working specifically to increase public access to Galveston Bay and its tributaries and to save critical habitats in the watershed. (<http://www.tpl.org/>)

University of Houston-Clear Lake and Environmental Institute of Houston (EIH) at the University of Houston/Clear Lake helps people in the Houston region participate more effectively

in environmental improvement. Information and technology is obtained and disseminated from research supported by EIH in critical areas including pollution prevention, natural resource conservation, public policy, and societal issues. EIH seeks to expand balanced environmental education based on objective scholarship to empower the entire community to make sound decisions on environmental issues. (<http://www.eih.uh.edu/>)

State Government

Coastal Coordination Council (CCC) is the policy board for the Coastal Management Program (CMP). The Council is made up of representatives from state resource agencies, local governments, small business, citizens, agriculture, as well as gubernatorial appointees. It adopts uniform goals and policies to guide decision-making by all entities regulating or managing natural resource use within the Texas coastal area. The Council reviews significant actions taken or authorized by state agencies and subdivisions that may adversely affect coastal natural resources to determine their consistency with the CMP goals and policies. In addition, the Council oversees the CMP grants program and the Small Business and Individual Permitting Assistance Program. (<http://www.glo.state.tx.us/coastal/ccc.html>)

Galveston Bay Estuary Program is a program of the TCEQ that coordinates efforts to implement The Galveston Bay Plan, the Comprehensive Conservation and Management Plan for Galveston Bay. The Estuary Program works with local stakeholders to develop projects and programs to protect and restore Galveston Bay habitats, ensure adequate freshwater inflows to maintain a healthy estuarine system, manage fish and wildlife species, control invasive species, protect and improve water quality, particularly through addressing non-point source pollution, compile and analyze resource data to determine ecosystem health, conduct necessary research, and conduct public outreach and education to promote conservation of bay resources. The Galveston Bay Council, a management committee made up of representatives of state and federal agencies, local governments, citizens, commercial and recreational fishing interests, business and industry, and conservation organizations, is charged with guiding Estuary Program activities to ensure the best use of available resources in implementing The Galveston Bay Plan. (<http://gbep.state.tx.us>)

Texas Coastal Management Program (CMP), administered by GLO, provides a framework for coordinating state, local, and federal programs for the management of Texas coastal resources. The CMP was created in the late 1980s to provide for a more coordinated, comprehensive approach to coastal resource management. (<http://www.glo.state.tx.us/coastal/cmp.html>)

Texas Commission on Environmental Quality (TCEQ) is responsible for regulating the discharge of contaminants to surface water, groundwater, soil, and air through a wide variety of programs, and conducts public outreach and education in support of these programs. The TCEQ also conducts monitoring and assessment of surface waters to determine compliance with water quality standards. TCEQ conducts Section 401 certification reviews of U.S. Army Corps of Engineers Section 404 permit applications for the discharge of dredged or fill material into waters of the U.S., including wetlands. These certification reviews determine whether a

proposed discharge will comply with state water quality standards. TCEQ also administers the Supplemental Environmental Project Program, an innovative approach to resolving enforcement actions and improving environmental quality. Supplemental Environmental Projects are comprised of a wide variety of activities including wetland protection and restoration. TCEQ hosts the Galveston Bay Estuary Program and also provides extensive outreach materials. (<http://www.tceq.state.tx.us/index.html>)

Texas General Land Office (GLO) In Texas, nearshore waters below the mean high-tide mark belong to the state. Texas state law delegates regulation of activities conducted in coastal areas on state-owned lands such as the construction of marinas, piers, docks, etc., to the Texas General Land Office (GLO). Although federal regulations also apply in most of these circumstances, GLO review provides an additional level of scrutiny of impacts to state waters and the public. Any lands that accumulate as a result of activities within waters over state-owned lands generally revert to the State. The General Land Office administers several coastal conservation programs, including the Coastal Management Program and the Coastal Erosion Planning and Response Act Program. (<http://www.glo.state.tx.us/>)

Texas Parks and Wildlife Department (TPWD) provides outdoor recreational opportunities by managing and protecting fish and wildlife and their habitat and acquiring and managing parklands and historic areas. Responsibilities include hunting and fishing, wildlife management areas, law enforcement, state parks and historic areas, conservation and resource protection, and hunter and boater education. In the Galveston Bay watershed, TPWD operates several state parks, historic sites, and wildlife management areas, and has coordinated several large habitat restoration projects. Locally, TPWD leases the Armand Bayou Coastal Preserve from the General Land Office. Also of local interest is TPWD's Recreation Grants Program, which offers matching funds for communities wishing to construct recreational facilities. The Private Lands Initiative and the Wildscapes Program are available to assist landowners in managing their property in an ecologically friendly manner. (<http://www.tpwd.state.tx.us/>)

Texas State Soil and Water Conservation Board (TSSWCB) administers Texas' soil and water conservation law and coordinates conservation and pollution abatement programs throughout the state. One program is the Water Quality Management Plan (WQMP) program. Also known as the 503 program, the WQMP program is a voluntary mechanism by which site-specific plans are developed and implemented on agricultural and silvicultural lands to prevent or reduce nonpoint source pollution from these operations. Plans include appropriate treatment practices, production practices, management measures, technologies, or combinations thereof. Plans are developed in cooperation with local SWCDs, cover an entire operating unit, and allow financial incentives to augment participation. (<http://www.tsswcb.state.tx.us>)

Federal Government

U.S. Department of Agriculture is active in natural resource management, particularly through the Natural Resource Conservation Service and the U.S. Forest Service. Both organizations

provide resources for natural resource conservation, public land management for conservation purposes, and educational programs. (<http://www.usda.gov>)

Environmental Protection Agency (EPA) works to develop and enforce regulations that implement environmental laws enacted by Congress, such as the Clean Water Act and Clean Air Act. EPA is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist the states and tribes in reaching the desired levels of environmental quality. The EPA also sponsors several initiatives and grant programs to provide assistance to organizations involved in watershed management, pollution prevention, education, and sustainable development. (<http://www.epa.gov/>)

Federal Emergency Management Administration (FEMA) has undertaken a massive effort of flood hazard identification and mapping to produce Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps. The maps identify Special Flood Hazard Areas (SFHAs), which are regulated to minimize potential loss of life and property and the economic benefits to be derived from floodplain development. Development may take place within the SFHA, provided that development complies with local floodplain management ordinances, which must in turn meet the minimum Federal requirements. Flood insurance is required for insurable structures within the SFHA to protect Federal financial investments and assistance used for acquisition and/or construction purposes within communities participating in the National Flood Insurance Program. (<http://www.fema.gov/>)

National Oceanic and Atmospheric Administration (NOAA) NOAA Fisheries is a division of the National Oceanic and Atmospheric Administration. NOAA Fisheries works to restore and maintain sustainable fisheries, promote the recovery of protected species, and to protect and maintain the health of coastal marine habitats. The agency conducts research to restore and create fish habitat, reviews coastal development and water projects that may alter or destroy habitat, and recommends measures to offset development and use impacts. NOAA works to achieve its goals by its own actions in cooperation with other resource protection agencies, conservation organizations, and local communities, and by sponsoring national programs such as the Coastal Management Program and Community-Based Restoration Program. (<http://www.noaa.gov/>)

U.S. Army Corps of Engineers (USACE) administers regulatory programs and issues permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. In addition to its military role, it leads efforts in planning, designing, building, and operating water resources and other civil works projects, such as navigation, flood control, environmental protection, and disaster response. Locally, the Galveston District of the Corps of Engineers leads the Interagency Coordination Team, which was created to address key environmental issues and concerns associated with the widening and deepening project for the Houston-Galveston Navigation Channel. The Beneficial Uses Group is a subcommittee of the Interagency Coordination Team and identifies environmentally and economically responsible ways to utilize the material dredged from the ship channel expansion project. Efforts include

several recent and ongoing efforts to create new islands and restore historic islands that provide important upland, intertidal, and submerged habitats for water birds and aquatic species. (<http://www.usace.army.mil>)

U.S. Fish and Wildlife Service (USFWS), part of the Department of the Interior, protects America's diverse fish and wildlife resources. Locally, its Texas Coastal Program focuses on restoring and protecting economically, recreationally and ecologically important coastal fish and wildlife habitats through partnerships. By sharing biological knowledge, offering technical assistance in identifying and designing restoration projects, identifying habitat protection opportunities, and providing federal matching funds to implement projects, USFWS Texas Coastal Program biologists play a vital role in supporting and implementing coastal conservation initiatives that succeed through partnerships. (<http://www.fws.gov/>)

25. Appendix B: History of Dickinson Bayou and Bay

26. Appendix C: Fish Kill Data

Documented fish kills from Texas Parks and Wildlife Department and Texas Commission on Environmental Quality files.

Date	Estimated Total Killed	Location	Major Species	Cause
9/14/1970	219,648	Dickinson Bayou	gulf menhaden	Low Dissolved Oxygen
6/13/1971	200	Magnolia Bayou	mullet, shad	Low Dissolved Oxygen
7/7/1971	3,000,000	Dickinson Bayou from FM 646 to 1.5 miles below IH 45	gulf menhaden	Low Dissolved Oxygen
8/16/1971	4,000,000	Dickinson Bayou near Hwy 3	gulf menhaden	Low Dissolved Oxygen
8/23/1971	240,000	Magnolia Bayou near FM 517	gulf menhaden	Low Dissolved Oxygen
9/3/1971	1000000	Dickinson Bayou near IH 45	gulf menhaden	Low Dissolved Oxygen
7/14/1972	4,000	Dickinson Bayou, 2 miles West of IH 45	multiple species	Unknown
7/31/1972	2,000,253	Dickinson Bayou btwn Magnolia and FM 646	gulf menhaden	Low Dissolved Oxygen
4/23/1974	12	Dickinson Bayou, 5 miles NE of Alvin	Catfish	Brine Discharge
4/21/1976	12	Dickinson Bayou at FM 646	bullhead catfish	Low Dissolved Oxygen

7/29/1978	2,058	Dickinson Bayou and Captain's Drive (btwn SH 3 and SH 146)	gulf menhaden	Low Dissolved Oxygen
8/29/1978	8,000,038	Dickinson Bayou between IH-45 and Gum Bayou	gulf menhaden	Low Dissolved Oxygen
9/7/1980	3,000,008	Dickinson Bayou - between SH 3 and 1/4 mile West of the IH 45 bridge	gulf menhaden	Low Dissolved Oxygen
8/30/1981	51,000	Dickinson Bayou - 1 mile East of IH-45 bridge upstream 2 miles West of IH-45 bridge.	gulf menhaden	Low Dissolved Oxygen
8/8/1982	20,058	Dickinson Bayou near IH 45	gulf menhaden	Low Dissolved Oxygen
9/1/1982	100,000	Dickinson Bayou from IH 45 upstream about 3 miles	gulf menhaden	Low Dissolved Oxygen
10/8/1982	3,000	Dickinson Bayou between IH 45 and FM 646	gulf menhaden	Low Dissolved Oxygen
10/30/1982	1,000	Dickinson Bayou near SH 3	gulf menhaden	Low Dissolved Oxygen
8/26/1983	2,650	Dickinson Bayou between SH 3 and IH 45	gulf menhaden	Low Dissolved Oxygen
7/19/1984	88,660	Dickinson Bayou between SH 3 and FM 646	gulf menhaden	Low Dissolved Oxygen
9/4/1984	730,000	Dickinson County Club Bayou Bend canal that drains into		Low Dissolved Oxygen

		Dickinson Bayou.		
8/11/1988	1,000,037	Dickinson Bayou - Above and below SH 3 crossing	gulf menhaden	Low Dissolved Oxygen
9/13/1993	10,000	Dickinson Bayou from SH 3 to IH 45	gulf menhaden	Low Dissolved Oxygen
6/20/1996	500,000	Dickinson Bayou, between SH 3 and IH 45	gulf menhaden	Low Dissolved Oxygen
7/30/1997	500	Dickinson Bayou - One mile west of I-45 and 517	gulf menhaden	Low Dissolved Oxygen
9/10/1997	100,050	Dickinson Bayou and IH 45	gulf menhaden	Low Dissolved Oxygen
11/17/1999	Unknown	Dickinson Bayou north of IH 45 to Cemetery Road		Low Dissolved Oxygen
3/27/2003	500	Trib to Dickinson Bayou off FM 517	gulf menhaden	sewage
6/4/2003	10,000	Dickinson Bayou between SH 3 and IH 45	gulf menhaden	Low Dissolved Oxygen

27. Appendix D: Common Trees found in the Dickinson Bayou Watershed

Common Name	Scientific Name
Ash, Green	<i>Fraxinus pennsylvanica</i>
Basswood	<i>Tilia caroliniana</i>
Beauty-Berry, American	<i>Callicarpa americana</i>
Birch, River	<i>Betula nigra</i>
Buckthorn, Carolina	<i>Rhamnus caroliniana</i>
Cedar, (Eastern) Red	<i>Juniperus virginiana</i>
Centaury, Branched	<i>Centaureum pulchellum</i>
Cypress, Bald	<i>Taxodium distichum</i>
Elm, American	<i>Ulmus americana</i>
Elm, Cedar	<i>Ulmus crassifolia</i>
Elm, Winged	<i>Ulmus alata</i>
Greenbriar, Saw	<i>Smilax bona-nox</i>
Hackberry, Sugar	<i>Celtis levigata</i>
Hawthorn, Parsley	<i>Crataegus marshallii</i>
Hercules Club / Tickle Tongue	<i>Zanthoxylum clava-herculis</i>
Hickory, Bitternut	<i>Carya cordiformis</i>
Hickory, Pignut	<i>Carya glabra</i>
High Tide Bush / Iva	<i>Iva frutescens</i>
Holly, Deciduous / Possum-Haw	<i>Ilex decidua</i>
Huisache	<i>Acacia farnesiana</i>
Ligustrum, Wax-Leaf	<i>Ligustrum licidum</i>

Locust, Honey	<i>Gleditsia triacanthos</i>
Mulberry, Red	<i>Morus rubra</i>
Mulberry, White	<i>Morus alba</i>
Oak, Cherrybark	<i>Quercus falcata</i>
Oak, Live	<i>Quercus virginiana</i>
Oak, Post	<i>Quercus stellata</i>
Oak, Water	<i>Quercus nigra</i>
Oak, Willow	<i>Quercus phellos</i>
Onion, Wild	<i>Allium canadense</i>
Orange, Trifoliolate	<i>Citrus trifoliata</i>
Osage Orange	<i>Maclura pomifera</i>
Palmetto, Dwarf	<i>Sabal minor</i>
Pear, Callery	<i>Pyrus calleryana</i>
Pecan	<i>Carya illinoensis</i>
Pine, Loblolly	<i>Pinus taeda</i>
Pine, Slash	<i>Pinus elliottii</i>
Privet, Chinese	<i>Ligustrum sinense</i>
Privet, Japanese	<i>Ligustrum japonica</i>
Privet, Upland	<i>Forestiera ligustrina</i>
Privet, Upland	<i>Mimosa strigillosa</i>
Rattlebox, Drummond	<i>Sesbania drummondii</i>
Rattlesnake Master	<i>Eryngium yuccifolium</i>
Rose-Mallow, Halberd-Leaved	<i>Hibiscus militaris</i>
Wood Sage	<i>Teucrium canadense</i>
Shrubby Seedbox	<i>Ludwigia octovalvis</i>

Sweetgum	<i>Liquidambar styraciflua</i>
Sycamore, American	<i>Platanus occidentalis</i>
Chinese Tallow	<i>Triadica sebifera</i>
Wax Myrtle	<i>Myrica cerifera</i>
Willow, Black	<i>Salix nigra</i>
Willow, Lance-Leaved Water	<i>Justicia ovata</i>
Yaupon	<i>Ilex vomitoria</i>

28. Appendix E: Common Fish Found in Dickinson Bayou/Dickinson Bay

Common Name	Scientific Name
Lined Sole	<i>Achirus lineatus</i>
Bowfin	<i>Amia calva</i>
Sea Catfish	<i>Arius felis</i>
Gafftopsail Catfish	<i>Bagre marinus</i>
Inland Silversides	<i>Menidia beryllina</i>
Tidewater Silversides	<i>Menidia peninsulae</i>
Bay Whiff	<i>Citharichthys spilopterus</i>
Southern Flounder	<i>Paralichthys lethostigma</i>
Blue Runner	<i>Caranx crysos</i>
Leatherjack	<i>Oligoplites saurus</i>
River Carpsucker	<i>Carpionodes carpio</i>
Creek Chubsucker	<i>Erimyzon oblongus</i>
Smallmouth Buffalo	<i>Ictiobus bubalus</i>
Blacktail Redhorse	<i>Moxostoma poecilurum</i>
Green Sunfish	<i>Lepomis cyanellus</i>
Warmouth	<i>Lepomis gulosus</i>
Orangespotted Sunfish	<i>Lepomis humilis</i>
Bluegill / Bluegill Sunfish	<i>Lepomis macrochirus</i>
Dollar Sunfish	<i>Lepomis marginatus</i>
Longear Sunfish	<i>Lepomis megalotis</i>
Redear Sunfish	<i>Lepomis microlophus</i>
Largemouth Bass	<i>Micropterus salmoides</i>

