AIRPORT MASTER PLAN 1975-1995
STILLWATER MUNICIPAL AIRPORT, STILLWATER OKLAHOMA

by

JERRY ROY WALKUP

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A MASTER'S THESIS

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Approved by:

Robert L Pop

Major Professor

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INTRODUCTION

The problems of air transportation and the areas of consideration required for the proper development of airports have grown with the complexities of our society. Today, planning for individual airports must not only consider the requirements of all facets of aviation but must also weigh carefully the effects and relationship of aviation to the environment, community development, and other modes of transportation.

The Stillwater Municipal Airport has had many problems in the past in securing the necessary funds that have been needed for airport maintenance and minor and major improvements. This has been the result of spontaneous improvements based on the "as needed" approach. If future airport developments are to be successful, they must be based on guidelines established as the result of comprehensive airport master plan studies. Accordingly, the City Commissioners have recognized the need and have approved funding for an airport master plan study.

This report seeks to investigate and arrive at solutions over a twenty year period. The areas of application will be presented in four phases, Airport Requirements, Site Selection, Airport Plans, and Financial Plan.

PHASE I, AIRPORT REQUIREMENTS

A. Inventory

1. Historical Review

The earliest record of flying activities in Stillwater was in 1917 when at various times an airplane would land in someone's pasture.

In 1923, Billy Parker, one of the early barnstormers, began hopping passengers at $3.75 per ride using an irregular pasture, now the Berry Addition, for a landing field. This caused many other pilots to come and stay for a day or so, but it wasn't until 1924 that Lyle Borer decided to bring an airplane in and keep it at Stillwater, which he kept in a pasture on South Husband Street.

During the late 1920's, Mayor George Thompson and a few enterprising persons thought it would be well to purchase a tract of land that could develop into a municipal airport. Their idea was met with great opposition, but on December 7, 1929, 152.59 acres was purchased by the City of Stillwater, warranty deed 81 D.R. 183, for section 34, T 20 N-R2E. On December 14, 1929, warranty deed 81 D.R. 198, the City of Stillwater purchased an additional 87.31 acres, the north adjacent lot to the previous lot. This remained the original size of the airport for the next 12 years.

Management of the airport was not very rewarding

and only a few managers lasted over a few months. Then in the early 1930's, George Searcy agreed to take over management of this plot of grass land. He and a friend left to accept delivery on a new airplane but crashed over the Lake of the Ozarks on their return trip. Searcy Senior, a groceryman at the time, took over the airport to carry out his son's plans. Lt. Arthur Kingman, an Air Force pilot took over management from Searcy and during his stay, the airport was dedicated in honor of George Searcy, giving it the name, Searcy Field.

Jack Huff followed Kingman as manager and remained manager until 1936 when Al Guthrie, another barnstormer, decided to try his hand at management. Al Guthrie is credited for much of the airport's early growth. This he accomplished by going door to door getting businessmen and professional men interested in taking flying lessons at the rate of $50.00. He flew from town to town giving rides for $1.00 per flight and he got many people interested in buying airplanes. Guthrie was also well known for his stunt flying and would put on air shows or fly all over the country to do stunts for other shows to raise money. It was Guthrie who interested the city fathers, with the help of the WPA, to build the first office-hangar building (120' X 60'). This is the native stone building now being used by the Oklahoma State University Aerotechnology Department.

Before this, the only buildings were a small corrugated iron building that could house two airplanes (if the doors were open), and a wooden 8' X 10' office building, both painted a sickly yellow.

The landing light at the time was a swinging kerosene lantern which Guthrie held at the boundary fence to show the pilot where to let down on his final approach. Some of these pilots were Wiley Post, Will Rogers, and Harold Getty.

In 1941, the Civilian Pilot Training program got underway and trained hundreds of students who went on to advanced Air Force schools. It was during this period that the airport began to change drastically.

PROJECT IMPROVEMENTS

Early in 1943, the airport was turned over to the War Assets Administration (WAA) and, under the Development of Landing Areas for National Defense (DLAND), the Navy began major airport development. (C.A.A. Docket number 904-34-9). The civilian portion of the airport moved, temporarily, five miles south of Stillwater. The initial facilities developed consisted of three concrete runways, an apron, taxiways from the apron to the ends of all runways, and lighting. The North-South (17/35) runway is the primary runway due to climatic conditions and is 5,002' X 150'. The Northwest-Southeast runway (13/31) is 5,003' X 150', and the Northeast-Southwest runway (4/22) is 5,002' X 150'. All runways

are parallelled by a 50' taxiway. These facilities were designed to handle the largest military aircraft at the time. The apron was constructed in a central location where all runways and taxiways intersected. The final improvement of the DLAND program was Low Intensity Runway Lighting (LIRL) for all runways which was not installed until late in 1945, along with a small field transformer concrete vault. The vault was located approximately 300' east of the constructed apron. Prior to constructing runway lighting, a 75' beacon tower was built near the rock hanger built by the WPA. This tower was moved near the transformer vault when the lighting project began in August, 1945. (C.A.A. Docket 904-34-19, DLAND 1941-45). The project was constructed at a cost of $1,026,738.00. The original acreage was not enough to facilitate this development, so additional land had to be acquired. These properties are described in Table I-1, giving the date they were acquired and the instrument used. Figure I-1 gives the location of these properties. Between April 25, 1941 and July, 1943, the total amount of land acquired was 1,315 acres.

After completion of the DLAND project, the City constructed a hangar containing 17,200 square feet, while the college constructed an 11,200 square foot hangar. The cost of those hangars was approximately $55,000.00.

In 1951, the City and the University decided to

Table I-1

OWNERSHIP
Stillwater Municipal Airport

Description	Title Aquired By	Date	Instrument
(Section 3, T19N-R2E)			
(1) Beginning at the SW/cor SW/4 of said Section 3; thence North 0° 02' 34" East along the West line of said Section 3 to the property line of the Stillwater Municipal Airport; thence North 89° 56' 32" East a distance of 853 feet to the NW/cor of Lot 7, Block 2, University Estates Addition to the City of Stillwater; thence South 8° 42' 58" East a distance of 1668.53 feet to the South line of said Section 3; thence South 89° 59' 27" West along the South line of said Section 3 a distance of 1107.08 feet to the point of beginning.	City of Stillwater	3/10/67	Warranty Deed 196 D.R. 300
(2) The W/2 NE/4, the E/2 of Lot 3 (Lot 3 being otherwise described as the NE/4 NW/4), and the E/2 SE/4 NW/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 106
(3) The W/2 of Lot 3 (Lot 3 being otherwise described as the NE/4 NW/4), all of Lot 4 (Lot 4 being otherwise described as the NW/4) the SW/4 NW/4 and the W/2 SE/4 NW/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 108
(4) The W/2 NW/4 SE/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 110

Table I-1 OWNERSHIP (continued)

(5) The North 60 Acres of the N/2 SW/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 120
(Section 4, T19N-R2E)			
(6) NE/4 SE/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 112
(7) NE/4 SW/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 114
(8) The East 60 Acres of the E/2 NW/4.	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 116
(Section 33, T20N-R2E)			
(9) Lots 3 and 4 (57.36 Acres)	City of Stillwater	7/3/43	Patent 75 Misc. 123
(10) Lots 5 and 6 (102.20 Acres)	City of Stillwater	4/26/43	Commissioner's Report 76 Misc. 118
(Section 34, T20N-R2E)			
(11) Lots 6,7 and 8 (152.59 Acres)	City of Stillwater	12/7/29	Warranty Deed 81 D.R. 183
(12) Lots 1, 2 and 3 (87.31 Acres	City of Stillwater	12/14/29	Warranty Deed 81 D.R. 198
(13) The S/2 NW/4	City of Stillwater	4/25/41	Warranty Deed 106 D.R. 185

Table I-1 OWNERSHIP (continued)

(14) The N/2 NW/4	City of Stillwater	4/25/41	Warranty Deed 106 D. R. 186
(15) SW/4 SW/4 NE/4 and W/2 SE/4 SW/4 NE/4	City of Stillwater	5/6/41	Warranty Deed 106 D.R. 233

(16) On June 21, 1941, by Warranty Deed recorded at 106 D.R. 369, the City of Stillwater conveyed to the State of Oklahoma, the following portion of said Section 34:

> Lots 1, 2, 3, 6, 7 and 8, the S/2 NW/4, the SW/4 SW/4 NE/4 and the W/2 SE/4 SW/4 NE/4.
> (Same as 11, 12, 13, and 15.)

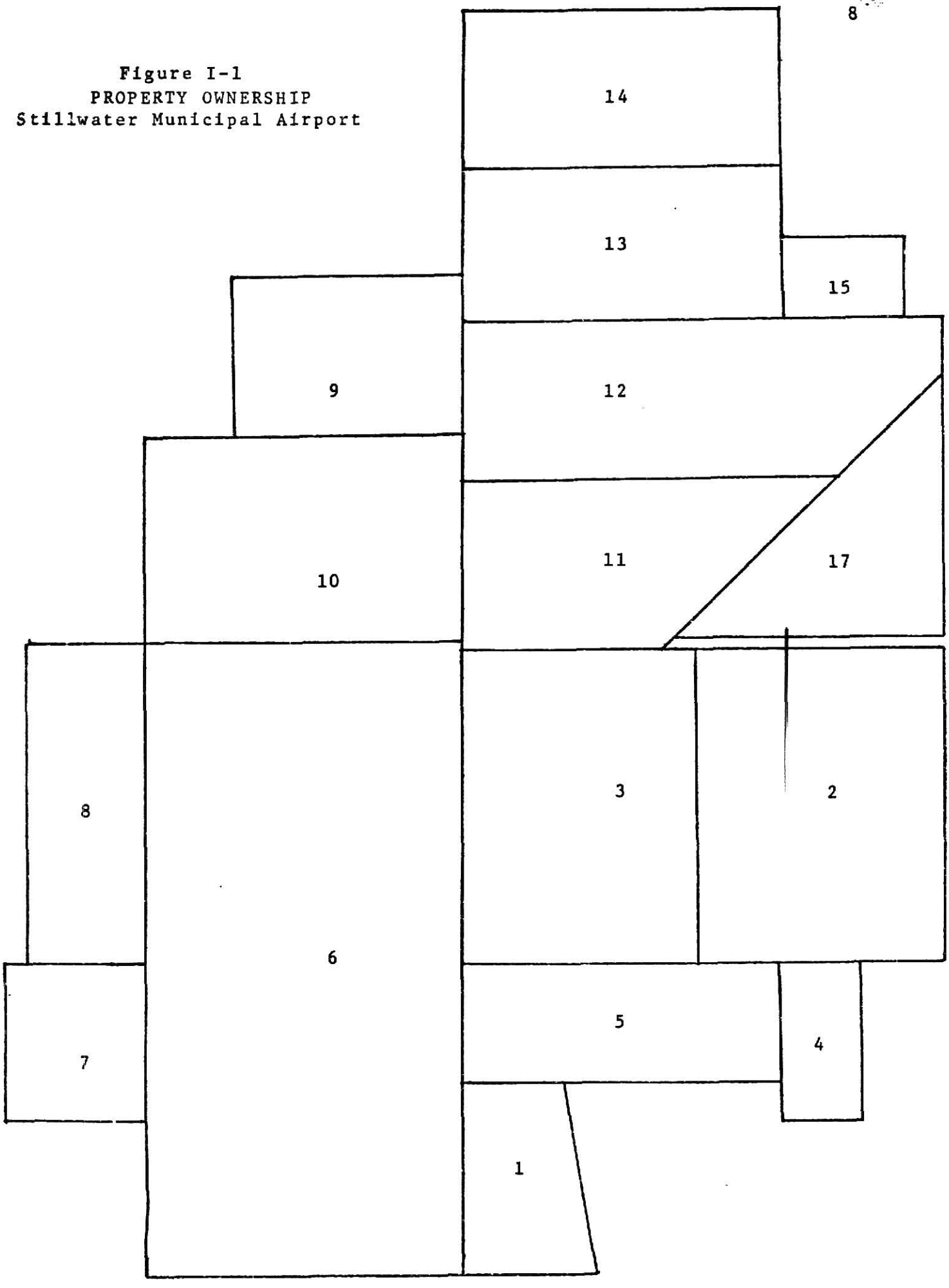
(17) On the December 6, 1963, by Quit Claim Deed recorded at 184 D. R. 435, the Board of Regents of OAMC conveyed to the City of Stillwater, the following described portion of the SE/4 of said Section 34:

> Beginning at the point 1320 feet West and 67 feet North of the SE/4 of said Section 34; thence North 2149.2 feet; thence Southwesterly 3011 feet; thence East 2129.7 feet to the point of beginning, containing 52.54 acres.

On December 16, 1963, by Quit Claim Deed recorded at 184 D.R. 437, the City of Stillwater conveyed the above described portion of the SE/4 of said Section 34 to the Stillwater Industrial Foundation, Inc.

Prepared by Daniel D. Draper, Jr., City Attorney, on September 22, 1967.

Figure I-1
PROPERTY OWNERSHIP
Stillwater Municipal Airport



construct the Administration Building, a fence adjacent thereto, paved aircraft parking area, and construct an access road and parking areas. Federal Aid was requested which resulted in the Federal Aid to Airports Program Project (FAAP 9-34-050-901). The Federal share was $91,352.45 and the sponsor's share was $86,410.64 a total of $177,763.09. The project was completed May 27, 1952, at a total cost of $175,881.00 and open house was held on June 29, 1952. The access road was originally anticipated to be paved, but only crushed rock surface was provided at this time due to rising prices and lack of funds.

By the 12th of December, 1943, the airport was turned ever to the City of Stillwater for management. From July of 1945 until the last months of 1946, the airport served as a storage base for surplus medium and heavy bombers (B-17, B-24, P-17, P-40, etc). The field was then closed down until they were sold and dismantled.

On October 21, 1957, the City and the University applied for Federal Aid for Project FAAP 9-34-050-0802, which consisted of; "Grade, drain, and pave aircraft apron, entrance road, and auto parking; install Medium Intensity Runway Lights (MIRL) on North/South 17/35 runway; perform turfing incidental to grading." The Federal grant of $66,668.00 was issued on January 23, 1958. The Federal portion was $33,334.00. Construction began May 1, 1958, and was completed September 16, 1958 at the total cost of

$62,863.04 (FAA $28,350.00 and sponsor $34,513.04).

On June 17, 1965, the City again applied for assistance for a project that consisted of "Acquiring land/fee simple title, or other property interests satisfactory to the Administrator, in and to Tract 3; overlay North/South (17/35) runway; construct extension to terminal apron; construct fire and rescue equipment building; perform marking incidental to construction." The project was issued the number FAAP 9-34-050-C603 and the Grant Agreement was made on the 9th of August, 1965. The City asked to amend the project and add the construction of a T-hangar taxiway and to install a 48" reinforced concrete drainage pipe. The amendment was approved December 17, 1965. Funds for the sponsor came from the Oklahoma Aeronautic Commission ($20,000), City Force Account Labor Material and Equipment (2,800.00), Cash on hand in Airport fund ($32,000.00), cash available from General Fund ($5,500.00) and Oklahoma State University ($37,500.00). (At this time, the City sold the old south airport 160 acres for $33,000.00 and used this revenue for the mentioned Airport funds.) The total being $97,800.00. The FAA obligated matching funds at $97,800.00. The final cost of the project was $177,894.39 (sponsor $89,170.73; FAA $88,732.66).

Following was project FAAP 9-34-050-C904. This project consisted of strengthening taxiways and a portion of existing terminal apron; construction of 100 feet of

extension to the existing terminal apron; removing obstructions in the north approach, (trees); and perform pavement markings incidental to construction. Application for Federal Aid was made February 24, 1969, and Grant Agreement was issued March 26, 1969. The construction on this project began April 24, 1969, and was completed November 24, 1969, at the cost of $69,567.00. The sponsor supplied $34,784.00, and the FAA $34,783.00.

In 1972, the airport began the process to develop its fire protection program. By March 9, 1973, application for funds was made for the Airport Development Program Act ADAP 8-40-0090-01. The purpose of this project was to purchase a crash-fire-rescue vehicle plus back-up equipment. The Grant was approved March 21, 1973. FAA paid $17,958.00 (82%) on the rescue vehicle and is expected to pay 82% of the proximity suits.

Project ADAP 8-40-0090-02 followed the -01 project and it was to "acquire land for clear zone/fee simple title or other property interest satisfactory to the Administration in and to that portion of Tract 4 overlay, mark, and install centerline lighting on N/S parallel taxiway, including runway surface adjustments and intersections with Runways 4/22 and 13/31; install lighting on aircraft parking apron, and VASI and REILS on both ends of Runways 17/35; clear approach to Runway 35; construct three new parking aprons (approximately 6,860 square yards)." Application for funds was made

November 8, 1973 and Grant Agreement was issued March 25, 1974 for $495,522.00. The FAA obligation was for 75% of the total amount ($371,642.00) and the sponsor 25% ($123,880.00). Funds by the sponsor came from General Obligation Bonds ($125,000.00) and Oklahoma Aeronautics Commission ($15,000.00). Notice to proceed was given April 3, 1974.

On August 20, 1974, application was submitted to "Construct and install centerline lighting on north bypass taxiway (approximately 240' X 50') to Runway 17/35 and to install lighted wind cone." The estimated cost of the project ADAP 8-40-0090-03 is $76,114.00 whereas FAA will pick up 75% of the cost ($57,086.00), and the sponsor 25% ($19,028.00). Grant Agreement was approved October 22, 1974, and notice to proceed was given December 16, 1974.

LEASES

Through the years, the airport received little care primarily due to lack of funds and the technology needed to operate and maintain the airport. The college at the time had both, so on March 4th, 1949, the Oklahoma Agricultural and Mechanical College (A&M College) leased the airport from the City of Stillwater for $1.00. The City of Stillwater agreed to turn over the property, facilities, and rights for a term of 25 years with certain provisions. The college had to pay, in advance, $48,625.00 as a re-

quirement of the Civil Aeronautics Authority for the purpose of obtaining a grant of $100,000.00. The Authority would transmit the additional $51,375.00. This grant was to be used for the construction of buildings and other structures and improvements on the airport including an administration building, hangar space, adequate hard surface parking, concrete aprons for existing hangars, and hard surfacing of roads. The lease also granted priority to citizens of Stillwater in the use of the City's hangar for reasonable rates and charges. The college agreed to operate the airport for the use and benefit of the public and to make all airport facilities and services available to them. The revenues derived from the operation of the airport would be applied to the maintenance improvements and operations. Reserved from the conveyance and convenants of this lease was a 40 acre tract of airport property which was set aside and used by the Isaac Walton League.

Glenn Rucker was appointed manager and served until 1952. Rucker retired the same year and the management position was given to Hoyt E. Walkup who is the present manager and Director of Aviation at Oklahoma State University.

The 1949 lease remained in effect until March, 1974. A year extension was given until provisions of the new lease were agreed upon and the new lease was signed on March 3, 1975. The amount of consideration remained as

one dollar, but the term of the lease was reduced to five years. The University still assumed the obligation of managing, operating, and maintaining the airport, but the City became responsible for a funding source. The University is responsible for project costs under $1,000.00 and the City is responsible for capital improvements exceeding $1,000.00. The City would supply electrical power for the operation of the airport beacon, the runways, the obstruction lights, and taxi strip, security lights, VASE, REIL, and other external lights. The lease also called for the appointment of an airport advisory board of five persons representing the University and the City.

On November 3, 1969, the City of Stillwater and Oklahoma State University entered into a contract whereby the University would pay monthly rent on a T-Hangar constructed by the City. Oklahoma State University agreed to pay the City $421.97 per month for rental of the hangar, plus pay all insurance premium costs and maintenance expense. The contract covering the lease is only in effect for as long as the existing lease continues.

Universal Aviation leased office space in the City hangar for $50.00 per month beginning July, 1967. The agreement also allowed parking spaces for two aircraft. During July, 1969, Universal moved to the new T-Hangar. Rent was increased to $150.00 per month and an area for

four to five spaces for aircraft parking was allocated. All utilities were furnished.

When the college took over the airport in 1949, there were 573.7 acres of surplus land. On October 3, 1949, Joe L. Preston leased this land for a term of five years at $1.00 per acre for the purpose of cattle grazing. The lease by Preston was terminated on March 15, 1963, and the Red Rock Cattle Company picked up the option. By this time, the surplus land had increased to 703 acres and the term of the lease was reduced to a two year period.

On December 6, 1963, a Quit Claim Deed conveyed a 52.54 acre tract of land of the 703 acres to the City of Stillwater. The purpose of the release was to permit transfer of the property to the Stillwater Industrial Foundation for Aero-space oriented industrial development. The industry failed to materialize and in 1972 the Industrial Foundation considered the sale of this acreage. At the request of the Airport Manager, the FAA District Office notified the City that they must meet the conditions of the April 24, 1964, release agreement; specifically to use the proceeds received from the sale or leasing of the property for the operation and maintenance of the airport. Therefore, the matter is unsolved and remains in litigation.

AIRPORT AUTHORITY

On October 28, 1974, the city Mayor requested that an ordinance be introduced to the City Commission. This ordinance (no. 1539) was for the purpose of establishing the Stillwater Airport Authority. This was introduced during the termination of the 25 year lease held by Oklahoma State University. The ordinance was defeated and Oklahoma State University picked up its present five year lease.

2. Airport and Facilities

Location

The airport is approximately 2.5 miles northwest from the center of Stillwater and covers nearly 1,400 acres. It is located on the common corners of Sections 33, 34, and 43 with the geological coordinate points Latitude 36° 09' 3" North and Longitude 97° 05' 00" West. The airport elevation is 984.9 feet above mean sea level at the highest point.

Directly south and east of airport property, is predominately residental property, and to the north and west is agricultural land. The terrain is slightly rolling with natural drainage to the southeast corner. Drainage of the airport is by means of storm sewers. The deep depression at the southeast corner is dammed and forms Sanborn Lake.

The entire site is fenced with an outer perimeter fence and an inner perimeter fence, both in poor condition. The land between the two fences is leased for cattle grazing (Figure I-2). The soil structure is a Renfrow-Kirkland type which is primarily a clay loam to clay soil.

Runways

All three of the concrete runways are presently being used and maintained, but with primary interest and funding to the North/South (17/35) runway.

