

# Comprehensive Plan 2001

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## INFRASTRUCTURE SYSTEMS

## INTRODUCTION

The City of Lufkin operates and maintains an extensive water treatment and distribution system, wastewater collections system and plant, and solid waste collection system. The sections below provide descriptions of these existing systems and briefly address their future development.

## WATER SYSTEM

The City of Lufkin supplies potable water to residential, commercial, and industrial users within the City limits and some surrounding communities. Emergency interconnections are also maintained with surrounding public water suppliers.

### Existing Raw Water Supply

At the present time, groundwater is the only source of raw water utilized by the City of Lufkin and all other public water suppliers in Angelina County. The City currently operates eleven wells, each of which is capable of producing about 1,000 gallons of water per minute (gpm). The maximum production rate from these wells (assuming that all are pumping at the same time) is estimated to be 16 million gallons per day (MGD). However, maintaining that production rate on a continuous basis is not feasible due to physical limitations of the

machinery as well as the potential for increased drawdown and/or reduced groundwater quality. Groundwater from the well field is pumped to the City's existing water treatment plant.

Lufkin's water wells are located to the north of the City. However, this area has been extensively developed with water wells operated by both the City of Lufkin and by other public water suppliers and industrial users. This heavy development means that the spacing of wells in the area is limited due to their tendency to adversely impact one another with overlapping cones of groundwater depression (or drawdown). In recent years Lufkin has been forced to construct new wells at greater distances from the City as feasible sites have become less available nearby.

Based on the City's projected population growth, recent studies have concluded that existing groundwater resources in the area will not be able to fully supply the needs of the City in the future. Plans are currently underway to construct a surface water treatment plant on Sam Rayburn Reservoir to alleviate this situation (see Proposed Water System Improvements section below).

## Existing Water Treatment Processes

Lufkin's existing water treatment plant is located in the northern portion of the City on Martin Luther King, Jr. Boulevard next to Ellen Trout Park and Zoo. During normal operation, raw groundwater is pumped from the well field to the City's treatment plant via a system of collector lines. Once at the facility, the groundwater undergoes treatment by the following processes:

- ◆ **Orthophosphate Injection** - The raw groundwater first undergoes orthophosphate injection. Orthophosphate is utilized for lead and copper control.

This is necessary because the plumbing in some of the older houses in the City has copper fittings and/or fittings with lead solder. Over time, water can corrode those items causing the dissolved lead and copper levels in the water to rise above the minimum permitted water quality standards. When introduced into the distribution system, orthophosphate deposits a protective film on the surface of pipes that inhibits the corrosion process by shielding the regions of corrosion activity and preventing it from interacting with the environment.

- ◆ **Prechlorination** - Prechlorination is the next process used in treating the raw groundwater. Chlorine is an efficient disinfectant and prechlor-

ination serves as the first line of defense against possible bacteriological contamination of the groundwater.

In addition, prechlorination is also effective at removing hydrogen sulfide from the raw groundwater. Hydrogen sulfide is a naturally occurring gas that is present in local groundwater that can cause taste and odor problems if not removed from drinking water.

- ◆ **Fluoride Injection** - Fluoride is added to the water as an aid to the reduction of tooth decay.
- ◆ **Aeration** - Generally speaking, aeration is the process of bringing the raw groundwater into vigorous contact with the air. Aeration is utilized at the water treatment plant (in conjunction with prechlorination) to remove hydrogen sulfide from the raw groundwater.
- ◆ **Ground Storage** - After undergoing treatment by orthophosphate injection, prechlorination, fluoride injection, and aeration the treated water is then directed to one of the facility's ground water storage tanks. It will remain in these tanks until it is necessary to pump it into the distribution system.

Extended storage time after chlorination and aeration treatment seems to provide improved removal of hydrogen sulfate gas (the pH of

local groundwater is too high for complete removal to occur as a result of prechlorination and aeration alone). However, during summer months, taste and odor problems may be more frequent due to higher temperatures and increased pumping capacity that result in smaller detention times in the ground storage tanks.