Yellow Bass	<i>Morone mississippiensis</i>
White Crappie	<i>Pomoxis annularis</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
Gulf Menhaden	<i>Brevoortia patronus</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Threadfin Shad	<i>Dorosoma petenense</i>
Blackcheek Tonguefish	<i>Symphurus plagiusa</i>
Grass Carp	<i>Ctenopharyngodon idella</i>
Common Carp	<i>Cyprinus carpio</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Sheepshead Minnow	<i>Cyprinodon variegatus</i>
Gulf Killifish	<i>Fundulus grandis</i>
Bayou Killifish	<i>Fundulus pulverous</i>
Rainwater Killifish	<i>Lucania parva</i>
Ladyfish	<i>Elops saurus</i>
Bay Anchovy	<i>Anchoa mitchilli</i>
Diamond Killifish	<i>Adinia xenica</i>
Violet Goby	<i>Gobioides broussonetti</i>
Naked Goby	<i>Gobiosoma bosc</i>
Clown Goby	<i>Microgobius gulosus</i>
Blue Catfish	<i>Ictalurus furcatus</i>
Black Bullhead	<i>Ictalurus melas</i>
Yellow Bullhead	<i>Ictalurus natalia</i>
Channel Catfish	<i>Ictalurus punctatus</i>
Flathead Catfish	<i>Pylodictis olivaris</i>

Spotted Gar	<i>Lepisosteus oculatus</i>
Longnose Gar	<i>Lepisosteus osseus</i>
Shortnosed Gar	<i>Lepisosteus platostomus</i>
Alligator Gar	<i>Lepisosteus spatula</i>
Striped Mullet	<i>Mugil cephalus</i>
White Mullet	<i>Mugil curema</i>
Mosquitofish	<i>Gambusia affinis</i>
Sailfin Molly	<i>Poecilia latipinna</i>
Freshwater Drum	<i>Aplodinotus grunniens</i>
Sand Seatrout	<i>Cynoscion arenarius</i>
Spotted Seatrout (Speckled Seatrout)	<i>Cynoscion nebulosus</i>
Spot	<i>Leiostomus xanthurus</i>
Atlantic Croaker	<i>Micropogonias undulatus</i>
Black Drum,	<i>Pogonias cromis</i>
Red Drum	<i>Sciaenops ocellatus</i>
Hogchoker	<i>Trinectes maculatus</i>
Sheepshead	<i>Archosargus probatocephalus</i>
Pinfish	<i>Lagodon rhomboides</i>
Gulf Pipefish	<i>Syngnathus scovelli</i>
Southern Puffer	<i>Sphoeroides nephelus</i>
Bighead Searobin	<i>Prionotus tribulus</i>

29. Appendix F: Common Reptiles and Amphibians of Dickinson Bayou/Dickinson Bay

Reptiles - Snakes	Scientific Name	Comments
Eastern Yellow-bellied Racer	<i>Coluber constrictor</i>	
Great Plains Rat Snake	<i>Elaphe guttata emoryi</i>	
Texas Rat Snake	<i>Elaphe obsoleta</i>	
Western Mud Snake	<i>Farancia abacura reinwardtii</i>	
Eastern Hognose Snake	<i>Heterdon platyrhinus</i>	
Prairie Kingsnake	<i>Lampropeltis calligaster</i>	
Speckled Kingsnake	<i>Lampropeltis getulus</i>	
Eastern Coachwhip	<i>Masticophis flagellum</i>	
Yellowbelly Water Snake	<i>Nerodia erythrogaster favigaster</i>	
Gulf Saltmarsh Snake	<i>Nerodia clarkii</i>	Threatened
Blotched Water Snake	<i>Nerodia erythrogaster transversa</i>	
Broad-banded Water Snake	<i>Nerodia fasciata confluens</i>	
Diamondback Water Snake	<i>Nerodia rhombifer rhombifer</i>	
Rough Green Snake	<i>Ophiodryas aestivalis</i>	
Graham's Crayfish Snake	<i>Regina grahamii</i>	
Marsh Brown Snake	<i>Storeria dekayi limnetes</i>	
Texas Brown Snake	<i>Storeria dekayi texana</i>	
Flathead Snake	<i>Tantilla gracilis</i>	
Western Ribbon Snake	<i>Thamnophis proximus proximus</i>	
Rough Earth Snake	<i>Virginia striatula</i>	

Texas Coral Snake	<i>Micrurus fulvius</i>	
Southern Copperhead	<i>Agkistrodon contortix</i>	
Western Cottonmouth	<i>Agkistrodon piscivorus</i>	
Western Pygmy Rattlesnake	<i>Sistrurus miliaris</i>	
Reptiles - Alligator	Scientific Name	Comments
American Alligator	<i>Alligator mississippiensis</i>	
Reptiles - Turtles	Scientific Name	Comments
Red-eared Slider	<i>Chysemys scripta elegans</i>	
Western Chicken Turtle	<i>Deirochelys reticularia miaria</i>	
Texas Cooter	<i>Pseudemys texana</i>	
Three-toed Box Turtle	<i>Terrapene carolina triunguis</i>	
Ornate Box Turtle	<i>Terrapene ornata ornata</i>	
Mississippi Mud Turtle	<i>Kinosternon subrubrum hippocrepis</i>	
Common Musk Turtle	<i>Sternotherus odoratus</i>	
Common Snapping Turtle	<i>Cholera serpentina serpentina</i>	
Alligator Snapping Turtle	<i>Macrolemys temminckii</i>	State Threatened
Pallid Spiny Softshell	<i>Trionyx spiniferus pallidus</i>	
Texas Diamondback Terrapin	<i>Malaclemys terrapin littoralis</i>	State Threatened
Reptiles – Lizards, Anoles and Skinks	Scientific Name	Comments
Green Anole	<i>Anolis carolinensis</i>	
Western Slender Glass Lizard	<i>Ophisaurus attenuatus attenuatus</i>	
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	State Threatened
Five-lined Skink	<i>Eumeces fasciatus</i>	

Broadhead Skink	<i>Eumeces laticeps</i>	
Ground Skink	<i>Scincella lateras</i>	
Mediterranean Gekko	<i>Hemidactylus turcicus</i>	
Amphibians – Frogs and Toads	Scientific Name	Comments
Cricket Frog	<i>Acris crepitans</i>	
Blanchard's Cricket Frog	<i>Acris crepitans crepitans</i>	
Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	
Green Treefrog	<i>Hyla cinerea</i>	
Squirrel Treefrog	<i>Hyla squirella</i>	
Gray Treefrog	<i>Hyla versicolor</i>	
Northern Spring Peeper	<i>Pseudacris crucifer crucifer</i>	
Upland Chorus Frog	<i>Pseudacris triseriata feriarum</i>	
Sheep Frog	<i>Hypopachus variolosus</i>	
Bullfrog	<i>Rana catesbeiana</i>	
Leopard Frog	<i>Rana sphenoccephala</i>	
Eastern Narrow-mouth Toad	<i>Gastrophryne carolinensis</i>	
Gulf Coast Toad	<i>Bufo valliceps vaiilcpes</i>	
Amphibians – Salamanders and Aquatic Salamanders	Scientific Name	Comments
Smallmouth Salamander	<i>Ambystoma texanum</i>	
Three-toed Amphiuma	<i>Amphiuma tridactylum</i>	
Western Lesser Siren	<i>Siren intermedia nettingi</i>	
Gulf Coast Waterdog	<i>Necturus beyeri</i>	

30. Appendix G: Parks in the Dickinson Bayou Watershed

GALVESTON COUNTY PARKS

Nine recreational Galveston County Parks including three boat ramps are located within the Dickinson Bayou watershed. Galveston County Parks may be contacted via:

Galveston County Park Administration

(409) 934-8100

(409) 934-8140 (fax)

info.parks.seniors@co.galveston.tx.us .

To review more park information, visit the:

http://www.galvestonparks-seniors.org/locations/ls_overview.asp

Paul Hopkins County Park, in the center of Dickinson provides public access to Dickinson Bayou and one of its tributaries, Benson's Bayou. Recent efforts by local citizens and the county park department have brought major improvements to the park for walking trails, birding, and canoeing and kayaking access to the bayou. This park hosts the Texas State Canoe Championship Series annually. Each year the City of Dickinson, Dickinson Beautiful and Galveston County host the "festival of lights" in the Park between the Thanksgiving and New Year's holidays. This event features an array of lights throughout the park and provides entertainment while strolling through the park to view the lights and special activities for small children. The property around this park was historically restricted for exclusive residential use, creating a park like atmosphere well beyond the actual boundaries of the park. This surrounding area retains many pines, post oaks and other native tree species providing crucial habitat for birds, possum, squirrel and raccoons.

Elva Lobit County Park, in the northeast portion of the watershed, offers baseball and soccer fields along with basketball and picnic facilities. The baseball field is used by private citizen groups and by a Dickinson youth baseball organization. Families gather for sports events as well as outdoor cookouts. Two wetland creation sites in the park provide additional stormwater detention and habitat for waterfowl and wildlife.

Ray Holbrook County Park on Gum Bayou offers softball fields, picnic areas, walking and jogging space, and preserves crucial green space for local residents. The park remains open only during daylight hours and is primarily used by the Dickinson Girls' Softball League. There is also a potential canoe and kayak launching site within this Park as it also provides parking space for vehicles and trailers. Shallow draft vessels may access Dickinson Bayou from this launching site during high tides. This park is located between Dickinson High School and recently completed Barber Middle School.

Two Galveston County boat ramps are located at State Highway 3 and at State Highway 146. These boat ramps provide access for recreational boating and sport fishing, as well as picnic areas for families fishing along the banks and piers of Dickinson Bayou. Construction of a second bridge at State Highway 146 will eventually provide more parking spaces for trailers and a paved surface over the existing parking lot and ramp.

DICKINSON CITY PARKS

The city of Dickinson maintains two public parks and several undeveloped pocket parks. **Village Green Gazebo Park** is located across from the Hwy 3 Boat Ramp and is adjacent to City Hall. The Dickinson Historic Society maintains the **Dickinson Historic Train Depot** on FM 517 W. The City also owns many undeveloped street “right of ways” or access points to Dickinson Bayou and its tributaries that are currently not readily accessible to the public but are suitable for developing pocket parks on the bayou. Some of these access points are limited due to minimal parking spaces available in a private residential community, or have set up informal agreements to maintain these “green spaces” for neighborhood use only. However, some of the City’s potential pocket parks provide access points to the Bayou that are of sufficient size to develop canoe or kayak launching facilities, nature trails, picnic tables, and bird watching areas, with five to eight parking spaces. The city also owns several residential neighborhood properties that are suitable for developing future green spaces or pocket parks not directly located on Dickinson Bayou

In addition to potential City pocket parks at undeveloped access points along Dickinson Bayou, several community churches have recreational areas they are willing to share with the local community. The Pine Drive Community Church has expressed interest in partnering with other community groups to develop a park open to the public on a large portion of their land with Bayou frontage off Hughes Road.

For additional Information on City of Dickinson Parks contact:

City of Dickinson

2716 FM 517 East

Dickinson Texas 77539

281-337-2489

<http://www.ci.dickinson.tx.us/>

SANTA FE CITY PARKS

There are two parks located in City of Santa Fe which are located within the Dickinson Bayou watershed.

Runge Park is located in Santa Fe along the southern boundary of the watershed. Approximately 11 acres of parkland were given to the county in 1942. The park amenities were given to the county in 1942; these include Little League and Pony Colt baseball fields, riding arenas, a community center, and an open air pavilion.

Mae S. Bruce Park, located downtown on Hwy 6, provides an informal atmosphere where the community can enjoy the park's simple and intimate surroundings for the purpose of public and private small group gatherings

For additional information on Santa Fe city parks contact:

City of Santa Fe Parks Department

(located in City Hall)

12002 Hwy. 6

P.O. Box 950

Santa Fe, TX 77510-0950.

409-925-6412

<http://www.ci.santa-fe.tx.us/>

LEAGUE CITY PARKS

League City manages two large parks within the Dickinson Watershed. Each park features multiple soccer, baseball, and softball fields, basketball courts, skateboarding, and other activities. **Big League Dream Sports** Park, which is located on the west side of I-45 off of Calder Road at 1150 Big League Dreams Parkway, League City, TX 77573. This park also features a lighted skate board area and multiple ball fields within the sports complex. A complete list of recreational opportunities for this park is available at **<http://www.bigleaguedreams.com>**, via email **info@bigleaguedreams.com** or telephone at **(281) 316-3400**.

League City also manages the large Sports Park on Link Road which also provides lighted recreational sports fields, restrooms and picnic areas.

BRAZORIA COUNTY PARKS AND BOAT RAMPS

One Brazoria County Park is located in the Dickinson Bayou watershed. **Resoft County Park** located just north of Alvin off of CR 281 and Hwy 35 is an 80 acre day use only park. This park offers both large and small covered pavilions, with picnic tables and outdoor grills that are available for a small rental fee. The park has a freshwater lake for recreational fishing or just

playing by the water. It also features one of the county's largest custom designed playgrounds along with softball and soccer fields, horseshoe pits, basketball and volleyball courts.

Additional information on Brazoria County Parks may be obtained at:

Brazoria County Parks Department Administration

313 W. Mulberry

Angleton, TX 77515

(979) 864-1541

http://www.brazoriacountyparks.com/day_use/index.asp

ALVIN CITY PARKS

There are three Alvin City Parks located within the watershed.

Newman Park provides baseball and softball fields, and basketball courts in addition to a playground and covered pavilion for picnics. The **Ruben Adame Park** provides baseball, softball, basketball and a covered pavilion for picnics. The **Alvin Railroad Depot** provides a unique facility with a historic railroad depot building. It provides air-conditioned and heated restrooms throughout the year. It also is the beginning of the **Tom Blakeney Jr. Hike and Bike Trail**, a paved trail that is located in the downtown area of Alvin.

For additional information on Alvin City Parks contact:

City of Alvin Parks and Recreation Department

800 Dyche Lane

Alvin, Texas 77511

281-388-4299

281-388-4350 (fax)

<http://www.alvin.tx.citygovt.org/deptdtl.asp?Dept=130>

PRIVATE PARKS AND RECREATIONAL FACILITIES

There are several privately owned but open to the public recreational parks, swimming pools, golf courses, and camping facilities in the Dickinson watershed.

Dickinson Gator Swim Club is located on Spruce Drive in Dickinson near I-45 Highway between Deats Road and FM 517. This privately owned swim club features a heated lap lane

pool that is open to private members. Additional information including membership fee is available at: www.dickinsongatorswim.org.

The Dickinson Bayou watershed is home to three private golf courses. **Chaparral Recreation Association Inc.** is located along the south side of Dickinson Bayou on Avenue J, and features an unlighted 9-hole course with a swimming pool for members. **Green Caye Golf Course** is located near Gum Bayou and Dickinson High School on Caroline Avenue in Dickinson, and features a lighted 9-hole course with a driving range and putting green for both day and night use by the public. **Beacon Lakes Golf Course** is located on FM 646 and features a lighted 8-hole course open to the public.

Zempter Park is located on the south side of Dickinson Bayou adjacent to Highway 3. Although it is privately owned by Little League of Dickinson, it offers recreational access to Dickinson Bayou for bank fishing as well as multiple baseball fields for youth sports in the evenings and weekend.

Bayou Campground is located in the City of Dickinson with access to Dickinson bayou. This campground has rental facilities for canoes and pedal boats, as well as 100 primitive camping sites, and 15 electrical hook-up camping sites. It also features 40 RV camp sites with full hook ups. This campground is conveniently located on Hwy 3 just south of the Dickinson Bayou State Hwy 3 Boat Ramp.

Via Bayou RV Park is located in Texas City with water frontage access to Dickinson Bayou. This park has 81 RV camp sites with full hook up service. The park features a five boat slip marina and access to fishing and boating opportunities in Dickinson Bayou. Additional information is available at: www.viabayourv.com

Meadowlark RV Park is located on South Street in Alvin and has a freshwater lake with fishing, canoeing, swimming and 37 RV camp sites. Additional information is available at: <http://www.gocampingamerica.com/campgrounds/default.aspx?state=TX&id=8245&dynamic=0/> or call (281) 331-5992 or email mjour77542@aol.com.

Valentino's Marina off of Hwy 146 on the south side of Dickinson Bayou features covered boat slips for privately owned boats. This site has a boat ramp and fuel facilities.

The **Bayou Zoo** located in Alvin at 5050 FM 517 on banks of Dickinson Bayou. It features walking trails and special tram rides to see the 40 species of animals and 400 species of birds that roam freely through the park's open wooded and prairie habitats. There are picnic areas and animal petting areas for small children. **To contact the park owner Clint Wolson call 281-337-6376.**

31. Appendix H: GIS Dataset Sources

2006 Aerial Imagery. 2006. Obtained from the H-GAC via personnel communication, June 2007.

City Boundaries. 2008. Obtained via email from Brazoria, Galveston, and Harris Appraisal District and local City data.

Coastal Change Analysis Program (CCAP). 2007. Downloaded from the NOAA Coastal Services Center. <<http://www.csc.noaa.gov/crs/lca/gulfcoast.html>>. Accessed January 2008.

County Boundaries. Unknown. Obtained from Tiger files. May 2008.

FEMA Q3 Floodplains. Unknown. Galveston and Brazoria FEMA Q3 floodplains layers were downloaded from the TNRIIS website in May of 2008. FEMA is the original creator of the data. <http://www.tnris.state.tx.us/datadownload/county.jsp?Name=GALVESTON>> Accessed unknown.