The concrete paving on this field was constructed during World War II. (Project 904-34-19). No steel was

used in its construction and there are no dowels in any of the joints except expansion joints. This absence of steel, combined with an expansive clay soil subgrade, has resulted in a continous maintenance problem during the history of the airport. Runway construction is of Portland Cement concrete at a thickness of 6" on 6" of select soil and 9" of compacted subsoil.

The North/South (17/35) runway was overlayed with asphalt concrete during project FAAP 9-34-050-C603. Asphalt concrete in the center 110 feet width of the runway is 3" thick, sloping out to a one inch thickness. The runway is 150' X 5,002' and has a load bearing capacity of 28,000 pounds critical gross load for Single Gear, 46,000 for Dual and 61,000 for Tandem Gear for approximately the first 1,000 feet on each end of the runway. The remaining center section has a load bearing capacity of 34,000 (Single) and 51,000 (Dual). All joints of the existing pavement are causing the asphalt to crack where joints appear.

The Northeast/Southwest (4/22) runway is 150' X 5,003'. Both remain as originally constructed and have a load bearing capacity of 14,000 pounds critical gross load for Single Gear. The first 1,500 feet of Runway (4/22) and the first 2,000 feet of Runway (13/31) show signs of spalling.

The runways are marked in accordance with AC 150/5340-ID for instrument runway markings at a noncontrolled

airport. All runways are cleared, drained and turfed for a distance of 125' on each side for safety. A safety area of 400' X 200' extends at each end of the Runway (17/35). The north end of Runway (17/35) is presently being prepared to be extended an additional 500 feet.

Taxiways

All taxiways are 50' wide and are constructed of 6" of Portland Cement concrete on 6" of select soil and 9" of compacted subsoil. Each have a load bearing capacity of 14,000 pounds gross load for Single Gear.

Taxiways for Runway 17/35 are being overlayed with asphalt and centerline lighting is being installed. This project (ADAP 8-40-0090-03) is near completion.

In 1969, a portion of the taxiways connecting the terminal apron with Runways 13/31 and 4/22 was overlayed with 3 1/2 inches of asphalt (FMP 9-34-050-C904). The load bearing capacity at these points is 42,000 pounds for Single Gear, 53,000 pounds for Dual Gear, and 95,000 pounds for Dual Tandem.

In 1952, two concrete taxiways were constructed (FAAP 9-34-050-901), one leading to the Oklahoma State University maintenance hangar and the other to the City hangar. Each was constructed of 6" Portland Cement concrete and had 14,000 pounds of load bearing capacity for Single Gear.

In 1965, the asphalt concrete taxiway was constructed

for the T-hangars with a 4" subbase course, 2 1/2" base course, and 2" of surface course (FAAP 9-34-050-C603). Load bearing capacity is 10,000 pounds gross load for Single Gear.

Presently being constructed and near completion is a 50' X 250' asphalt bypass taxiway with centerline lighting 200' from the north end of Runway 17/35. Also the taxiways for Runway 17/35 are being overlayed with 3" of asphalt.

Aprons

The apron that is directly in front of the terminal building was constructed the same time as the concrete runways and its structure was identical. In 1969, (FAAP 9-34-050-C904), this apron was overlayed with 3 1/2" of asphalt giving it a gross load strength of 52,000 pounds for Single Gear and 72,000 pounds and 105,000 pounds for Dual and Tandem Gear respectively. This apron served the loading and unloading of aircraft passengers and cargo for transient aircraft and Frontier Airlines.

During the year 1952, a 6" Portland Cement concrete apron was constructed connecting the Oklahoma State University hangar and the City's hangar (FAAP 9-34-050-901). It has a load bearing capacity of 14,000 pounds gross Single Gear and is mainly used to handle local based aircraft and aircraft in need of maintenance.

An asphalt apron, consisting of 5" of subbase course,

4 " base course, and 2" surface course, was constructed in 1958 under FAAP 9-34-050-0802. This apron abutted the west edge of the existing terminal apron and serves primarily for transient parking. The load bearing capacity is 7,000 pounds gross load for Single Gear.

During the construction project of the T-hangar taxiways in 1965 (FAAP 9-34-050-C603), an asphalt apron, was also laid for overflow parking for transient and local based aircraft. The T-hangar taxiways are located directly west of the T-hangar. The structure consisted of 4" of subbase course, 2 1/2" of base course, and 2" of surface course giving a gross Single Gear load bearing capacity of 8,000 pounds. The driveways leading into the T-hangars are less than 2" thick and are showing wheel depressions and breaking apart. The apron itself did not appear to meet specifications and shows signs of cracking.

In 1969, (FAAP 9-34-050-C904), the apron directly west of the terminal apron was extended again. The construction of the apron was identical to the previous apron with the exception that the top 6" of subgrade was treated with lime. It also serves as transient parking and has a gross load capacity of 28,000 pounds. At the same time, another apron was constructed abutting the northern edge of the terminal apron. It has the same quality as the apron just covered and serves as parking for the local based aircraft (primarily the Flight

School aircraft).

An asphalt apron serving as parking for transient and local based aircraft has just been completed and is located on the northwest side of the City hangar (ADAP 8-40-0090-03). A small asphalt apron was also constructed under this project and is located between the T-hangars and the fire-rescue building and helps to serve as overflow aircraft parking. Directly across the taxiway from the T-hangar is an asphalt apron which was constructed under this same project and it serves as overflow parking for transient and local based aircraft. All three aprons are at least 2" of asphalt on 6 1/2" of crushed aggregate subbase on 6" of compacted subgrade.

Fixed Base Operator (FBO) Facilities and Service

Terminal Building:

The terminal building provides facilities for Frontier Airlines, Oklahoma State University (O.S.U.) Flight Training, Administration Offices, record storage, and O.S.U. Flight Service and Administration. The building is primarily a one-story structure, but the north end is comprised of three stories and a tower.

The first floor includes Frontier Airlines (southwest corner), the Administration offices (southeast corner), the waiting area and the restrooms (center), and the O.S.U. Flight Training (north end).

Frontier Airlines has adequate operating and waiting space, although the waiting space is also used by other persons visiting or working at the airport.

The administration offices are divided into three units. Two of these serve the airport manager and the head secretary and are considered to be of adequate space. The third area serves as office space for one secretary, a sales counter for gasoline, charts, flight equipment, and the operation of airport unicom and intercom. This space does present adequate working space at the present.

The O.S.U. Flight Training area was used as a restaurant from 1953 to 1957, but was closed because it was economicially unfeasible to operate. It is presently cramped with flight instructor cubicals. The only kitchen equipment remaining is presently being removed in order to expand the flight training area. The O.S.U. Flight School trains an average of 200 pilots annually and offers related ground school.

A boiler room is also located on this floor and serves to house the electrical circuit box, janitorial supplies, and trash containers.

The second floor contains two offices, a restroom, a storage closet, and a room presently being developed to store equipment for ground communications between aircraft and the FAA operated VOR Station.

The third floor has only a restroom, and the air-conditioning unit for the tower.

The control tower is empty and has never been in operation, but has served as a viewing tower and sleeping

quarters for night watchmen in the past.

The structure of the building is in good condition, but needs remodeling throughout in order to meet future needs and comfort of the community and the aviation industry.

Hangars:

There are three hangar buildings serving the airport. They are the Oklahoma State University hangar, the City hangar and the ten-unit hangar.

The O.S.U. hangar serves to store local based aircraft, aircraft maintenance, and the storage of parts and supplies. The City hangar is for storage of local and transient aircraft. There are storage rooms along each side of the hangar which are completely filled with surplus salvage parts and supplies. The ten-unit T-hangar is rented out to local based aircraft and at the present time all units are occupied.

The north end of the T-hangar building contains classroom space and office space for Universal Aviation, Inc. This FBO offers aircraft rental service, new and used aircraft sales, and sale of aircraft component parts. It also offers instructions in flight training and trains an average of 60 pilots annually.

O.S.U. Aeronautical Technology Department:

The first constructed rock hangar at the north-east corner of the airport is presently being used by the

O.S.U. Aeronautical Technology Department. Approximately 60 aircraft and engine mechanics are trained annually. The department also offers related instruction in aircraft operations.

In 1972, Oklahoma State University, at the cost of $42,000.00 increased classroom space and added additional equipment for the Aeronautical Technology Laboratory. Later that year, the University again increased the size by enlarging the structure once again. This was done at the cost of $50,000.00 with part of the funds coming from the O.S.U. Development Foundation. Although Aeronautical Technology occupies all buildings, the O.S.U. Development Foundations hold a lease on the later of the two buildings constructed.

Severe Weather Research Laboratory:

This facility is operated by the O.S.U. Electrical Engineering Department and conducts research in severe weather phenomena.

Fire, Crash and Rescue Building:

The Rescue building provides cover for fire fighting equipment as well as living space for night watchmen for 24 hour surveillance.

Mobile Home:

The mobile home near the Administration building serves to house the Supervisor of Airport Services for the airport.

Concrete Vault:

Northwest of the mobile home is a small concrete vault transformer building which is used also for the storage of records and receipts of the airport. These existing structures may be located on Layout Plan Figure III-3 and are listed in Table I-2.

Fuel:

The available fuel capacity includes 8,000 gallons of 80 octane gasoline and 13,000 gallons of 100 octane and 8,000 gallons of jet fuel. There are three fuel trucks, one containing 350 gallons of 80 octane, another at 600 gallons of 100 octane, and the last at 2,500 gallons of jet fuel.

Fire Fighting Equipment:

The fire fighting equipment at the Stillwater Municipal Airport consists of a 1973 model Fire Boss, mounted on a Ford F 350 4 X 4 chassis and is known as a rescue vehicle. It has a light water capacity of 100 gallons plus 450 pounds of dry chemical. Additional equipment includes four nitrogen cylinder spaces of 300 cubic feet at 3,000 PSI, breathing equipment for three men, two complete proximity suits, rechargeable equipment, and other miscellaneous tools necessary for fire and rescue services. There is a transceiver radio in the airport fire truck (154.13 MHZ frequency) to communicate with the Stillwater Fire Department if their

Table I-2

EXISTING BUILDINGS
Stillwater Municipal Airport

Building Number	Building	Owner	Occupant	Maintenance Responsibility	Structure Condition
8	Terminal 6,100 Ft. masonry	City*	O.S.U. & Frontier Airlines	O.S.U.	Good
11	City Hangar 17,200 Sq. Ft. metal	City*	O.S.U.	O.S.U.	Good
12	O.S.U. Hangar 11,200 Sq. Ft. metal	O.S.U.	O.S.U.	O.S.U.	Good
13	Aero-Tech. Lab. 7,200 Sq. Ft. 7,200 Sq. Ft. Stone & Metal	City* O.S.U. O.S.U.Foundation	O.S.U.	O.S.U.	Good
5&6	T-Hangar Universal Avia. 12,750 Sq. Ft. metal	City*	Multiple renters	O.S.U.	Good

Table I-2 EXISTING BUILDINGS (continued)

Building Number	Building	Owner	Occupant	Maintenance Responsibility	Structure Condition
7	Fire & Rescue 1,500 Sq. Ft. masonry	City*	O.S.U.	O.S.U.	Good
2	Mobile Home 980 Sq. Ft. metal	Dennis Graham Graham Supervisor of Airport Services		Dennis Graham	Good
4	Transformer Vault 460 Sq. Ft. concrete	City*	O.S.U.	O.S.U.	Fair

* Buildings owned by the City of Stillwater, but under lease agreement to Oklahoma State University.

NOTE: Building numbers refer to numbers shown on the Airport Layout Plan. Figure III-1.

help is needed. There are two fire hydrants located on the airport property. One is on the south side of the entrance road across from the City's hangar and the other is located just east of the Universal Aviations office.

Security:

An Airport Security Program was developed in compliance with Federal Aviation regulations (FAR) part 107 and became effective January 1, 1973. The program describes procedures to follow and measurements to be taken by the airport, airport employees, and the City to insure the security of the airport.

Security Fences:

The Air Operations Area is separated from the non-air operations area by a 9-gauge chain link fence with the top and bottom of the fence having a twisted and barbed finish. Signs are posted on this fence indicating that no unauthorized personnel shall go beyond it. There is an outer perimeter fence that encompasses the the entire airport property and is posted with "No Admittance" signs, which are inadequate in number to cover the entire area. Besides the outer perimeter fence, there is an inside barrier fence that surrounds the Air Operations Area, Figure I-2. These fences are considered to be in fair condition except the outside perimeter fence as earlier mentioned.

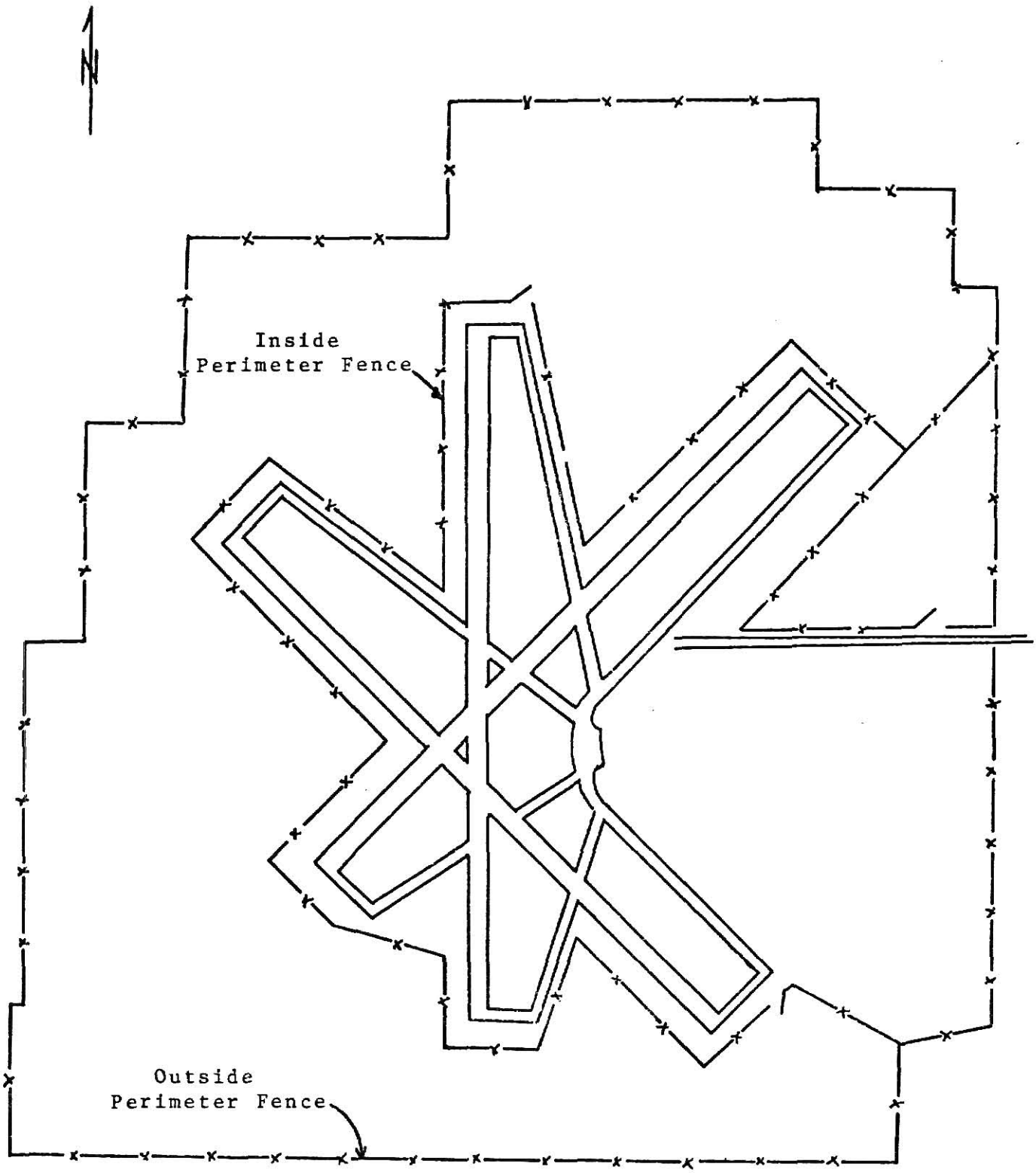


Figure I-2

FENCES
Stillwater Municipal Airport

Security Lighting:

Three floodlights are located on the west side of the third floor of the terminal in order to light the terminal ramp. There are ten mercury vapor lights mounted on poles from the O.S.U. hangar to the T-hangars giving ample security lighting for all structures.

Lighting

Airport lighting includes Medium Intensity Runway Lights (MIRL) L802 spaced 200' apart with step control for intensity for a 5,000' section of Runway 17/35. Runway End Identifier Lights (REIL) are at both approaches and the centerline lighting for 17/35 taxiway has just been installed. The airport also has a rotating beacon and a segmented circle with a lighted tetrahedron. All of these are in good operating condition. There are red obstruction lights on top of the 80' radar tower, located next to the severe weather lab, on top of the 75' rotating beacon tower, and the 75' Terminal building tower. Emergency lighting is provided by a 230 volt electrical gasoline driven generator. Contained with this unit are four 1,000 watt bulbs installed with reflectors on a nine foot steel beam (beams are telescopic and may be raised to 18' automatically.)

Utilities

According to the present lease agreement, the City of Stillwater will provide electrical power and water for

the operation of the airport. The City will provide, free of cost to the airport, electrical power required to operate and light the beacon, the runways and obstruction lights; and taxi strip, security lights, VASI, REIL, and all other external lights. The University will purchase the water and any electrical power not already covered.

The airport is presently on two sepic tanks, but with compliance with the new lease, the City will construct a sewer system. In 1967, the City and the University covered and destroyed laterals to one septic tank with a land fill across from the T-hangars. When the tank is full, it dumps sewage onto the ground.

Access

U.S. Highway 177, adjoining the east side of the airport, provides access south 2 1/2 miles to downtown Stillwater and north to Perry and Ponca City, 25 and 45 miles north respectively. U.S. Highway 177, intersects U.S. Highway 51 in the downtown area of Stillwater, which provides access northeast to Tulsa, 75 miles, and to Oklahoma City, southwest 65 miles. U.S. Highway 177 also intersects the Cimmaron Turnpike 3 miles north of Stillwater. The Turnpike is presently under construction but is expected to open soon. The Turnpike provides direct access to Tulsa and to Interstate Highway 35 to Oklahoma City. The City's comprehensive plan is to continue the Cimmaron Turnpike spur to intersect

U.S. Highway 51 west. These will pass one mile west of the airport. U. S. Highway 51 west out of Stillwater is also presently being developed into a four lane highway connecting Stillwater to Interstate 35.

Land Use

Other than the airport operations area, there are 651 acres of airport property being leased to Earl Buss for cattle grazing, 52.54 acres set aside as an industrial site, and 40 acres reserved for the Isaac Walton League. On the south side, the access road and east of the O.S.U. hangar are three baseball diamonds used by city group organizations.

3. Airspace Structure and Navigational Aids

Stillwater Municipal Airport (Searcy Field) is located on the Wichita and Dallas-Fort Worth Sectional Aeronautical Chart, northeast of the intersection of Federal Airways V77 and V140. The nearest VHF Omni-Directional Radio Range (VOR) is approximately 3.5 miles north of the airport at a frequency of 108.4. The only obstruction affecting the use of airspace is the severe weather tower at the end of Runway 31. This obstruction has been waived. There are no restricted airspace areas or warning areas for the airport.

The airport is equipped with air to ground radio communication (UNICOM) which operates on 122.8 mega-hertz during daylight hours. The airport is in the process

of installing VASI and REIL on the North-South (17/35) runway. The current approach zones are shown in Figure III-2.

4. Airport Related Land Use

Proposed land use is shown on Figure III-4. This figure includes contours in Composite Noise Rating (CNR) for the existing level of air traffic. The contours are based on "Land Use Planning Relating to Aircraft Noise," a technical report produced for the FAA by Bolt, Beranek and Newman, Inc. Utilization of this study to establish CNR contours requires data on current and forecast numbers of aircraft operations by type of aircraft and engines used, percent of runway utilization on an annual basis, and time of day of aircraft operations. A more detailed discussion of CNR's and their meaning is provided in the Environmental Study as applicable to suggested land use plans for land adjacent to airport property.

5. Area Wide Plans

There are two plans that were incorporated in the development of this master plan study that may influence future airport development. Included are the Cimarron Turnpike Authority and the Stillwater Comprehensive Plan developed by the Stillwater Planning Commission.

6. Laws and Ordinances

Land use regulation for the City of Stillwater is specified in Ordinance No. 1452 by the Commissioners

of the City of Stillwater. Article 4, Sections 16-32 through 16-38 of this ordinance covers general intent and application, establishing airport hazard area, airport hazard area zones, height regulations, use restrictions, hazard marking and lighting, and the zoning map. This ordinance should be revised, as it pertains to the airport, to incorporate revised approach zones. The approach plan included in Figure III-2. can be used as an Airport Height Zoning Map for the City. This map provides for coordination, regulations and restriction of the height of structures and objects of natural growth. It also coordinates, regulates, and restricts certain types of uses in various airport zones in the vicinity of the Stillwater Municipal Airport. These uses include airport approach zones, transition zones, the horizontal surface, and the conical zone.

7. Financial Resources

Over the last eight years, the Stillwater Municipal Airport has had average revenues of $143,602.00 and average expenses of $137,189.00 for an average net income of $6,412.00 per year (Table I-3).