- ◆ **Post Chlorination** - Post chlorination is the application of chlorine to water following any other treatment. In this case, the treated water is chlorinated prior to being pumped into the City's distribution system. Adequate chlorine residuals prevent bacterial growths and also provide a way of measuring general water quality in the distribution system.

## Existing Water Distribution System

Lufkin's water distribution system consists of its water treatment plant (with ground storage and pumping facilities), water distribution system (the network of water lines throughout the City), and elevated storage facilities. Each of these items is briefly described below:

- ◆ **Existing Ground Storage Facilities** - The Lufkin Water Treatment Plant is currently equipped with five ground storage tanks. Four of the tanks have a capacity of about one million

gallons (1.0 MG) each, and the newest tank has a capacity of two million gallons (2.0 MG). Therefore, the facility has a total ground storage capacity of six million gallons (6.0 MG).

- ◆ **Existing Pumping Facilities** - Centrifugal pumps are utilized at the Lufkin Water Treatment Plant to transfer treated water from the ground storage tanks to the water distribution system. Currently, the facility's maximum pump capacity is estimated to be approximately eighteen million gallons per day (18 MGD).

The City has recently completed a plant expansion that was intended to address the water needs of high volume industrial users and residential demands in the northwest quadrant of the City of Lufkin. The new pump facilities provide water directly to the northwest quadrant of the distribution system. The old pump facilities will continue to supply the remainder of the system.

- ◆ **Existing Water Lines** - Treated water is pumped from the existing water treatment plant into 24" and 30" diameter water mains, from which it then enters the City's water distribution system. The distribution system consists of individual water lines ranging in diameter from 1¾" to 30". The older parts of the system tend to have primarily 2", 4", or 6" diameter lines, while the newer areas

tend toward 6" or 8" diameter lines. Water is delivered to residential, commercial, and industrial connections and to the City's elevated storage tanks via the distribution system.

With the new plant facilities constructed, a series of valves are utilized to separate the northwest quadrant of the distribution system from the rest of the system. The new plant facilities pump water directly to this quadrant while the old plant facilities continue to supply the rest of the system.

- ◆ **Existing Elevated Storage Facilities -** The City of Lufkin's water distribution system is equipped with four elevated storage tanks (EST). The location and listed capacities for these are as follows: (1) the Ellen Street EST has a capacity of 1.0 MG and is located in the far northwest corner of the City; (2) the Whitehouse Drive EST has a capacity of 2.0 MG and is located in the southern part of town; (3) the Wood Street EST has a capacity of 0.5 MG and is located in the eastern quadrant of the City; and (4) the Kiln Street EST has a capacity of 0.5 MG and is centrally located in the middle of town near the medical complexes.

A computerized SCADA (Supervisory Control and Data Acquisition) system has been incorporated into the water system to allow for the monitoring and operation of both

water well and water distribution pumps from the plant site and to also allow monitoring by other City computer systems.

As noted above, the new water plant facilities pump water directly to the northwest quadrant of the distribution system, and hence to the Ellen Street EST. The existing plant facilities will continue to service the rest of the distribution system and its elevated storage tanks.

## Proposed Water System Improvements

- ◆ **Proposed Surface Water Treatment Plant -** As noted above, studies indicate that groundwater resources in the area will not be able to accommodate the City's future growth. Therefore, plans are underway to construct a surface water treatment plant at Sam Rayburn Reservoir.

The City of Lufkin has water rights at Sam Rayburn Reservoir in the amount of 28,000 acre-feet/year. The City plans to exploit those rights by constructing a surface water treatment plant and pipeline from the lake to the City. Construction is expected to begin within five years. The proposed water plant will have an initial capacity of 10 MGD, and is slated to be upgraded every five years in 5 MGD increments until it

reaches a capacity of 25 MGD. The facility will also be equipped with 6 million gallons of additional ground storage capacity. Four 3,250 gpm pumps will provide service pump capacity.