Habitat Dataset. 2008. Created by the Texas Coastal Watershed Program, September 2008. Metadata available upon request. www.urban-nature.org.

H-GAC Land Cover. 2002. Obtained from H-GAC via email, December 2007.

H-GAC Population Forecast Data 1 Mile Grid. 2008. Obtained from the H-GAC's website. < <http://www.h-gac.com/rds/forecasts/default.aspx>>. Accessed March 2008.

Hydrology data. Unknown. Obtained from the Texas General Land Office and TCEQ, January 2008.

Onsite Sewage Systems. 2007. GIS layer obtained from Roger Miranda at the Texas Commission of Environmental Quality (TCEQ). Mr. Miranda retrieved this data from the Houston Galveston Area Council (Date Unknown).

Permitted Waste Water Treatment Facilities Location and data. 2008. Obtained from Roger Miranda at TCEQ via email, June 2008.

Recreational Areas in the Dickinson Bayou Watershed. 2008. Developed by Jan Culbertson and the Dickinson Bayou Watershed Partnership Parks and Recreation Subcommittee.

Roads data. Unknown. Obtained from the Texas General Land Office and Tiger files in January 2008.

Soil data. Unknown. Obtained from the Natural Resource Conservation Service's (NRCS) Soil Survey Geographic Dataset (SSURGO), March 2008.

Watershed Boundary. 2008. The Watershed Boundary was constructed by the Texas Commission of Environmental Quality.

Water Quality Sampling Sites. Obtained from TCEQ, January 2008.

32. Appendix I: Public Surveys

Dickinson Bayou Watershed Survey

Combined Results from May, 2006 And August, 2008. A total of 90 persons took this survey.

The first set of questions focuses on your use and knowledge of Dickinson Bayou and your opinions about the local environmental quality. Please answer these questions to the best of your ability.

1. What is a **watershed**?
 - < 1%** A small building used to store water
 - 83%** An area of land that drains to one body of water
 - 15%** A generic name for a bayou, river, stream or creek
2. Do you know generally the boundaries of the Dickinson Bayou watershed?
 - 46%** Yes
 - 28%** No
 - 26%** Not sure
3. With what portions of Dickinson Bayou, if any, are you familiar (please check all that apply)?
Please see the map at the back of the survey for reference
 - 33%** The upper (above tidal) portion of Dickinson Bayou
 - 58%** The lower (tidal) portion of Dickinson Bayou
 - 9%** I am not familiar with any portion of Dickinson Bayou
4. Which of the following outdoor activities **do you** participate in on Dickinson Bayou? (*Please check all that apply*)
 - 50%** Fishing
 - 22%** Swimming
 - 17%** Skiing/Jet Skiing
 - 31%** Exploring by walking/hiking along the bayou
 - 26%** Kayaking or canoeing
 - 40%** Wildlife viewing
 - 16%** Boating
 - 22%** None of these
5. Do you **still** participate in those outdoor activities listed in Question 4?
 - 71%** Yes
 - 29%** No

6. If you answered **No** to the previous question, why did you decide not to participate in outdoor activities on the Dickinson Bayou?

- 62%** Polluted water
- 8%** Snakes, gators, or other creatures
- 15%** Boat traffic
- 15%** Other, Specify_____

7. Are you concerned about your children or family swimming in the Dickinson Bayou?

- 59%** Yes
- 27%** No
- 14%** Have not decided

8. Do you believe there are enough public access sites on Dickinson Bayou for outdoor recreational enjoyment?

- 32%** Yes
- 48%** No
- 20%** Not sure

9. Where do you usually access the bayou?

- 41%** Public boat ramp
- 27%** Private dock
- 23%** Public park
- 9%** Private backyard

10. Habitats are natural areas suitable for wildlife and that retain at least some of their natural character. Some examples include wetlands, salt marshes, shallow open water bays, and tall grass prairies. Do you believe any of these habitats should be protected in the Dickinson Bayou watershed?

- 96%** Yes
- 4%** No

11. Based upon what you know about Dickinson Bayou, do you think there are environmental problems associated with it? (*Please check one*)

- 73%** Yes => Please answer Question 12
 - 7%** No
 - 20%** Don't know
- } Please skip to Question 13

12. If you answered “Yes” in Question 11, what environmental problems are you aware of on Dickinson Bayou? *(Please check all that apply)*

- 83%** Illegal dumping and littering
- 71%** Habitat loss
- 33%** Lack of recreational opportunities
- 71%** Polluted stormwater runoff
- 42%** Dirt or sediment in water
- 75%** Other, please specify _____
- 68%** Shoreline erosion
- 26%** Livestock
- 36%** Flooding
- 53%** Sewage
- 26%** Fish kills

13. How concerned are you about the ability of fish and other aquatic life to survive in Dickinson Bayou? *(Please check one)*

- 61%** Very concerned
- 34%** Some what concerned
- 5%** Not concerned at all

14. Are you aware that Dickinson Bayou is impaired and is currently being studied to find ways to correct the pollution problem? *(Please check one)*

- 78%** Yes
- 22%** No

15. Who do you believe is responsible for providing this study on the Dickinson Bayou watershed?

- 28%** County Health District
- 3%** University of Houston
- 16%** Each city works together on the study
- 27%** Texas Commission on Environmental Quality
- 15%** Texas A & M University
- 11%** Federal Government

16. When you think about the thousands of new homes being constructed in the Dickinson Bayou watershed how do you feel about:

	Very Positive	Somewhat positive	Neutral	Somewhat negative	Very negative
The impact it will have on the bayou?	6%	16%	22%	18%	38%
The effect will it have on public services?	6%	11%	25%	29%	29%
The effect will it have on crime?	6%	14%	35%	20%	25%

17. Would you be willing to live in a house with a very small yard if you also had access, within easy walking distance, of a small grocery store or convenience store and other shops such as cleaners and coffee shops, restaurants, etc.?

- 17% Very willing
- 24% Somewhat willing
- 25% Neutral
- 14% Somewhat unwilling
- 20% Not at all willing

18. I would like to walk more and drive less.

- 27% Very willing
- 30% Somewhat willing
- 27% Neutral
- 8% Somewhat unwilling
- 8% Not at all willing

19. When you think about the increasing growth/development in and around your community, how do you feel about:

	Very Positive	Somewhat positive	Neutral	Somewhat negative	Very negative
The possibility of more jobs?	40%	31%	19%	8%	2%
The possibility of increased congestion?	14%	10%	16%	26%	34%
The possibility of more shopping and entertainment opportunities?	32%	22%	24%	12%	10%
Additional environmental challenges?	8%	19%	26%	19%	28%
The need to manage growth to protect quality of life?	39%	35%	12%	12%	2%
Increased tax burdens on existing residents?	15%	10%	33%	23%	19%

The following four questions are all hypothetical (made up); the purpose of these questions is to gauge the public’s willingness to financially support environmental projects along the bayou. There are **NO** plans to tax citizens to fund a Dickinson Bayou clean-up or purchase land. The Dickinson Bayou Watershed Partnership has no authority to impose any type of taxes or fees.

20. Would you be willing to pay an extra few dollars a month, for example on your utility bill, to help cities and non-profits organizations purchase, and set aside, important natural areas so they can be enjoyed by all citizens?

- 25% Very likely
- 45% Somewhat likely
- 18% Neutral
- 4% Somewhat unlikely
- 8% Very unlikely

21. Assume that you are asked to vote on a project that would provide the funding required to clean-up Dickinson Bayou. In approximately five years, this clean-up would make Dickinson Bayou safer for contact recreation (swimming/wading) by improving the water quality. This project would raise local taxes over a five year period in order to pay for the clean-up project. Would you support, oppose, or remain neutral about this project? *(Please check one)*

- 38%** Very supportive
- 25%** Somewhat supportive
- 27%** Neutral
- 0%** Somewhat unsupportive
- 10%** Very unsupportive

22. If you **support** the proposed project, what is the highest level of taxation that you would be willing to pay each year for five years to clean-up Dickinson Bayou?

- | | | | |
|------------|---------|------------|------------|
| 37% | \$0-20 | 17% | \$80-100 |
| 9% | \$20-40 | 6% | \$100-150 |
| 9% | \$40-60 | 6% | \$150-200 |
| 8% | \$60-80 | 9% | Over \$200 |

23. If you **oppose or remain neutral** about this clean-up project, which statement best reflects why you would **not** be willing to provide financial support for clean-up of Dickinson Bayou? *(Please check one)*

- 41%** I support the clean-up of Dickinson Bayou, but cannot afford higher taxes at this time.
- 12%** I support the clean-up project, but I think someone else should pay for it.
- 27%** I support the clean-up project, but I don't think taxes are the best way to pay for it.
- 7%** I support the clean-up project, but I don't think it can be accomplished.
- 5%** I support the improvement of Dickinson Bayou, but I think that bacteria and low dissolved oxygen levels are not environmental problems in the bayou.
- 3%** I think Dickinson Bayou is okay the way it is.
- 5%** Other, please specify _____

24. What other improvements, if any, would you like to see along Dickinson Bayou? *(Please check all that apply)*

- 61%** Walking or biking trails
- 39%** Public access for fishing and recreation
- 26%** Additional Parks and Open Space
- 58%** Regular trash clean-ups
- 36%** Fish stocking
- 52%** Protection of forests along the creeks
- 30%** Additional flood control mechanism installed
- 3%** None
- 8%** Other, please specify _____

25. Are you concerned about flooding or storm surges along Dickinson Bayou and in the watershed in general?

- 38%** Very concerned
- 48%** Somewhat concerned
- 10%** Neutral
- 2%** Not very concerned
- 2%** Not concerned

We would like to finish up this survey with some questions about you. These questions are for research purposes only. The information that you provide will remain confidential and will not be shared with any business or other institution.

26. What is your zip code?

- 56%** Dickinson, **14%** League City, **10%** Galveston, **2%** La Marque, **4%** La Porte, **2%** Liverpool, **2%** Deer Park, **2%** Channelview, **4%** Baclif, **2%** Alvin, **2%** Sugarland

27. What type of land do you own in the **watershed** (a watershed is the land that drains into a river system or body of water, in this case the land that drains into Dickinson Bayou)

(Please check all that apply)

- 71%** Home or residential
- 3%** Commercial
- 18%** None
- 2%** Agricultural
- 4%** Riparian (stream side) land
- 0%** Other, please specify _____

28. How long have you been a resident of the **watershed**? *(Please check one)*

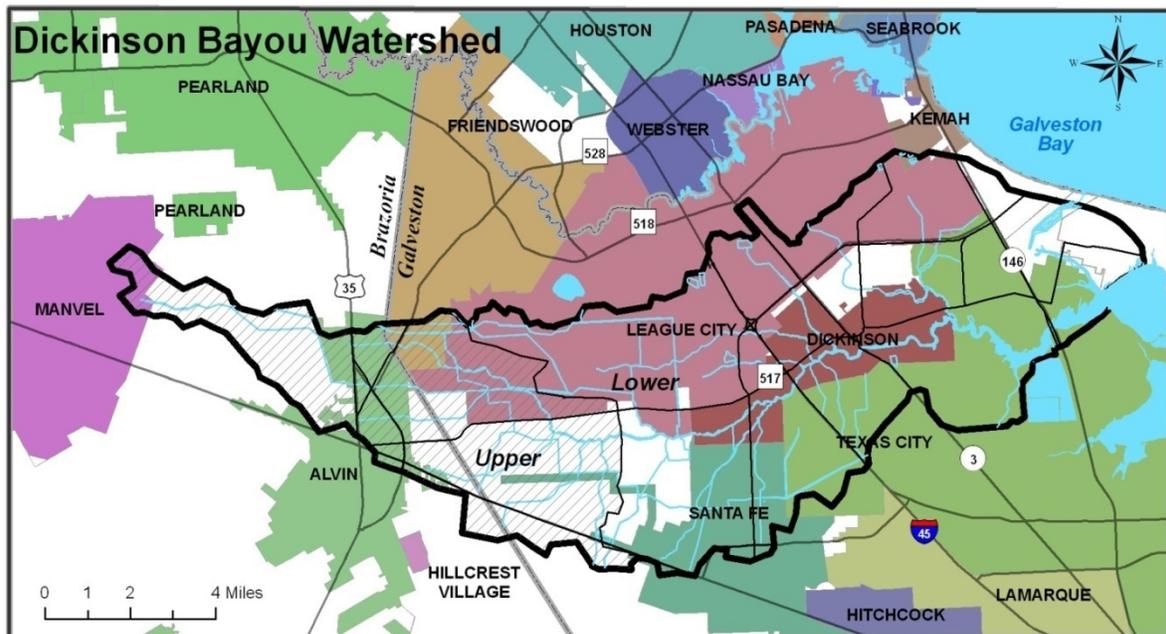
- | | | | |
|------------|------------------------------|------------|------------------------|
| 13% | Less than 1 year | 30% | Between 1 and 10 years |
| 28% | Longer than 10 years | 7% | All my life |
| 22% | I live outside the watershed | | |

29. What is your highest level of education? *(Please check one)*

- | | |
|------------|---------------------------------|
| 1% | Less than a high school diploma |
| 11% | High school diploma or GED |
| 29% | Some college/technical school |
| 35% | College degree |
| 24% | Graduate school |

30. What year were you born?

- | | | | |
|------------|----------------|------------|----------------|
| 11% | 20-30 yrs. old | 26% | 51-60 yrs. old |
| 26% | 31-40 yrs. old | 13% | 61-70 yrs. old |
| 17% | 41-50 yrs. old | 7% | 71+ yrs. Old |



Results from Community Voting at May 2006 Watershed Partnership Meeting

Water Quality

Statement	Example questions	Rank within category	Overall rank
How does pollution impact Dickinson Bayou		1	12 (tie)
	What impacts do point and non-point source pollution have on how Dickinson Bayou is used for fishing and swimming?		
	What are the primary sources of point and non-point source pollutants in Dickinson Bayou?		
What are the water quality standards for Dickinson Bayou		4	8 (tie)
	Does Dickinson Bayou meet the State of Texas water quality criteria?		
	How are state standards set?		
	How can Dickinson Bayou meet the designated uses for water bodies in Texas?		
Examine water quality monitoring on Dickinson Bayou and it's tributaries		3	12 (tie)
	Where does current monitoring take place and what kind of data is gathered?		
	Are additional monitoring sites needed and where?		

	Can citizens participate and serve as volunteer monitors?		
Flow of water and how it effects Dickinson Bayou		2	10 (tie)
	What are the current flow levels of Dickinson Bayou?		
	How can the flow of water affect the water quality of the bayou?		
	Does the shape of the bayou affect the flow and quality of the water?		

Flooding and Stormwater

Statement	Example questions	Rank within category	Overall rank
Examine flood control mechanisms and water storage techniques			
	Compare and contrast the different flood control mechanisms: non structural controls (wetland, detention/retention basins) versus structural controls (channelization).	1	9 (tie)
Develop bayou maintenance guidelines		2	4 (tie)
	Should fallen trees/snags be removed from the bayou?		
	How would snag removal affect landowners downstream?		
	Will snag removal improve navigation and safety?		
	Do the snags provide important habitats?		
Compile regulations on building in and along the flood plain		4	12 (tie)
	How do different cities handle development along the bayou?		
Examine reducing and managing stormwater		3	7
	How can stormwater quantities be reduced?		
	How is stormwater currently managed within the watershed?		

Land Use

Statement	Example questions	Rank within category	Overall rank
Increase And Improve Recreational Opportunities On And Along The Bayou		3	6
	Does the public have enough access to Dickinson Bayou?		
	Would you like to hike/bike along Dickinson Bayou?		
	Are there enough parks in the watershed?		
	Do you enjoy skiing/jet skiing on Dickinson Bayou?		
How Does Sprawl Impact The Watershed		2	2
	Can there be too much development occurring in the Dickinson watershed?		
	Do you believe there has been a significant loss of natural open spaces in the watershed?		
	Are developers currently creating communities that require longer car trips?		
	Are newly developed communities lacking in character and charm?		
	Is a walkable community important to you?		
Examine Building And Developing Codes/Ordinances		1	1

	Do or should current building ordinances for new developments take into account enhancing and protecting natural resources (forest, wetlands and prairies)?		
	Should developers/builders be given incentives to maintain, protect and preserve natural resources when possible?		

HABITAT

Statement	Example questions	Rank within category	Overall rank
Examination Of The Loss Of Habitat In The Watershed		6	11
	Has there been a significant loss of habitat in the watershed?		
	What types of habitats have been lost?		
	Where in the watershed has a significant amount of habitat been lost?		
	What does habitat fragmentation do to the wildlife?		
Shoreline Erosion Management		2	8 (Tie)
	Is it possible to decrease shoreline erosion by using alternative means i.e. no bulkheads?		
	Should motorized boat traffic be reduced to decrease shoreline erosion?		
Habitats Role In Reducing The Impacts Of Flooding		3	10 (Tie)
	How can habitats also serve as flooding/stormwater retention?		
	Which types of habitat have the greatest benefits to flooding/stormwater retention?		
Management Of Plant And Animal Species In The Watershed		5	13
	What impact do invasive species have on the bayou and the watershed?		