As explained by Gene Satterfield, Oklahoma State University Comptroller, in his Organization and Operation of Airport Operations Statement,"The revenue is somewhat misstated due to certain direct costs that were charged to other airport departments. The primary

Table I-3
REVENUE AND EXPENSE SUMMARY
June 1967-June 1974
Stillwater Municipal Airport

Revenue:	1967	1968	1969	1970	1971	1972	1973	1974	8 Year Total	Average of 8 Year Total
Gasoline Sales										
Transient	$ 23,149	$ 26,656	$ 30,145	$ 26,253	$ 34,596	$ 34,046	$38,330	$ 90,657	$ 304,836	$ 38,104
Transportation	9,122	8,717	10,375	10,526	10,906	9,312	7,055	8,305	74,318	9,290
Contract	12,200	13,793	14,057	14,722	14,722	11,364	9,961	12,977	103,060	12,882
Themis				732	2,408	3,200	1,247		7,587	948
Oil Sales										
Transient	707	1,049	1,235	1,438	1,676	2,065	2,130	2,727	13,027	1,628
Transportation	437	529	716	857	666	788	553	1,133	5,699	712
Contract	535	712	843	727	852	760	844	1,822	7,095	887
Themis				22	88	263			373	47
Hangar Rent and Tiedowns										
Transient	537	668	473	2,149	9,146	566	1,375	591	15,505	1,938
Local	2,979	3,809	4,890	3,957	5,147	8,381	8,696	11,613	49,472	6,184
Hangar Rent - University	3,048	3,408	3,768	4,393		4,315	3,139	2,133	24,204	3,025
Airline Lease	3,760	4,035	3,530	3,600	1,720	3,120	4,830	568	25,163	3,145
Concessions	6,408	6,134	6,386	6,842	6,860	6,620	6,258	8,167	53,675	6,709
Shop Sales										
Transient										
Labor	9,441	13,143	11,582	12,502	10,694	14,262	15,392	19,478	106,494	13,312
Parts	7,828	7,077	8,146	9,124	9,548	10,215	16,235	12,321	80,494	10,062
Transportation										
Labor	3,962	5,367	7,664	11,776	11,632	8,230	7,312	8,123	64,066	8,008
Parts	2,437	3,187	3,571	8,848	6,185	5,913	7,742	5,387	43,270	5,409
Contract										
Labor	8,922	7,162	10,526	9,273	8,188	7,759	6,067	9,737	67,636	8,454
Parts	4,325	6,935	7,421	5,729	5,537	6,958	2,557	7,644	47,106	5,888
Themis										
Labor				85	1,808	2,893	1,295		6,081	760
Parts				150	291	906	3,040		4,387	548
Sales Tax	590	322	419	560	641	818	695	789	4,834	604
Office Rent					608	631	2,218	5,078	8,535	1,067
Vending					57	365	330	127	879	110
Pasture Rent	1,090	4,359	2,179	2,882	3,022	3,002	3,002	4,101	23,637	2,955
Charter Flying					4	24	10	222	260	32
Telephone Income					422	17	42	72	553	69
Miscellaneous	609	1,181	304	1,447	723	724	528	1,060	6,576	822
TOTAL REVENUE	$102,086	$118,263	$128,159	$137,931	$148,147	$148,517	$150,883	$214,832	$1,148,818	$143,602
Expense:										
Cost of Goods Sold										
Gas and Oil	25,914	27,046	29,735	28,088	29,654	30,169	28,757	60,864	260,227	32,528
Concession, Parts & Supplies	20,688	24,070	24,179	31,603	28,083	30,940	25,623	36,138	221,324	27,665
Inventory	2,201	(4,873)	(5,597)	2,455	(4,374)	(446)	930	(3,782)	(13,486)	(1,686)
Salaries and wages	38,992	40,182	41,772	59,044	62,404	57,238	58,175	60,462	418,269	52,285
OASI	1,196	1,363	1,517	2,313	2,464	2,148	2,598	2,907	16,506	2,063
Employees' Insurance	251	85	140	860	845	1,086	1,213	1,063	5,543	693
Unemployment Tax						204	282	301	787	98
TIAA-CREF						14	96	113	223	28
Repairs and Maintenance	2,525	2,746	3,031	4,304	4,534	3,677	5,703	16,003	42,523	5,315
Administrative Charges & Audit	2,439	(109)	1,519	1,156	1,102	900	900	2,906	10,813	1,352
Professional Fees						108	75	75	258	32
Telephone & Telegraph	1,146	1,196	952	1,062	1,817	1,233	1,496	2,435	11,337	1,417
Office Supplies	1,087	600	498	888	579	694	683	1,006	6,035	754
Uniform and Towels	1,689	1,586	1,036	1,007	767	1,042	940	1,010	9,077	1,135
Equipment Rental	434	355	419	530	93	912	433	715	3,911	489
Shop	1,116	1,425	2,108	1,830	1,759	956	1,156	1,174	11,524	1,440
Motor Vehicle	821	1,177	496	758	699	1,723	2,519	1,196	9,389	1,174
Insurance	1,218	1,297	1,058	1,523	2,335	2,631	2,255	4,575	16,892	2,111
Travel	859	394	889	1,974	2,167	1,337	661	535	8,816	1,102
Safety Inspection							203	(3,285)	(3,082)	(385)
Freight and Express	231	243	307	428	783	379	344	440	3,155	394
Sales and Gasoline Tax	1,314	1,273	560	735	3,137	936	1,391	1,085	10,431	1,304
Airplane Rental					230	175	314	858	1,577	197
Hangar Rental				3,934	5,064	5,064	5,064	5,064	24,190	3,025
Airway Users Tax						2,158	2,080	8,693	12,731	1,591
Miscellaneous	198	423	271	1,421	1,182	467	1,019	(16)	4,965	621
Contract Labor					187				187	23
Ground Transportation						141			141	18
Replacements						362	16		378	47
Bad Debts	868	40		44					952	119
Capital Additions					1,785	(2,900)	821	2,218	1,924	240
TOTAL EXPENSE	$105,187	$100,519	$104,890	$145,957	$147,296	$143,368	$145,747	$204,553	$1,097,517	$137,189
Excess Loss of Revenue over Expenditures	(3,101)	17,744	23,269	(8,026)	851	5,149	5,136	10,279	51,301	6,412
Cumulative Income	(3,101)	14,643	37,912	29,886	30,737	35,886	41,022	51,301		

reason for presenting other costs under the section of the statement titled "Subsidies from O.S.U. Budget" (Table I-4) is to reflect those costs that could have been charged as an Airport Operations cost. These costs, or some of the same costs, would still have been incurred had there not been other University departments operating at the Airport.

The Airport Director, Administrative Assistant, and Office Secretary salaries are pro-rated to the three airport departments because all three persons in these positions perform duties for each department. Thus, presenting these costs as part of the cost history reflects what it would cost to operate the airport by another operator, had the same conditions prevailed.

The expenses listed under expenditures for improvements and utility costs represents monies expended from other ancillary funds, other than airport entities for the benefit of the airport. Exclusion of the cost would seriously misstate the cost of actual operation.

Generally, there has been considerable difficulty in securing funds to sponsor repair and minor improvement projects at the airport. Monies expended at the airport for repairs and minor improvements have, to a large extent, been on a have-to basis, with the money secured primarily through the "persistent efforts" of the Airport Director. Free funds (ancillary money) which can be used in airport projects has become scarce.

Table I-4
SUBSIDIES FROM O.S.U. BUDGET
June 1967-June 1974
Stillwater Municipal Airport

Subsidies:	1967	1968	1969	1970	1971	1972	1973	1974
Salaries paid from:								
Flight Training Account	$ 6,530	$14,261	$17,696	$ 6,412	$ 8,803	$ 8,572	$10,222	None
Flight Service Account	2,100	2,270	2,634	3,188	3,080	3,306	3,336	"
Expenditures for Improvements				2,000	10,379	731	2,148	"
Utilities Costs	(not available)	5,345	8,349	8,884	8,644	5,908	6,297	"
TOTAL OSU SUBSIDIES	$ 8,630	$21,876	$28,679	$20,484	$30,906	$18,517	$21,903	"

Other repair and maintenance projects on campus are competing for these funds.

Repairs and maintenance expense is a continous expense that must be recognized and provided for. Some type of maintenance fund should be provided whereby there will be paid each year, by the University and the City, a certain sum of money to cover cost of major maintenance."

In 1972, the City passed a bond issue for $125,000. for the purpose of airport improvements. This amount will be exhausted upon completion of present projects.

8. Socioeconomic

Stillwater has experienced a population increase of 562.1 percent during 1920 to 1970 period. The population has increased steadily from 4,701 in 1920 to 31,126 in 1970. Stillwater's population increased from 20,238 in 1950 to a present estimated population of 35,800. This is an average increase of 623 persons per year over the past 25 years.

Stillwater is in a position to improve its socio-economic conditions greatly during the projection period due to the City's appreciable industrial growth. The physical location of Stillwater is near the intersection of Interstate Highway 35 and the new Cimarron Turnpike which will provide an exceptional opportunity for population and labor force growth.

B. Forecast

1. Population

From 1950 to 1970, Stillwater's population grew from 20,238 to 31,126, an average of 544 persons per year. From 1960 to 1970, the population of Stillwater increased 29.8%, largely because of the growth of Industrial Park, and the growth of Oklahoma State University. Stillwater's population is expected to be approximately 38,252 by 1980 (Figure I-3.)

The major factor in Stillwater's past population growth is O.S.U.'s student growth, the installation of Swan Rubber Company, Moore Business Forms, and other industrial installations with 100 or more employees. This factor can be expected to increase as new industry develops. Two industries, Mercury Marine Corporation and National Standard Tire Company are under construction and are due to open in the near future. Each is expected to employ over 500 people. This will have a great impact on the population increase.

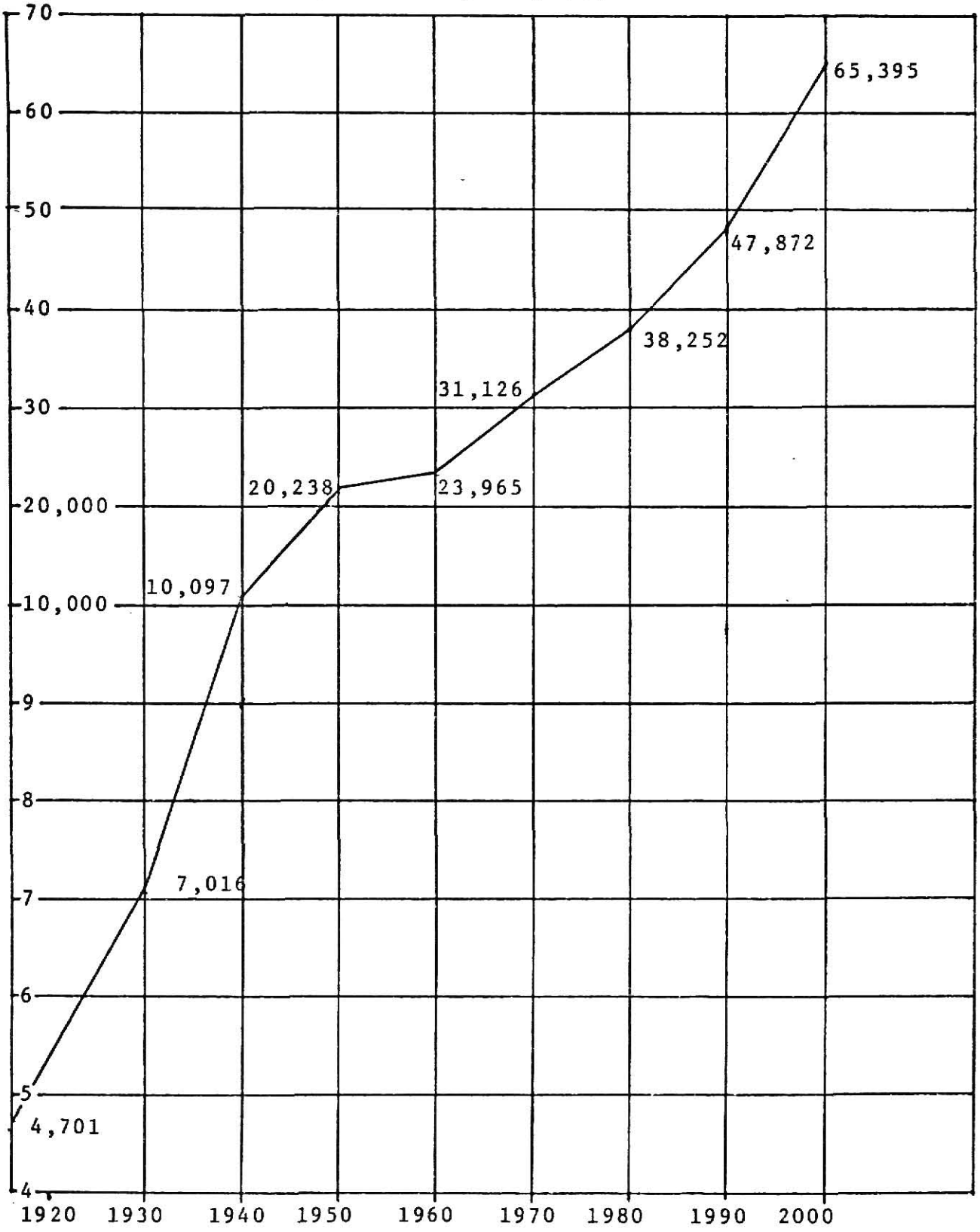
All of this growth offers Stillwater Municipal Airport an opportunity for increasing use as a capacity reliever airport facility. Approximately 45 private aircraft owners from Stillwater and surrounding areas and Oklahoma State University (20 airplanes) are now basing their aircraft at the Stillwater Municipal Airport.

2. Labor Force

Stillwater has a labor force of approximately

Figure I-3

POPULATION GROWTH
Stillwater, Oklahoma



Source: U.S. Bureau of Census . City of Stillwater Planning Office.

19,400 persons. Of this number, about 18,770 persons (97.8%) are employed. The total unemployment is approximately 630 persons or 3.2% of the total work force. The total employment of the city has increased from 15,100 in 1964 to 18,770 in 1971. This is a total increase of 80.4% or an average increase of 11.5% per year.

A significant percent of the Stillwater work force commutes to the city from surrounding towns. Some of these workers maintain farms in addition to their other employment. The communities of Cushing, Perkins, and Yale supply the greatest number of commuters. The estimated number of persons available for work in a 30 mile radius of Stillwater totals 3,910 persons (2,110 males and 1,800 females).

The majority of the labor force in Stillwater is in non-agricultural employment. This category consists of 17,540 persons or 90.4% of the total labor force. Non-agricultural employment has decreased 2% of the total labor force from the 1964 figures.

Manufacturing employment in Payne County and Stillwater totals approximately 8% of the total work force according to the 1971 figures. This accounts for approximately 1,552 persons. This figure is expected to increase predominately because of the present and future increase in manufacturing plants in the Stillwater area.

Agricultural employment in Stillwater totals

approximately 1,230 persons and accounts for 8.2% of the labor force according to the 1971 figures. This compares with 6.3% of the total labor force in 1964. This latter percent should remain fairly constant with only slight increases expected in agricultural employment.

Miscellaneous government operations employ approximately 7,566 people in Payne County. This accounts for 39% of the total labor force. Over 215 of the total are employed by the Stillwater school systems.

There are eight industries in Stillwater that employ 100 or more persons. The largest industry, Oklahoma State University, has 5,509 total employees.

3. Per Capita Income

From 1960 to 1971, the average family income in Stillwater increased 84%. This reflects an average Annual increase of 7.6% for the 11 year period. In 1960, the average family income was $8,028.00. The average family income decreased to $7,727.00 in 1970. It should be noted that these figures are weighted by the low income student population. The per capita income is expected to continue to increase at approximately 6% annually. In 1970, there were 2,151 families in Stillwater with incomes over $10,000.00.

4. Retail Trade

The downtown business district historically has been the primary retail trade center for Stillwater.

Retail sales in Fiscal year 1973 totaled $60,102,000.00 for Stillwater. This reflects an average amount per household of $5,678.00.

5. Geographic Factors

Stillwater Municipal Airport is located 2 1/2 miles north of Stillwater, 65 miles northeast of Oklahoma City, 75 miles southwest of Tulsa and 40 miles south of Ponca City. The field elevation of the airport is 985' above mean sea level (MSL). The airport is located conveniently near to Stillwater and is easily accessible by Highway 51. Stillwater is located at the intersection of U.S. Highway 51, which is a direct route to Tulsa to the northeast and Interstate 35 to the west, and Highway 177 which is a direct route to Ponca City northward.

Excellent accessibility to Stillwater Municipal Airport is provided by the recent and present widening of U.S. Highway 177 from Stillwater to the Cimarron Turnpike located 3 miles north of Stillwater.

Stillwater Municipal Airport is considered ideally situated when proper consideration is given to such vital factors as environmental compatibility, expansion capacity, unrestricted facilities development. Adequate room exists on all sides of the airport for future airport expansion. Because of the flatness of the land, minimum grading will be required for future expansion.

6. Competitive Position

Passenger transportation services are provided to the City of Stillwater by M.K.&O. Bus Company. M.K.&O. provides 4 departures daily for Oklahoma City and Tulsa. The Stillwater Limosine Service provides 5 trips daily to Tulsa and 4 to Oklahoma City.

There are five freight companies which provide service to Stillwater and surrounding areas from Tulsa and Oklahoma City, in addition to other areas of the state. Cargo service is provided to Stillwater at the Santa Fe freight terminal.

7. Forecast of Aviation Demand

a. Air Traffic Data

Obtaining aircraft operations information from airports not served by FAA Traffic Control Services (FAA-TCS) is generally difficult since historical records of activities such as aircraft operations and based aircraft are not available.

Periodic inspections by FAA are made of activities of airports not having FAA-TCS. These inspections serve to estimate annual operations and based aircraft of a specific airport and the results are recorded on FAA Form 5010 (previously FAA Form 29A). Estimates of past operational activities is generally unreliable from these reports, however, based aircraft figures are more acceptable.

Without accurate data for the past operational

activity, it is important to establish means that will give a more accurate view of past and current operational activity. The best available source for this data would be through interviews with persons familiar with activity history of the airport. Such people would be the local users, the Supervisor of Airport Services, and the Airport Manager. Comparing the results, the figures given were generally consistant regarding total annual activity and are tabulated in Table I-5.

The Flight Training Program at the airport has become one of the best in the nation. Most of the students are with the Oklahoma State University Flight Training Program and past and present enrollments indicate an upward trend. The present enrollment for 1975 is 114 students and is expected to increase to 200 by the end of the year. There has been a 5% increase in the enrollment per year between the years 1968 and 1974 according to the Airport Manager.

Table I-5

HISTORICAL RECORD OF AIRCRAFT OPERATIONS*
Stillwater Municipal Airport

Year	Local**	Itinerant***	Total
1962	18,966	13,531	32,497
1963	19,965	14,243	43,208
1964	21,016	14,993	36,007
1965	22,122	15,783	37,905
1966	23,287	16,613	39,900
1967	24,513	17,487	42,000
1968	37,096	26,468	63,558
1969	39,049	27,855	66,904
1970	41,104	29,322	70,426
1971	43,268	30,865	74,133
1972	45,545	32,490	78,035
1973	47,943	34,200	82,143
1974	50,467	36,000	86,467
1975	56,075	40,000	96,075*

Source: Hoyt E. Walkup, Airport Manager, Estimates.

* The term "Operation" as used here refers to the number of takeoffs and landings. One takeoff equals one operation and one landing equals one operation.

** Within a 25 mile radius.

*** Beyond a 25 mile radius.

Historical based aircraft data presented in Table I-6 was obtained from FAA Forms 20A and 5010 for the years 1959 through 1974. The 1975 figures are those aircraft presently based at the airport and are estimated, by the Airport Manager, to remain at this count for the remainder of the year. Those years labled "N/A" were a result of no records available at the airport or the FAA.

Table I-6

HISTORICAL RECORD OF BASED AIRCRAFT
Stillwater Municipal Airport

Year	Single Engine	Multi-Engine	Total
1959	54	6	60
1960	35	2	37
1961	N/A	N/A	
1962	52	5	57
1963	52	5	57
1964	52	5	57
1965	52	5	57
1966	54	5	59
1967	54	5	59
1968	N/A	N/A	
1969	N/A	N/A	
1970	50	7	57
1971	54	9	63
1972	N/A	N/A	
1973	N/A	N/A	
1974	59	10	69
1975	57	10	67

Source: FAA 29A and 5010 (1959 through 1974)
Hoyt E. Walkup, Airport Manager (1975)
N/A - Not Available

b. Forecast Methodology

For the purpose of projecting aviation growth at Stillwater Municipal Airport, growth rate factors based on national and regional growth trends were developed for five-year time increments and adjusted to reflect major contributing factors. These factors include flight training activity, general aviation growth, increase in fuel prices and fuel shortage, accelerated industrial growth, and increase in airport facilities. Also, automobile sales taxes are expected to increase whereas aviation fuel taxes will not. In cases of long automobile trips, at the 55 MPH speed limit, it will become more economical to fly than drive. These growth rates are presented in Table I-7.

Table I-7

ACTIVE GENERAL AVIATION AIRCRAFT
GROWTH RATES
Stillwater Municipal Airport

Period	U.S.[1]	FAA S.W. Region[1]	Stillwater[3]
1970-75	10.00%	7.85%	N/A
1975-80	23.60%	19.06%	35.00%
1980-85	27.50%	22.60%	25.00%
1985-90[2]	32.00%	26.60%	28.00%
1990-95[2]	37.00%	30.60%	33.00%

Source: [1]Active General Aviation Aircraft "Aviation Forecast, Fiscal years 1968-1984", Federal Aviation Administration.

[2]Extrapolation of 1968-1984 growth rates.

[3]Modulation of composite growth factors.

N/A - Not Available

For purposes of projecting future numbers of based aircraft at Stillwater Municipal Airport, factors were developed utilizing growth rates in excess of national figures for a short term, then gradually reducing to forecast growth slightly less than those predicted for the nation in the long term.

c. Forecast of Aircraft Operations

Aircraft operations were broken down into three categories and growth rates were adjusted to each based on national and regional trends and prevailing local conditions. The results established the forecast of aircraft operations for Stillwater Municipal Airport through 1995 and are presented in Table I-8. Table I-9 indicates the predicted Local and Itinerant operational activity through 1995. Itinerant operations are expected to increase in percentage due to the increased growth of general aviation and the development of industry in Stillwater.

