

Enclosure Three

**U.S. Fish and Wildlife Service
Recommendations for Protection of
Water Quality of the Edwards Aquifer**

September 1, 2000

These recommendations were produced with the intent of identifying measures that would achieve an objective of "non-degradation" of water quality for projects within the Edwards Aquifer. While true "non-degradation" is not technically possible today, these recommendations strive to maintain current water quality. Anyone implementing projects following these recommendations is encouraged to go beyond water quality maintenance and demonstrate ways that the project can achieve improved water quality.

These recommendations to protect water quality are current as of the date listed above and will change as new information becomes available. They are not rules, regulations, laws or requirements. These recommendations were formulated by reviewing existing scientific information, existing rules and regulations, and by working closely with water quality engineers and biologists. These recommendations pertain to the protection of water quality for Federally listed endangered and threatened species. These measures do not address other possible impacts to Federally listed endangered or threatened species.

It is recognized that strict adherence to any general set of development recommendations may be problematic at the project level. Problems that arise are usually very site-specific and should be dealt with on a case-by-case basis. Variations from these recommendations could be used and still achieve the "non-degradation" objective. In cases where flexibility is appropriate, variations should be designed to achieve the "non-degradation" objective.

1. Buffer Zones.

Buffer zones (undisturbed natural areas) should be established for the stream drainage system and for sensitive environmental features within the Edwards Aquifer watersheds.

- A. Buffer zones should remain free of construction, development, or other alterations. The number of roadways crossing through the buffer zones should be minimized and constructed only when necessary to safely access property that cannot otherwise be accessed. Other alterations within buffer zones could include utility crossings, but only when necessary, fences, low impact parks, and open space. Low impact park development within the buffer zone should be limited to trails, picnic facilities, and similar construction that does not significantly alter the existing vegetation. Parking lots and roads are not considered low impact. Neither golf course development nor wastewater effluent irrigation should take place in the buffer zone. Stormwater from development should be dispersed into overland flow patterns before reaching the buffer zones.

B. Each stream should have an undisturbed native vegetation buffer on each side as follows:

Streams draining 640 acres (one square mile) or greater should have a minimum buffer of 300 feet from the centerline on each side of the stream.

Streams draining less than 640 acres but 320 or more acres should have a minimum buffer of 200 feet from the centerline on each side of the stream.

Streams draining less than 320 acres but 128 or more acres should have a minimum buffer of 100 feet from the centerline on each side of the stream.

Streams or swales draining less than 128 acres but 40 or more acres should have a minimum buffer of 50 feet from the centerline on each side of the drainage.

Streams or swales draining less than 40 acres but 5 or more acres should have a minimum buffer of 25 feet from the centerline on each side of the drainage.

- C. Sensitive environmental features should have a minimum buffer of 150 feet around the feature (radius). If the drainage to a feature is greater than 150 feet in length, then the minimum buffer should be expanded to a minimum of 300 feet for the area draining into the feature. Sensitive environmental features include: caves, sinkholes, faults with solution-enlarged openings, fracture zones with solution-enlarged openings, springs, seeps, or any area that holds water or supports mesic vegetation for sustained periods. Possible sensitive features and sensitive features as defined by the "Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zones", TNRCC document 0586 (Rev. 6/1/99) should have these buffers established.

2. **Low-impact development designs.**

Low-impact development design is defined not only by impervious cover, but also by a philosophy of development planning, engineering design and construction, and tenant occupation that reduces the impact upon the surrounding environment. The goal of low-impact development design is to produce a product with the least effect upon the natural biota and the hydrologic regime of the site. A source of guidance for such design may be obtained from Low-Impact Development Design Manual (hereafter LIDDM), Department of Environmental Resources, Prince George's County, Maryland, November 1997. Site specifics will affect the applicability of the measures to the Central Texas area.

Recharge zone development should be limited to no more than 15% impervious cover in the uplands zone. Contributing zone development should be limited to no more than 20% impervious cover in the uplands zone. The uplands zone includes all land not within a buffer

zone and not within golf course turf areas subject to fertilizer, pesticide and herbicide applications. Buffer zones and golf course turf areas should not be included in impervious cover calculations.

Preservation of large, undisturbed upland areas through the use of innovative site design techniques that, for example, cluster development is encouraged. Cluster development should also incorporate design principles that: reduce roadway widths; reduce residential street lengths using alternate street layouts that increase the number of homes per unit length; reduce residential street right-of-way widths; minimize the use of residential street cul-de-sacs using alternative turnaround designs; use vegetated channels instead of curb and gutters; and use subdivision designs that incorporate, where appropriate, narrower lot frontages. Additional recommendations for low impact designs include the use of non-toxic building materials, water conservation, rainwater harvesting, wastewater recycling, and xeriscaping.