	Which invasive species are located in the watershed?		
	Can invasive species be eradicated?		
	What type of biodiversity exists in the watershed?		
Developing Protected Areas Within The Watershed		1	3
	Should there be an effort to increase the number of acres of land for the preservation of wildlife and plant communities?		
	Should and if so where within the watershed should land be designated as protected (no development can ever occur).		
	Are there existing programs available to landowners who want to preserve their land forever?		
Examination Of The Regulations And Laws Regarding Disturbing Land Along The Bayou		4	9 (Tie)
	Should there be a central location where the public can find out what developments will be occurring or any permits were applied for along Dickinson Bayou?		
	What are the regulations or laws regarding building along the bayou?		

Outreach and Education

Statement	Example questions	Rank within category	Overall rank
Increase Stewardship Of Citizens		2	5
	Should there be a greater effort to get the public more involved with land preservation (natural spaces)?		
	Should individuals be guided to take more personal responsibility for their actions (littering/dumping)?		
	Is the public educated about their personal impact on Dickinson Bayou?		
	What does the public know about the bayou and the watershed?		
Educate Students About The Bayou And The Watershed		3	9 (Tie)
	Students should be made aware of how they impact the bayou.		
	It is important to teach students about how the Dickinson Bayou watershed fits into the greater Galveston Bay watershed.		
	Students need to know what non-point and point source pollutants are and how they affect the water quality of Dickinson Bayou.		
	Educating students about the types of flora and fauna that exists in the watershed is needed.		

Develop A List Of Laws That Govern Impact/Uses Of The Bayou		1	4 (Tie)
	Develop a guide that assists in determining where building can and can't take place along the bayou.		

**Public Polling at the Dickinson Bayou Watershed Planning Round Up
& BBQ Bash, August 2008**

Stormwater Management (Low Impact Development)		AGREE	DISAGREE
1	Businesses should be required to use best management practices for their parking lots and land.	96%	4%
2	Home owners should be required to install best management practices on their property.	17%	29%
3	Developers should be required to use install best management practices on all newly developed properties.	95%	5%
4	Tax incentives should be given to businesses and homeowners for installing best management practices.	100%	0%
5	Cities should charge a small storm water utility fee to help pay for best management practices on both public and private land.	45%	55%

WATER QUALITY		AGREE	DISAGREE
1	I am concerned about the water quality in Dickinson Bayou.	100%	0%
2	I believe that my everyday behaviors effect the water quality of Dickinson Bayou.	100%	0%
3	Waste water treatment plants should be monitored more often.	97%	3%
4	Septic system owners should be forced to upgrade to sanitary sewers (waste water treatment plants).	91%	9%
5	Public funds should be used to help upgrade septic systems.	77%	23%

RECREATION		AGREE	DISAGREE
1	Everyone in the watershed should have at least a small park within walking distance of their home.	97%	3%
2	The tidal section of Dickinson Bayou should be dredged to allow for more and larger boat access.	68%	32%
3	Barges and other abandoned vessels should be removed from the bayou.	100%	0%
4	The watershed should have more:	63%	37%
	Athletic (soccer, softball, etc) fields	100%	0%
	Nature Parks	89%	11%
	Public boat ramps/access points	100%	0%
	Walking trails	75%	25%
	Marinas	98%	2%
	Signs telling about the bayou and the watershed		

WATERSHED PLAN AND PARTNERSHIP		AGREE	DISAGREE
1	Cities within the Dickinson Bayou watershed should work together to solve water quality problems.	100%	0%
2	Cities and Counties within the watershed should find a way to continue the Dickinson Bayou Watershed Partnership as a long term group.	100%	0%

WATERSMART & RAIN GARDENS		AGREE	DISAGREE
1	Landscape ordinances should include recommended plant lists.	100%	0%
2	Homeowners should be able to plant more garden beds and less lawn.	100%	0%
3	Conservation landscaping should be a part of city and county policy.	95%	5%
4	All city and county landscapes should follow WaterSmart principles.	100%	0%
5	Cities and counties should work to limit the use of soluble fertilizers and pesticides.	100%	0%

HABITAT		AGREE	DISAGREE
1	The preservation of all the native habitats in the Dickinson Bayou watershed is essential to the future of the watershed.	100%	0%
2	The Dickinson Bayou watershed, as a whole, needs a plan to protect natural areas.	100%	0%
3	The Dickinson Bayou watershed must designate specific areas for conservation and develop site-specific plans to preserve and protect those areas.	100%	0%
4	At least 30% of remaining habitat types in the watershed should be preserved and/or restored.	100%	0%

STORMWATER WETLANDS		AGREE	DISAGREE
1	Stormwater wetlands should be required for all stormwater detention areas.	100%	0%
2	Incentives should be given to groups (developers, home owners associations, businesses) who install stormwater treatment wetlands.	100%	0%
3	Public funds should be used to help defray the cost of installing stormwater wetlands.	73%	27%

Livable Centers		AGREE	DISAGREE
1	Barriers to town-centered development should be removed.	93%	7%
2	Watershed communities should use commuter rail to build walkable communities.	87%	13%
3	Liveable centers can help preserve the small town character many value in this area.	93%	7%

33. Appendix J: Model Stormwater Ordinance

This ordinance is excerpted from the Center for Watershed Protection's Stormwater Management Post-Construction Guidance Manual and Tools. Additional guidance and language is available in the full document available on line at:

http://www.cwp.org/Resource_Library/Center_Docs/SW/pcguidance/Tool3.pdf

Post-Construction Stormwater Model Ordinance

For more information on the Post-Construction Guidance Manual, contact the Center for Watershed Protection, 8390 Main Street, 2nd floor, Ellicott City, MD 21046, 410-461-8323
center@cwp.org
www.cwp.org.

Post-Construction Stormwater MODEL Ordinance

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Section 1. General Provisions

1.1. Findings of Fact

It is hereby determined that:

- (1) Land development activities and associated increases in site impervious cover often alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, or sediment transport and deposition;
- (2) This stormwater runoff contributes to increased quantities of water-borne pollutants, including siltation of aquatic habitat for fish and other desirable species;
- (3) *Improper design and construction of stormwater best management practices (BMPs) can increase the velocity of stormwater runoff thereby increasing stream bank erosion and sedimentation;*
- (4) *Impervious surfaces allow less water to percolate into the soil, thereby decreasing groundwater recharge and stream baseflow;*
- (5) Substantial economic losses can result from these adverse impacts on the waters of the municipality;
- (6) Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of stormwater runoff from land development activities;

- (7) The regulation of stormwater runoff discharges from land development activities in order to control and minimize increases in stormwater runoff rates and volumes, stream channel erosion, and nonpoint source pollution associated with stormwater runoff is in the public interest and will minimize threats to public health and safety.
- (8) Regulation of land development activities by means of performance standards governing stormwater management and site design will produce development compatible with the natural functions of a particular site or an entire watershed and thereby mitigate the adverse effects of stormwater runoff from development.
- (9) *Clearing and grading during construction tends to increase soil erosion and add to the loss of native vegetation necessary for terrestrial and aquatic habitat;*
- (10) *Illicit and non-stormwater discharges to the storm drain system can contribute a wide variety of pollutants to waterways, and the control of these discharges is necessary to protect public health and safety and water quality.*

1.2. Purpose

The purpose of this ordinance is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public residing in watersheds within the [JURISDICTION]. This ordinance seeks to meet that purpose through the following objectives:

- (1) To inhibit the deterioration of water resources resulting from development.
- (2) To protect the safety and welfare of citizens, property owners, and businesses by minimizing the negative impacts of increased stormwater discharges from new land development and redevelopment.
- (3) To control the rate, quality and volume of stormwater originating from development and redevelopment sites so that surface water and groundwater are protected and flooding and erosion potential are not increased.
- (4) To control nonpoint source pollution and stream channel erosion.
- (5) To maintain the integrity of stream channels and networks for their biological functions, drainage, and natural recharge of groundwater.
- (6) To protect the condition of state (and U.S.) waters for all reasonable public uses and ecological functions.
- (7) To provide long-term responsibility for and maintenance of stormwater BMPs.
- (8) To facilitate the integration of stormwater management and pollution control with other ordinances, programs, policies, and the comprehensive plan of [JURISDICTION].
- (9) To establish legal authority to carry out all the inspection and monitoring procedures necessary to ensure compliance with this ordinance.

Specific to the MS4

- (1) *To regulate the contribution of pollutants to the MS4 by stormwater discharges from development, redevelopment.*
- (2) *To enable [JURISDICTION] to comply with the National Pollution Discharge Elimination System permit and applicable federal and state regulations.*
- (3) *To facilitate compliance with state and federal standards and permits by owners of construction sites, developments, and permanent stormwater BMPs with [JURISDICTION].*

Other Special Resources

- *To preserve the natural infiltration of groundwater to maintain the quantity and quality of groundwater resources.*
- *To protect against and minimize the pollution of public drinking water supplies resulting from development and redevelopment.*
- *Impaired Waters*
- *Lakes*
- *Cold-Water Fisheries*
- *Coastal Areas*
- *Wetlands*

1.3. Applicability

This ordinance shall be applicable to all land development, including, but not limited to, site plan applications, subdivision applications, and grading applications, unless exempt pursuant to Section 1.4. These provisions apply to any new development or redevelopment site within [JURISDICTION] that meets one or more of the following criteria:

- (1) Land development that creates **[FIVE-THOUSAND (5,000) SQUARE FEET OR MORE]** of impervious cover.
- (2) Redevelopment that creates, adds, or replaces **[FIVE-THOUSAND (5,000) SQUARE FEET OR MORE]** of impervious cover.
- (3) Land development activities that are smaller than the minimum applicability criteria set forth above if such activities are part of a larger common plan of development, even though multiple, separate and distinct land development activities may take place at different times on different schedules.

1.4. Exemptions

The following activities are exempt from this ordinance:

- (1) Individual single-family or duplex residential lots that are not part of a subdivision or phased development project that is otherwise subject to this ordinance.
- (2) Additions or modifications to existing single-family or duplex residential structures.
- (3a) Projects that are exclusively for agricultural and silvicultural uses. Agricultural or silvicultural roads that are used to access other land uses subject to this ordinance are not exempt. Agricultural structures that are also used for other uses subject to this ordinance are not exempt.

OR

(3b) Any agricultural or silvicultural activity that is conducted according to an approved farm conservation plan or timber management plan prepared or approved by [APPROPRIATE STATE AGENCIES].

- (4) Maintenance and repair to any stormwater BMP deemed necessary by the **[STORMWATER AUTHORITY]**.
- (5) Any emergency project that is immediately necessary for the protection of life, property, or natural resources.

- (6) Linear construction projects, such as pipeline or utility line installation, that do not result in the installation of any impervious cover, as determined by the [STORMWATER AUTHORITY]. Such projects must be designed to minimize the number of stream crossings and width of disturbance, and are subject to [APPLICABLE CONSTRUCTION STORMWATER OR EROSION & SEDIMENT CONTROL ORDINANCE].
- (7) Any part of a land development that was approved by [JURISDICTION'S PLAN APPROVING AUTHORITY] prior to the effective date of this ordinance.

1.5. Legal Authority

This ordinance is adopted pursuant to authority conferred by and in accordance with [APPLICABLE STATE AND/OR FEDERAL REGULATIONS].

1.6. Compatibility with Other Permit and Ordinance Requirements

This ordinance is not intended to interfere with, abrogate, or annul any other ordinance, rule or regulation, statute, or other provision of law. The requirements of this ordinance should be considered minimum requirements, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, whichever provisions are more restrictive or impose higher protective standards for human health or the environment shall be considered to take precedence.

1.7. Severability

If the provisions of any article, section, subsection, paragraph, subdivision or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any article, section, subsection, paragraph, subdivision or clause of this ordinance.

1.8. Liability

Any person who undertakes or causes to be undertaken any land development shall ensure that soil erosion, sedimentation, increased pollutant loads and changed water flow characteristics resulting from the activity are controlled so as to minimize pollution of receiving waters. The requirements of this ordinance are minimum standards and a person's compliance with the same shall not relieve such person from the duty of enacting all measures necessary to minimize pollution of receiving waters.

By approving a plan under this regulation, [JURISDICTION] does not accept responsibility for the design, installation, and operation and maintenance of stormwater BMPs.

1.9. Designation of Stormwater Authority: Powers and Duties

The [STORMWATER AUTHORITY] shall administer and enforce this ordinance, and may furnish additional policy, criteria and information including specifications and standards, for the proper implementation of the requirements of this ordinance and may provide such information in the form of a Stormwater Design Manual.

The Stormwater Design Manual may be updated and expanded from time to time, at the discretion of the [STORMWATER AUTHORITY], based on improvements in engineering, science, monitoring and local maintenance experience.

Representatives of the [STORMWATER AUTHORITY] shall have the right to enter upon any land for the purposes of making an inspection or acquiring information to determine whether or not the property conforms to the requirements of this ordinance.

Section 2. Definitions

"Applicant" means a property owner or agent of a property owner who has filed an application for a stormwater management permit.

"Building" means any structure, either temporary or permanent, having walls and a roof, designed for the shelter of any person, animal, or property, and occupying more than 100 square feet of area.

"Channel" means a natural or artificial watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

"Dedication" means the deliberate appropriation of property by its owner for general public use.

"Detention" means the temporary storage of storm runoff in a stormwater BMP with the goals of controlling peak discharge rates and providing gravity settling of pollutants.

"Easement" means a legal right granted by a landowner to a grantee allowing the use of private land for conveyance or treatment of stormwater runoff and access to stormwater practices.

"Erosion and Sediment Control Plan" means a plan that is designed to minimize the accelerated erosion and sediment runoff at a site during construction activities.

"Fee in Lieu Contribution" means a payment of money in place of meeting all or part of the stormwater performance standards required by this ordinance.

"Groundwater Management Area" means a geographically defined area that may be particularly sensitive in terms of groundwater quantity and/or quality by nature of the use or movement of groundwater, or the relationship between groundwater and surface water, and where special management measures are deemed necessary to protect groundwater and surface water resources.

"Groundwater Recharge Volume (Rev)" – The portion of the water quality volume (WQv) used to maintain groundwater recharge rates at development sites.

"Impaired Waters" means those streams, rivers and lakes that currently do not meet their designated use classification and associated water quality standards under the Clean Water Act.

"Impervious Cover" means those surfaces that cannot effectively infiltrate rainfall (e.g., building rooftops, pavement, sidewalks, driveways, etc).

"Industrial Stormwater Permit" means a National Pollutant Discharge Elimination System permit issued to a commercial industry or group of industries that regulates the pollutant levels associated with industrial stormwater discharges or specifies on-site pollution control strategies.

“Infill Development” means land development that occurs within designated areas based on local land use, watershed, and/or utility plans where the surrounding area is generally developed, and where the site or area is either vacant or has previously been used for another purpose.

"Infiltration" means the process of percolating stormwater into the subsoil.

"Infiltration Facility" means any structure or device designed to infiltrate retained water to the subsurface. These facilities may be above grade or below grade.

"Jurisdictional Wetland" means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

“Land Development” means a human-made change to, or construction on, the land surface that changes its runoff characteristics.

"Land Disturbing Activity" means any activity that changes the volume or peak flow discharge rate of rainfall runoff from the land surface. This may include the grading, digging, cutting, scraping, or excavating of soil, placement of fill materials, paving, construction, substantial removal of vegetation, or any activity that bares soil or rock or involves the diversion or piping of any natural or man-made watercourse.

"Landowner" means the legal or beneficial owner of land, including those holding the right to purchase or lease the land, or any other person holding proprietary rights in the land.

"Maintenance Agreement" means a legally recorded document that acts as a property deed restriction, and that provides for long-term maintenance of stormwater BMPs.

“Municipal Separate Storm Sewer System (MS4)” means publicly-owned facilities by which stormwater is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, catch basins, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage ditches/channels, reservoirs, and other drainage structures.

“National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit” means a permit issued by the EPA, or by a State under authority delegated pursuant to 33 USC § 1342(b), that authorizes the discharge of pollutants to waters of the State, whether the permit is applicable on an individual, group, or general area-wide basis.

“Non-Stormwater Discharge” means any discharge to the storm drain system that is not composed entirely of stormwater.

“Non-Structural Measure” means a stormwater control and treatment technique that uses natural processes, restoration or enhancement of natural systems, or design approaches to control runoff and/or reduce pollutant levels. Such measures are used in lieu of or to supplement structural practices on a land development site. Non-structural measures include, but are not limited to: minimization and/or disconnection of impervious surfaces; development design that reduces the rate and volume of runoff; restoration or enhancement of natural areas such as riparian areas, wetlands, and forests; and on-lot practices such as rain barrels, cisterns, and vegetated areas that intercept roof and driveway runoff.

"Nonpoint Source Pollution" means pollution from any source other than from any discernible, confined, and discrete conveyances, and shall include, but not be limited to, pollutants from agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

"Off-Site Facility" means a stormwater BMP located outside the subject property boundary described in the permit application for land development activity.

"On-Site Facility" means a stormwater BMP located within the subject property boundary described in the permit application for land development activity.

"Owner" means the owner or owners of the freehold of the premises or lesser estate therein, a mortgagee or vendee in possession, assignee of rents, receiver, executor, trustee, lessee or other person, firm or corporation in control of a piece of land. As used herein, owner also refers to, in the appropriate context: (i) any other person authorized to act as the agent for the owner; (ii) any person who submits a stormwater management concept or design plan for approval or requests issuance of a permit, when required, authorizing land development to commence; and (iii) any person responsible for complying with an approved stormwater management design plan.

