

RESOLUTION NO. 22-1990

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ABILENE, TEXAS, ADOPTING THE ELM CREEK MAINTENANCE PLAN, ESTABLISHING THE CONCEPTUAL FRAMEWORK TO CLEAN, CLEAR AND GRUB, AND MAINTAIN ELM CREEK TO A LEVEL CONDUCTIVE TO THE PERFORMANCE OF ROUTINE ANNUAL MAINTENANCE WHICH WILL ALLOW THE MAXIMUM CONVEYANCE CAPACITY ON ELM CREEK.

WHEREAS, the need for the establishment of an overall Creek Maintenance Plan for the City of Abilene was identified in the Flood Control Policies adopted in 1982; and,

WHEREAS, the overall Creek Maintenance Plan for the City of Abilene can most reasonably be developed on a creek-by-creek basis; and,

WHEREAS, it is anticipated this plan, in combination with downstream improvements (complete and in progress), the upstream detention/diversion proposal currently under study, and the continued enforcement of current policies/ordinances/drainage standards, will favorably impact Abilenians within the Elm Creek Watershed; and,

WHEREAS, upon adoption of the Elm Creek Maintenance Plan, a copy of which is attached hereto as Exhibit "A", development of the next plan (Catclaw Creek) will commence; now, therefore,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ABILENE, TEXAS:

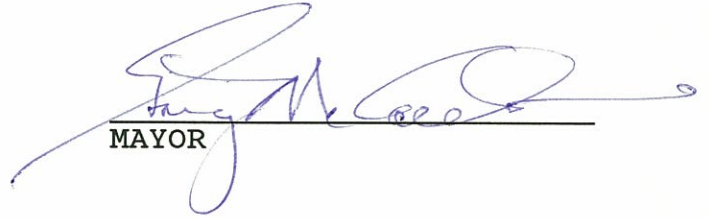
PART 1: That the City Council hereby adopts the Elm Creek Maintenance Plan as the first of a series of plans necessary for establishment of an overall Creek Maintenance Plan for the City of Abilene.

PART 2: That this Resolution shall take effect immediately from and after its passage.

PASSED this 28 day of June, A.D., 1990.

ATTEST:

  
CITY SECRETARY

  
MAYOR

APPROVED:

  
CITY ATTORNEY

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Exhibits

Appendix A

I. INTRODUCTION:

The creeks flowing through Abilene have caused flooding of property over the years. The Federal Government has a program to allow federally backed loans in cities with flooding conditions. This, as enforced by the Federal Emergency Management Agency (FEMA), requires that a map be prepared and maintained of the areas in the City subject to flooding by floods up to the 100-year event. Real estate within the designated flood areas must have flood insurance to be eligible for federally backed mortgages. FEMA requires strict control within the floodway to maintain passage of the rainfall runoff and prevent any action which may increase the danger of flooding.

As creek channels are being improved by the City, the areas subject to flooding are reduced. This allows the City to request a Flood Insurance Rate Map (FIRM) Amendment reducing the area subject to mandatory flood insurance. FEMA requires a maintenance plan in the form of an ordinance be submitted with each improved creek channel for which the City would request a FIRM Amendment. Once a map amendment is granted, FEMA is required to assure that the flow capacity is maintained. In addition to meeting FEMA requirements, the establishment and execution of a drainage maintenance plan is a necessity in protecting the infrastructure investment and maintaining the desired level of flood protection for the community.

As the landscape is changed by the works of mankind, the rainfall runoff is changed. The waterways are then altered to

better serve man's needs. This, in turn, causes both erosion and siltation. Natural growth of weeds and trees, together with siltation and erosion, make it necessary to maintain an altered waterway if its usefulness is to be preserved.

These facts establish a need for the execution of a creek maintenance plan within the City. The photographs on pages A-1 to A-5 show examples of maintenance needs on Abilene's creeks.

## II. GENERAL CONDITIONS:

Elm Creek is the largest of several creeks that flow through the City of Abilene. The area drained by Elm Creek begins in southern Nolan and southwest Taylor counties. The length of the drainage area is approximately 52 miles, and the average width is approximately 10 miles. The drainage area begins in the Callahan Divide, which is rough land characterized by rock outcroppings. The next section of the drainage area is primarily cultivated farm land. The following area lies within the City and is characterized by streets and other man-made infrastructure placed on the land. On the northern part of the City, Elm Creek is joined by its tributaries - Little Elm, Catclaw, Indian and Cedar Creeks. From the City to Lake Fort Phantom Hill, the drainage area is mixed agricultural land (see Exhibit 1).