Table I-8

FORECAST OF OPERATIONS
Stillwater Municipal Airport

Year	Training	% of Total	% of Growth Rate	Corp.	% of Total	% of Growth Rate	Other G.A.	% of Total	% of Growth Rate	Total
1974	17,130	31.4	15	6298	7.3	3	53,080	61.3	10	86,508
1975	31,200	32.5	10	6487	6.8	10	58,388	60.7	12	96,075
1980	34,320	32.1	5	7135	6.7	10	65,394	61.2	14	106,849
1985	36,036	30.4	8	7848	6.6	10	74,549	63.0	15	118,433
1990	38,918	29.2	7	8632	6.5	10	85,731	64.3	16	133,281
1995	41,642	27.7		9495	6.3		99,448	66.0		150,585

Table I-9

TOTAL AVIATION OPERATION
Stillwater Municipal Airport

	General Aviation				
Year	Itinerant	% of Total G.A.	Local	% of Total G.A.	Total General Aviation Operation
1975	40,000	42	56,075	58	96,075
1980	45,945	43	60,904	57	106,849
1985	52,111	44	66,322	56	118,433
1990	59,976	45	73,305	55	133,281
1995	69,269	46	81,316	54	150,585

d. Forecast of Based Aircraft

Forecasts of based aircraft are derived from FAA forecasts of active general aviation aircraft. The rate of growth is slightly higher than the national growth rate for the first five years, but is expected to grow similar to the growth rate forecast for the nation for the remaining period.

The mix of the based aircraft for the forecast period reflects the national trend of increasing multi-engine aircraft usage. The increase in multi-engine and turbine aircraft is credited to industrial development and the increase in aircraft facilities. Table I-10 indicates the projected growth of Based Aircraft at Stillwater Municipal Airport and further delineates the expected mix of the Base Aircraft.

Table I-10

FORECAST OF BASE AIRCRAFT
Stillwater Municipal Airport

Year	Single Engine No.	% of Tot.	Multi-Engine No.	% of Tot.	Turbine No.	% of Tot.	Helipoter & Others No.	% of Tot.	Total
1975	58	85	10	15	0	0	0	0	67
1980	63	85	11	15	0	0	0	0	74
1985	66	82	14	17	1	1	0	0	81
1990	70	79	19	19	1	1	1	1	89
1995	75	77	19	20	2	2	1	1	97

e. Aircraft Operations Mix

The mix of aircraft operations can be expected to reflect the based aircraft closely except for Turbine type aircraft. Frontier Airlines is presently making two operations per day, but has filed an application to delete Stillwater. Other large aircraft, such as, executive jet and transport twin-engine piston or turbo-prop aircraft are expected to increase as facilities are provided. Figures for aircraft operations mixed are found in Table I-11.

Table I-11

AIRCRAFT OPERATIONS MIX
Stillwater Municipal Airport

Year	Single Engine No.	% of Tot.	Multi-Engine No.	% of Tot.	Turbine No.	% of Tot.	Helicopter & Others No.	% of Tot.	Total
1975	81,664	85	12,009	12.5	2,402	2.5	0	0	96,075
1980	87,616	82	16,242	15.2	2,778	2.6	214	.2	106,849
1985	93,562	79	21,081	17.8	3,317	2.8	473	.4	118,433
1990	98,628	74	28,789	21.6	4,531	3.4	1,333	1.0	133,281
1995	108,421	72	34,635	23.0	5,722	3.8	1,807	1.2	150,505

f. Peak Period Operations

Accurate historical data relating to peak periods of activity was unavialable. In the absence of this information, statistics regarding this peak period activity at similar general aviation airports was utilized. Study of data available from airports exibiting similar operational characteristics reveals that peak month operations typically comprise 10% of the total annual operations. Further analysis regarding peak hour activity at airports with a high incidence of flight training indicates this relationship to be in the area of 15% of the average day-peak month. These statistics were utilized in preparing peak period estimates for Stillwater Municipal Airport and are provided in Tables I-12 and I-13.

Table I-12

PEAK PERIOD AIRCRAFT OPERATION
Stillwater Municipal Airport

Year	Annual Operations	Peak Month	Ave. Day Peak Month	Peak Hours
1975	96,075	9,600	320	48
1980	106,849	10,685	356	53
1985	118,433	11,843	394	59
1990	133,281	13,328	444	66
1995	150,585	15,058	502	75

Table I-13

AIRCRAFT OPERATIONS PER PEAK DAY*
Stillwater Municipal Airport

Year	Total Annual Operations	Avg. Day Peak Month Operations	Single Engine	Multi-Engine	Turbine	Helicopter & Others
1975	96,075	320	272	40	8	0
1980	106,849	356	292	54	9	1
1985	118,433	394	311	70	12	1
1990	133,281	444	329	96	15	4
1995	150,505	502	362	115	19	6

* Reduce number of operations by one-half for the number of landings or takeoffs.

C. Demand/Capacity Analysis

1. Aircraft Operational Requirements

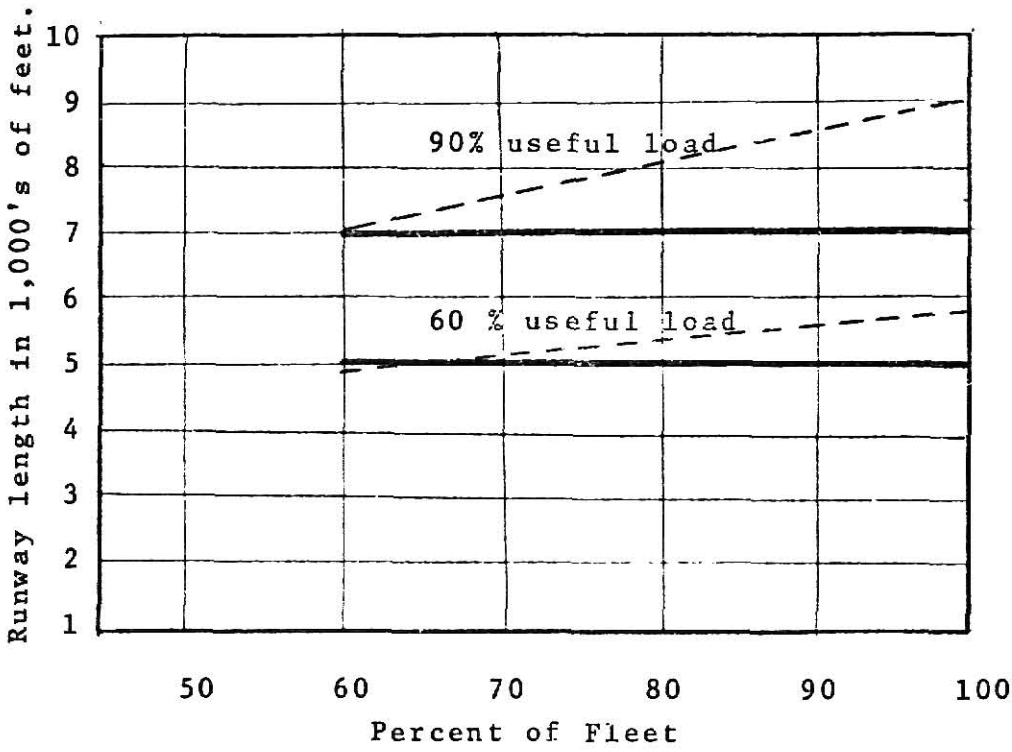
Present air traffic at the Stillwater Municipal Airport is primarily general aviation activity of light single engine and multi-engine aircraft (under 12,500 pounds). The only based aircraft at the airport over 12,500 pounds is a DC-3 operated by the Oklahoma State University Flight Service. Frontier Airlines is presently making a scheduled stop twice a day, six days a week. Frontier filed application to delete Stillwater from it's route, and the application was approved, but the decision is presently being appealed. Even with the loss of the airline, turbine type aircraft are expected to become a part of the aviation activity within the time span of the forecast. This is due to the accelerated industrial growth, present and future surface access, and economic position.

The capacity of the airport presently includes the capacity to accommodate the smaller type business jet activity. The FAA has developed runway length requirements for typical business jet aircraft, as shown in FAA Advisory Circular 150/5300-6. The critical operation conditions chosen for runway length calculations were 60 to 90 percent of the typical fleet, Figure I-4. Other parameters influencing the calculations were wind, temperature and elevation. Wind is always considered at zero velocity as this results in the most adverse

conditions and the longest runway requirements. Actual airfield normal maximum temperature of 94° F., and an airfield elevation of 985 feet above MSL was used in calculations for Stillwater Municipal Airport Runway Length Requirements. Desirable runway lengths for business jet aircraft under the conditions stated above are shown in Table I-14.

Figure I-4

BUSINESS JET RUNWAY LENGTH
Stillwater Municipal Airport



Normal Maximum Temperature = 94°F.
Airport Elevation = 985 Feet, MSL.

Source: FAA AC 150/5300-6, Airport Design Standards for Basic and General Transport.

Table I-14

BUSINESS JET RUNWAY LENGTH
Stillwater Municipal Airport

Percent of Fleet	Percent of Useful Load	Runway Length
60	60	4,900'
60	90	7,000
100	60	5,700
100	90	9,000

Source: FAA Advisory Circular 150/5300-6, Airport Design Standards for Basic and General Transport.

From the investigation of runway length requirements, the present runways at Stillwater Municipal Airport are capable of handling only 60%. A one thousand foot extension is planned to be added to Runway 17/35 increasing the fleet percent to 100 and 60 percent useful load. The airport is not capable of handling useful loads of 90 percent. Facilities existing at Stillwater Municipal Airport are capable of accommodating all of the known general aviation activity.

Increasing Runway 17/35 to 6,000 feet will also meet the requirements for Instrument Landing System (ILS) operations.

2. Airfield Capacity

The existing runway system configuration of Stillwater Municipal Airport exceeds forecast demands on the basis of number of aircraft operations. The results of

airfield capacity analysis are presented in Table I-15. Data is presented for Practical Annual Capacity (PANCAP) and Practical Hourly Capacity (PHOCAP). PHOCAP is provided for conditions requiring instrument flight rules (IFR) and Visual Flight Rules (VFR).

Table I-15

AIRFIELD CAPACITY
Stillwater Municipal Airport

Source	Existing			Ultimate		
	PANCAP	PHOCAP		PANCAP	PHOCAP	
		IFR	VFR		IFR	VFR
AC 150/5060-1A[1]	100,000			100,000		
Appendix	170,000			170,000		
AC 150/5060-1A[1] Appendix[2]	180,000	64	129	180,000	64	129
AC 150/5060-3A[1]	375,000	71	175	375,000	71	175

[1]FAA Advisory Circular 150/5060-1A is for the purpose of determining when improvements should be programmed as demand approaches capacity.

[2]FAA Advisory Circular 150/5060-1A provides capacity for typical runway configurations for long-term planning.

The data shown in Table I-15 is the result of examination of the present configuration of the airfield. FAA Advisory Circular 150/5060-1A is recommended for use in calculating capacity to meet short term requirements. Appendix 1 of AC 150/5060-1A identifies the typical range of aircraft operations where it becomes necessary to expand airfield facilities to

accommodate operational activity. Appendix 2 of AC 150/5060-1A provides a detailed method of determining airfield capacities based on runway length, number and types of runway exits, mix of aircraft using the airfield, percent of touch-and-go operations, typical operational constraints and utilization based on windrose studies.

Advisory Circular 150/5060-3A provides approximate capacities for typical airport layouts for purposes of intermediate and long range forecasts. The more detailed calculations of Appendix 2, AC 150/5060-1A, are felt to be the most accurate of the methods utilized and more indicative of actual capacities. The hourly capacities shown may not be readily attainable without FAA-TCS, but forecast demand is well below VFR PHOCAP. IFR PHOCAP for this method was determined from the Airport Capacity Handbook, Second Edition, for runways with precision instrument approach systems but without radar control.

3. Terminal Area Capacity

Comparing Table I-16 with Table I-19, apron and hangar areas are operating above maximum capacity and are restricting growth of aviation activity. It should be stated that figures in Table I-19 are considered as minimums and do not take into account added congestion caused by sport activities at the University. Therefore, even though the terminal building shows

adequate space until 1980, and parking until 1990, this is somewhat misleading. Another factor not taken into account for terminal areas is the area occupied by the O.S.U. Flight School. This area accounts for nearly 1/4 of the area needed for general aviation. By constructing a building for the Flight Training School, the terminal building would have adequate operating space until 1990. However, it would be advisable to eventually enlarge the present facility in its present location.

Aircraft storage areas in the O.S.U., City hangar and T-hangars are filled beyond capacity. According to information supplied by the Airport Manager and Superviser of Airport Operations, there are many aircraft owners who wish to have their aircraft hangared but are forced to use apron tie-downs because of the unavailable hangar space. Also, aircraft owners from surrounding airports have stated that they would base their aircraft at Stillwater if available hangar space was available. The reason for this is lack of facilities at their present location and the cost of hangar rental.

It is felt that forecasts of based aircraft will not materialize unless project hangar facilities are supplied. Portions of hangar space should be adequately sized for business or other medium-to-large multi-engine aircraft to encourage acquisition and basing of these aircraft at Stillwater Municipal Airport. There is an

immediate requirement for 8,430 square yards of hangar area to meet the 1975 requirements. By constructing a smaller shop hangar, the existing hangar could supply 1,244 square yards. Five additional T-hangars would be required to meet the remaining hangar requirement. By 1995, 3,640 square yards of hangar space will be needed. This can be accomplished by constructing three more T-hangars or one T-hangar and one large hangar within the time span. The areas between the existing O.S.U. hangar and the Aero-Tech. building and between the T-hangar and the Weather Research building must be reserved for facilities directly related to aviation activities.

By increasing apron space by an average of 5,845 square yards every five years, requirements for the projected forecast shall be met.

The auto parking area at the terminal area is presently adequate to meet average daily use, but should be expanded to accomadate automobiles during sports events. The Airport Manager estimated that 40 stalls would be adequate. At the present, there is a telephone in the Terminal building for the purpose of renting a car, but facilities should be provided for a rent-a-car operation at the airport. This would greatly benefit the itinerant airport users.

Table I-16

EXISTING AVIATION FACILITIES
Stillwater Municipal Airport

Facility	Approximate Total Area
Usable Apron*	18,820 square yards
Hangar	4,570 square yards
Terminal Building**	4,500 square feet
Vehicular Parking	3,020 square yards

* Area within 75' of taxiway centerline is considered unusable.

**Does not include tower or utility areas.

4. Airspace Capacity

An analysis of airspace in the vicinity of the Stillwater Municipal Airport shows that sufficient air space is available to establish control zones. The only obstruction to interfere with existing approaches is the existing radar tower used by the Weather Research Laboratory in the approach to Runway 31. The tower in the control zone does not present a problem for the future.

5. Airport Access Capacity

From the terminal area south is a dirt road providing access to the Weather Research Laboratory. This road should be located 300' from the building restriction line, hard surfaced, and extended to intersect with Lakeview Drive about a quarter of a mile south. This would provide two access points to the

airport and make possible sites for development of commercial or light industrial establishments.

A paved surface road should also be constructed for access to the Aero-Tech. Laboratory. At the present time, a dirt road is being used and Taxiway 22 serves as access to this area in case of wet weather.

The proposed extension of the Cimarron Turnpike spur to U.S. Highway 51 will provide an excellent opportunity to develop the land west of the airport. North of the airport is the north section of the proposed loop built around Stillwater. Because of these proposed roadways, the land between them and the airport should be zoned industrial.

6. Air Traffic Control and Navigational Aid Requirements

Planned Navigational Aid (NAVIAD) developments to meet future requirements are outlined in Phase IV. By 1978, with the installation of 1,000 feet to Runway 17/35, an ILS (Instrument Landing System) should be installed to provide business jets with Instrument Flight Rules (IFR) capacity to land during periods of low visibility and low ceilings. By 1979, Runway 13/31 should be brought up to profile and runway and taxiway lights should be installed. The same should be done to Runway 04/22 by 1990.

Because of the intense flight training activity at the airport and the forecast increase in general operational activity, it is suggested that the existing control

tower be made operational for the safety of the airport, community, and pilots (both local and itinerant).

7. Aircraft Fire-Rescue Facility

The airport operates in cooperation with the City Fire Department which has two locations, one at the University and the other at the south end of town. There is a proposed fire station about a mile east of the airport. The facilities of the airport and the City are adequate to handle any emergency that might arise at the airport.

b. Facility Requirements

1. Facility Dimensional Standards

Dimensional standards for runways, taxiways, aircraft parking and building restriction lines, primary surfaces, clear zones and approach surfaces recommended for Stillwater Municipal Airport are shown in Table I-17. The minimum standards for Runways 17/35, 13/31, and 04/22 are as specified in Advisory Circular 150/5300-6 for General Transport Airports with precision-instrumented runways and non-precision-instrumented runways.

Recommended minimums have been increased in some instances over the minimum standards recommended by current FAA Advisory Circulars because they already exceed the requirements for this type of airport. Sufficient provisions have been made for installation of future precision instrument landing systems.

Table I-17

RECOMMENDED DIMENSIONAL STANDARDS
Stillwater Municipal Airport

Item	RUNWAY 17/35		RUNWAY 13/31		RUNWAY 4/22	
	Minimun Standard[1] Feet	Recommended Minimum Feet	Minimum Standard[1] Feet	Recommended Minimum Feet	Minimum Standard[1] Feet	Recommended Minimum Feet
Runway Length		6,000		5,000		5,000
Runway Width	100	150	100	150	100	150
Taxiway Width	40	50	40	50	40	50
Runway Centerline to Taxiway Centerline	200	200	200	200	200	200
Runway Centerline to Aircraft Parking	300	300	300	300	300	300
Runway Centerline to Bldg. Restriction Line	300	400	300	400	300	400
Taxiway Centerline to Aircraft Parking	75	75	75	75	75	75
Taxiway Centerline to Bldg. Restriction Line	75	105	75	105	75	105
Primary Surface Width	1,000*	1,000	500	500	500	500
Clear Zones Width at Start	1,000*	1,000	500	500	500	500

Table I-17 RECOMMENDED DIMENSIONAL STANDARDS (Continued)

Clear Zone Runway End to Start	200*	200	200	200	200	200
Clear Zone Length	2,500*	2,500	1,000	1,000	1,000	1,000
Clear Zone at End	1,750	1,750	800	800	800	800
Clear Zone Slope	50:1	50:1	34:1	34:1	34:1	34:1
Approach Slope	50:1-10,000* 40:1-40,000*	50:1-10,000 40:1-40,000	34:1	34:1	34:1	34:1
Approach Surface Width at End	16,000	16,000	3,500	3,500	3,500	3,500
Approach Surface Length	50,000	50,000	10,000	10,000	10,000	10,000

[1]Advisory Circular 150/5300-6.
*Federal Aviation Regulations, Part 77, Volume XI.

The present length of Runways 13/31 and 04/22 are adequate for all general aviation aircraft except the larger business jets. It is recommended that Runway 17/35 continue being the primary runway. There is adequate land to increase Runway 35 by 500 feet to the south and Runway 17 by 500 feet north. Although this is the limit to the extension of Runway 35, Runway 17 could exceed the recommended distance. The purpose of placing 500 feet on each end rather than just one end is to keep the amount of aircraft taxiing time down to a minimum and to keep the terminal facility and runway length in a balanced central location.

2. Approach Zones

Standards for controlled imaginary surfaces (zoned areas with no physical boundaries) in the vicinity of airports are specified in Federal Aviation Regulations, Part 77, Volume XI. Table I-18 presents dimensions to define recommended control surfaces for the ultimate development of Stillwater Municipal Airport. In order to protect the airspace for ultimate development, the town of Stillwater should enact a new Airport Hazard Zoning Ordinance incorporating these dimensions.

3. Airfield Facilities

Additions to and modifications of existing facilities at Stillwater Municipal Airport will be required at various stages in the ultimate development of Stillwater Municipal Airport. These requirements were

developed utilizing procedures recommended in FAA AC 150/5040-2.

Table I-18

IMAGINARY SURFACE
Stillwater Municipal Airport

Item	Runway 17/35 Recommended Height Zoning Dimensions Precision Instrument Approach for Basic Transport	Runway 13/31 Recommended Height Zoning Dimensions Non-Precision Instrument Approach for Basic Transport	Runway 4/22 Recommended Height Zoning Dimensions Non-Precision Instrument Approach for Basic Transport
Horizontal Surface			
Height	150 ft.	150 ft.	150 ft.
Radius	10,000 ft.	10,000 ft.	10,000 ft.
Conical Surface			
Slope	20:1	20:1	20:1
Length	4,000 ft.	4,000 ft.	4,000 ft.
Primary Surface			
Length	RWY + 400 ft.	RWY + 400 ft.	RWY + 400 ft.
Width	500 ft.	500 ft.	500 ft.
Approach Surface			
Width at Inner End	1,000 ft.	500 ft.	500 ft.
Width at Outer End	16,000 ft.	3,500 ft.	3,500 ft.
Slope*	*		
Length	50,000 ft.	10,000 ft.	10,000 ft.
Transitional Surface			
Slope	7:1	7:1	7:1
Length Each Side	50,000 ft.	50,000 ft.	50,000 ft.

*50:1 for first 10,000 feet; 40:1 for 40,000 ft.
Source: Federal Aviation Regulations, Part 77, Volume XI.