"Permanent Stormwater BMP" means a stormwater best management practice (BMP) that will be operational after the construction phase of a project and that is designed to become a permanent part of the site for the purposes of managing stormwater runoff.

"Private Inspector" means an independent agency or private entity that is retained by the applicant to conduct inspections and submit documentation to the [STORMWATER AUTHORITY] in accordance with this ordinance, and that is certified by the [STORMWATER AUTHORITY] to conduct such inspections.

"Pro-Rata Share" means the proportional amount to be paid by an applicant to contribute to the construction of a regional stormwater BMP, as determined by the [STORMWATER AUTHORITY].

"Receiving Stream or Channel" means the body of water or conveyance into which stormwater runoff is discharged.

"Recharge" means the replenishment of underground water reserves.

"Redevelopment" means a change to previously existing, improved property, including but not limited to the demolition or building of structures, filling, grading, paving, or excavating, but excluding ordinary maintenance activities, remodeling of buildings on the existing footprint, resurfacing of paved areas, and exterior changes or improvements that do not materially increase or concentrate stormwater runoff or cause additional nonpoint source pollution.

"Regional Stormwater" means stormwater BMPs designed to control stormwater runoff from multiple properties or a particular land use district, and where the owners or developers of the individual properties may participate in the provision of land, financing, design, construction, and/or maintenance of the facility.

"Responsible Party" means any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity, or any other legal entity; or their legal representatives, agents, or assigns that is named on a stormwater maintenance agreement as responsible for long-term operation and maintenance of one or more stormwater BMPs.

"Stop Work Order" means an order issued that requires that all construction activity on a site be stopped.

"Stormwater Authority" means the department or agency, and its authorized agents, which is responsible for coordinating the review, approval, and permit process as defined by this ordinance.

"Stormwater Design Manual" means an engineering and/or project review document maintained by the [STORMWATER AUTHORITY] containing technical standards and specifications, policies, procedures, and other materials deemed appropriate by [STORMWATER AUTHORITY] to assist with compliance with the provisions of this ordinance.

"Stormwater Hotspot" means an area where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater.

"Stormwater Management" means the use of structural or non-structural practices that are designed to reduce stormwater runoff pollutant loads, discharge volumes, peak flow discharge rates and detrimental changes in stream temperature that affect water quality and habitat.

"Stormwater Pollution Prevention Plan" means a plan, usually required by a permit, to manage stormwater associated with industrial, commercial, institutional, or other land use activities, including construction. The Plan commonly describes and ensures the implementation of practices that are to be used to reduce pollutants in stormwater and non-stormwater discharges.

"Stormwater Best Management Practice (BMP)" means a measure, either structural or nonstructural, that is determined to be the most effective, practical means of preventing or reducing point source or nonpoint source pollution inputs to stormwater runoff and water bodies.

"Stormwater Retrofit" means a stormwater BMP designed for an existing development site that previously had either no stormwater BMP in place or a practice inadequate to meet the stormwater management requirements of the site.

"Stormwater Runoff" means flow on the surface of the ground, resulting from precipitation.

"Stream Buffer" means an area of land at or near a streambank, wetland, or waterbody that has intrinsic water quality value due to the ecological and biological processes it performs or is otherwise sensitive to changes which may result in significant degradation to water quality.

"Water Quality Volume (WQv)" means the storage needed to capture and treat 90% of the average annual stormwater runoff volume. Numerically (WQv) will vary as a function of long term rainfall statistical data.

"Watercourse" means a permanent or intermittent stream or other body of water, either natural or man-made, which gathers or carries surface water.

"Watershed or Subwatershed Management Plan" means a document, usually developed cooperatively by government agencies and other stakeholders, to protect, restore, and/or otherwise manage the water resources within a particular watershed or subwatershed. The plan commonly identifies threats, sources of impairment, institutional issues, and technical and programmatic solutions or projects to protect and/or restore water resources.

“**Wetland Hydroperiod**” means the pattern of fluctuating water levels within a wetland caused by the complex interaction of flow, topography, soils, geology, and groundwater conditions in the wetland.

Section 3. Permit Procedures and Requirements

3.1. Stormwater Management Concept Plan and Consultation Meeting

Each owner subject to this ordinance shall submit to the [STORMWATER AUTHORITY] for review and approval a stormwater management concept plan as provided herein:

- (1) **Stormwater Management Concept Plan:** All preliminary plans of subdivision and site plans shall provide a stormwater management concept plan describing, in general, how stormwater runoff through and from the development will be treated and conveyed. The concept plan shall also identify important natural features identified through a Natural Resources Inventory conducted in accordance with Section 4.1(17). All other land development projects subject to this ordinance shall submit a stormwater management concept plan prior to preparation of the stormwater management design plan.
- (2) **Application Requirements:** The stormwater management concept plan submittal shall contain a completed application form provided by the [STORMWATER AUTHORITY], the fee required by Section 3.10, and a stormwater management concept plan that satisfies the requirements of this section and the Stormwater Design Manual.
- (3) **Concept Plan Prior to Design Plan:** The stormwater management concept plan must be approved prior to submission of a stormwater management design plan (as part of the construction or final site plan) for the entire development, or portions thereof.
- (4) **Meetings with [STORMWATER AUTHORITY]:** All applicants are encouraged to hold a pre-submittal consultation meeting with the [STORMWATER AUTHORITY] to discuss potential approaches for stormwater design and opportunities to use design techniques to reduce runoff rates, volumes, and pollutant loads. In addition, the applicant or his representative shall meet on-site with a designee of the [STORMWATER AUTHORITY] prior to approval of the stormwater management concept plan for the purposes of verifying the conditions of the site and all receiving channels.
- (5) **Maximize Use of Techniques to Reduce Runoff by Design:** The stormwater management concept plan shall utilize to the maximum extent practicable site planning and design technique that reduce runoff rates, volumes, and pollutant loads. Such techniques include, but are not limited to, minimization and/or disconnection of impervious surfaces; development design that reduces the rate and volume of runoff; restoration or enhancement of natural areas such as riparian areas, wetlands, and forests; and distributed practices that intercept and treat runoff from developed areas.

3.2. Stormwater Management Design Plan

Each owner subject to this ordinance shall submit to the [STORMWATER AUTHORITY] for review and approval a stormwater management design plan as provided herein:

Stormwater Management Design Plan: A stormwater management design plan containing all appropriate information as specified in this Ordinance shall be submitted to the [STORMWATER AUTHORITY] in conjunction with the final subdivision plat, final site plan, construction plan, or any other land development plan subject to this ordinance.

Application Requirements: The stormwater management design plan submittal shall contain a completed application form provided by the [STORMWATER AUTHORITY], the fee required by Section 3.10, a stormwater management design plan that satisfies the requirements of this section and the Stormwater Design Manual, a stormwater maintenance plan, and a certification stating that all requirements of the approved plan will be complied with. Failure of the owner to demonstrate that the project meets these requirements, as determined by the [STORMWATER AUTHORITY], shall be reason to deny approval of the plan.

Consistency between Concept & Design Plans: A copy of the approved stormwater management concept plan shall be submitted with the stormwater management design plan. The [STORMWATER AUTHORITY] shall check the design plan for consistency with the concept plan and may require a revised stormwater management concept plan if changes in the site development proposal have been made.

Stormwater Management Design Plan Content: The stormwater management design plan shall contain maps, charts, graphs, tables, photographs, narrative descriptions, explanations, citations to supporting references, a record of all major permit decisions, and other information as may be necessary for a complete review of the plan, and as specified in the latest version of the Stormwater Design Manual.

3.3. Stormwater Management Design Plan: Review Procedures

Preliminary Review for Completeness of Plan: The [STORMWATER AUTHORITY] shall have a maximum of ten (10) calendar days from the receipt of an application for preliminary review to determine if the application is complete. During this period, the application will be accepted for review, which will begin the thirty (30) day review period, or rejected for incompleteness. The applicant will be informed in writing of the information necessary to complete the application.

Review Period: The thirty (30) day review period begins on the day the complete stormwater management design plan is accepted for review by the [STORMWATER AUTHORITY]. During the thirty (30) day review period, the [STORMWATER AUTHORITY] shall either approve or disapprove the plan and communicate the decision to the applicant in writing. Approval or denial shall be based on the plan's compliance with this Ordinance and the Stormwater Design Manual.

Modifications Needed for Approval: In cases where modifications are required to approve the plan, the [STORMWATER AUTHORITY] shall have an additional thirty (30) days to review the revised plan from the initial and any subsequent resubmission dates. If the plan is approved, one copy bearing certification of such approval shall be returned to the applicant. If the plan is disapproved, the applicant shall be notified in writing of the reasons.

Appeal Decisions of [STORMWATER AUTHORITY]: The applicant or any aggrieved party authorized by law may appeal the [STORMWATER AUTHORITY'S] decision of approval or disapproval of a stormwater management design plan. The appeal shall be made to the [GOVERNING BOARD OF JURISDICTION], must be in writing, and must be submitted within thirty (30) days after the [STORMWATER AUTHORITY] renders its decision to approve or disapprove the plan.

Substantive Changes to Plan: No substantive changes shall be made to an approved plan without review and written approval by the [STORMWATER AUTHORITY]. The [STORMWATER AUTHORITY] may request additional data with a plan amendment as may be necessary for a complete review of the plan and to ensure that changes to the plan will comply with the requirements of this ordinance.

Expiration of Plan Approval: The stormwater management design plan's approval expires in one year from the date of approval unless a final plat is recorded or unless work has actually begun on the site. The recordation of a final plat for a section of a subdivision (or initiation of construction in a section) does not vest the approval of the stormwater management design plan for the remainder of the subdivision. If the stormwater management design plan expires, the applicant shall file with the [STORMWATER AUTHORITY] for reapproval of the stormwater management design plan.

3.4. Plan Preparation and Certification

- (1) **Certification by Plan Preparer:** The stormwater management design plan shall be prepared by a licensed landscape architect, certified professional surveyor, or professional engineer and must be signed by the professional preparing the plan, who shall certify that the design of all stormwater BMPs meet the requirements in this local law.
- (2) **Certification by Owner:** The owner shall certify that all land clearing, construction, land development and drainage will be done according to the approved plan.

3.5. Coordination with Other Approvals and Permits

- (1) **Approval of Other Permits:** *No grading or building permit shall be issued for land development without approval of a stormwater management design plan.*
- (2) **Coordination with Other Plans:** *Approval of the stormwater management design plan shall be coordinated by the [STORMWATER AUTHORITY] with approval of an erosion and sediment control or construction stormwater plan with regard to the location, schedule, and/or phasing for temporary and permanent stormwater management measures. If natural drainage features or other natural areas are to be preserved, then these areas must be shown and measures provided for their protection on both the erosion and sediment control plan and the stormwater management design plan. If other elements of the stormwater management design plan utilize soils, vegetation, or other natural features for infiltration or treatment, then these areas must be shown on the erosion and sediment control plan and measures provided for their protection during construction*
- (3) **Other Permits or Approvals May Be Needed:** *Approvals issued in accordance with this ordinance do not relieve the applicant of responsibility for obtaining all other necessary permits and/or approvals from other federal, state, and/or local agencies. If requirements vary, the most restrictive shall prevail. These permits may include, but are not limited to: construction stormwater discharge permits, applicable state and federal permits for stream and wetland impacts, and applicable dam safety permits. Applicants are required to show proof of compliance with these regulations before the [JURISDICTION'S PLAN APPROVING AUTHORITY] will issue a grading, building, or zoning permit.*

- (4) **Stormwater Measures within Flood Plain:** *Construction of stormwater measures or facilities within a Federal Emergency Management Agency (FEMA) designated floodplain shall be avoided to the extent possible. When this is unavoidable, all stormwater BMP construction shall be in compliance with all applicable requirements of the [JURISDICTION'S FLOOD PLAIN CODE].*

3.6. Maintenance Agreement and Plan

Prior to approval by the [STORMWATER AUTHORITY] of a stormwater management design plan, each owner shall submit a maintenance agreement and maintenance plan in accordance with the following:

- (1) **Responsible Party:** The owner shall be responsible for the operation and maintenance of such measures and shall pass such responsibility to any successor owner, unless such responsibility is transferred to [JURISDICTION] or to another governmental entity in accordance with Section 3.12.
- (2) **Requirement for Maintenance Agreement & Plan:** If a stormwater management design plan requires structural or nonstructural measures, the owner shall execute a stormwater maintenance agreement prior to the [STORMWATER AUTHORITY] granting final approval for the plan, or any plan of development or other development for which a permit is required under this Ordinance. The agreement shall be recorded in the office of the clerk of the circuit court for [JURISDICTION] and shall run with the land.
- (3) **Required Elements for Maintenance Agreement & Plan:** The stormwater maintenance agreement shall be in a form approved by [JURISDICTION], and shall, at a minimum:
 - (a) **Designate Responsible Party:** Designate for the land development the owner, governmental agency, or other legally established entity (responsible party) which shall be permanently responsible for maintenance of the structural or non-structural measures required by the plan.
 - (b) **Pass Responsibility to Successors:** Pass the responsibility for such maintenance to successors in title.
 - (c) **Right of Entry for Stormwater Authority:** Grant the [STORMWATER AUTHORITY] and its representatives the right of entry for the purposes of inspecting all stormwater BMPs at reasonable times and in a reasonable manner. This includes the right to enter a property when the [STORMWATER AUTHORITY] has a reasonable basis to believe that a violation of this Ordinance is occurring or has occurred and to enter when necessary for abatement of a public nuisance or correction of a violation of this Ordinance.
 - (d) **Maintenance Plan:** *Ensure the continued performance of the maintenance obligations required by the plan and this ordinance through a maintenance plan (which may be an attachment to the actual maintenance agreement). The plan shall include a list of inspection and maintenance tasks, a schedule for routine inspection and maintenance, actions to be taken when maintenance is required, and other items listed in the Stormwater Design Manual.*

3.7. Easements

Storm drainage easements shall be required where the conveyance, storage, or treatment of stormwater is identified on the stormwater management design plan, or where access is needed to structural or non-structural stormwater measures.

The following conditions shall apply to all easements:

- (1) Dimensions: Easements shall be of a width and location specified in the Stormwater Design Manual.*
- (2) Easements Approved Before Plat Approval: Easements shall be approved by the [JURISDICTION'S PLAN APPROVING AUTHORITY] prior to approval of a final plat and shall be recorded with the [JURISDICTION] and on all property deeds.*
- (3) Deeds of Easement: A deed of easement shall be recorded along with the final plat specifying the rights and responsibilities of each party to the easement.*

3.8. Performance Bond or Guarantee

- (1) **Performance Bond or Guarantee Required:** No permits shall be issued unless the applicant furnishes a performance bond or guarantee. This is to ensure that action can be taken by [JURISDICTION], at the applicant's expense, should the applicant fail to initiate or maintain those measures identified in the approved stormwater management design plan (after being given proper notice and within the time specified by the [STORMWATER AUTHORITY]). If [JURISDICTION] takes such action upon such failure by the applicant, [JURISDICTION] shall collect from the applicant the difference should the amount of reasonable cost of such action exceed the amount of the security held.*
- (2) **Term of Performance Bond or Guarantee:** The performance bond or guarantee furnished pursuant to this section, or the unexpended or unobligated portion thereof, shall be returned to the applicant within sixty (60) days of issuance by the [STORMWATER AUTHORITY] of a Stormwater Certificate of Completion in accordance with Section 5, OR the final acceptance of the permanent stormwater BMP by the [STORMWATER AUTHORITY].*
- (3) **Term Extended for Initial Maintenance:** At the discretion of the [STORMWATER AUTHORITY], the performance bond or guarantee may be extended beyond the time period specified above to cover a reasonable period of time for testing the practices during storm events and for initial maintenance activities. For the purposes of this section, the time shall not exceed 2 years.*
- (4) **Partial Release of Bond:** The [STORMWATER AUTHORITY] shall have the discretion to adopt provisions for a partial pro-rata release of the performance bond or guarantee on the completion of various stages or phases of development.*

3.9. As-Built Plans

All applicants are required to submit as-built plans for any permanent stormwater management facilities located on-site after final construction is completed. The plan must show the final design specifications for all stormwater management facilities, meet the criteria for as-built plans in the Stormwater Design Manual, and be sealed by a registered professional engineer. A final inspection by the [STORMWATER AUTHORITY] is required before any performance bond or guarantee will be released.

3.10. Fees

The [STORMWATER AUTHORITY] has the ability to require a fee to support local plan review, inspection and program administration. Each owner seeking approval of a stormwater management concept plan or stormwater management design plan shall pay a fee upon submittal of such plan, and shall pay a fee for each inspection, in amounts according to the schedule set forth below.

- (1) Stormwater Management Concept Plan: \$
- (2) Stormwater Management Design Plan: \$
- (3) Amendment to a Stormwater Management Concept or Design Plan: \$
- (4) Request for a Waiver: \$
- (5) Each Inspection: \$

3.11. Fee-In-Lieu Payment

The [STORMWATER AUTHORITY] may maintain a Fee-In-Lieu and/or Pro-Rata Share program in accordance with an approved watershed or subwatershed plan or stormwater master plan. Such a program shall follow the general conditions of Section 4.9.