- ◆ **Proposed Water Line Improvements** - The asbestos content in the City's water comes from asbestos cement piping which was installed in the 1970's. The local water is of a nature that it causes the cement to deteriorate over time, which allows asbestos fibers to be released into the water. The City is currently in the process of replacing those waterlines throughout its service area.

The City has broken down the replacement of asbestos lines into fifteen separate projects. The City plans to replace the asbestos waterlines over the next three to five years until all of the lines are completed. In all, this amounts to the removal of about 60 miles of asbestos cement pipe to be replaced with standard PVC lines.

As the population of the City of Lufkin expands it will be necessary to install new water lines to meet the rising demand. As illustrated on the attached *Water Distribution System Master Map*, it is envisioned that the majority of these new lines will be installed to the south and east of the existing City limits in what is now the Lufkin Extraterritorial Jurisdiction.

- ◆ **Proposed Elevated Storage Improvements** - Estimated population growth based on a 2 percent growth rate compounded annually indicates that the addition of a new elevated storage tank is warranted for the planning cycle. The size of this tank should be approximately two million gallons.

## WASTEWATER SYSTEM

The following section briefly addresses the City of Lufkin's wastewater collection system and wastewater treatment facility.

### Existing Collection System

At the present time, the City of Lufkin's wastewater collection system consists of an extensive network of gravity flow sewer lines, lift stations, force mains, and a wastewater treatment plant. The City operates and maintains this entire system.

- ◆ **Gravity Flow Lines** - Standard gravity flow sewer lines are installed at a grade that uses the force of gravity to transport wastewater from a higher to a lower elevation. The majority of the City's wastewater collection system consists of this type of sewer line.

- ♦ **Lift Stations and Force Mains** - The main drawback to gravity flow lines is that they can only transport wastewater from a higher elevation to a lower elevation. The City of Lufkin is spread across a ridge and extends into several creek basins or drainage areas. This means that several sections of the collection system are located in areas where it is physically impossible to deliver sewage to the wastewater treatment plant by gravity flow. The City of Lufkin overcomes this difficulty by utilizing lift stations at strategic points in its wastewater collection system. Conventional gravity flow systems direct sewage to these lift stations, from which it is pumped via force main to a location in the system where unimpeded gravity flow directly to the plant is available. The City is currently equipped with 20 lift stations.

## Existing Wastewater Plant

The City of Lufkin Water Pollution Control Plant is located southwest of the City on FM 324. The plant is currently permitted for a daily average flow of 11.3 MGD of wastewater. The facility consists of three storm water lagoons, two aerated grit removal units, two primary clarifiers, three aeration basins, three final clarifiers, one chlorine contact basin, one dissolved air flotation unit, one gravity belt thickener, three anaerobic digesters, and two belt presses. Treated effluent is discharged from the facility via a 42" diameter pipe

to Hurricane Creek, from which it flows to Cedar Creek, thence to the Neches River.

This site will provide adequate treatment capacity through the planning period. Proposed future plant expansion to 16 MGD is currently planned for the site.

## Projected System Expansions

As the population of the City of Lufkin grows it will be necessary to expand the City's wastewater collection system in order to meet increasing needs. This will require the installation of new sewer lines and lift stations in areas not currently serviced by the existing system. It is expected that the majority of these system expansions will take place to the south and east of the existing City limits in what is now the Lufkin extraterritorial jurisdiction. This is generally indicated in the attached *Wastewater Collection System Master Plan*.

## STORMWATER DRAINAGE

The following section briefly addresses the City of Lufkin's existing stormwater drainage programs and policies.