3. Provisions for increased development intensity.

Onsite development intensity may be increased if additional land, conservation easement, or development rights are acquired offsite. Offsite land should be located in the same watershed and aquifer zone as the development. Offsite land being used to offset higher development on a project should not include areas that would be part of a buffer system under these recommendations.

In the recharge zone, development should not exceed a maximum of 30% on-site impervious cover of the upland zone (developed site) when sufficient offsite land is provided. Such offsite land should be maintained in an undeveloped condition (25 acre tracts or larger) in perpetuity such that the effective impervious cover (developed land plus offsite land) does not exceed 10% impervious cover. In the contributing zone, development should not exceed 35% on-site impervious cover of the upland zone when sufficient offsite land is provided. Such offsite land should be maintained in an undeveloped condition in perpetuity such that the effective impervious cover of the combined tracts does not exceed 15%. Golf course areas receiving fertilizer, pesticide, and herbicide applications should be excluded from the uplands area calculation and should not be used to calculate allowable impervious cover. The offsite acreage may be reduced when more sensitive land can be preserved; however, this consideration should be made on a case-by-case basis.

Offsite land should be in a low impervious cover condition (2 percent or less) in perpetuity. Conservation easements or deed restrictions should be used to ensure permanent protection. Offsite lands should also have provisions made for appropriate long term management, which could include a property owner, home-owners association, river authority, municipality, county or land trust. Offsite land should be in large contiguous areas and used to augment existing conservation efforts, to the greatest extent practical.

4. **Stormwater quality treatment.**

The stormwater management goal should be to prevent degradation of the aquifer and surface water by meeting specific non-degradation performance objectives. Satisfying the non-degradation goal should be demonstrated by meeting the following two objectives:

The development should not result in an increase in annual average stormwater pollutant loads over pre-development conditions for discharges from the site.

The development should preserve the current form and function of the drainage network/stream system. This may be achieved by either non-structural or structural means, depending upon the nature of the development.

The use of vegetative practices is encouraged to meet the goals of non-degradation and erosion control. Key to the success of vegetative practices is providing a low impact development design incorporating elements that more closely mimic the existing hydrologic setting. Developments or portions of developments at 10% impervious cover or lower should be able to achieve such designs. Non-structural approaches are encouraged whenever feasible in order to avoid concentrating runoff patterns. Relying primarily on vegetative and other non-structural approaches increases the likelihood of long-term water quality protection as well as minimizing future maintenance responsibilities. Developments or portions of a development with impervious cover greater than 10% are encouraged to rely on such practices to achieve non-degradation, though it is understood that permanent, structural best management practices should be employed in many instances. When non-structural controls are used to achieve non-degradation, then it should be demonstrated for streambank erosion that the pre-development levels of stream flow are maintained for streams draining at least 40 acres. If the site to be developed lies within a contributing area of less than 40 acres, or if there is no defined channel at the outlet, then pre-development levels of flow should be maintained for the point(s) of the greatest drainage area within the development. When structural controls are used, capturing the runoff from the 1-year, 3-hour storm event, and releasing it over a 24-hour or greater period should accomplish stream channel erosion protection.

5. **Construction-related erosion and sedimentation controls.**

Development should incorporate an erosion control plan in accordance with the temporary best management practices of the Nonpoint Source Pollution Control Technical Manual and/or the Technical Guidance Manual on Best Management Practices (June 1999, TNRCC, RG-348). Temporary erosion and sedimentation control plans should also be applied to individual lots as they are developed through appropriate mechanisms.

6. **Maintenance plans.**

Plans for maintenance of structural water quality and erosion controls should be prepared and implemented in accordance with the Nonpoint Source Pollution Control Technical Manual and/or the Technical Guidance Manual on Best Management Practices (June 1999, TNRCC, RG-348). Documentation should be provided that ensures that sufficient annual funding exists to properly maintain stormwater treatment facilities.

7. **Environmental education.**

An educational program should be implemented to inform the public about the sensitivity of the aquifer and their potential impacts on water quality. The developer or owner of the project should include within the development plans an environmental educational program for residential, industrial, and/or commercial developments. Topics may include information about endangered aquatic species, karst geology, best management practices, buffer zone maintenance, fertilizer application, pesticide use, organic gardening, and disposal of hazardous household chemicals. Materials used should be obtained from the Fish and Wildlife Service, TNRCC, American Water Works Association, National Ground Water Association, Water Environment Federation, or from another appropriate sources. Development of kiosks, displays, video, and/or other media to present material covering a variety of non-point source pollution control topics should be encouraged. Alternative educational efforts, such as site-specific recharge feature displays and educational nature trails should also be encouraged. Similarly, all developments should include an integrated pest management plan to minimize exposure of stormwater runoff to chemicals (fertilizers, herbicides and pesticides).