3.12. Dedication of Stormwater BMPs

The owner of a stormwater practice required by this Ordinance may offer for dedication any such stormwater practice, together with such easements and appurtenances as may be reasonably necessary, as provided herein:

- (1) **Preliminary Determination by [STORMWATER AUTHORITY]:** Upon receipt of such offer of dedication by [JURISDICTION], the [STORMWATER AUTHORITY] shall make a preliminary determination that the dedication of the practice is appropriate to protect the public health, safety and general welfare, and furthers the goals of [JURISDICTION'S] stormwater management program and/or associated watershed plans. The [STORMWATER AUTHORITY] shall forward its determination to [GOVERNING BOARD OF JURISDICTION]. Prior to making its determination, the [STORMWATER AUTHORITY] shall inspect the practice to determine whether it has been properly maintained and is in good repair.
- (2) **Acceptance by [GOVERNING BOARD]:** [GOVERNING BOARD OF JURISDICTION] may accept the offer of dedication by adoption of a resolution. The document dedicating the stormwater BMP shall be recorded in the office of the clerk of the circuit court for the [JURISDICTION].
- (3) **Owner to Provide Documentation:** The owner, at his sole expense, shall provide any document or information requested by the [STORMWATER AUTHORITY] or the [GOVERNING BOARD OF JURISDICTION] in order for a decision to be reached on accepting the practice.

Section 4. Post-Construction Performance Criteria for Stormwater Management

4.1. General Post-Construction Stormwater Management Criteria

- (1) **Stormwater BMP Maintenance:** All stormwater BMPs shall be maintained in accordance with the approved and deeded stormwater maintenance agreement and stormwater maintenance plan. The design of stormwater facilities shall incorporate maintenance accommodation and long-term maintenance reduction features in accordance with the latest version of the Stormwater Design Manual.
- (2) **Overland Flood Routes:** Overland flood routing paths shall be used to convey stormwater runoff from the 100-year, 24-hour storm event to an adequate receiving water resource or stormwater BMP such that the runoff is contained within the drainage easement for the flood routing path and does not cause flooding of buildings or related structures. The peak 100-year water surface elevation along flood routing paths shall be at least one foot below the finished grade elevation at the structure. When designing the flood routing paths, the conveyance capacity of the site's storm sewers shall be taken into consideration.
- (3) **Velocity Dissipation:** Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall to provide non-erosive flow velocity from the structure to an adequate receiving stream or channel so that the natural physical and biological characteristics and functions of the receiving stream are maintained and protected.
- (4) **Discharges to Adjacent Property:** Concentrated discharges from land development, including from stormwater practices, shall not be discharged onto adjacent developed property without adequate conveyance in a natural stream or storm sewer system. The [STORMWATER AUTHORITY] may require drainage easements where stormwater discharges must cross an adjacent or off-site property before reaching an adequate conveyance.
- (5) **Individual Lots Not Separate Land Development:** Residential, commercial or industrial developments shall apply these stormwater management criteria to land development as a whole. Individual residential lots in new subdivisions shall not be considered separate land development projects, but rather the entire subdivision shall be considered a single land development project.
- (6) **Location of Stormwater Facilities on Lots:** Stormwater facilities within residential subdivisions that serve multiple lots and/or a combination of lots and roadways shall be on a lot owned and maintained by an entity of common ownership, unless an alternative arrangement is approved by the [STORMWATER AUTHORITY]. Stormwater practices located on individual lots shall be maintained by the lot owner, or, at the discretion of the [STORMWATER AUTHORITY], be placed within an easement and maintained by an entity of common ownership.
- (7) **Hydrologic Computation Assumptions:** Hydrologic parameters shall reflect the ultimate land development and shall be used in all engineering calculations. All pre-development calculations shall consider woods and fields to be in good condition, regardless of actual conditions at the time of application.
- (8) **Authorization to Discharge to MS4:** If runoff from a land development will flow to a municipal separate storm sewer system (MS4) or other publicly-owned storm sewer system, then the applicant shall obtain authorization from the system's owner to discharge into the system. The

[**STORMWATER AUTHORITY**] may require the applicant to demonstrate that the system has adequate capacity for any increases in peak flow rates and volumes.

- (9) **Compliance with Federal & State Regulations:** All stormwater facilities and conveyance systems shall be designed in compliance with all applicable state and federal laws and regulations, including the Federal Clean Water Act and all applicable erosion and sediment control and flood plain regulations. To the extent practical, stormwater facilities shall not be located in areas determined to be jurisdictional waters through Section 404 of the Federal Clean Water Act and/or applicable state regulations.
- (10) **Protect Public Health, Safety & General Welfare:** The design of stormwater BMPs shall consider public health, safety, and general welfare. These considerations include, but are not limited to: preventing flooding of structures and travelways; preventing standing water in facilities, manholes, inlets, and other structures in a manner that promotes breeding of mosquitoes; preventing attractive nuisance conditions and dangerous conditions due to velocity or depth of water and/or access to orifices and drops; and preventing aesthetic nuisances due to excessive slopes, cuts and fills, and other conditions.
- (11) **Adherence to Stormwater Design Manual:** *All stormwater BMPs shall be designed to the standards of the most current version of the Stormwater Design Manual, unless the [**STORMWATER AUTHORITY**] grants the applicant a waiver or the applicant is exempt from such requirements.*
- (12) **Treat Entire Land Development:** *The stormwater design shall provide for treatment of runoff from the entire land development, to the extent practical.*
- (13) **Landscape Plan:** *The design of stormwater BMPs shall include a landscape plan detailing both the vegetation to be in the practice and how and who will manage and maintain the vegetation. The landscape plan shall be prepared in accordance with the Stormwater Design Manual.*
- (14) **Pretreatment:** *Each stormwater BMP shall have an acceptable form of water quality pretreatment, in accordance with the pretreatment requirements found in the current Stormwater Design Manual.*
- (15) **Stormwater Authority Discretion:** *If hydrologic, geologic, topographic, or land use conditions warrant greater control than that provided by the minimum control requirements, the [**STORMWATER AUTHORITY**] may impose additional requirements deemed reasonable and necessary to control the volume, timing, rate and/or quality of runoff. The [**STORMWATER AUTHORITY**] may restrict the use of certain stormwater BMPs, require pretreatment above the minimum standards in the Stormwater Design Manual, and/or require a stormwater pollution prevention plan in certain circumstances. These include, but are not limited to: stormwater generated from stormwater hotspots, stormwater discharges that are conveyed with non-stormwater discharges, and stormwater discharged in important groundwater management areas or areas where geologic conditions are conducive to groundwater contamination (e.g., karst).*
- (16) **Replicating Pre-Development Hydrology:** *Stormwater management designs shall preserve the natural hydrologic functions, stream channel characteristics, and groundwater recharge of the pre-developed site, to the extent practical. This shall be accomplished by treating runoff at the source, disconnecting impervious surfaces, preserving or enhancing natural flow paths and vegetative cover, preserving or enhancing natural open spaces and riparian areas, and other measures that replicate pre-development hydrologic conditions. The [**STORMWATER AUTHORITY**] shall exercise*

discretion in the application of this standard, especially in cases of infill development, redevelopment, or other unique circumstances.

- (17) **Natural Resources Inventory:** Stormwater management designs shall include an inventory of important natural resources features on the site, and these features shall be shown on the Stormwater Management Concept Plan that may be prepared in accordance with Section 3.1. Protection and/or conservation of the site's natural features may, at the discretion of the [STORMWATER AUTHORITY], be used and given credit as "Non-Structural Measures" in accordance with Section 4.8. The natural resources inventory shall include, but not be limited to the following: natural drainage features, riparian buffers, wetlands, steep slopes, soils with high infiltration capacity, significant forest or prairie patches, and significant trees and natural communities.
- (18) **Treatment of Off-Site Stormwater:** Off-site stormwater conveyed through a land development shall be placed within an easement and conveyed in a manner that does not increase upstream or downstream flooding. Off-site stormwater shall be conveyed around on-site stormwater BMPs, unless the facilities are designed to manage the off-site stormwater. The [STORMWATER AUTHORITY] may allow credits for treating off-site stormwater.
- (19) **Stream & Wetland Crossings:** All stream and wetland crossings subject to Section 404 and/or state stream and wetland regulations shall minimize impacts on streams and wetlands, to the extent practical and achievable, by crossing streams and wetlands at a right-angle, reducing the footprint of grading and fill, and utilizing bridges, open bottom arches, spans, or other structures that do not restrict or alter stream or wetland hydrology. If culverts are placed within stream and wetlands, at least one culvert shall be countersunk or otherwise placed to allow the formation of a natural channel or wetland bottom to allow movement of aquatic organisms.

4.2 Runoff Reduction Criteria

In order to replicate pre-development hydrologic conditions, and to promote baseflow to streams and wetlands, some portion of the post-development runoff shall be permanently reduced by disconnecting impervious areas, maintaining sheetflow to areas of natural vegetation, infiltration practices, and/or collection and reuse of runoff. The applicant shall use either (1) (2) or (3) below to comply with these criteria:

(1) Groundwater Recharge/Infiltration

Replicate the pre-development recharge volume, based on regional average recharge rates for hydrologic soil groups

- Residential Sites: Post-development recharge = 90% of pre-development recharge
- Non-Residential Sites: Post-development recharge = 60% of pre-development recharge

(2) Overall Runoff Reduction (Option 1)

No increase in the overall runoff volume compared to the pre-development condition for all storms less than or equal to the 2-year, 24-hour storm.

(3) Overall Runoff Reduction (Option 2)

Capture and remove from the site hydrograph the volume of water associated with the 80th percentile storm event (or other storm event deemed appropriate by the STORMWATER AUTHORITY).

- (4) *This criterion shall be met using practices outlined in the **Stormwater Design Manual** that provide for the infiltration, evapotranspiration, and/or storage and reuse of runoff.*
- (5) *The volume of water needed for Runoff Reduction shall be considered part of the overall Water Quality Volume (WQv) required in Section 4.3, and shall not be in addition to the Water Quality Volume.*

The [STORMWATER AUTHORITY] may waive some or all of the requirements of this section as specified in (6) and (7) below:

- (6) **Risk of Groundwater Contamination:** *Stormwater hotspots, contaminated soils, and sites in close proximity to karst or drinking water supply wells may not be subject to groundwater recharge/infiltration requirements, as determined by the [STORMWATER AUTHORITY]. The [STORMWATER AUTHORITY] may impose reasonable conditions in granting such a waiver.*
- (7) **Site Constraints:** *Areas characterized by high water table, shallow bedrock, clay soils, contaminated soils, and other constraints may be subject to reduced volume control requirements, as determined by the [STORMWATER AUTHORITY]. The [STORMWATER AUTHORITY] may impose reasonable conditions in granting such a waiver.*
- (8) **Documentation for Waiver:** *When seeking a waiver in accordance with either (6) or (7) above, the applicant shall demonstrate that no reasonable alternatives for compliance exist through site and stormwater management design, and that stormwater discharges will not unreasonably increase the extent, frequency, or duration of flooding at downstream properties and structures or have an unreasonable adverse effect on streams, aquatic habitats, and channel stability. In making its determination to allow full or partial waivers, the [STORMWATER AUTHORITY] shall consider cumulative impacts and also the land development's adherence to the land use plans and policies of [JURISDICTION], including the promotion of infill and redevelopment in particular areas.*

4.3. Water Quality Criteria

Post-development runoff that is not permanently removed through the application of the runoff reduction criterion shall be captured and treated in a water quality BMP to prevent or minimize water quality impacts from land development. The applicant shall use (1) below to comply with this criterion:

- (1) **Water Quality Volume Standard:** Structural and non-structural practices shall be designed to capture and treat the Water Quality Volume (WQv). The WQv shall be computed as follows, unless another volume is specified in the **Stormwater Design Manual**.

$WQv = [P \times Rv \times A]/12$, where:

P = rainfall depth generated by the 90% storm event (inches)

$Rv = \text{Site Runoff Coefficient} = Rv_I \times \%I + Rv_T \times \%T + Rv_F \times \%F$

Where:

Rv_I = runoff coefficient for impervious cover

%I = percent of site with impervious cover (fraction)

R_{vT} = runoff coefficient for turf cover and disturbed soils
 % T = percent of site with turf cover or disturbed soils (fraction)
 R_{vF} = runoff coefficient for forest cover or natural open space
 % F = percent of site with forest cover or natural open space (fraction)

A = Area draining to stormwater BMP (acres)

Value for R_{vI} , R_{vT} , and R_{vF} shall be determined from the following table based on hydrologic soil groups present on the site.

Rv Coefficients	A soils	B Soils	C Soils	D Soils
Forest Cover & Natural Open Space	0.02	0.03	0.04	0.05
Turf Cover & Disturbed Soils	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

- (2) This criterion shall be met using practices from the Stormwater Technology Table in the **Stormwater Design Manual**. BMPs or combinations of BMPs should be selected that achieve the highest pollutant load reduction for the pollutants of concern.
- (3) All runoff removed through the runoff reduction criterion counts towards treating the WQv.
- (4) **Additional Criteria for Stormwater Hotspots:** *In addition, stormwater discharges from stormwater hotspots may require the use of specific structural, non-structural, and/or pollution prevention practices, including enhanced pre-treatment. Discharges from a stormwater hotspot shall not be infiltrated without enhanced pre-treatment, as approved by the [STORMWATER AUTHORITY].*

4.4. Channel Protection Criteria

The stormwater system shall be designed so that post-development discharges will not erode natural channels or steep slopes. This will protect in-stream habitats and reduce in-channel erosion. The applicant shall use Tier 1 or Tier 2 performance standards, as applicable, to meet this criterion.

- (1) *At each discharge point from the site, if the on-site drainage area is less than 10% of the total contributing drainage area to the receiving channel or waterbody, the following Tier 1 performance standards shall apply:*

Tier 1 Performance Standards

- (a) *Wherever practical, maintain sheetflow to riparian buffers or vegetated filter strips. Vegetation in buffers or filter strips must be preserved or restored where existing conditions do not include dense vegetation (or adequately sized rock in arid climates).*
- (b) *Energy dissipaters and level spreaders must be used to spread flow at outfalls.*
- (c) *On-site conveyances must be designed to reduce velocity through a combination of sizing, vegetation, check dams, and filtering media (e.g., sand) in the channel bottom and sides.*
- (d) *If flows cannot be converted to sheetflow, they must be discharged at an elevation that will not cause erosion or require discharge across any constructed slope or natural steep slopes.*

- (e) *Outfall velocities must be non-erosive from the point of discharge to the receiving channel or waterbody where the discharge point is calculated.*
- (2) *At each discharge point from the site, if the on-site drainage area is **greater** than 10% of the total contributing drainage area to the receiving channel or waterbody, then the Tier 1 performance standards in subsection (1) shall apply in addition to the following Tier 2 performance standards:*

Tier 2 Performance Standards

- (a) *Sites greater than 10 acres (or a site size deemed appropriate by the [STORMWATER AUTHORITY]) must perform a detailed downstream (hydrologic and hydraulic) analysis based on post-development discharges. The downstream analysis shall extend to the point where post-development discharges have no significant impact, and do not create erosive conditions, on receiving channels, waterbodies, or storm sewer systems.*
- (b) *If the downstream analysis confirms that post-development discharges will have an impact on receiving channels, waterbodies, or storm sewer systems, then the site must incorporate some or all of the following to mitigate downstream impacts:*
- *Site design techniques that decrease runoff volumes and peak flows.*
 - *Downstream stream restoration or channel stabilization techniques, as permitted through local, state, and federal agencies.*
 - *24-hour detention of the volume from the post-development 1-year, 24-hour storm. The [STORMWATER AUTHORITY] may give credit for the application of Runoff Reduction (Section 4.2) and WQv measures (Section 4.3) toward meeting storage requirements. Discharges to cold water fisheries should be limited to 12-hour detention.*
- (c) *Sites less than 10 acres (or a site size deemed appropriate by the [STORMWATER AUTHORITY]) shall verify that stormwater measures provide 12- to 24-hour detention of the volume from post-development 1-year, 24-hour storm. The [STORMWATER AUTHORITY] may give credit for the application of Runoff Reduction (Section 4.2) and WQv measures (Section 4.3) toward meeting storage requirements. A detailed downstream analysis is not required unless the local program identifies existing downstream conditions that warrant such an analysis.*

4.5. Flood Control Criteria

Downstream overbank flood and property protection shall be provided by controlling the post-development peak discharge rate to the pre-development rate. This criterion shall be met for the 10-year, 24-hour storm event, or other design storm(s) listed in the **Stormwater Design Manual**.

Stormwater BMPs that impound water shall demonstrate that the 100-year storm can safely pass through the structure without overtopping or creating damaging conditions downstream.

The [STORMWATER AUTHORITY] may waive some or all of the requirements of this section as specified in (1), (2), (3) and (4) below:

- (1) **Discharge to Large Waterbody:** The land development discharges directly to a flood plain, ocean, or major river or waterbody, and the [STORMWATER AUTHORITY] determines that waiving the flooding criteria will not harm public health and safety. The applicant shall secure drainage easements from any downstream property owners across whose property the runoff must flow to reach the flood plain, ocean, or major river or waterbody. The applicant shall also demonstrate that

any piped or open-channel system in which the runoff will flow has adequate capacity and stability to receive the project's runoff plus any off-site runoff also passing through the system.