Since the time Elm Creek was a "natural" stream, the developments of man have altered the creek's characteristics. The runoff patterns have been altered by agricultural use of the land and the establishment of infrastructure. Also, in many cases the primary waterway or creek channel has been altered. In some cases

construction has encroached on the waterway and restricted the volume of water the creek can carry. In other cases, the size of the primary waterway has been increased and the creek alignment has been straightened. These facts influence the maintenance requirements.

### III. CREEK REACHES:

An overall look at Elm Creek reveals that the maintenance needs vary considerably for different sections of the creek. With this in mind, the creek has been divided into "reaches" as shown on Exhibit 2. The creek characteristics and maintenance needs of each reach are covered in the following discussion.

#### A. REACH I

##### 1. Location

Reach I starts at the beginning of Elm Creek in Nolan County and extends downstream to U.S. 83/Winters Freeway in southwest Abilene.

##### 2. Features

The shape of the waterway conforms to what is normally expected with the following features:(See Exhibit 3-A)

- a. Primary Channel - Extends "first bank" to "first bank" and carries the runoff from most rains. The bottom is usually rounded and the sides are steep. Some growth may exist on the sides.
- b. First Bank - Highest point immediately adjacent to the primary channel. Confines most runoffs. In many cases will have large trees on first bank and

may have undergrowth. Will be inundated in flood stage. Exhibit 4 illustrates the development of the primary channel and the first bank.

- c. Floodplain - Normally stretches each way from the first bank. Generally slopes to and drains into the primary channel. During flood stage the water that cannot be carried by the primary channel will cover part of the floodplain.

In Reach I there has been no significant altering of the primary channel and when overflowing occurs it is not considered a significant problem. The creek is in a state of natural equilibrium and there is no compelling reason to attempt maintenance activities at this time. The U. S. Corps of Engineers is studying this area for possible major stream alterations. If these alterations are constructed then maintenance needs will arise and will need to be addressed.

### 3. Proposed Maintenance

None at this time.

## B. REACH II:

### 1. Location

Reach II begins at the Winters Freeway in southwest Abilene and extends downstream to the northwest crossing of Elm Creek and the Winters Freeway near Ambler Avenue.

### 2. Features

The significant features of Reach II are:

- a. The floodplain has the unusual shape of sloping away from the first bank of Elm Creek. Therefore, any overflowing of the primary channel goes to either Catclaw or Little Elm Creek (see Exhibit 3-B). This configuration is referred to as a "perched channel" since the creek is perched or elevated on the floodplain.
- b. In many areas there is dense growth on the first bank and it extends into the primary channel in many cases. The primary channel is much smaller than normally would be expected.
- c. The floodplain is highly developed with houses, streets, etc. This development extends up to the first bank in a great number of cases.
- d. There are several systems of inlets and storm sewers that drain from the nearby streets into Elm Creek (the map and areas they drain are shown on Exhibit 5). The inlets are lower than the first bank of Elm Creek so a "flapper" gate has been placed on the pipe where it empties into the creek. There are two features about these systems that are particularly important:
  - (1) The flapper works when there is little or no water in Elm Creek (see Exhibit 6). When Elm Creek is full the "flappers" close and then the water will not flow from the street to the



creek and it "stacks up" until the water level in Elm Creek goes down.

- (2) The potential exists for the flapper to be stuck open and if that occurs when Elm Creek is full, then water will flow from Elm Creek into the street. The water in the street will seek the same elevations as the water in the creek with the potential of flooding houses. Both of these features can cause localized flooding, and there are known instances when this has happened. The photographs on page A-5 show the results of not maintaining these gates.
- e. An important feature of this "perched" creek is when the water level reaches the elevation of the first bank, that is all the water Elm Creek can carry (ref. Exhibit 3-B). Additional water will overtop the first bank. The water overtopping the first bank changes direction. It no longer flows down Elm, but flows at a right angle to Elm and toward Catclaw or Little Elm Creek. This, in turn, means that trees which are on the first bank and not in the primary channel do not reduce the capacity of the primary channel. The roots of these trees stabilize the first bank and, therefore, the trees on the first bank should not be removed. It is

significant that these are the trees that are most important to the abutting property owners (See Exhibit 7).

3. Proposed Maintenance

- a. Mow and remove brush and excessive growth from the primary channel. Trim overhanging limbs. Apply herbicide as needed.
- b. Remove trees, snags, debris and siltation from channel.
- c. Stabilize channel slopes where needed.
- d. Clean inlets, storm sewers as needed.
- e. Remove man-made encroachments from the primary channel.