## City of Lufkin Drainage Criteria

All new development in the City of Lufkin must meet the requirements set forth in the Lufkin Drainage Criteria Manual for on-site storm water detention. Development of a site usually increases the peak runoff rate for the property above what it was at original conditions. This increase in the peak runoff rate can have impacts on adjacent landowners or downstream waterways. On-site detention will be required if the proposed development will increase the potential for flood damages and/or increase the danger to the safety of the general public. In those instances, sufficient detention must be provided to offset the increase of runoff due to the construction of the proposed project.

The Drainage Criteria Manual quantifies the amount of detention necessary based upon the size of the project area. In general, no detention is required for new development with impervious surfaces equal to or less than 14,000 square feet (about 0.32 acres). Detention sufficient to offset the effects of the proposed development during a 5-year storm event is required for new development with impervious areas greater than 14,000 square feet (0.32 acres) but with proposed sites less than 5 acres in size. If the entire development covers at least 5 acres and calls for an impervious cover of at least 50 percent then detention is required for a 25-year storm event in order to reduce discharges back to existing conditions.

In lieu of on-site detention, the Manual also states that the developer may enter into an agreement with the City of Lufkin under the City's flood mitigation ordinance if the development is located within the influence of a regional detention pond and no localized flooding exists.

## Regional Drainage Plans

Regional plans have been completed for Hurricane Creek, Cedar Creek, Shirley Creek, Biloxi Creek, and One Eye Creek. These are briefly addressed below:

- ♦ **Hurricane Creek Basin** - The central portion of the City of Lufkin lies within the Hurricane Creek Watershed. Primarily unimproved drainage channels and open-ditch, secondary drainage systems characterize drainage in this area, although a few improved channels and storm sewer systems do exist therein. The existing creek channel is mostly unimproved. The banks and bottom of the channel are vegetated with brush and small trees in many areas. Channel side slopes are steep in several locations, and evidence of erosion can be found in some areas. Seven major tributaries of Hurricane Creek also drain areas within the incorporated limits of the City of Lufkin. These channels are relatively small and moderately to heavily vegetated and they are generally unimproved.

The most recent study for the identification of flood hazards concluded that, with existing conditions, overbank flooding will occur in many areas of the Hurricane Creek basin for even a 5-year storm event. In general, the study concluded that future development in the Hurricane Creek area could be accommodated through a combination of regional detention, on-site detention, and limited channelization.

The near-term drainage improvements recommended for the Hurricane Creek watershed include the construction of three regional detention ponds. The first proposed detention pond will be located on a tributary of Hurricane Creek immediately upstream of the Englewood Subdivision (an area which has suffered from flooding in the past). The second pond will be located on a small tributary that empties into Hurricane Creek a short distance upstream of the Lufkin and Angelina Malls. The third detention pond will be located on a tributary upstream of Tulane Street. It was also recommended that existing culverts on Tulane Street, Whippoorwill Drive, and South Third Street be upgraded.

In terms of long range planning, it has been recommended that a total of nine regional detention ponds be developed and included in the regional drainage plan. Limited channelization, construction of two

overflow relief channels, and the replacement of undersized roadway culverts are also recommended. The proposed channelization along Hurricane Creek is divided into the following segments: (1) from Chestnut to Denman; (2) from Denman to South Third Street; (3) from Tulane to US Highway 59; and (4) US Highway 59 to Loop 287. The proposed overflow channels are to be located (1) on Hurricane Creek between Tulane Street and US Highway 59 and (2) on the tributary to Hurricane Creek from US Highway 59 to the site of the proposed detention basins. It is also recommended that on-site detention be required for new development in the Hurricane Creek watershed.

- ♦ **Cedar Creek Basin** - Much of the western portion of the City of Lufkin lies within the watershed of Cedar Creek. Primarily unimproved drainage channels and open-ditch, secondary drainage systems characterize drainage in this area. The existing creek channel is mostly unimproved. The banks and bottom of the channel are vegetated with brush and small trees in many areas. Channel side slopes are steep in several locations, and evidence of erosion can be found in some areas. Four major tributaries of Cedar Creek drain areas within the incorporated limits of the City of Lufkin. These channels are relatively small and moderately to heavily vegetated and they are generally unimproved.