Table I-19

GENERAL AVIATION FACILITY REQUIREMENTS
Stillwater Municipal Airport

Item	Year 1975	1980	1985	1990	1995
Annual Operations, Total G.A.	56,075	60,904	66,322	73,305	81,316
Annual Operations, Itinerant	40,000	45,945	52,111	59,976	69,269
Peak Hour Operations	48	53	59	66	75
Based Aircraft, Total	67	74	81	89	97
Based Aircraft, Single Engine	58	63	66	70	75
Based Aircraft, Multi-Engine	10	11	14	17	19
Based Aircraft (Over 12,500 lbs.)	1	2	2	3	3
Based Aircraft (Under 12,500 lbs.)	66	72	79	86	94
Apron Requirements					
Itinerant Aircraft					
No. of spaces	35	40	47	54	64
Area, S.Y.	12,950	14,800	17,390	19,980	23,680
Based Aircraft (Over 12,500 lbs.)					
No. of Spaces	1	2	2	2	3
Area S.Y.	3,000	6,000	6,000	6,000	9,000
Based Aircraft (Under 12,500 lbs.)					
No. of Spaces	46	50	55	60	65
Area, S.Y.	16,100	17,500	19,250	21,000	22,750
Total Apron Area S.Y.	32,050	38,300	42,640	46,980	55,430
Hangar Requirements					
Based Aircraft (Over 12,500 lbs.)					
No. of Spaces	1	1	1	1	1
Area, S.Y.	3,900	3,900	3,900	3,900	3,900
Based Aircraft (Under 12,500 lbs.)					
No. of Spaces	20	21	24	26	28
Area S.Y.	9,100	9,555	10,920	11,830	12,740
Total Area S.Y.	13,000	13,455	14,820	15,730	16,640
G. A. Terminal Building Requirements					
Waiting Area/Pilots Lounge S.F.	1,305	1,425	1,590	1,875	2,025

Table I-19 GENERAL AVIATION FACILITY REQUIREMENTS (Continued)

Management/Operations, S.F.	261	285	318	357	405
Public Conveniences, S.F.	130	142	159	178	202
Concession, etc. S.F.	435	475	530	595	675
Functional Space, S.F.	2,131	2,327	2,597	2,915	3,307
Total S.F.	4,262	4,654	5,194	5,830	6,614
	Vehicular Parking				
No. of Spaces	63	69	77	86	98
Area, S.Y.	2,237	2,450	2,734	3,053	3,480

E. Environmental Study

1. General

The operation of Stillwater Municipal Airport has not adversely affected environmental conditions in the vicinity of the airport. The projected growth in aircraft operations and the proposed developments to the airfield can be provided with a minimum of environmental effect. Aircraft noise, which is typically the major cause of objections to airport operations, will not become excessive since the number of business jet operations will remain relatively low. Areas mostly effected from aircraft noises will be those from southerly aircraft takeoffs and departures from Runway 17/35.

2. Aircraft Noise

Because of demands placed upon the air carrier industry by business and the general public, the industry finds it imperative to develop bigger, faster and more powerful aircraft. Such technological advancement is not without drawbacks. Noise and air pollution is an inherent by-product of any jet or internal combustion engine. These problems must be faced as unavoidable and efforts concerted to minimize their effect. The airport and the land adjacent to it must be environmentally compatible to insure the longevity of the airport as well as the maximum serviceability of the land. Certain forms of land use are incompatible with aircraft noise and efforts should be made to insure that their encroachment upon the airport system is

controlled. Where residential or commercial settlements exist around an airport, the noise generated by endeavors by the National Aeronautics and Space Administration (NASA) and the aircraft industry to reduce the noise generated by aircraft engines, the frequency and intensity of aircraft noise levels in the vicinity of airports will in all probability increase. Therefore, comprehensive land use planning and the implementation of effective zoning laws are essential to insure the longevity of an airport site.

Figure III-3 illustrates the existing land use around Stillwater Municipal Airport. At present, Stillwater Municipal Airport is relatively free of noise problems. Present levels of noise and the number of people exposed are not deemed excessive, and a precise analysis of noise levels could not be justified at this time. Noise measurement and analysis would require the services of specialists in that field, and such an analysis would probably conclude that no inhabitants in the area affected are exposed to high noise levels. The proposed land use for 1994 is shown on Figure III-4. The noise contours depict maximum acceptable levels of noise in the vicinity of the airport. The contours do not represent constant levels of noise, but only show the land areas that would be exposed to periodic noise levels due to arriving and departing aircraft. Noise exposure patterns are dependent upon

variables such as runway utilization aircraft flight patterns, prevailing winds, type of aircraft and time of day that flights occur.

Methods of measuring aircraft noise levels in the vicinity of airports have been under development for some time. Two methods currently in use which are recognized by the FAA are the Composite Noise Rating (CNR) and the Aircraft Sound Description System (ASDS). This study utilized the CNR method.

The CNR method is based on the results of research supported by the FAA as explained in "Land Use Planning Relating to Aircraft Noise", by Bolt, Beranek and Newman, Inc., October, 1964. Aircraft noise studies based on the CNR method result in contours of possible exposure and are intended only as guides in planning land use in the vicinity of an airport. CNR contours do not establish noise standards for purposes of enforcement or define levels of noise that are tolerable or intolerable. CNR contours define zones in which studies (responses of residents to sound levels, number of occurrences and time of day) have indicated that certain levels of complaint or action might be expected. The description of expected responses for these zones is shown in Table I-20.

Historical and forecast data required to establish CNR contours consist of the following:

Number of landings and takeoffs by aircraft classification.

Runway utilization data, consisting of percent of runway utilization by aircraft classification on an annual basis.

Time of day of landings and takeoffs by aircraft classification. (There are two critical time periods per 24-hour day: 1700-2200 hours and 2200-0700 hours.)

The items of data listed above are used to establish correction factors to be applied to standard sound level contour sets available for various aircraft classifications.

Table I-20

ESTIMATED RESPONSE OF RESIDENTIAL COMMUNITIES TO VARYING LEVELS OF AIRCRAFT NOISE
Stillwater Municipal Airport

	Composite Noise Rating (CNR)		
Zone	Takeoffs & Landings	Runups	EXPECTED RESPONSE
1	Less than 100*	Less than 80	Essentially no complaints would be expected. The noise may, however, interfere occasionally with certain activities of the residents.
2	100 to 115	80 to 95	Individuals may complain, perhaps vigorously. Concerted group action is possible.
3	Greater than 115	Greater than 95	Individual reaction would likely include repeated, vigorous complaints. Concerted group action might be expected.

Source: "Land Use Planning Relating to Aircraft Noise," Bolt, Beranek and Newman, Inc., October, 1964.

* Figures given are ratings established by Bolt, Beranek, and Newman, Inc., and are not to be confused with decibels (e.g., 100 CNR equals approximately 80 decibels).

Table I-21

PEAK DAY LANDINGS AND TAKEOFFS
Stillwater Municipal Airport

	1975		1995	
Aircraft Type	Landings	Takeoffs	Landings	Takeoffs
Single Engine	136	136	181	181
Multi-Engine	20	20	57	57
Turbine	4	4	9	9
Helicopter and Other	0	0	3	3

The data presented in Tables I-21 and I-22 provides for selection of the proper contour and CNR correction factors from the Bolt, Beranek and Newman Research Project. Contours for single engine light aircraft are not provided, because these aircraft are not a source of irritating noise. Examination of standard landing and takeoff contours and CNR correction factors for multi-engine piston or turboprop aircraft result in 100 CNR contours. The number of operations by these types of aircraft at the Stillwater Municipal Airport produce correction factors that reduce the extent of the standard contours to a point where there are no 115 CNR contours.

Table I-22

ANNUAL RUNWAY UTILIZATION
Stillwater Municipal Airport

1975

Aircraft Type	Percent Utilization by Runways							
	13,04	35,04	31	22	35	13	04	17
Single Engine	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Multi-Engine	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Turbo Prop	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Turbo Jet/ Turbo Fan	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Helicopter & Others	0	0	0	0	0	0	0	0

1995

Aircraft Type	Percent Utilization by Runways							
	13,04	35,04	31	22	35	13	04	17
Single Engine	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Multi-Engine	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Turbo Prop	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Turbo Jet/ Turbo Fan	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44
Helicopter & Others	26.25	17.27	11.33	36.16	.655	5.85	.835	1.44

Numbers of landings and takeoffs in a 24-hour day have been calculated and can be obtained from Table I-21. Values shown are for total operations on a peak day upon which the CNR contours are based. Aircraft operations for the years examined in determining CNR contours are 1975 through 1995, since they provide the extremes of

data. The peak day forecast of landings and takeoffs is shown.

The time period in which landings or takeoffs occur must be considered, since sound levels that may be acceptable during hours when a resident is awake may be very unacceptable if that same resident is trying to sleep. However, the nature of a general aviation airport such as Stillwater Municipal Airport is that there are not enough night-time operations to present a problem. Local pleasure and training flights are conducted during the day with some concentration of activity in the early evening, when business people make use of daylight for training flights. Business flights will be concentrated during business hours. Operations of aircraft during the time period of 2200-0700 hours is so infrequent that CNR corrections will not be made for time-of-day.

Figure III-4, Proposed Land Use Plan, presents future land use recommendations considering the projected (1995) 100 CNR sound contour. It can be seen from these plans that areas mostly effected from aircraft noises will be those from southerly aircraft takeoffs and departures from the Runway 17/35, because this runway was selected for jet activity (CNR contours for this runway result from business jet activity). Runway 13/31 would cause serious environmental disturbances to the southeast if used for excessive jet

activity and therefore, should be limited to multi-engine aircraft. Runway 04/22 does not present noise problems, but because of length, should also be limited to multi-engine aircraft (CNR contours for these runways are for light multi-engine aircraft).

3. Pollution

Existing air quality statistics for the Stillwater Municipal Airport area are unavailable because there is no recording station in the immediate area. Existing air quality records in adjacent communities were considered too remote to be of any value in assessing local conditions in the Stillwater area. It can generally be assumed, however, that because of the types of industry located there, the overall quality of the ambient air in the Stillwater area would be somewhat lower than the quality of the air in the average community in Oklahoma.

It can also be assumed that because of the location of Stillwater Municipal Airport away from industrial development, the existing air quality in the area of the airport would be somewhat higher than that of the City of Stillwater.

In order to assess the effect of the development of Stillwater Municipal Airport air quality, the anticipated change in air quality conditions was calculated. The method employed utilized the application of accepted pollutant emissions produced by a general aviation piston engine aircraft during a typical landing and takeoff cycle.

A landing-takeoff cycle (LTO) includes all normal operation modes performed by an aircraft between the time it descends through an altitude of 3,500 feet on its approach and the time it subsequently reaches the 3,500 foot altitude after takeoff. It should be made clear that the term "operation" used by the Federal Aviation Administration to describe either a landing or a takeoff is not the same as the LTO cycle. The LTO cycle incorporates the ground operations of idle, taxi, landing run, and takeoff run and the flight operations of takeoff and climbout to 3,500 feet and approach from 3,500 feet to touchdown.

In the determination of emissions, the LTO cycle is separated into five distinct modes: (1) taxi-idle, (2) takeoff, (3) climbout, (4) approach and (5) taxi-idle. Table I-23 shows typical operating time in each mode for the various types of aircraft classes during periods of heavy activity at a large metropolitan airport. Emissions factors for the complete LTO cycle presented in Table I-24 were determined through the use of typical times shown in Table I-23.

Table I-25 presents the anticipated changes in the quality of air in the area of Stillwater Municipal Airport. Ultimate pollution levels in this range are generally considered insignificant.

Table I-23

TYPICAL TIME IN MODE FOR LANDING-TAKEOFF AT A METROPOLITAN AIRPORT
Stillwater Municipal Airport

Aircraft	Time in mode, minutes				
	Taxi-idle	Takeoff	Climbout	Approach	Taxi-idle
Jumbo Jet	19.00	0.70	2.20	4.00	7.00
Long range jet	19.00	0.70	2.20	4.00	7.00
Medium range jet	19.00	0.70	2.20	4.00	7.00
Air carrier jet	19.00	0.50	2.20	4.50	7.00
Business jet	6.50	0.40	0.50	1.60	6.50
General Aviation turboprop	19.00	0.50	2.50	4.50	7.00
General Aviation piston	12.00	0.30	4.98	6.00	4.00
Piston transport	6.50	0.60	5.00	4.60	6.50
Helicopter	3.50	0.00	2.50	4.50	7.00
Military transport	19.00	0.50	2.50	4.50	7.00
Military jet	6.50	0.40	0.50	1.60	6.50
Military piston	6.50	0.60	5.00	4.60	6.50

Source: "Compilation of Air Pollutant Emissions", Second Edition, AP42, April, 1973.

Table I-24

EMISSION FACTORS PER AIRCRAFT LANDING-TAKEOFF CYCLE[a,b]
(lb/engine and kg/engine)
Stillwater Municipal Airport

EMISSION FACTOR RATING: B

Aircraft	Solid particulates[a]		Sulfur oxides[c]		Carbon monoxide		Hydrocarbons		Nitrogen oxides[d] (NO_x as NO_2)	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
Junbo jet	1.30	0.59	1.82	0.83	46.8	21.2	12.2	5.5	31.4	14.2
Long range jet	1.21	0.55	1.56	0.71	47.4	21.5	41.2	18.7	7.9	3.6
Medium range jet	0.41	0.19	1.01	0.46	17.0	7.71	4.9	2.2	10.2	4.6
Air carrier turbo-prop	1.1	0.49	0.40	0.18	6.6	3.0	2.9	1.3	2.5	1.1
Business jet	0.11	0.05	0.37	0.17	15.8	7.17	3.6	1.6	1.6	0.73
General aviation turboprop	0.20	0.09	0.18	0.08	3.1	1.4	1.1	0.5	1.2	0.54
General aviation piston*	0.02	0.01	0.014	0.006	12.2	5.5	0.40	0.18	0.047	0.021
Piston transport	0.56	0.25	0.28	0.13	304.0	138.0	40.7	18.5	0.40	0.18
Helicopter	0.25	0.11	0.18	0.08	5.7	2.6	0.52	0.24	0.57	0.26
Military transport	1.1	0.49	0.41	0.19	5.7	2.6	2.7	1.2	2.2	1.0
Military jet	0.31	0.14	0.76	0.35	15.1	6.85	9.93	4.5	3.29	1.49
Military piston	0.28	0.13	0.14	0.04	152.0	69.0	20.4	9.3	0.20	0.09

[a]Source: "Compilation of Air Pollutant Emissions", Second Edition, AP42, April, 1973
[b]Emission factors based on typical times in mode shown in Table I-23.
[c]Based on 0.05 percent sulfur content fuel.
[d]Engine emissions based on Pratt & Whitney R-2800 engine scaled down two times.
*Utilized for emission calculations.
Will effect the town primarily during winter months when wind is from a notherly direction.

Table I-25

PROJECTED INCREASES IN AIRPORT USAGE AND AIR POLLUTION
Stillwater Municipal Airport

Year	Aircraft Type	No. Based	No. of LTO's[c]	Solid Particals tons/yr.	SO[d] tons/yr	CO[e] tons/yr	Hydro-Carbons tons/yr	No. as NO_2 tons/yr	Total tons/yr	Total	Increase of 1975
1975	Single Engine	58	40,832	.408	.286	249.075	8.166	.959	258.894		
	Multi-Engine	10	6,005	.120	.084	73.261	2.401	.282	76.149		
	Turbine		1,201	.066	.222	9.488	2.162	.960	12.898		
	Heli-copter	0	0	0	0	0	0	0	0		
										349.941	
1980	Single Engine	63	43,808	.438	.307	267.228	8.761	1.029	277.763		
	Multi-Engine	11	8,121	.162	.117	99.076	3.248	.382	102.985		
	Turbine		1,389	.076	.257	10.973	2.500	1.111	14.917		
	Heli-copter		107	.013	.009	.305	.028	.030	.385		
										396.050	13.82%
1885	Single Engine	66	46,781	.468	.327	285.36	9.356	1.099	296.610		
	Multi-Engine	14	10,540	.211	.147	128.588	4.216	.495	133.657		
	Turbine	1	1,659	.091	.307	13.106	2.986	1.327	17.745		
	Heli-copter		237	.029	.021	.675	.095	.067	.887		
										448.899	29.01%

Table I-25 PROJECTED INCREASES IN AIRPORT USAGE AND AIR POLLUTION (continued)

1990	Single Engine	70	49,314	.493	.345	300.81	9.862	1.158	312.668	
	Multi-Engine	17	14,395	.288	.201	175.619	5.758	.676	182.542	
	Turbine	1	2,265	.124	.419	17.893	4.077	1.812	24.325	
	Heli-copter	1	666	.083	.059	1.898	.173	.189	2.319	
										521.854 49.98%
1995	Single Engine	75	54,210	.542	.379	330.681	10.842	1.274	343.718	
	Multi-Engine	19	17,315	.346	.242	211.243	6.926	.814	219.571	
	Turbine	2	2,861	.157	.529	22.602	5.149	2.288	30.725	
	Heli-copter	1	903	.112	.081	2.573	.234	.257	3.258	
										597.218 71.64%

[a]From Table 3.2.1-3 "Compilation of Air Pollutent Emissions," Second Edition.

[b]Does not take into consideration federal regulations for reduced aircraft emissions.

[c]Includes both local and itinerant LTO's

[d]Sulfur Oxides.

[e]Carbon Monoxide.

4. Water Pollution

Stillwater Municipal Airport utilizes city water and septic tanks. Anticipated development of available airport land for revenue-producing purposes will require evaluation of demands on system capabilities. It is anticipated that eventual conversion to a sewage disposal system, provided in the 1974 Lease Agreement with the City, will be more economically feasible.

The composition of the effluents from the airport must be controlled to prevent malfunction of the sewage system. Fuels and other hazardous chemicals now are handled at the airport in relatively small amounts. Solid waste should be disposed of in municipal land fills approved by the State of Oklahoma and the Environmental Protection Agency.

5. Environmental Changes Caused by Airport Site Development

There are no known historic or archeological sites directly affected by the proposed airport development. In the event that any unusual archeological relics should be discovered prior to or during construction, all necessary steps must be taken to protect these findings in coordination with concerned local and state agencies.

Drainage patterns in the area of the airport are firmly established. The proposed development will not change those patterns.

FAA Advisory Circular 150/5370-7, "Airport Construction Controls to Prevent Air and Water Pollution," supplies guidance construction of airports developed

under the Airport and Airways Development Act of 1970. The procedures outlined in the Advisory Circular must be followed for all airport construction work. Precautions taken during construction should include, but not be limited to the following:

> Brush, vegetation and other solid wastes resulting from land clearing and construction should be disposed of in the sanitary land fill. Burning of waste materials must not be allowed.
>
> No large areas should be stripped of vegetation at one time. All areas stripped of vegetation during construction must be replanted to insure future growth. All construction areas should be graded so as to provide adequate drainage yet not cause erosion. Surface run-off in construction areas should be collected through a storm sewer system to discharge into existing drainage courses. Water-sprinkling equipment should be utilized to minimize dust conditions at the construction site and at paving-mixing plants.
>
> Recommended application rates and storage methods for pesticides and herbicides must be followed during and following construction. Application equipment and empty containers must not be rinsed and discharged so as to pollute a stream or ground water.
>
> The sanitary sewer, water lines and other utilities that cross the construction area must be encased in load-bearing casings to meet structural requirements.
>
> Spills of fuels, lubricants or other hazardous liquids should be removed with absorbent cleaning agents such as distomaceous earth, emulsion compounds or rags, as specified by National Fire Protection Association Pamphlet No. 407. Contaminated absorbents should be placed in metal containers with self-closing lids until they can be disposed of in a safe location. Contaminated soils should be removed for disposal in the sanitary land fill.

Hazards associated with particular land uses are shown in Table I-26. It is undesirable to have heavily

populated areas close to airport approach and departure routes. The highest percentage of aircraft accidents occur during the approach and departure phases of flight.[1]

[1] A recent analysis of air carrier accidents for the period 1957-1968 indicates that approximately 95% of survivable accidents occurred during takeoff and landing phases of flight, and that 70% of all airline accidents occurred on or near the airport.

Table I-26
COMPATIBILITY OF LAND USES
Stillwater Municipal Airport

USE	RATING	HAZARDS AND OTHER COMMENTS
OPEN SPACE		
Natural Uses		
Forest Reserves	Very Good	Most wildlife will adapt to aircraft noise. Areas should be fenced. Birds can be a hazard near water areas. See FAA Advisory Circular 150/5200-1.
Game and Fish Preserves	Very Good	Same as above.
Land Reserves	Very Good	-----
Rivers and Canals	Very Good	-----
Bays and Lakes	Very Good	Birds can be a hazard.
Agricultural Uses		
Landscape Nurseries	Good	-----
Truck Farming	Very Good	-----
Sod and Seed Farming	Very Good	Seed farms can attract birds.
Tree Farming	Very Good	-----
Crop Farming	Very Good	-----
Stock Farming	Good	Livestock adapt to aircraft noise.
Dairy Farming	Good	Cows adapt to noise conditions
Poultry Farming	Poor	Particularly under approach areas.
Stockyards	Good	Livestock adapt to aircraft noise under approach areas.
Highway and Railroad Uses		
Highways (4-lane or greater)	Very Good	An exception would be under approach areas, (adverse psychological effect).

Table I-26 COMPATIBILITY OF LAND USES (Continued)

Railroads	Very Good	Same as Highways
PUBLIC USE		
Recreational Uses		
Marinas	Very Good	-----
Golf Courses	Very Good	To be avoided close in under approach areas.
Parks and Picnic Areas	Very Good	-----
Playgrounds	Marginal	To be avoided under approach areas.
Athletic Fields	Marginal	Noise and hazard.
Riding Academies and Trails	Good	-----
Tennis Courts	Good	Avoid under approach areas.
Outdoor Theaters	Poor	Noise, hazard, landing lights.
Swimming Pools	Very Good	-----
Fairgrounds and Racetracks	Poor	Noise and hazard.
Municipal Utilities Uses		
Water Storage	Very Good	Can attract birds
Water Treatment Plants	Very Good	-----
Sewage Disposal Facilities	Very Good	-----
Gas and Oil Facilities	Very Good	Considered a hazard under approach areas.
Electrical Plants	Marginal	Hazard, particularly under approach areas.
Power Lines	Poor	Hazard, high voltage lines may affect navigation aids.
Coal Yards	Good	-----
COMMERCIAL USES (None to be under approach areas - ratings are for other areas around airports.)		
Aerial Surveying (office/plant)	Very Good	Incorporate sound conditioning to control interior noise level.
Aircraft Sales	Very Good	Same as above
Aviation Repairs	Very Good	Same as above
Hotels and Motels	Very Good	Same as above
Retail Businesses	Good	Incorporate sound conditioning in construction.

Shopping Centers	Good	Incorporate sound conditioning in construction.
Banks	Good	Sound reduction in construction is necessary.
Gasoline Service Stations	Very Good	Hazard in approach areas.
Automobile Storage	Very Good	-----
Parking Lots	Very Good	-----
Office Buildings	Good	Incorporate sound reduction conditioning.
Theaters	Good	Avoid in approach areas.
Auditoriums	Good	Same as above.
Stadiums	Poor	Hazard and noise under approach or close to airport boundaries.
Public Buildings	Good	Incorporate sound conditioning in construction.
Taxi Terminals	Good	-----
Bus Terminals	Good	-----
Truck Terminals	Very Good	-----
Memorial Parks	Very Good	May affect ILS when located under approach areas.
Pet Cemeteries	Good	-----

INDUSTRIAL USES (Careful consideration should be given before locating industries under approach areas.)