- (2) **Insignificant Increases in Peak Flow:** The land development results in insignificant increases in peak flow rates, as determined by the [STORMWATER AUTHORITY].
- (3) **Alternative Criteria Provided:** The land development is subject to a floodplain study that recommends alternative criteria for flood control.
- (4) **Increases in Downstream Peak Flows or Flood Elevations:** The [STORMWATER AUTHORITY] determines that complying with the requirements of this section will result increases in peak flows or downstream flooding conditions due to coincident peaks from the site and the contributing watershed or another factor.
- (5) **Documentation for Waiver:** When seeking a waiver in accordance with either (1), (2), (3) or (4) above, the applicant shall demonstrate that stormwater discharges will not unreasonably increase the extent, frequency, or duration of flooding at downstream properties and structures or have an unreasonable adverse effect on streams, aquatic habitats, and channel stability. In making its determination to allow full or partial waivers, the [STORMWATER AUTHORITY] shall consider cumulative impacts and also the land development's adherence to the land use plans and policies of [JURISDICTION], including the promotion of infill and redevelopment in particular areas.

4.6. Redevelopment Criteria

Land development that qualifies as redevelopment shall meet one of the following criteria:

- (1) **Reduce Impervious Cover:** *Reduce existing site impervious cover by at least 20%.*
- (2) **Provide Treatment:** *Provide Runoff Reduction and water quality treatment for at least 30% of the site's pre-development impervious cover and any new impervious cover through stormwater BMPs designed in accordance with the criteria in Sections 4.2 through 4.3 and the Stormwater Design Manual.*
- (3) **Apply Innovative Approaches:** *Utilize innovative approaches to reduce stormwater impacts across the site. Examples include green roofs and pervious parking materials. The local program can exercise flexibility with regard to sizing and design standards for sites that are fitting practices into existing drainage infrastructure.*
- (4) **Provide Off-Site Treatment:** *Provide equivalent stormwater treatment at an off-site facility*
- (5) **Address Downstream Issues:** *Address downstream channel and flooding issues through channel restoration and/or off-site remedies*
- (6) **Contribute to Watershed Project:** *Contribute to a watershed project in accordance with Section 4.9.*
- (7) **Combination of Measures:** *Any combination of (1) through (6) above that is acceptable to the [STORMWATER AUTHORITY].*

4.7. Sensitive Waters and Wetlands: Enhanced Criteria

*Land development that discharges to sensitive waters and wetlands, as designated in the **Stormwater Design Manual**, shall meet enhanced criteria. These may include, but are not limited to:*

- (1) **Nutrient-Sensitive Waters:** Enhanced control of nutrients and sediment for discharges to drinking water reservoirs, lakes, estuaries, and/or coastal waters.*
- (2) **Cold-Water Fisheries:** Control of temperature increases for discharges to designated cold-water fisheries.*
- (3) **Groundwater:** Enhanced recharge and pre-treatment requirements to protect groundwater supply.*
- (4) **Wetlands:** The control of impacts to wetland hydrology, including limiting fluctuations to the natural or pre-development wetland hydrology.*
- (5) **Impaired Waters:** Enhanced bacteriological or pollutant controls for discharges to impaired waters, as designated in the most recent 303(d) list produced by EPA or the appropriate State agency.*

In these cases, the [STORMWATER AUTHORITY] may require additional storage, treatment, filtering, infiltration, or other techniques. The use of non-structural practices shall be used to the maximum extent practical to meet enhanced criteria.

In making its determination to apply enhanced criteria, the [STORMWATER AUTHORITY] shall consider cumulative impacts and also the land development's adherence to the land use plans and policies of [JURISDICTION], including the promotion of infill and redevelopment in particular areas.

4.8. Non-Structural Measures

*The use of nonstructural measures is encouraged to reduce sole reliance on structural stormwater management measures. The applicant may, if approved by the [STORMWATER AUTHORITY], take credit for the use of nonstructural measures as a means to comply with the criteria in **Sections 4.2 through 4.7**. For each potential credit, there is a minimum set of design criteria that identify the conditions or circumstances under which the credit may be applied. The site design practices that qualify for this credit and the criteria and procedures for applying and calculating the credits shall be included in the **Stormwater Design Manual**.*

4.9. Contribution to a Watershed Project: Fee-in-Lieu & Pro-Rata Share

The [STORMWATER AUTHORITY] shall establish the criteria and conditions by which a project is eligible for a fee-in-lieu payment for off-site and watershed enhancements. The [STORMWATER AUTHORITY] may allow a fee-in-lieu payment, according to the established criteria and conditions, in lieu of partial or full on-site compliance with the requirements of this Ordinance.

Provided that the [STORMWATER AUTHORITY] implements a program in accordance with **Section 3.11**, land development projects that are within the target or drainage area of a watershed or subwatershed management plan adopted by the [STORMWATER AUTHORITY], [JURISDICTION], and/or another appropriate local, regional, or state agency or program, shall comply with the following:

- (1) **On-Site Projects:** If the watershed or subwatershed management plan identifies specific projects on the applicant's property, the [STORMWATER AUTHORITY] may allow implementation of some or all of these projects as part of the stormwater management design plan to satisfy, in part or in whole, the criteria in Sections 4.2 through 4.7.
- (2) **Fee-in-Lieu Contribution for Off-Site Projects:** The [STORMWATER AUTHORITY] may allow a fee-in-lieu contribution to off-site watershed project(s) identified in the management plan to satisfy, in part or in whole, the criteria in Sections 4.2 through 4.7. The fee-in-lieu contribution shall be in accordance with the fee schedule adopted by [JURISDICTION] and maintained by the [STORMWATER AUTHORITY].
- (3) **Regional Stormwater Management:** If the land development is within the drainage area of an existing or planned regional stormwater BMP identified in the management plan, the applicant shall pay a pro-rata share of the cost of implementing the practice. The pro-rata share contribution shall be in accordance with the fee schedule adopted by [JURISDICTION] and maintained by the [STORMWATER AUTHORITY]. If a project is eligible for a fee-in-lieu and pro-rata share contribution, then the [STORMWATER AUTHORITY] shall determine one or the other fee or contribution for the project to pay.
- (4) **Other Off-Site Projects:** In certain circumstances dictated by the [STORMWATER AUTHORITY], the applicant may propose an off-site watershed solution as a means to comply, in part or in whole, with the criteria in Sections 4.2 through 4.7. In these cases, the [STORMWATER AUTHORITY] shall require submission of a comprehensive watershed study that includes sufficient information to evaluate impacts of the proposed solution on runoff rates, water quality, volumes and velocities, and environmental characteristics of the affected areas. The [STORMWATER AUTHORITY] may approve the watershed solution as a means to comply with Sections 4.2 through 4.7, in part or in whole, if the watershed solution provides better overall protection for water resources than strict application of the on-site criteria. In all cases, land rights, access agreements or easements, and a maintenance agreement and plan shall be provided to ensure long-term maintenance of any off-site watershed project.

Nothing in the subsection shall compel the [STORMWATER AUTHORITY] to approve a plan that, in its determination, may pose a threat to public health, safety, or the environment. In approving a contribution to a watershed project, the [STORMWATER AUTHORITY] may apply conditions necessary to protect downstream property and environmental resources.

4.10. Waivers

Every applicant shall provide for stormwater management as required by this Ordinance, unless a written request for a waiver is filed and approved by the [STORMWATER AUTHORITY]. Prior to applying for a waiver request, the applicant must demonstrate that all reasonable options to comply with Ordinance have been exhausted, including the use of non-structural measures (**Section 4.8**) and/or construction or contribution to a watershed project (**Section 4.9**).

The request for a waiver must be in writing and must include waiver fee specified in **Section 3.10**. The [STORMWATER AUTHORITY] shall respond in writing by granting or denying the waiver in full, or granting the waiver with any necessary conditions or mitigation measures to protect public health, safety, and the environment. The applicant shall note any full or partial waivers, and conditions imposed by the [STORMWATER AUTHORITY], on the stormwater management design plan.

Section 5. Construction Inspection for Permanent Stormwater BMPs

5.1. Notice of Construction Commencement

The applicant must notify the [STORMWATER AUTHORITY] before the commencement of construction. In addition, the applicant must notify the [STORMWATER AUTHORITY] in advance of construction of critical components of the stormwater practices on the approved stormwater management design plan. The [STORMWATER AUTHORITY] may, at its discretion, issue verbal or written authorization to proceed with critical construction steps, such as installation of permanent stormwater practices based on stabilization of the drainage area and other factors.

5.2. Construction Inspections by [STORMWATER AUTHORITY] or its Representatives

The [STORMWATER AUTHORITY] or its representatives shall conduct periodic inspections of the stormwater practices shown on the approved stormwater management design plan, and especially during critical installation and stabilization steps. All inspections shall be documented in writing. The inspection shall document any variations or discrepancies from the approved plan, and the resolution of such issues. Additional information regarding inspections can be found in the **Stormwater Design Manual**. A final inspection by the Stormwater Authority is required before any performance bond or guarantee, or portion thereof, shall be released.

5.3. Inspection by Certified Inspector

At its discretion, the [STORMWATER AUTHORITY] may authorize the use of private inspectors to conduct and document inspections during construction. Such private inspectors shall submit all inspection documentation in writing to the [STORMWATER AUTHORITY]. All costs and fees associated with the use of private inspectors shall be the responsibility of the applicant.

If the use of private inspectors is authorized, the [STORMWATER AUTHORITY] shall maintain a training and certification program, or authorize another entity to maintain such a program. All private inspectors shall be certified prior to conducting any inspections or submitting any inspection documentation to the [STORMWATER AUTHORITY].

If private inspectors are utilized, then inspections by the [STORMWATER AUTHORITY] or its representatives, as provided in **Section 6.2**, may be reduced in frequency. However, the [STORMWATER AUTHORITY] shall remain the responsible entity for ultimate inspection, approval, and acceptance of all stormwater BMPs, and for issuance of the Certificate of Completion in accordance with **Section 5.5**.

5.4. Stormwater Certificate of Completion

Subsequent to final installation and stabilization of all stormwater BMPs shown on the stormwater management design plan, submission of all necessary as-built plans, and final inspection and approval by the [STORMWATER AUTHORITY], the [STORMWATER AUTHORITY] shall issue a Stormwater Certificate of Completion for the project. In issuing such a certificate, the [STORMWATER AUTHORITY] shall determine that all work has been satisfactorily completed in conformance with this Ordinance.

Section 6. Ongoing Maintenance for Stormwater BMPs

6.1. Maintenance Responsibility

The responsible party named in the recorded stormwater maintenance agreement (**Section 3.6**) shall maintain in good condition and promptly repair and restore all structural and non-structural stormwater BMPs and all necessary access routes and appurtenances (grade surfaces, walls, drains, dams and structures, vegetation, erosion and sedimentation controls, and other protective devices). Such repairs or restoration and maintenance shall be in accordance with the approved stormwater management design plan, the stormwater maintenance agreement, and the stormwater maintenance plan.

6.2. Maintenance Inspection by [STORMWATER AUTHORITY] or its Representatives

The [STORMWATER AUTHORITY] or its representatives shall conduct periodic inspections for all stormwater practices for which a Stormwater Certificate of Completion has been issued in accordance with Section 5.5. All inspections shall be documented in writing. The inspection shall document any maintenance and repair needs and any discrepancies from the stormwater maintenance agreement and stormwater maintenance plans.

6.3. Maintenance Inspection by Certified Inspector

At its discretion, the [STORMWATER AUTHORITY] may authorize the use of private inspectors to conduct and document ongoing maintenance inspections. Such private inspectors shall submit all inspection documentation in writing to the [STORMWATER AUTHORITY]. All costs and fees associated with the use of private inspectors shall be the responsibility of the responsible party.

If the use of private inspectors is authorized, the [STORMWATER AUTHORITY] shall maintain a training and certification program, or authorize another entity to maintain such a program. All private inspectors shall be certified prior to conducting any inspections or submitting any inspection documentation to the [STORMWATER AUTHORITY].

If private inspectors are utilized, then inspections by the [STORMWATER AUTHORITY] or its representatives, as provided in **Section 6.2**, may be reduced in frequency. However, the [STORMWATER AUTHORITY] shall remain the responsible entity for ultimate inspection of stormwater practices and any enforcement actions necessary under **Section 7 of this Ordinance**.

6.4. Records of Maintenance Activities

The responsible party shall make records of the installation and of all maintenance and repairs, and shall retain the records for at least five (5) years. These records shall be made available to the [STORMWATER AUTHORITY] during inspection of the practice and at other reasonable times upon request.

6.5. Failure to Provide Adequate Maintenance

In the event that the stormwater BMP has not been maintained and/or becomes a danger to public safety or public health, the [STORMWATER AUTHORITY] shall notify the responsible party by registered or certified mail. The notice shall specify the measures needed to comply with the maintenance agreement and the maintenance plan and shall specify that the responsible party has thirty (30) days or other time frame mutually agreed to between the [STORMWATER AUTHORITY] and the responsible party, within which such measures shall be completed. If such measures are not completed, then the [STORMWATER AUTHORITY] shall pursue enforcement procedures pursuant to Section 7 of this Ordinance.

If a responsible person fails or refuses to meet the requirements of an inspection report, maintenance agreement, or maintenance plan the [STORMWATER AUTHORITY], after thirty (30) days written notice (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient), may correct a violation of the design standards or maintenance requirements by performing the necessary work to place the practice in proper working condition. The [STORMWATER AUTHORITY] may assess the responsible party of the practice for the cost of repair work which shall be a lien on the property, or prorated against the beneficial users of the property, and may be placed on the tax bill and collected as ordinary taxes by [JURISDICTION].

Section 7. Violations, Enforcement and Penalties

7.1. Violations

Any action or inaction which violates the provisions of this Ordinance, the requirements of an approved stormwater management design plan or permit, and/or the requirements of a recorded stormwater maintenance agreement may be subject to the enforcement actions outlined in this Section. Any such action or inaction is deemed to be a public nuisance and may be abated by injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

7.2. Notice of Violation

If the [STORMWATER AUTHORITY] or [JURISDICTION] determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved stormwater management design plan, a recorded stormwater management maintenance agreement, or the provisions of this ordinance, it shall issue a written notice of violation to such applicant or other responsible person. Where a person is engaged in activity covered by this ordinance without having first secured a permit therefore, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the site.

The notice of violation shall contain:

- (1) The name and address of the owner or the applicant or the responsible person;
- (2) The address or other description of the site upon which the violation is occurring;
- (3) A statement specifying the nature of the violation;
- (4) A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management design plan, the stormwater maintenance agreement, or this ordinance and the date for the completion of such remedial action;
- (5) A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and,
- (6) A statement that the determination of violation may be appealed to **[GOVERNING BOARD OF JURISDICTION]** by filing a written notice of appeal within thirty (30) days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient).

7.3. Penalties

In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed.

- (1) **Stop Work Order:** The **[STORMWATER AUTHORITY]** or **[JURISDICTION]** may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.
- (2) **Withhold Certificate of Occupancy:** The **[STORMWATER AUTHORITY]**, **[JURISDICTION'S PERMIT ISSUING AUTHORITY]**, or **[JURISDICTION]** may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.
- (3) **Suspension, Revocation or Modification of Permit:** The **[STORMWATER AUTHORITY]** or **[JURISDICTION]** may suspend, revoke or modify the permit authorizing the land development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated upon such conditions as the **[STORMWATER AUTHORITY]** or **[JURISDICTION]** may deem necessary to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.

(4) **Civil Penalties:** In the event the applicant or other responsible person fails to take the remedial measures set forth in the notice of violation, the [STORMWATER AUTHORITY] or [JURISDICTION] may impose a penalty not to exceed \$1,000 (depending on the severity of the violation) for each day the violation remains unremedied after receipt of the notice of violation. A schedule of civic penalties is outlined in the table below.

Violation	Penalty
Failure to submit and receive approval of a stormwater management design plan prior to construction	[\$ 1,000]
Failure to submit and receive approval of a stormwater maintenance agreement and plan prior to construction	[\$ 500]
Failure to install stormwater BMP(s) as indicated on the approved stormwater management design plan	[\$ 750]
Failure to notify Stormwater Authority before commencement of construction	[\$ 500]
Failure to maintain stormwater BMP within 30 days of notification (See Section 6.5 for more detail)	[\$ 750]

(5) **Criminal Penalties:** For intentional and flagrant violations of this ordinance, the [STORMWATER AUTHORITY] or [JURISDICTION] may issue a citation to the applicant or other responsible person, requiring such person to appear in [APPROPRIATE MUNICIPAL, MAGISTRATE, OR RECORDERS] court to answer charges for such violation. Upon conviction, such person shall be punished by a fine not to exceed \$1,000 or imprisonment for 60 days or both. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

7.4. Appeals

The decisions or orders of the [STORMWATER AUTHORITY] or [JURISDICTION] shall be final. Further relief shall be to a court of competent jurisdiction.

7.5. Remedies Not Exclusive

The remedies listed in this Ordinance are not exclusive of any other remedies available under any applicable federal, state or local law.