The Cedar Creek watershed is the least developed watershed in the City of Lufkin, but it is also has the highest potential for future development. Flood insurance rate maps indicate that the areas of greatest flooding potential are the stream segment between Gobbler's Knob (FM 1336) and Hanks Street, the segment between Copeland Dive and Pershing Avenue, and the segment upstream of Frank Street (State Highway 94). The most recent study for the identification of flood hazards concluded that, with existing conditions, overbank flooding will occur in many areas of the Cedar Creek basin for even a 5-year storm event. In general, the study concluded that an interim flood abatement plan involving two regional detention ponds will significantly reduce peak flow rates and that the establishment of additional detention ponds will provide for the full future development of the watershed without increasing the potential for flooding along Cedar Creek and its tributaries.

The near-term drainage improvements completed for the Cedar Creek watershed consist of the construction of two regional detention ponds. The first pond is located a short distance upstream of Lotus Lane. The location of the other pond is on a tributary of Cedar Creek a short distance upstream of Old Union Road (FM 1271) and west of Largent Street (Spur 72). In terms of

long range planning, it has been recommended that a total of four regional detention ponds be developed and included in the regional drainage plan.

- ♦ **Shirley Creek** - The Shirley Creek watershed covers the northeastern portion of the City of Lufkin. The western portion of the watershed is covered by urban development. The eastern portion of the watershed beyond Loop 287 is mostly undeveloped at the present time. Unimproved drainage channels and open ditches characterize drainage in this watershed. However, some improved channels and storm sewer systems do exist in the area. The existing creek channel is mostly unimproved with steep side slopes in some areas. The banks and bottom of the channel are vegetated with brush and small trees in many areas, and there is evidence of erosion in some reaches.

The study identifying existing flood hazards concluded that overbank flooding would occur in many areas for even a 10-year storm event. However, few structures appear to be impacted by existing flooding because residential development is not very dense in the majority of the study area.

The study concluded that channelization projects would be expensive to implement and would benefit very few structures at the

present time. The study indicates that existing flooding problems can be addressed through future drainage improvements as the watershed becomes more developed, although some on-site detention will be necessary in more developed portions of the watershed. Over the long term, the report calls for limited regional detention and bridge and culvert modifications to alleviate future flooding problems, although it also notes that such a program will not eliminate the potential for flooding during severe storm events.

- ◆ **Biloxi Creek** - The main stem of Biloxi Creek lies outside of the City limits. The recent drainage study addresses three tributaries of Biloxi Creek, which cover the eastern and central outskirts of the City of Lufkin. The western half of this watershed has substantial urban development, while the eastern half beyond Loop 287 is less developed. The channels of the three tributaries are mostly unimproved, heavily vegetated, and have steep slopes.

The studies for Shirley, Biloxi, and One Eye Creeks were conducted in conjunction with one another. As noted for Shirley Creek, the study identifying existing flood hazards for Biloxi Creek concluded that overbank flooding would occur in many areas for even a 10-year storm event. However, few structures appear to be impacted by existing flooding because residential development is not very dense in the

majority of the study area. The recommended improvements to reduce flooding are also the same as listed for Shirley Creek.

- ◆ **One Eye Creek** - The studied portion of this watershed covers the southeast outskirts of the City limits and beyond. The majority of the watershed consists of low density residential development or open space. The creek channels of One Eye Creek and its tributaries are unimproved, heavily vegetated, and have steep banks.

The studies for Shirley, Biloxi, and One Eye Creeks were conducted in conjunction with one another. As noted for Shirley Creek, the study identifying existing flood hazards for One-Eye Creek concluded that overbank flooding would occur in many areas for even a 10-year storm event. However, few structures appear to be impacted by existing flooding because residential development is not very dense in the majority of the study area. The recommended improvements to reduce flooding are also the same as listed for Shirley Creek.