Research Laboratories	Very Good	Incorporate sound conditioning where interior noise control is desired. Noise and vibration may affect sensitive instrumentation in certain industries.
Warehouses	Very Good	Same as above.
Aircraft Factories	Very Good	Same as above.
Transportation Terminals and Parks	Very Good	-----
Air Freight Terminals	Very Good	-----
Rail Yards	Very Good	-----

RESIDENTIAL AND INSTITUTIONAL USES*

Residential (1 acre or above)	Poor	Poor under approaches or close to airport boundaries.
Single Family Dwellings	Poor	-----
Multifamily Dwellings	Poor	-----
Schools	Poor	-----

Table I-26 COMPATIBILITY OF LAND USES (Continued)

Hospitals	Poor	-----
Churches	Poor	-----

*Residential and institutional uses can be made acceptable as far as interior noise levels are concerned through sound conditioning and air conditioning of the structures. The extent of outdoor activity, then, becomes the critical factor.

Source: Transportation Consultants: "Compatible Land Use Planning Around Airports," FAA, Washington, D.C., June, 1966.

PHASE II, SITE SELECTION

At this stage of an Airport Master Plan Study, it is important to determine if the existing airport is capable of handling the forecast traffic, if it is compatible with the development of the surrounding communities, and if it is financially feasible to continue the use of the airport in its present location. If the existing airport site does not meet these criteria, a new location must be established and plans developed for land acquisition and construction of a new airport at the proper time.

All land needed for the expansion of the airport is presently owned by the City or the University and, therefore, is capable of handling the planned expansion.

The present runway configuration will accomodate the forecast traffic beyond 1994 with the lengthening of Runway 17/35. Existing airspace is unrestricted and will allow space for the planned approach zones. Environmentally, the airport growth is compatible with growth of the surrounding communities. There is no foreseeable problem in the development of an additional access point to the airport and all utilities are available or are financially feasible for development.

All established criteria had been met by the present location of the airport and by the City adopting the recommended zoning requirements, the site should be protected beyond the time span of this report.

PHASE III, AIRPORT PLANS

A. Airport Layout Plan

1. Existing and Proposed Development

The existing airport facility is classified by the FAA at the present as a general utility airport. Existing conditions are such that most clearance criteria required by basic and general transport can be provided at little or no cost. The airport layout plan showing existing and proposed development for Stillwater Municipal Airport is presented in Figure III-1.

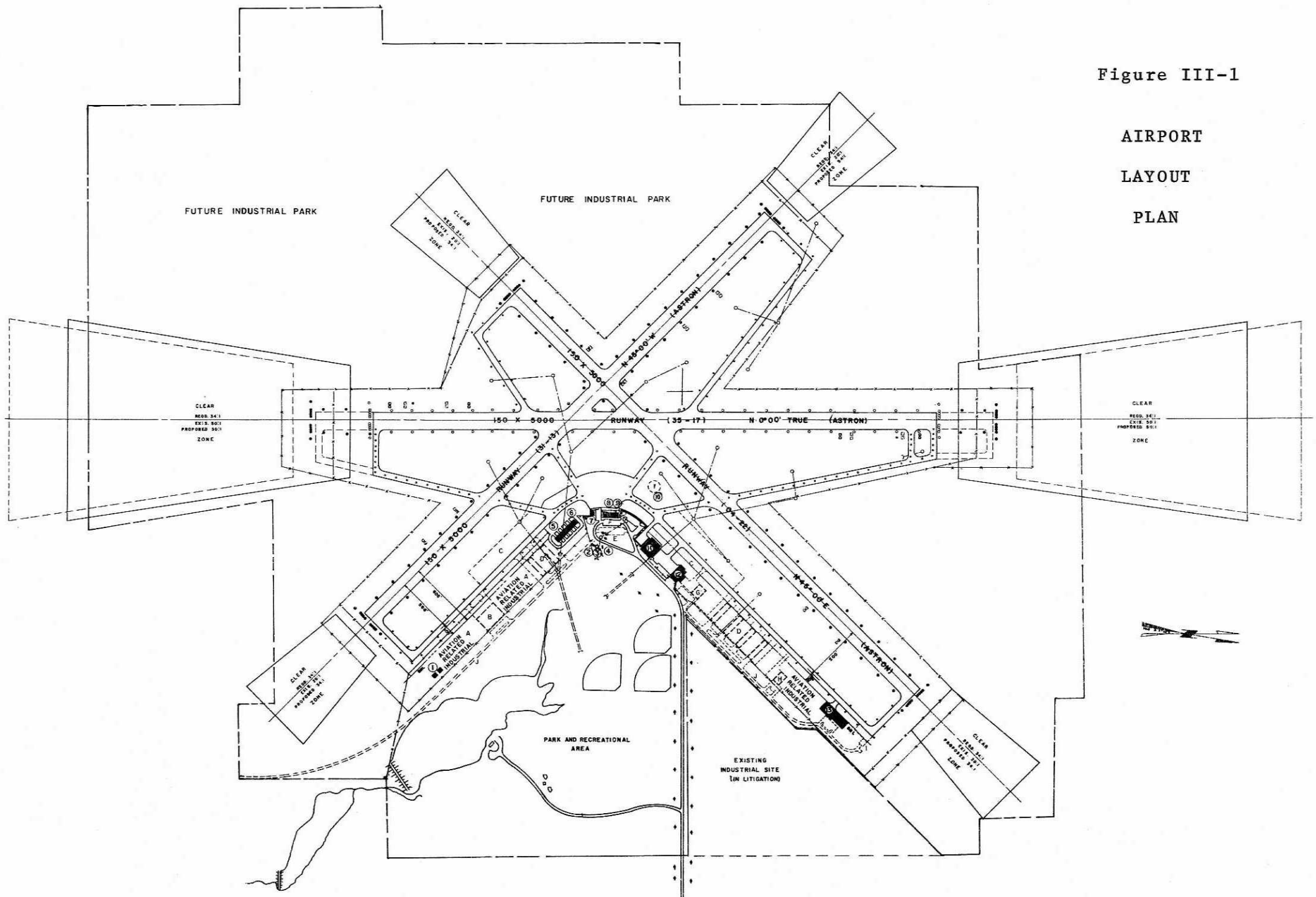
The present industrial site at the airport is presently being held in litigation due to poor planning techniques. The land just southeast of the existing T-hangar was used as a landfill and land directly north of the airport property is presently being used for the same. Approximately 140 acres at the northwest corner of the airport was just purchased by the City for the purpose of another landfill. FAA regulation 150/5200-3A explains that landfills attract birds and are, therefore, classified as hazardous areas to airports. Allowing landfill areas near the airport can result in loss of government aid for airport funding. It is recommended that land use planning techniques be applied to establish a basis for optimum utilization of airport and surrounding property.

2. Facilities No Longer Needed

Most of the existing airport property fencing is in

Figure III-1

AIRPORT LAYOUT PLAN



BUILDING SCHEDULE			
EXISTING		FUTURE	
1	SEVERE WEATHER LAB	A	INDUSTRIAL SITE
2	MOBILE HOME	B	EXECUTIVE HANGAR
3	BEACON	C	AIRCRAFT TIE-DOWN
4	TRANSFORMER VAULT	D	T-HANGAR
5	T-HANGAR	E	AUTO PARKING
6	UNIVERAL AVIATION	F	TERMINAL EXTENTION
7	FIRE & RESCUE	G	MAINTENANCE HANGAR
8	TERMINAL	H	OSU FLIGHT TRAINING
9	CONTROL TOWER	I	FUEL STORAGE
10	TETRAHEDRON	J	ROAD
11	CITY HANGAR		
12	UNIVERSITY HANGAR		
13	AERO-TECH LAB		

LEGEND	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	
BUILDINGS		
DRAINAGE LINES		
SECURITY FENCE		
LIGHTING		
ROADS & PAVING		
VASI		

BASIC DATA TABLE							
	RUNWAY DATA						AIRPORT DATA
	RUNWAY 17-35 EXIST.	RUNWAY 17-35 ULT.	RUNWAY 04-22 EXIST.	RUNWAY 04-22 ULT.	RUNWAY 13-31 EXIST.	RUNWAY 13-31 ULT.	
EFFECTIVE GRADIENT %	.46	.46	.58	.58	.30	.30	AIRPORT ELEVATION 985' MSL
% WIND COVERAGE	94	94	+2	+2	+3.7	+37	MEAN MAX. TEMP. 94° F
INSTRUMENT RUNWAY	NO	YES	NO	NO	NO	NO	
PAVEMENT STRENGTH	46,000S	55,000S	14,000S	14,000S	14,000S	14,000S	
APPROACH SURFACES	50:1	50:1	20:1	34:1	20:1	34:1	
RUNWAY LIGHTING	MIRL	MIRL	NONE	MIRL	NONE	MIRL	
RUNWAY MARKING	N.P. INST	N.P. INST	BASIC	BACIC	BASIC	BASIC	
NAVIGATIONAL AIDS	VASI, REIL	VASI, REIL ALS, MLS	NONE	VASI, REIL	NONE	VASI, REIL	
TAXIWAY LIGHTING	MITL	MITL	NONE	MITL	NONE	MITL	
TYPE PAVEMENT	ASPH. O'LAY	ASPH. O'LAY		ASPH. O'LAY		ASPH. O'LAY	

fair to poor condition and does not meet the current criteria as to distance from fence to end of runway. The fence should be repaired and extended to 170 feet at the ends of Runways 04/22 and 13/31 to meet criteria established for 34:1 slope. Runway 17/35 has a 50:1 slope requiring the fence to be relocated 250 feet from the ends of the runway.

3. Airport Layout Drawing

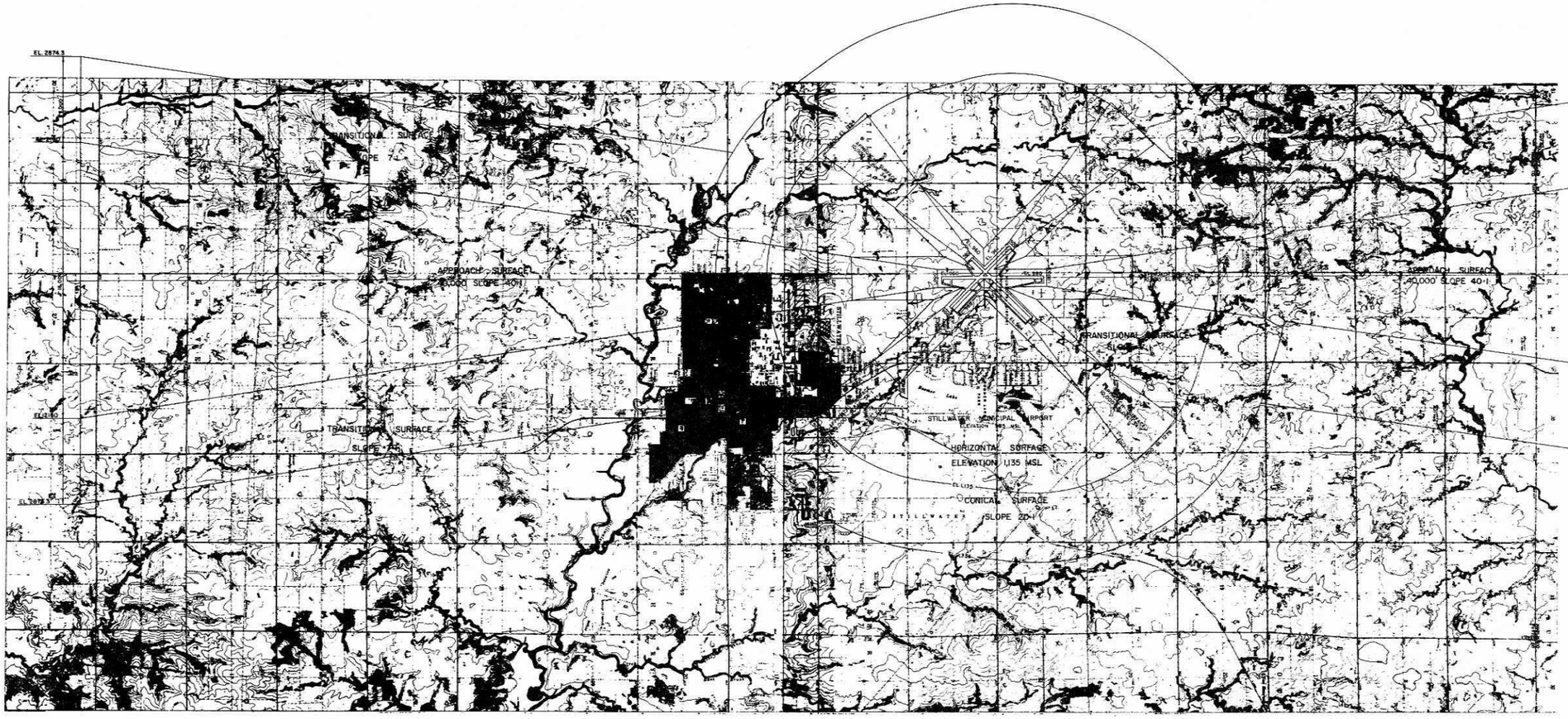
Figure IV-1 illustrates the existing and proposed airport layout and includes the basic data table, wind information, clear zones and airport access. The basic data table presents critical airfield information, including identification of structures.

4. Approach and Clear Zone Plan

The approach and clear zone plan for Stillwater Municipal Airport serves as the vicinity map and is shown in Figure III-2.

Clear zones shown in greater detail on the airport layout plan for Runway 17/35 have a 50:1 slope and are for precision instrument approaches. Prior to the installation of the ILS, however, only a 34:1 slope is required. Clear zones for Runways 13/31 and 04/22 have a slope of 34:1 and are for non-precision instrument approaches with visibility minimums greater than 3/4 of a mile.

All obstructions were removed from the existing clear zones and no additional clearing will be necessary



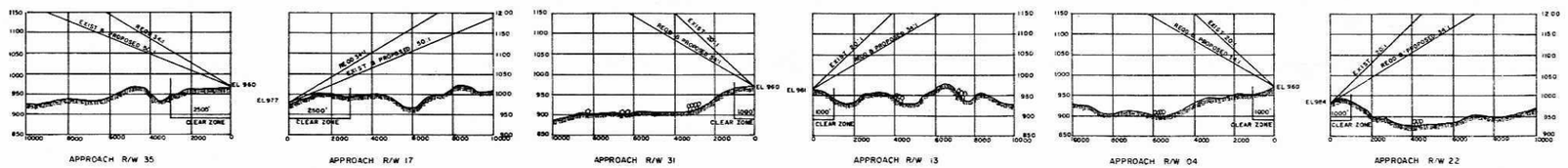


Figure III-2

APPROACH & CLEAR ZONE PLAN

to meet the requirements for the recommended clear zones. It is recommended that the hazard zoning ordinances of Stillwater be updated to reflect the approach and clear zone plan (Figure III-2).

B. Land Use Plan

1. Noise

Incompatibility between airports and adjacent land use is primarily a result of aircraft noise. Most of the land area within Zone 2 (100 CNR), as identified by Bolt, Beranek, and Newman, falls within the airport property with the exception of those CNR contours from Runway 17/35 to the south. At the present time, little residential development has occurred in the area covered by this contour. Accepted land planning techniques should be followed to insure that this condition is continued. Recommendations stated in the environmental section of this study for Runways 04/22 and 13/31 (to be limited to multi-engine aircraft or smaller) shall also be followed to protect present developed residential areas.

2. Land Use On Airport Property

The airport layout plan (Figure III-1) provides for the orderly development of (1) the airfield facilities, (2) aviation related development, (3) industrial parks, and (4) a park and recreational area. The airfield area consisting of the recommended runway and taxiway systems, safety and clearance areas and clear and approach

zones will provide takeoff and landing areas for aircraft including general utility, business jet and general transport classifications.

Future industrial parks could result from the anticipated Cimarron Turnpike spur as explained in "Land Use of Airport Property." It is also suggested that the land used by the Isaac Walton league be developed into a park and recreational area for the airport and the City. For the protection of the public, the skeet shooting range should be relocated to a more appropriate site.

3. Land Use Off Airport Property

The existing land use adjacent to Stillwater Municipal Airport is shown in Figure III-3. While industrial developments to the west and southeast seem inpractical because of the established residential development, the area lying north, west and south of the airport is very well suited to such usage. Although the areas to the north and south fall into the approach zones for Runway 17/35, this land could be used for certain types of industry not affected by noise. Upon the anticipated development of the Cimarron Turnpike spur to U.S. Highway 51, it is recommended that all land west to the airport property be zoned industrial. This provides an excellent opportunity for the onsite industrial development.

C. Terminal Area Plan

With the exception of extending the terminal building, providing additional auto parking, and remodeling the

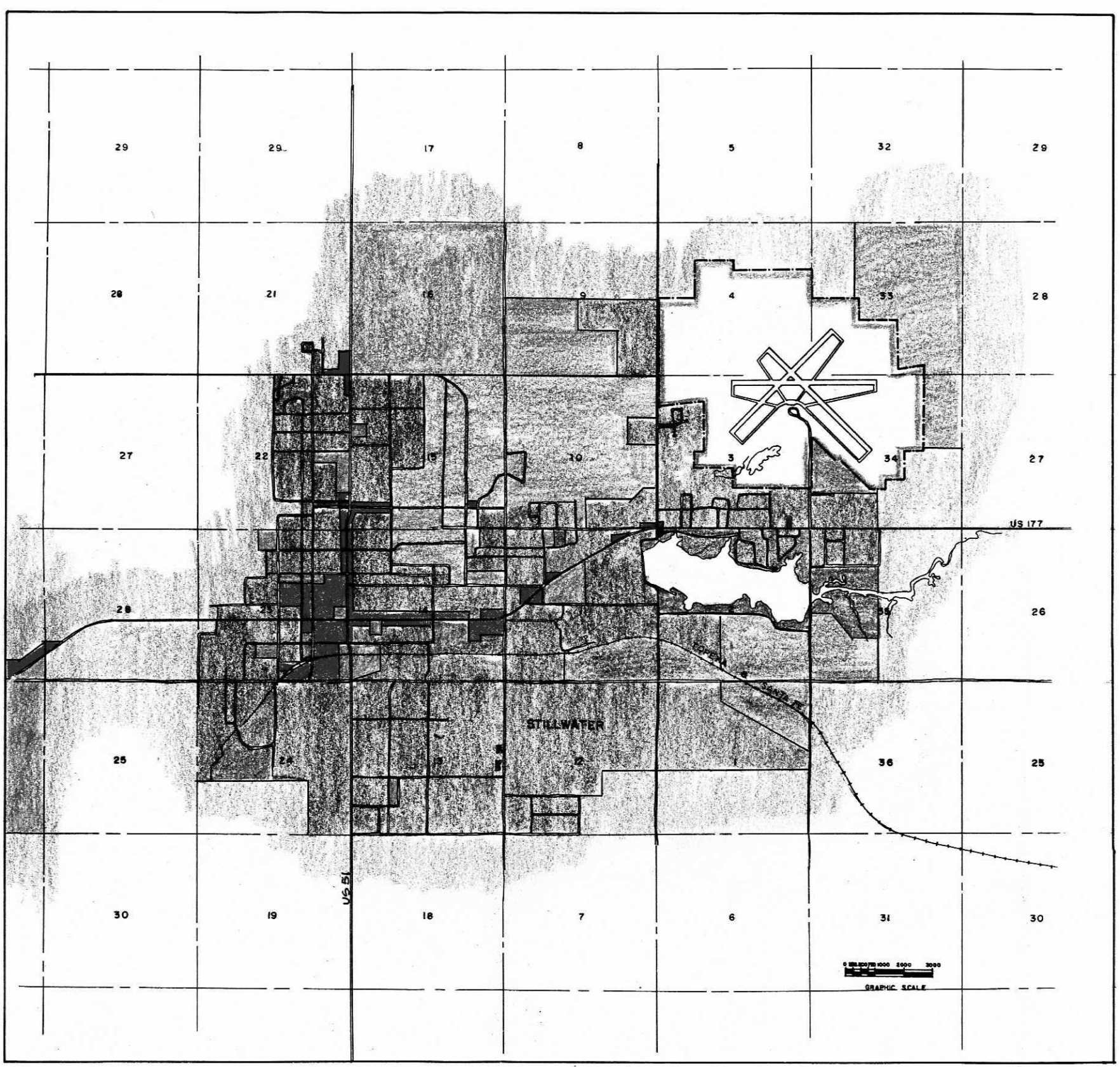


Figure III-3

EXISTING

LAND USE

PLAN

STILLWATER
MUNICIPAL
AIRPORT

RESIDENTIAL
COMMERCIAL
PUBLIC
INDUSTRIAL
PARKS
AGRICULTURAL
AIRPORT
BOUNDARY

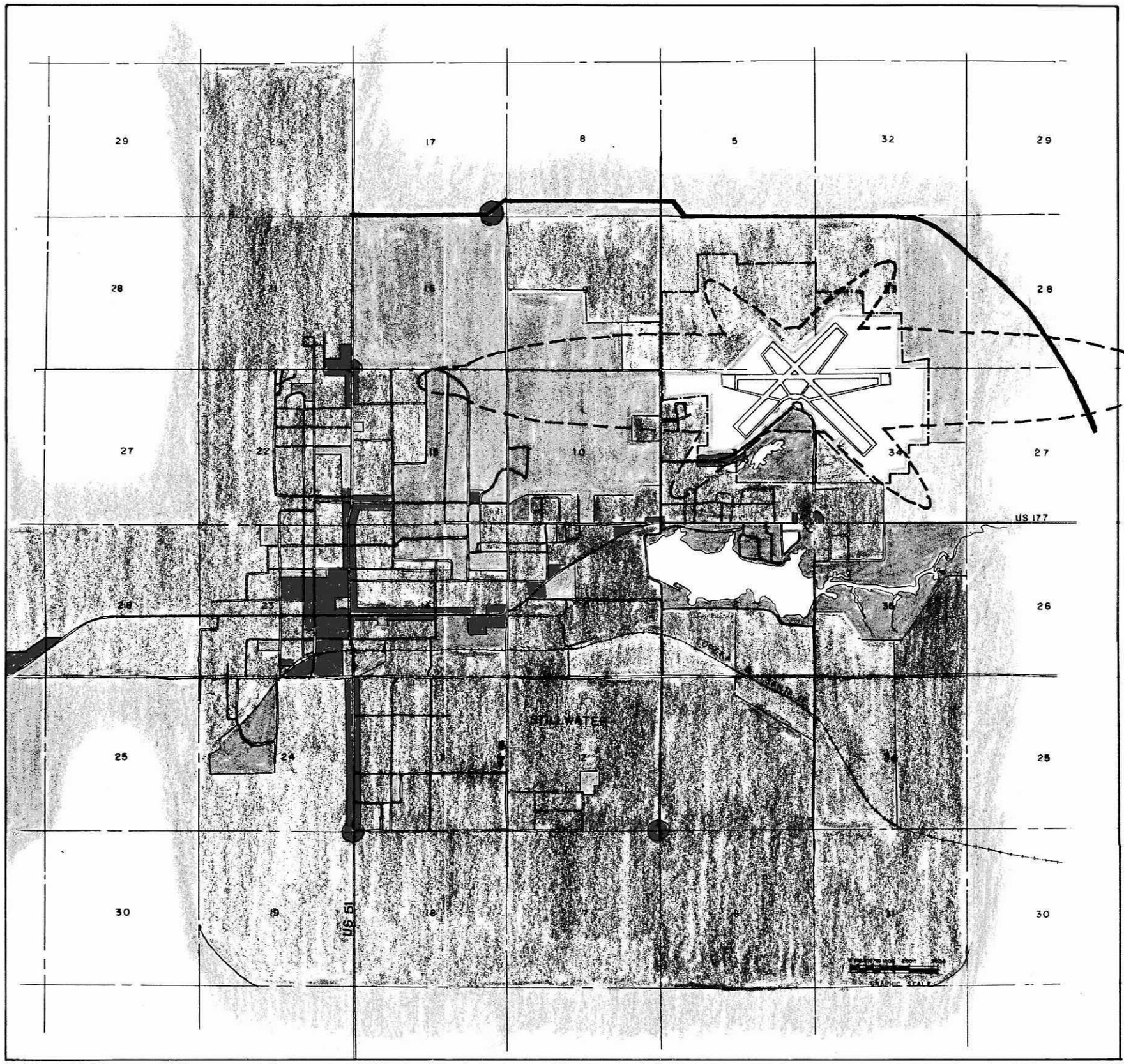


Figure III-4

PROPOSED

LAND USE

PLAN

interior, no development was needed for the terminal area. Terminal area improvements in the recommended development program are shown on the airport layout plan.