Approved by: _____ Date _____

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34. Appendix K: Watershed Partnership Groups

Dickinson Bayou Watershed Partnership Advisory Committee

Armand Bastein, Larry Bigelow, Heather Biggs, Linda Broach, Brian Craig, Jan Culbertson, Kevin Cunningham, Michael Cunningham, Gabi DelaRosa, Winston Denton, Meredith Fant, Rebekah Gano, George Guillen, Mike Hogan, Ken Hoffstetler, John Jacob, Rick Johnson, Steven Johnston, Scott Jones, Jared Judy, Jim Keese, Brian Koch, Julie Masters, Carl Masterson, Jim McBride, Jack Murphy, Wes Padgett, George Regmond, Sean Rosenberry, Ronnie Schultz, Marissa Sipocz, Elsie Smith, Sara Snell, Jessica Stephens, Holli Swick, Mary Alice Trumble, Aaron Wendt, Berna Dette Williams, Jean Wright, Peggy Wright

Dickinson Bayou Watershed Partnership Chairs

Rick Johnson (Current Co-Chair)
Wes Padgett (Current Co-Chair)
Sara Snell (Past Chair)

Dickinson Bayou Watershed Partnership Workgroups

Flooding and Stormwater: Aaron Wendt, Al Louviere, Brian Craig, Brett Bercher, Carl Masterson, Heather Biggs, Ivan Langford, Jack Murphy, Jason Christain, Jim McBride, Ray and Sherrie Jones

Habitat: Charriss York, George Regmond, Jan Culbertson, Jared Judy, Jim Keese, Marissa Sipocz, Mary Alice Trumble, Pat Windstar, Wes Padgett

Land Use: Armand Bastein, Berna Dette Williams, Brian Koch, Heather Biggs, Holli Swick, John Jacob, Julie Masters, Laura Bowers, Laura Sykes, Meredith Fant, Rebekah Gano, Steven Johnston

Outreach and Education: Elsie Smith, Heather Biggs, Kevin Cunningham, Mary Villareal, Rebekah Gano, Sara Snell, Scott Jones

Recreation: Elaine Britcliffe, Jan Culbertson, Joe Privat, Joel and Pat Christie, Kathie Derrick, Kathleen Kirst, Ken Hufstetler, Mary Dunbaugh, P. Robinson, Ray and Sherry Jones, Rick Johnson, Sam Reichek

Water Quality: Antonietta Quigg, George Guillen, Jean Wright, Linda Broach, Steven Johnston, Winston Denton, Michael Cunningham, Roger Miranda

35. EPA 9 Elements Summary and Crosswalk

The EPA has identified nine specific items that should be present in a watershed protection plan⁸⁶. They are:

- A. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed.
- B. An estimate of the load reductions expected from management measures.
- C. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions, and a description of the critical areas in which those measures will be needed to implement this plan.
- D. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.
- E. An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.
- F. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.
- G. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.
- H. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.
- I. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item 8 above.

These nine elements are incorporated throughout the watershed plan, where most appropriate. Below is a table summarizing these elements for the Dickinson Bayou Watershed Protection Plan.

⁸⁶ U.S. EPA. 2008. Handbook for Developing Watershed plans to Restore and protect Our Waters. EPA 841-B-08-002.

EPA Element	Location in Plan
<p>Element A Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed.</p>	<p>Chapter 3</p>
<p>Element B An estimate of the load reductions expected from management measures.</p>	<p>Chapter 22: Table 22, Table 23, and Table 24</p>
<p>Element C A description of the nonpoint source management measures that will need to be implemented to achieve load reductions, and a description of the critical areas in which those measures will be needed to implement this plan.</p>	<p>Chapter 14, Chapter 15, Chapter 17, Chapter 18, and Chapter 19</p>
<p>Element D Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.</p>	<p>Plan Strategies & Milestones table page 128, “Funding Mechanism” column</p> <p>Also in Chapter 14, Chapter 15, Chapter 17, Chapter 18, and Chapter 19 under the heading “Financial Requirements”</p>
<p>Element E An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.</p>	<p>Chapter 13</p> <p>Also mentioned in Chapter 14, Chapter 15, Chapter 17, Chapter 18, and Chapter 19 under the heading “Education and Outreach”</p>

<p>Element F Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.</p>	<p>Summary of Milestones Table, pages 13-16</p>
<p>Element G A description of interim measureable milestones for determining whether nonpoint source management measures or other control actions are being implemented.</p>	<p>Plan Strategies & Milestones table page 128 “Milestones, short term” column</p>
<p>Element H A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.</p>	<p>Criteria are listed as short term load reductions in the “Plan Strategies & Milestones” table, page 128 “Milestones, short term” column</p>
<p>Element I A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item H above.</p>	<p>Chapter 21</p>

36. Glossary

303(d). Refers to section 303(d) of the Clean Water Act. Every two years, states must assess the quality of their water and submit a report to the EPA detailing the extent to which each water body in the state meets water quality standards. The TCEQ publishes this assessment as the Texas Water Quality Inventory and 303(d) List. The Inventory gives the status of all surface water bodies of the state that were evaluated for the given assessment period. The 303(d) List is an important management tool produced as part of the assessment. It identifies waters for which preventive measures are not sufficient to achieve established water quality standards. These waters are often referred to as “impaired” water bodies.

Best Management Practice (BMP). Structural and nonstructural techniques that store or treat stormwater runoff to reduce flooding, remove pollutants, and provide other amenities.

Biological Oxygen Demand (BOD). The amount of oxygen consumed by the natural decomposition of biological matter or chemical reactions in the water column. BOD is often used as a measure of organic pollutants discharged into streams. BOD loadings tend to deplete oxygen water in the receiving body as the organic material is decomposed, lowering dissolved oxygen content.

Chlorophyll-a. The primary photosynthetic pigment of plants that gives them their green color. Measured as an indicator of water quality. High levels of chlorophyll-a may indicate an algal bloom.

Coastal floodplain flooding. (Also called “storm surge flooding.”) When the storm surge associated with a hurricane or tropical disturbance pushes water onshore and inundates low lying coastal areas.

Conservation easement. A legally enforceable agreement between landowner(s) and a conservation group or government body, allowing the landowner(s) to continue ownership and most/all current uses while devoting the land to specified long-term conservation uses.

Conductivity. The ability of a water sample to conduct electricity. Conductivity is related to salinity, and is a measure of the concentration of dissolved solids or salts in the water.

Cone of Subsidence. The cone-shaped subsidence of the water table caused by over withdrawal (overpumping) of groundwater, which lowers the water table.

Dissolved Oxygen (DO). The concentration of oxygen dissolved in the water column, and available for biochemical activity. The amount of water that can dissolve in water varies with salinity and temperature, such that cold, fresh water can hold more oxygen when fully saturated than warm, salt water.

Ecological footprint. The extent and breadth of impacts that an activity has on the surrounding ecosystem. For example, the placement of a wide, well-maintained utility easement through the middle of a contiguous, pristine forest would be considered to have a much larger ecological

footprint than the clearing of a few trees at the forest's edge for a road sign. The easement would bisect a previously intact ecosystem, create extensive forest edge, and provide opportunities for penetrations of new species such as the Brown-headed Cowbird, all of which can significantly alter the system's ecology, while removing a few trees at the forest's edge would not likely have serious ecological impacts.

Estuary. A semi-enclosed system comprising a transition from freshwater to marine environments, where freshwater from rivers, bayous and tributaries mixes with salt water from an ocean. This mixing provides a unique environment that houses diverse flora and fauna. The Galveston Bay estuary is a highly productive, nutrient rich ecosystem that provides critical nursery areas for juvenile marine organisms such as shrimp, oysters, crabs, and numerous fish species.

Estuarine. Adjective, of or relating to an estuary. Example: estuarine ecology.

Eutrophic. Characterized by an excess accumulation of nutrients, increased algal production, and low dissolved oxygen levels.

Fecal coliform bacteria. Bacteria found in the intestinal tracts of warm-blooded animals. These organisms are used as indicators of fecal pollution and the possible presence of waterborne pathogens.

Flood Damage Reduction Plan (FDRP). Map developed to lessen the damages to an area caused by flooding that can include a combination of structural and non-structural elements.

Flood Insurance Rates Map (FIRM). Map showing the areas subject to flooding from a primary flooding source, typically major rivers, channels and their tributaries, and are meant to help determine the risk of flooding for a property. The FIRMs show floodplains based on a 1% flood, and sometimes floodplains based on a 2% flood

Floodplain. A strip of relatively level land bordering a stream, built of sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current. It is called a living floodplain if it is overflowed in times of high water, or a fossil floodplain if it is beyond the reach of the highest flood.

Habitat. (Also called "natural area.") Habitat refers to natural areas that are suitable for wildlife, and that retain at least some of their natural character.

Impaired waterbody. A waterbody is impaired when it does not support the uses established for it by the Texas Surface Water Quality Standards. Impaired waterbodies are listed on the Texas 303(d) list.

Impervious cover. Groundcover, natural or manmade, that does not allow storm water to infiltrate into the ground. Examples of impervious cover include pavement, buildings and rock.

Indicator. Measurable quantity of a chemical (i.e., elements or compounds) or biota (i.e., organisms, species, or communities) that can be used to evaluate the relationship between pollutant sources and their impact on environmental conditions.

Low Impact Development (LID). A technique to maintain or mimic predevelopment runoff conditions through a variety of small landscape features that infiltrate, filter, store, evaporate, and detain runoff close to its source. LID addresses stormwater through small, cost-effective landscape features located at the lot level.

Macroinvertebrate. Macroinvertebrates are invertebrate animals, animals without vertebral columns or spinal chords, which are visible to the naked eye. Those that inhabit the bottom of water bodies are referred to as benthic macroinvertebrates, or benthos. Macroinvertebrates are critical links in the food webs of aquatic systems. As many are sensitive to pollutants, and are often fairly immobile compared to fish species, they are useful indicators of water quality.

Main stem. The major channel of a waterbody into which tributaries flow.

Microgram (μg). One one-millionth of a gram; 10^{-6} gram.

Mima mound (Also called “pimple mound.”) Circular to elliptical mounds up to 150 feet in diameter and two to four feet in height from the general ground level. These features are often found in association with freshwater depressional wetlands in prairie pothole complexes.

Most Probable Number. A statistical estimate of the number of microbes in a known amount of water (usually 100mL); used when it is not feasible to count individual organisms.

Natural area. (Also called “habitat.”) Habitat refers to natural areas that are suitable for wildlife, and that retain at least some of their natural character.

Nitrates. Nitrates are compounds containing the nitrate ion (NO_3^-). Nitrates are important nutrients for green plants.

Nitrites. Nitrates are compounds containing the nitrite ion (NO_2^-), often produced by bacterial processing of ammonia. Nitrites are toxic to many animal species, as they bind to hemoglobin and interfere with respiration.

Non-point source (NPS). Pollution originating from many diffuse sources rather than one specific, identifiable source. Non-point source pollution is caused by rainfall or snowmelt. As the runoff moves, it picks up and carries away natural and man-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and groundwater.

Non-point source pollution. Pollution originating from many diffuse sources rather than one specific, identifiable source.

Nutrient. Any substance used by living things to promote growth. This term is usually applied to nitrogen and phosphorous in water and wastewater, but can also be applied to other essential

and trace elements. Excess quantities of nutrients can contribute to water quality problems and eutrophication.

Open space. Any undeveloped area, and includes natural habitat as well as parks, pastures, and water.

Overbank flooding. (Also called “shallow floodplain” flooding). Occurs when water level in stream or channel rises to a level higher than the channel bank, inundating the area adjacent to the channel.

Pervious cover. Groundcover, natural or manmade, that allows storm water runoff to infiltrate into the ground.

Phosphorus (Total P). Phosphorus is an essential nutrient in plant growth. Total phosphorus is a measure of all the various forms of phosphorus that are found in a water sample. Excess phosphorus can contribute to algal blooms and eutrophication.

Photosynthesis. The process by which many plants and algae convert energy in sunlight to chemical forms of energy that can be used by biological systems.

Phytoplankton. Photosynthetic aquatic organisms carried about by water motion. Phytoplankton are primary producers and form the foundation of the food chain in many ecosystems.

Pimple mound. (Also called “mima mound.”) Circular to elliptical mounds up to 150 feet in diameter and two to four feet in height from the general ground level. Pimple mounds are often found in association with freshwater depressional wetlands in prairie pothole complexes.

Point source. Any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, or container. It also includes vessels or other floating craft from which pollutants are or may be discharged. By law, the term “point source” also includes concentrated animal feeding operations, which are places where animals are confined and fed.

Point source pollution. Pollutants that come from a concentrated, discernable originating point, such as a pipe from a municipal wastewater treatment plant or factory or a large registered feedlot with a specific point of discharge.

Prairie pothole. Circular to irregular, undrained depressions scattered on the ground surface. These features are most often remnants of ancient river channels, partially filled with sediments, and abandoned by natural migration of the river channels. These potholes seasonally fill with water and are important in retaining water during rain events, processing pollutants and retaining sediments to improve the quality of water that eventually winds up in streams, and provides important habitat for a diversity of plant and animal species, notably waterfowl.

Rain Garden. A garden used to capture water during rainfall events. These gardens are usually planted with wetland or bog plants, which help in processing pollutants and trapping sediments, resulting in cleaner water runoff.

Respiration. In this document, reference is made to cellular respiration. Cellular respiration is the use of oxygen by living organisms during metabolic processes that generate energy.

Riparian. Pertaining to the banks of a stream.

Runoff. See Stormwater Runoff.

Salinity. The concentration of dissolved salts in water.

Secchi Depth. The depth at which a standard black-and-white disc is indistinguishable from the surrounding water. Secchi depth is used as a measure of water clarity, or turbidity (see definition below).

Sediment. Particles of sand, clay, silt, and plant matter deposited in slow moving areas of streams and rivers and in reservoirs and estuaries.

Smart growth. a compact, efficient, and environmentally sensitive pattern of development that preserves open spaces and agricultural lands by creating walkable pedestrian and transit-oriented communities that enable a high degree of social interaction and cohesion.

Storm surge flooding. (Also called “coastal floodplain” flooding.) Occurs when the storm surge associated with a hurricane or tropical disturbance pushed water onshore and inundates low lying coastal areas.

Shallow floodplain flooding. (Also called “overbank” flooding.) Occurs when water level in stream or channel rises to a level higher than the channel bank, inundating the area adjacent to the channel.

Stormwater. Runoff from land and impervious areas such as paved streets, parking lots, and building rooftops during rainfall and snow events.

Stormwater runoff. (Also called “runoff.”) Rainfall that does not evaporate or infiltrate into the ground but instead flows across land and into waterbodies.

Total Maximum Daily Load (TMDL). Maximum amount of pollutant loading that a waterbody segment can receive and still support water quality standards/designated uses.

Toxicity. The degree to which a substance is harmful to the health of humans or other organisms.

Trophic. Trophic state of a waterbody refers to its nutritional status. Various classification schemes exist that group waterbodies into discrete trophic (quality) states along a continuum from oligotrophic (poorly nourished) to mesotrophic to eutrophic to hypereutrophic (overnourished).

Turbidity. A measure of the cloudiness of water, which is a function of the amount of suspended material, both organic and inorganic. Typically turbidity is measured by determining the extent to which light is attenuated in passing through water.

Water column. Refers to the vertical region in a water body anywhere between the surface and the bottom, but not inclusive of the surface or bottom.

37. Acronyms

BFE	Base Flood Elevation Base Flood Elevation
BMP	Best Management Practice
CBOD	Carbonaceous Biological Oxygen Demand
CCC	Coastal Coordination Council
CWA	Clean Water Act
DO	Dissolved Oxygen
EA	Environmental Assessment
EFDC	Environmental Fluid Dynamics Code
EIH	Environmental Institute of Houston
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act Endangered Species Act
FBFM	Flood Boundary and Floodway Map
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Maps
FIRM	Flood Insurance Rate Map
GBEP	Galveston Bay Estuary Program
GBF	Galveston Bay Foundation
GBIC	Galveston Bay Information Center
GLO	Texas General Land Office
H-GAC	Houston-Galveston Area Council
HGCSD	Harris-Galveston Coastal Subsidence District
HHW	Household Hazardous Waste
HMGP	Hazard Mitigation Grant Program
HSPF	Hydrologic Simulation Program - Fortran

KDB	Keep Dickinson Beautiful
LID	Low Impact Development
LIDAR	Light Detection and Ranging
LLT	Legacy Land Trust
mg/L	Milligrams (1/1,000 gram) per liter, a unit of measure for concentration
MS4	Municipal separate storm sewer systems
MPN	Most Probable Number
NEPA	National Environmental Protection Act
NFIP	National Flood Insurance Program
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWF	National Wildlife Federation
OSSF	On-site Sewage Facility
OWOW	EPA's Office of Wetlands, Oceans, and Watersheds
PPT	Parts Per Thousand
SAV	Submerged Aquatic Vegetation
SEP	Supplemental Environmental Project Program of the Texas Commission on Environmental Quality
SFHA	Special Flooding Hazard Area
SWMP	Stormwater Management Program
SSURGO	Soil Survey Geographic
TCEQ	Texas Commission of Environmental Quality
TCWP	Texas Coastal Watershed Program (Texas Sea Grant / Texas AgriLife Extension Service)
TGLO	Texas General Land Office

TNC	The Nature Conservancy
TNRIS	Texas Natural Resources Information System
TPDES	Texas Pollution Discharge Elimination System
TPL	The Trust for Public Land
TPWD	Texas Parks and Wildlife Department
TSARP	Tropical Storm Allison Recovery Project
TSG	Texas Sea Grant College Program
TSS	Total Suspended Solids
TWDB	Texas Water Development Board
TWPC	Texas Water Policy Council
UHCL	University of Houston - Clear Lake
USACE	U.S. Army Corps of Engineers
USDA NRCS	Natural Resources Conservation Service, of the U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service, of the U.S. Department of the Interior
USGS	U.S. Geological Survey

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