## SOLID WASTE

The City of Lufkin's Solid Waste Department is responsible for the collection and disposal of all solid waste in the City. The City operates an automated collection system that was the first of its kind in East Texas.

The City of Lufkin's Recycling Department also collects all of the recycle material in the City. The Department sorts the material and packages it for shipment to areas throughout the State.

## Projected Growth

The City of Lufkin Solid Waste Department maintains various commercial and residential collection routes throughout the City. The projected 2 percent growth rate for the City is assumed herein to apply directly to the increase of needed routes for efficient collection:

- ◆ **Commercial Collection Routes** - The City's Solid Waste Department is currently configured so that its trucks run 21 commercial routes per week. Applying the projected 2 percent growth rate indicates that approximately 25 commercial routes will be required by the Year 2010 and approximately 31 commercial routes will be required by the Year 2020.
- ◆ **Residential Collection Routes** - The City's Solid Waste Department currently maintains about 20 routes for the collection of residential waste. Applying the projected 2 percent growth rate indicates that approximately 24 residential routes will be needed by the Year 2010 and that about 30 routes will be needed by the Year 2020.

## County Landfill Capacity

Based on the current rate of disposal, the most recent estimates for the Angelina County Waste Management Center indicate that the facility has enough capacity to dispose of waste for approximately 35 years.

## Recycling Effort

The City's recycling center is located on 14 acres of land in the southwest portion of the City. No expansion is currently planned for this facility.

## PROPOSED INDUSTRIAL DEVELOPMENT AREAS

The City of Lufkin has experienced a large degree of industrial expansion in recent years, and this growth is expected to continue into the 21st Century. At the present time, the City anticipates significant increases in poultry and metals processing industries. The future addition of plastics processing and computer chip industries are also expected.

The City has designated three areas for potential industrial development in the future. These areas were selected because they are favorably located with respect to transportation and the expanding City infrastructure. These

areas are labeled on the Future Land Use Plan map (**Plate 8-2**) as Alternate Areas A, B, and C<sup>7-1</sup>. A short description of each is provided below. Please note that all areas are currently located outside of Lufkin's existing corporate limits but are at least partially within its extra-territorial jurisdiction.

## Alternate Area A

Alternate Area A is located northeast of the Lufkin City Limits. This Alternate has the benefit of being located close to existing industrial areas (refer to **Plate 2-3**, Existing Land Use). Transportation is currently available via State Highway 103. In addition, if Interstate Highway 69 is constructed along its proposed alignment, this industrial site will be at the prime intersection of IH 69 and State Highway 103.

## Alternate Area B

Alternate Area B is located southeast of the Lufkin City Limits. The existing Angelina County Landfill is located within Alternate Area B.

Existing access to this area is available from Farm Road 58. However, similar to Alternate Area A, the site is located along the proposed Interstate 69 Corridor. Although it will utilize sections of the existing U.S. Highway 59 corridor, the proposed IH 69 will be separate from U.S. Highway 59 in the vicinity of Alternate Area B (i.e., it will be a full-bypass highway). At the time of this writing, right-of-way acquisition for the Interstate was slated to begin in the year 2001, with construction estimated to begin in the time frame of 2007-2010.

## Alternate Area C

Alternate Area C is located on Highway 59 immediately south of the existing Lufkin City limits. The area has some intermediate development due to the fact that it lies between the incorporated City limits of Lufkin and Burke.

This specific location is very accessible in terms of transportation: it is located within the existing U.S. Highway 59 Corridor, is close to the Angelina County Airport, and has railroad access. In addition, it is in close proximity to the City's existing wastewater treatment plant. Since Lufkin supplies water to the City of Burke, this location is also within the City's water distribution system.

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<sup>7-1</sup> The Future Land Use Plan discusses Lufkin's industrial development opportunities in further detail.