D. Airport Access and Parking Plan

Surface access facilities serving the Stillwater Municipal Airport are shown on the land use and approach and clear zone plans in Figures III-2 and III-3. The development of a new access road to the airport is shown in the airport layout plan, Figure III-1. Onsite access and parking to aid the existing and proposed development are also shown in Figure III-1.

E. Landscaping

Landscaping, although not shown in this study because of the scale involved, plays an important part in any development, existing or proposed. Because of the character that a smaller airport usually portrays, an airport does not always present itself in a pleasing manner. In some cases, this could limit certain types of development from occurring if, for instance, the site did not reflect the image a business wished to convey. There are also certain areas that would need screening from the public or prevent the public from entering. The selection of specific plant material could serve asthetic value as well as barriers and screening. As development progresses, landscaping should be considered for each type of construction.

PHASE IV. FINANCIAL PLAN

A. Schedules and Cost Estimates

1. General

The Stillwater Municipal Airport development schedule is predicated on:

- Upgrading of existing facilities to acceptable minimum standards.
- Improvement of general aviation service facilities in the interest of aviation related growth.
- Ultimate development of Stillwater Municipal Airport as a general utility airport.
- Continued planning and maintenance of facilities in order to protect existing and future investments.
- Encouragement of industrial growth for the City of Stillwater and Payne County.
- Land use planning keyed to future airport and industrial development.

2. Development Schedule

Recommended development projects have been divided into three time periods: Short Term, beginning in June of 1976, and ending in December 1979; Intermediate Term, beginning in 1980 and continuing through 1984; and Long Term, beginning in 1985 and extending through 1994.

Tables IV-1 and IV-2 present the proposed development schedule and associated project descriptions for Stillwater Municipal Airport broken down to reflect short term, intermediate term, long term and contingency development phases. Items in the short term phase are identified by calendar year project numbers, while intermediate term and long term items are identified by

Table IV-1

SHORT TERM (1976-1979) DEVELOPMENT SCHEDULE
COST ESTIMATES AND FUNDING SOURCES
Stillwater Municipal Airport

Project No.	PROJECT DESCRIPTION	Estimated Construction Cost	Cost Breakdown FAA	Cost Breakdown Local	Source of G. O. Bond	Local Funds Revenue Bonds
1976-1	Install and fence in fuel tanks, construct fueling apron near Aero-Tech.	$ 35,000	$ 26,000	$ 9,000	$ 9,000	-
1976-2	Construct aircraft tie-down area for 10 aircraft.	37,000	28,000	9,000	9,000	-
1976-3	Construct apron west of University hangar plus access.	32,000	24,000	8,000	8,000	-
1976-4	Construct maintenance shop plus parking.	89,000	-	89,000	89,000	-
1976-5	Construct asphalt road from new maintenance shop to Aero-Tech and fuel tanks.	56,000	-	56,000	56,000	-
1976-6	Construct asphalt parking for Aero-Tech.	12,000	-	12,000	12,000	-
1976-7	Overlay access around existing T-hangars.	10,000	-	10,000	10,000	-
	1976 Totals:	271,000	78,000	193,000	193,000	-
1977-1	Construct one ten-unit T-hangar and access west of new maintenance shop.	114,000	-	114,000	34,000	80,000
1977-2	Construct Flight School facilities including hangar and access.	222,000	-	222,000	222,000	
1977-3	Remodel Terminal Building plus landscaping.	58,000	-	58,000	58,000	-
1977-4	Construct auto parking for Terminal Building.	16,000	-	16,000	16,000	-
1977-5	Reseal runway pavement joints on Runway 13/31 and 04/22.	120,000	90,000	30,000	30,000	-
	1977 Totals:	530,000	90,000	440,000	360,000	80,000
1978-1	Extend Runway 17/35 1,000', relocate VASI's, REILS, install addition runway lights.	300,000	225,000	75,000	75,000	-
1978-2	Extend barbed wire fences at end of each runway.	30,000	23,000	7,000	7,000	-
1978-3	Construct ILS for Runway 17/35 and MALSR, install localizer.	429,000	322,000	107,000	107,000	-
1978-4	Clean out and repair lean to's on City hangar, repair roof.	1,000	-	1,000	1,000	-
1978-5	Construct auto parking for ground maintenance in City hangar.	3,000	-	3,000	3,000	-
1978-6	Construct one ten-unit T-hangar plus access west of maintenance shop.	117,000	-	117,000	33,000	84,000
	1978 Totals:	880,000	570,000	310,000	226,000	84,000
1979-1	Construct aircraft tie-down area north & west of new maintenance shop.	106,000	80,000	26,000	26,000	-
1979-2	Construct one ten-unit T-hangar and access west of maintenance shop.	123,000	-	123,000	34,000	89,000
	1979 Totals:	229,000	80,000	149,000	60,000	89,000
	SHORT TERM DIVELOPMENT TOTALS:	$1,910,000	$818,000	$1,092,000	$839,000	$253,000

Table IV-2

INTERMEDIATE TERM (1980-1984) AND LONG TERM (1985-1995)
DEVELOPMENT SCHEDULE, COST ESTIMATES AND FUNDING SOURCES
Stillwater Municipal Airport

Project No.	PROJECT DESCRIPTION	Estimated Construction Cost	Cost Breakdown FAA	Cost Breakdown Local	Source of G. O. Bond	Local Funds Revenue Bonds
1980-84-1	Bring Runway 04/22 up to profile, install runway and taxiway light, VASI's and REILS.	$ 535,000	$ 401,000	$ 134,000	$ 134,000	-
1980-84-2	Construct one ten-unit T-hangar and access west of new maintenance shop.	154,000	-	154,000	49,000	105,000
1980-84-3	Construct aircraft tie-down area north of taxiway for Runway 22.	187,000	140,000	47,000	47,000	-
1980-84-4	Overlay Runway 17/35 with 4" of asphalt.	467,000	350,000	117,000	117,000	-
	INTERMEDIATE TERM DEVELOPMENT TOTALS:	$1,343,000	$891,000	$452,000	$347,000	$105,000
1985-95-1	Construct asphalt road from Terminal south to City property.	165,000	124,000	41,000	41,000	-
1985-95-2	Construct two ten-unit T-hangar and access south of existing T-hangar.	249,000	-	249,000	24,000	225,000
1985-95-3	Construct executive hangar and apron south of existing T-hangar.	160,000	-	160,000	60,000	100,000
1985-95-4	Bring Runway 13/31 up to profile, install runway and taxiway lighting, VASI's and REILS.	573,000	430,000	143,000	143,000	-
1985-95-5	Construct aircraft tie-down area west of taxiway for Runway 31.	213,000	160,000	53,000	53,000	-
1985-95-6	Extend each end of Terminal Building 20 feet, remove concrete paving.	72,000	-	72,000	72,000	-
	LONG TERM DEVELOPMENT TOTALS:	$1,432,000	$714,000	$718,000	$393,000	$325,000
	TWENTY YEAR DEVELOPMENT TOTALS:	$4,685,000	$2,423,000	$2,262,000	$1,579,000	$683,000

time period. The tables list each of the projects included in the recommended development schedule and also show the estimated cost associated with each project. The cost figures are broken down to reflect estimated FAA, and local participation. The proposed development program is depicted graphically in Figures IV-1 and IV-2.

In order to be successful, a development program must meet the basic needs of the area involved. If that goal is to be attained for Stillwater Municipal Airport, the recommended improvements must consist of a well rounded program that will fully develop the airport's capabilities. In addition to programming the development on a priority basis, the development schedules have considered the obvious merits of phasing construction so that the outlay of local funds does not vary too greatly from year to year.

Short Term Development Program (Calendar Year 1976 Through Calendar Year 1979)

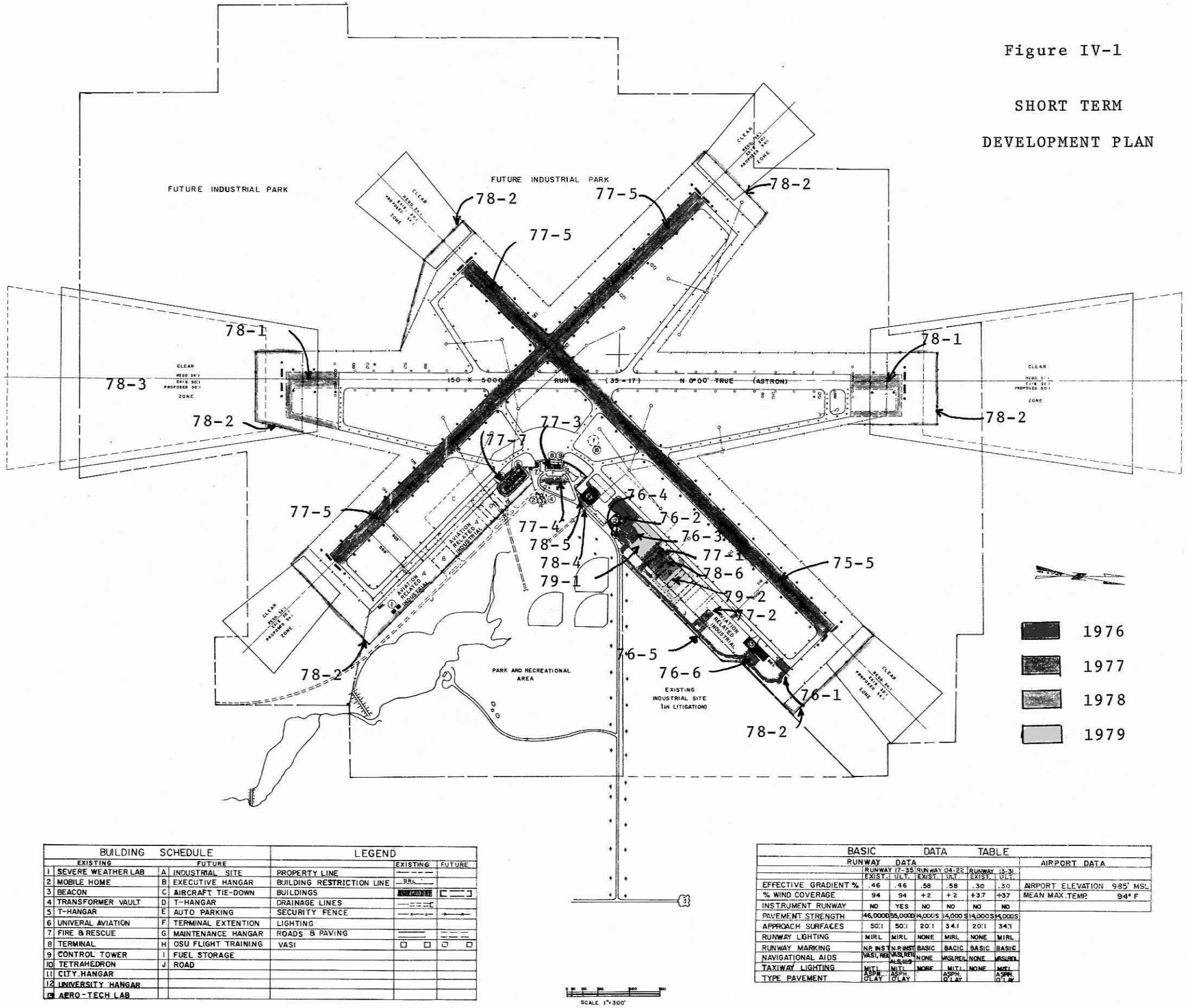
The 1976 program deals primarily with increasing hangar and apron space that is presently in demand. A new maintenance hangar is projected in order that the hangar presently being used for maintenance and repair may be used for the pressing need for additional aircraft hangar space. Other projects deal with reconstruction of deteriorated pavement surfaces and on site access roads.

The program for 1977 is directed primarily toward

Figure IV-1

SHORT TERM

DEVELOPMENT PLAN



BUILDING SCHEDULE			
EXISTING		FUTURE	
1	SEVERE WEATHER LAB	A	INDUSTRIAL SITE
2	MOBILE HOME	B	EXECUTIVE HANGAR
3	BEACON	C	AIRCRAFT TIE-DOWN
4	TRANSFORMER VAULT	D	T-HANGAR
5	T-HANGAR	E	AUTO PARKING
6	UNIVERAL AVIATION	F	TERMINAL EXTENTION
7	FIRE & RESCUE	G	MAINTENANCE HANGAR
8	TERMINAL	H	OSU FLIGHT TRAINING
9	CONTROL TOWER	I	FUEL STORAGE
10	TETRAHEDRON	J	ROAD
11	CITY HANGAR		
12	UNIVERSITY HANGAR		
13	AERO-TECH LAB		

LEGEND	EXISTING	FUTURE
PROPERTY LINE		
BUILDING RESTRICTION LINE	BRL	
BUILDINGS		
DRAINAGE LINES		
SECURITY FENCE		
LIGHTING		
ROADS & PAVING		
VASI		

SCALE 1"=300'

BASIC DATA TABLE							
	RUNWAY DATA						AIRPORT DATA
	RUNWAY 17-35		RUNWAY 04-22		RUNWAY 13-31		
	EXIST.	ULT.	EXIST.	ULT.	EXIST.	ULT.	
EFFECTIVE GRADIENT %	.46	.46	.58	.58	.30	.30	AIRPORT ELEVATION 985' MSL
% WIND COVERAGE	94	94	+2	+2	+37	+37	MEAN MAX. TEMP. 94° F
INSTRUMENT RUNWAY	NO	YES	NO	NO	NO	NO	
PAVEMENT STRENGTH	46,000S	55,000S	14,000S	14,000S	14,000S	14,000S	
APPROACH SURFACES	50:1	50:1	20:1	34:1	20:1	34:1	
RUNWAY LIGHTING	MIRL	MIRL	NONE	MIRL	NONE	MIRL	
RUNWAY MARKING	N.P. INST	N.P.INST	BASIC	BACIC	BASIC	BASIC	
NAVIGATIONAL AIDS	VASI, REIL	VASI, REIL ALS, MLS	NONE	VASI/REIL	NONE	VASI/REIL	
TAXIWAY LIGHTING	MITL	MITL	NONE	MITL	NONE	MITL	
TYPE PAVEMENT	ASPH. O'LAY	ASPH. O'LAY		ASPH. O'LAY		ASPH. O'LAY	

providing additional aids and facilities currently lacking at the airport. To provide more space for the University Flight School and to create Terminal building area for the public, office, classroom, and hangar space was proposed for the flight school.

The programs for 1978 and 1979 are mainly concerned with providing an Instrument Landing System (ILS) for Runway 17/35. Additional facilities were included to meet general aviation needs

Intermediate Term Development Program (1980 through 1984)

Intermediate term development for the airport consists mainly of reconstructing pavement surfaces and providing facilities to meet projected growth requirements.

Long Term Development Program (1985 through 1994)

Long term development again deals primarily with provisions for growth related facilities and with protection of the investment in existing facilities.

3. Cost Estimates

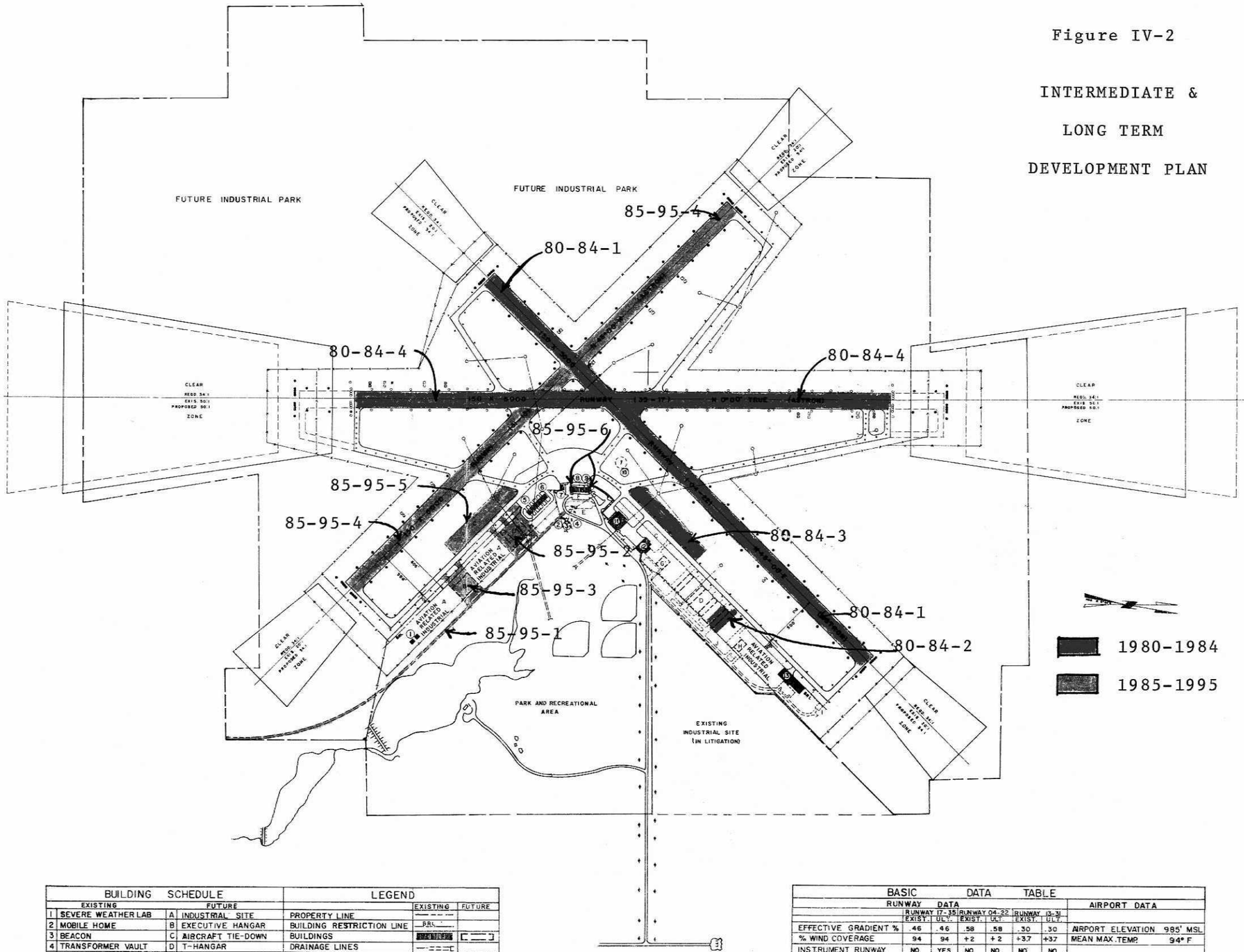
The cost estimates shown in Tables IV-1 and IV-2 are based on 1975 dollars with a 6% per year escalation rate for the first five years. The intermediate term development costs have been escalated 40% and the long term development 50%.

Figure IV-2

INTERMEDIATE &

LONG TERM

DEVELOPMENT PLAN



BUILDING SCHEDULE				LEGEND		
EXISTING		FUTURE			EXISTING	FUTURE
1 SEVERE WEATHER LAB	A	INDUSTRIAL SITE		PROPERTY LINE		
2 MOBILE HOME	B	EXECUTIVE HANGAR		BUILDING RESTRICTION LINE	BRL	
3 BEACON	C	AIRCRAFT TIE-DOWN		BUILDINGS		
4 TRANSFORMER VAULT	D	T-HANGAR		DRAINAGE LINES		
5 T-HANGAR	E	AUTO PARKING		SECURITY FENCE		
6 UNIVERAL AVIATION	F	TERMINAL EXTENTION		LIGHTING		
7 FIRE & RESCUE	G	MAINTENANCE HANGAR		ROADS & PAVING		
8 TERMINAL	H	OSU FLIGHT TRAINING		VASI		
9 CONTROL TOWER	I	FUEL STORAGE				
10 TETRAHEDRON	J	ROAD				
11 CITY HANGAR						
12 UNIVERSITY HANGAR						
13 AERO-TECH LAB						

BASIC DATA TABLE							
	RUNWAY DATA						AIRPORT DATA
	RUNWAY 17-35		RUNWAY 04-22		RUNWAY 13-31		
	EXIST.	ULT.	EXIST.	ULT.	EXIST.	ULT.	
EFFECTIVE GRADIENT %	.46	.46	.58	.58	.30	.30	AIRPORT ELEVATION 985' MSL
% WIND COVERAGE	94	94	+2	+2	+3.7	+3.7	MEAN MAX. TEMP. 94° F
INSTRUMENT RUNWAY	NO	YES	NO	NO	NO	NO	
PAVEMENT STRENGTH	46,000S	55,000S	14,000S	14,000S	14,000S	14,000S	
APPROACH SURFACES	50:1	50:1	20:1	34:1	20:1	34:1	
RUNWAY LIGHTING	MIRL	MIRL	NONE	MIRL	NONE	MIRL	
RUNWAY MARKING	N.P. INST	N.P. INST	BASIC	BACIC	BASIC	BASIC	
NAVIGATIONAL AIDS	VASI, REIL	VASI, REIL ALS-SUS	NONE	VASI, REIL	NONE	VASI, REIL	
TAXIWAY LIGHTING	MITL	MITL	NONE	MITL	NONE	MITL	
TYPE PAVEMENT	ASPH. O'LAY	ASPH. O'LAY		ASPH. O'LAY		ASPH. O'LAY	

B. Economic Feasibility and Financing

1. General

The "Airport and Airway Development Act of 1970" which includes the Airport Development Air Program (ADAP) was approved by the United States Congress on May 12, 1970, and was funded through June 30, 1975. Although the development proposed in this study extends past the June 30, 1975, expiration date, it is anticipated that a new federal law will be adopted that will allow continued FAA participation in airport development projects. The recommendations made in this report assume that federal participation will continue at the same level as in the ADAP law enacted in 1970.

2. Airport Finances and Financial Projects.

Presently, the only revenue received by the airport from outside sources consists of a subsidy received from Oklahoma State University. Table I-4 presents the monies that have been received by the University since 1967. Revenues from this source are expected to decrease and average approximately $10,000.00 per year throughout the projection period. The airport presently receives no funds from the City of Stillwater for operation of the airport. Table I-3 indicates the revenues and expenses for the airport since 1967.

3. Recommended Development Financing.

As indicated in Tables IV-1 and IV-2, the proposed development represents a total investment of $4,685,000.00

with $2,262,000.00 coming from local sources. Since, at present, revenues are insuffcient to fina ce proposed development, it is anticipated that general obligation bonding and short term notes must be considered as probable first steps in the financing of earlier projects included in the development schedule.

General Obligation Bonds

General obligation bonds will in all probability be the principal tool for financing future developments. Since bonds of this type are backed by the assets of the issuing governmental body, they typically can be issued at interest rates lower than rates paid on other types of bonds. As the community's debt limitation is approached, however, the interest rate at which the bonds can be sold increases.

Revenue Bonds

Revenue bonds may be issued to finance revenue-generating projects. The advantage of issuing revenue bonds whenever applicable is that the debt level of the sponsoring community is not raised and voter approval is not needed. One disadvantage of revenue bonds is that they are generally not as secure as general obligation bonds and therefore require a slightly higher interest rate than do general obligation bonds given the same market condition.

Revenue producing projects are scheduled to begin in 1978. Revenue bond financing should be used for these

projects whenever possible so that the borrowing capacity of the town may be preserved for non-revenue producing projects.

Short-Term Notes

Short-term notes are still another option open for the financing of airport development projects. During the construction phase of a project, short-term notes can provide the necessary working capital if delays in federal or state reimbursements are encountered. Use of short-term notes should be weighed carefully since the generally high interest rate may not be justifiable.

Interest Rates and Time

A 6% interest rate for both general obligation and revenue bonds has been selected arbitrarily for use throughout the development program. The uncertainty of today's money market makes it most difficult to predict with any degree of accuracy the rate that is likely to be in effect when bonds for the program are sold. All bonds are assumed to have a 20 year life.

Debt Service

Using the established criteria of 6% interest rate and a 20 year retirement schedule, annual debt service requirements were determined through appropriate procedures to assure an even flow of funds to cover principal and interest payments.

Private Capital

Private capital for industrial park development

and for the FBO facilities is not considered in the study. However, it is recommended that when applicable the use of private capital be encouraged so that the debt burden of the town may be eased. Use of private capital to construct hangars has the secondary effect of giving the tenant a feeling of being an owner rather than merely a renter.

4. Airport Financial Projections

Revenue Projections

Table IV-4 shows projected revenue for the Stillwater Municipal Airport for each year of the forecast period. The projection assumes both that the development schedule will be followed and that the recommended rental fees will be charged. Table IV-3 presents the recommended lease rates for the general aviation terminal should rental of such space become desirous in the future.

Table IV-3

ANNUAL LEASE RATE FOR GENERAL AVIATION TERMINAL
Stillwater Municipal Airport

Year	Recommended Annual Lease
1979/84	$6.25 per square foot
1985/89	$6.75 per square foot
1990/94	$7.50 per square foot

Gasoline revenue projections for the airport were based upon the average number of hours per year a general aviation aircraft might be expected to operate.

Assuming an average fuel consumption rate of 10 gallons of fuel per hour of operation, an estimate was made of the number of gallons of gasoline that aircraft based at Stillwater will consume. This figure was then applied to the anticipated yield of revenue per gallon of gasoline. It was assumed in the development of the revenue estimates that fuel sales to itinerant aircraft would offset gasoline sales that might be made at other airports to Stillwater based aircraft.

Projected tiedown revenue is subject to periodic fluctuations and should not be counted upon as a constant generator of funds. The projected revenue from tiedowns is shown in Table IV-4. These projections were made principally to illustrate the uncertainty of this revenue source.

Future revenue generated by the service hangar will be sufficient to retire the revenue bonds needed for its construction. Should the service hangar revenue bonds not be salable at the indicated interest rate, rental rates should be adjusted so that debt service payments can be met through rental fees.

Revenue projections for T-hangar rentals are based upon the forecast of based aircraft and upon the rental fees recommended in the following section of the airport master plan. In the projection it is assumed that each aircraft based at Stillwater will require a hangar.

Table IV-4

REVENUE PROJECTIONS FOR PROPOSED DEVELOPMENT
Stillwater Municipal Airport

Year	Gasoline*	Tiedowns*	10 Unit T-Hangar	10 Unit T-Hangar	10 Unit T-Hangar	10 Unit T-Hangar	Two 10 Unit T-Hangars	Executive Hangar	Total
1975	125								125
1976	125								125
1977	250								250
1978	375	1,260	6,960						8,595
1979	500	1,260	6,960	7,200					15,920
1980	750	5,100	6,960	7,200	6,240				26,250
1981	1,125	5,100	6,690	7,200	6,240				26,625
1982	1,500	5,100	6,960	7,200	6,240				27,000
1983	1,875	9,600	7,920	8,100	7,380	7,740			42,615
1984	1,875	9,600	7,920	8,100	7,380	7,740			42,615
1985	1,875	11,520	7,920	8,100	7,380	7,740			44,535
1986	2,000	11,520	7,920	8,100	7,380	7,740			44,660
1987	2,375	11,520	8,520	8,700	7,980	8,340			47,435
1988	2,750	11,520	8,520	8,700	7,980	8,340			47,810
1989	3,000	11,520	8,520	8,700	7,980	8,340	16,320		64,380
1990	3,125	13,440	8,520	8,700	7,980	8,340	16,320	9,500	75,925
1991	3,625	13,440	8,520	8,700	7,980	8,340	16,320	9,500	76,425
1992	3,750	22,260	8,520	8,700	7,980	8,340	16,320	9,500	85,370
1993	4,125	22,260	9,960	10,200	9,240	9,720	18,960	9,500	93,965
1994	4,250	22,260	9,960	10,200	9,240	9,720	18,960	9,500	94,090

*Gasoline revenue is that revenue that will be derived from additional based aircraft projected for Stillwater Municipal Airport.

*Tiedown revenues based on rental of those tiedowns to be constructed during scheduled development.

Expense Projections

Projections of airport expenses, are shown in Table IV-5. Airport administration, operation and maintenance expenses are considered in the table. These expenses consist of insurance, utilities and periodic minor maintenance costs. The projected expense figures were based upon financial reports of Stillwater Municipal Airport from 1967 to 1974. The figures were then adjusted upward to reflect probable future economic conditions.

Debt Service

Debt service is the average annual payment of principal and interest necessary to pay for the development projects. The debt service included in the analysis is based on the present value method of cash flow payments. Such a method provides constant annual payments over the life of the issue. In all cases, bonds used to fund development projects are assumed to have a 20 year life span and to bear an interest rate of six percent.

Tables IV-6 and IV-7 show the debt service requirement each year for the proposed development program. Table IV-6 shows debt service payments required to retire proposed revenue bonds and Table IV-7 shows the retirement schedule for general obligation bonds.

Revenue Bonds

A total of $683,000.00 in revenue bonds is required to finance revenue-producing projects. Table IV-6

TABLE IV-5

REVENUE AND EXPENSE PROJECTIONS
Stillwater Municipal Airport

Year	Anticipated Revenue from Existing Facilities[1]	Projected Revenue from Proposed Facilities[2]	Oklahoma State University Subsidy	Total Revenue	Anticipated Expenses Administration, Operation and Maintenance[3]	Debt Service General Obligation Bonds[4]	Debt Service Revenue Bonds[5]	Total Expenses	Net Income (Loss)	Net Income (Debt Service for G.O. Bonds Excluded)
1975	$223,400	$ 125	$10,000	$233,525	$213,800	$ -	$ -	$213,800	$ 19,725	$ 19,725
1976	232,300	125	10,000	242,425	223,400	73,144	-	296,544	(54,119)	19,025
1977	241,600	250	10,000	251,850	233,500	73,144	-	306,644	(54,794)	18,350
1978	251,300	8,595	10,000	269,895	244,000	73,144	6,974	324,118	(54,223)	18,921
1979	261,400	15,920	10,000	287,320	255,000	73,144	14,297	342,441	(55,121)	18,023
1980	271,900	26,250	10,000	308,150	266,500	73,144	22,056	361,700	(53,550)	19,594
1981	282,800	26,625	10,000	319,425	278,500	103,395	22,056	403,951	(84,526)	18,869
1982	294,100	27,000	10,000	331,100	291,000	103,395	22,056	416,451	(85,351)	18,044
1983	305,900	42,615	10,000	358,515	304,100	103,395	31,210	438,705	(80,190)	23,205
1984	318,100	42,615	10,000	370,715	317,800	103,395	31,210	452,405	(81,690)	21,705
1985	330,800	44,535	10,000	385,335	332,100	103,395	31,210	466,705	(81,370)	22,025
1986	344,000	44,660	10,000	398,660	347,000	137,657	31,210	515,867	(117,207)	20,450
1987	357,800	47,435	10,000	415,235	362,600	137,657	31,210	531,467	(116,232)	21,425
1988	372,100	47,600	10,000	429,910	378,900	137,657	31,210	547,767	(117,857)	19,800
1989	387,000	64,380	10,000	461,380	396,000	137,657	50,826	584,483	(123,103)	14,554
1990	402,500	75,925	10,000	488,425	413,800	137,657	59,544	611,001	(122,576)	15,081
1991	418,600	76,425	10,000	505,025	432,400	137,657	59,544	629,601	(124,576)	13,081
1992	435,300	85,370	10,00	530,670	451,900	137,657	59,544	649,101	(118,431)	19,226
1993	452,700	93,965	10,000	556,665	472,200	137,657	59,544	669,401	(112,736)	24,921
1994	470,800	94,090	10,000	574,890	493,400	137,657	59,544	690,601	(115,711)	21,946

[1] Revenue based on a conservative estimate of 4% per year increase.

[2] Revenue totals taken from Table IV-4.

[3] Expenses based on a conservative estimate of 4.5% per year increase.

[4] Totals taken from Table IV-7.

[5] Totals taken from Table IV-6.

Table IV-6

DEBT SERVICE - REVENUE BONDS
Stillwater Municipal Airport

Year	10 Unit T-Hangar $80,000*	10 Unit T-Hangar $84,000*	10 Unit T-Hangar $89,000*	10 Unit T-Hangar $105,000*	2-10 Unit T-Hangars $225,000*	Executive Hangar $100,000*	Total
1975	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1976	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-
1978	6,974	-	-	-	-	-	6,974
1979	6,974	7,323	-	-	-	-	14,297
1980	6,974	7,323	7,759	-	-	-	22,056
1981	6,974	7,323	7,759	-	-	-	22,056
1982	6,974	7,323	7,759	-	-	-	22,056
1983	6,974	7,323	7,759	9,154	-	-	31,210
1984	6,974	7,323	7,759	9,154	-	-	31,210
1985	6,974	7,323	7,759	9,154	-	-	31,210
1986	6,974	7,323	7,759	9,154	-	-	31,210
1987	6,974	7,323	7,759	9,154	-	-	31,210
1988	6,974	7,323	7,759	9,154	-	-	31,210
1989	6,974	7,323	7,759	9,154	19,616	-	50,826
1990	6,974	7,323	7,759	9,154	19,616	8,718	59,544
1991	6,974	7,323	7,759	9,154	19,616	8,718	59,544
1992	6,974	7,323	7,759	9,154	19,616	8,718	59,544
1993	6,974	7,323	7,759	9,154	19,616	8,718	59,544
1994	6,974	7,323	7,759	9,154	19,616	8,718	59,544

*Amount of Bonds

Table IV-7

DEBT SERVICE - GENERAL OBLIGATION BONDS
Stillwater Municipal Airport

Year	$839,000[1]	$347,000[2]	$393,000[3]	Total
1975	$ -	$ -	$ -	$ -
1976	73,144	-	-	73,144
1977	73,144	-	-	73,144
1978	73,144	-	-	73,144
1979	73,144	-	-	73,144
1980	73,144	-	-	73,144
1981	73,144	30,251	-	103,395
1982	73,144	30,251	-	103,395
1983	73,144	30,251	-	103,395
1984	73,144	30,251	-	103,395
1985	73,144	30,251	-	103,395
1986	73,144	30,251	34,262	137,657
1987	73,144	30,251	34,262	137,657
1988	73,144	30,251	34,262	137,657
1989	73,144	30,251	34,262	137,657
1990	73,144	30,251	34,262	137,657
1991	73,144	30,251	34,262	137,657
1992	73,144	30,251	34,262	137,657
1993	73,144	30,251	34,262	137,657
1994	73,144	30,251	34,262	137,657

[1]Projects scheduled in the short-term development.

[2]Projects scheduled in the intermediate-term development.

[3]Projects scheduled in the long-term development.

indicates the proposed schedule of issuance of the bonds and the debt service required to retire them.

It must be stressed that the recommended revenue bonds are for the construction of only those portions of the facilities that will generate revenue. The $80,000.00 for one ten unit T-hangar to be constructed in 1977 is for the building only. Apron costs are covered by the general obligation bonds scheduled in 1976.

General Obligation Bonds

General obligation bonds could be used as the method of financing the remaining cost of the development program. General obligation bonds are the logical and traditional source of airport funding. Possible alternative sources such as short-term notes, private capital, donations of land, and increased state participation are discussed in previous sections of the financial plan.

It is anticipated that general obligation bonds in the amount of $1,579,000.00 will be needed to finance the remainder of the proposed developments.

5. Summary

A complete summary of revenue and expenses by year for the total proposed development is shown in Table IV-5. The main body of the summary shows the cost of operating the airport and servicing both revenue bonds and general obligation bonds. The final column shows net income if revenues are used only for operating

expenses and revenue bond debt service.

C. Recommendations

1. Airport Authority

The City of Stillwater should consider the creation of an airport authority whose members would include representatives of governing bodies as well as other citizens interested in the promotion of the airport. This authority would have as its primary function the timely development and the effective operation of the airport. Its members would be responsive to airport tenants and yet be responsible also to their appointing political authority in regard to airport activities.

2. Airport Fees and Leases

Listed below are recommended rates for tiedown fees and T-hangar fees. Table IV-8 presents the recommended rate schedule for tiedowns. Lease rates recommended for the proposed T-hangars are shown in Table IV-9. Land rental fees should vary according to location and facilities for $ .02 to $ .06 per square foot.

Table IV-8

RECOMMENDED RATE SCHEDULE FOR TIE-DOWNS
Stillwater Municipal Airport

Year	Annual Rate	Transient/Short-Term
1975	$120	$1.00 per day
1976	$150	$1.00 per day
1977-1979	$180	$2.00 per day
1980-1984	$240	$2.50 per day
1985-1989	$300	$3.00 per day
1990-1994	$360	$4.00 per day

Table IV-9

RECOMMENDED MONTHLY LEASE RATES FOR PROPOSED T-HANGARS
Stillwater Municipal Airport

Year	Single Engine	Multi-Engine
1978	$50.00	$70.00
1983	$60.00	$75.00
1987	$65.00	$80.00
1993	$75.00	$95.00

The lease schedule shown in Table IV-9 was developed with the intention of establishing rates that would be fair and would yet cover required debt service and yeild a net return to the airport. It must be stressed that the rates are recommendations only. If increases or decreases in debt service requirements are found to be necessary because of revisions in the proposed development schedule, appropriate adjustments can be made in lease arrangements.

CONCLUSION

The Stillwater Municipal Airport is presently operating at maximum capacity and specific improvements will need to be made within the next twenty years in order to meet the forecast demands.

Timely development of Stillwater Municipal Airport is vital not only to the future of the airport but also to the growth of the town of Stillwater. The program required to develop the airport can be financed through a continuation of local, federal, and University funds. This report is presented as a guide to the orderly planning, financing and construction of the recommended development program.

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AIRPORT MASTER PLAN 1975-1995
STILLWATER MUNICIPAL AIRPORT, STILLWATER OKLAHOMA

by

JERRY ROY WALKUP

B.S., OKLAHOMA STATE UNIVERSITY, 1973

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture
College of Architecture and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1975

AIRPORT MASTER PLAN 1975-1995
STILLWATER MUNICIPAL AIRPORT, STILLWATER, OKLAHOMA

Presently, the Stillwater Municipal Airport is operating beyond maximum capacity and major improvements must be undertaken to alleviate the present and potential future problems. Sources of funding for major improvements at Stillwater Municipal Airport have been primarily from General Obligation Bonds, Oklahoma Aeronautic Commission, Oklahoma State University and matching FAA funds. Before approval of these funds, specific plans must be supplied supporting requests for project funding.

If future airport developments are to be successful, they must be based on guidelines established as the result of comprenhensive airport master plan studies. Accordingly, the City Commissioners have recognized the need and have approved funding for an airport master plan study.

In the airport master plan for the Stillwater Municipal Airport, FAA regulations and Advisory Circulars have been utilized as minimum standards with FAA Advisory Circular 150/5070-6 "Airport Master Plan," providing an outline of the study elements to be considered.

The master plan is divided into four phases. Phase I, Airport Requirements, is subdivided into five stages of development and represents the methods and procedures used in the development of the master plan. Phase II deals with the Site Selection and is dependent upon the results established in Phase I. Phase III is the Airport Plans in a graphic and written report. Phase IV, is the Financial Plan, in terms of financial

sources, feasibility, and development staging.

Phase I, Airport Requirements, encompasses the total Inventory of existing facilities which is the initial step in the preparation of the master plan. Included in the inventory is the historical information relating to the development of the airport; the existing airport facilities which include the location, runways, taxiways, aprons, fixed based operator facilities and services, fire fighting equipment, lighting, utilities, access, and land use; existing airspace structure and navigational aids, airport related land use, existing area wide plans; and laws, ordinances, financial resources, and socio-economics.

Stage two is the Forecast of Aviation Demand. This element of the master plan provides forecast in five year increments for a period of twenty years. To determine the effects the community would have on future airport development, it was also important to study population, labor force, income per capita, retail trade, geographic factors, and competitive position. Air traffic data was compiled to give past and present records of aircraft operations and based aircraft to forecast the aviation demand. This information, along with national and regional growth trends, were used as a basis in the forecasting of aircraft operations, based aircraft, aircraft operations mix, and peak period operations.

The third stage, Demand/Capacity Analysis, provides the basis for determination of facility requirements and feasibility. Aircraft operational requirements were determined to insure runway lengths would accommodate the projected aircraft activity.

A study was then made of the airfield configuration to determine present operational capacity. The results are analysized for Practical Annual Capacity and Practical Hourly Capacity and compared to forecast operations to determine forecast demands. Demand/Capacity Analysis was also made of the terminal area, airspace, and airport access, including the study of air traffic control and navigational aid requirements, and aircraft fire-rescue facilities.

Facility requirements, stage four, of the airport master plan provides for the establishment of requirements for runways, taxiways, primary surface, horizontal surface, conical surface, clear zones, approach surfaces, and transitional surfaces. Additions to the modifications of existing airfield facilities will also be established. Included among these are apron requirements, general aviation terminal building requirements, and vehicular parking.

The fifth and final stage of Phase I is the Environmental Study. This section presents an evaluation of the impact on the surrounding natural environment. The environmental considerations of importance include noise exposure, air quality, water quality, solid waste management, wildlife and wildlife refuges; and recreational, historical, cultural and unique areas. The results of the study shall be incorporated into the development plan to insure that the airport will be compatible with the environment.

Phase II, Site Selection, investigates the feasibility of the existing airport facility in terms of forecast traffic,

planned future expansion, compatibility with surrounding community uses, and economics.

Phase III, Airport Plans, presents a graphic and written proposal of the final recommendation for the airport. Encompassed are airport layout plans, an approach and clear zone plan, an industrial development plan, land use plans, a terminal area plan, and an airport access and parking plan.

The final phase of the master plan, Phase IV, is the Financial Plan. The Financial Plan encompassed scheduling of proposed development, estimates of development cost, and funding procedures.