C. REACH III:

1. Location

Reach III starts at the northwest crossing of the Winters Freeway and Elm Creek and extends downstream to the Fort Worth and Denver Railroad.

2. Features

The floodplain has the normal shape with the land sloping toward the creek and the overflows stay next to the creek and follow its path. Along this reach, most of the primary channel has been widened to 150 feet to 180 feet in width. Those places remaining where the channel has not been widened will be widened in the near future. When the widening is complete the channel will contain

foreseeable floods, including the 100-year event. Several sections have been built for a number of years and they are being filled with siltation as nature tries to reclaim the channel. Exhibit 8 illustrates the process currently underway which is reducing the capacity of the improved channel. Considerable effort will be required to restore the channel to the desired shape.

3. Proposed Maintenance

- a. Remove siltation from primary channel and restore waterway capacity.
- b. Cut or mow vegetation, apply herbicide to selected areas.
- c. Repair erosion and stabilize banks as needed.

D. REACH IV:

1. Location

Reach IV starts at the Fort Worth and Denver Railroad and continues downstream to Lake Fort Phantom Hill.

2. Features

The necessary right of way is being acquired so that the channel may be widened. The widening will be done with City forces and is scheduled to be completed in 1992. At that time, it will be necessary to incorporate Reach IV into the Maintenance Plan. At the present time, maintenance planning for this section is being deferred.

3. Maintenance Proposed

None at this time.

#### IV. MAINTENANCE IMPLEMENTATION

##### A. Proposed Work

In the previous discussion, we have defined the maintenance needs for the next few years as being confined to Reach II and Reach III. On both reaches there is a sizable backlog of maintenance requirements due to the lack of sufficient maintenance over the years. To remedy the situation we propose a "heavy maintenance" period of three years. Both reaches can be covered in this 3-year time frame, after which a lower level of effort will be required each year to maintain the system without deterioration. In a maintenance plan, the types of activities are determined and then the frequency must be established for each activity. For example, mowing will be performed usually three times per year, whereas silt removal will be scheduled so that one-third of the work is done each year, and after three years the cycle is repeated. The time of year these the various items of work take place is also important. Work in the primary channel should take place during the time of the least runoff and, of course, mowing must take place during the growing season. The work must also mesh with other projects for which the crews and equipment are committed.

Listed below are the major maintenance tasks and an explanation of when each will be performed.

##### 1. Mowing and Brush Removal

Frequency: Mowing and brush will be cut 3 times during a normal year as dictated by the

growth that takes place. This may be increased or decreased as needed in unusual years.

Time of Year: The first mowing will be in the Spring (May-June) and the last mowing will be in the Fall (Sept.-Oct.).

2. Debris removal, siltation, trees, etc.

Frequency: The reaches will be divided into 3 approximately equal lengths. One of these will be thoroughly cleaned each year. Spot cleaning will be done each year on an as needed basis on the two reaches not thoroughly cleaned that year.

Time of Year: This activity will take place during winter months (Dec.-Feb.) when creek flows are at a minimum. Spot clearing will take place when needed.

3. Stabilize Channel Slopes

Frequency: This work will be done on a yearly basis normally. Emergency work shall be done when needed.

Time of Year: This work will be done in late winter to early spring to take advantage of the growing season.

4. Clean Inlets and Storm Sewers

Frequency: This work will be done annually.

Emergency cleaning will be done as needed.

Time of Year: This work will be done in the winter.

5. Remove Encroachments

Frequency: This work will be done annually. The first three years should accomplish most of this.

Time of Year: This work will be during the late winter and early spring.

The graph on Exhibit 9 illustrates the proposed work schedule.

B. Plan Implementation

The system now exhibits a maintenance backlog which is the result of less than adequate maintenance over a number of years. It is recommended that this backlog be worked off over three years. A three year period is considered appropriate since once a channel has been cleaned, it will need attention again within three years to minimize the long-term cost of maintenance.

Also, periods in excess of 3 years can result in excessive loss of waterway capacity, leading to increased hazard from flooding. This, in turn, will ultimately result in excessive maintenance costs.

Once the backlog is removed, annual maintenance will be needed to preclude the building up of another large backlog. After three years of heavy maintenance, the level of maintenance needed annually will drop to approximately 1/2 of the initial annual maintenance cost.

An inventory of the maintenance backlog is shown on Exhibit

10. This list covers only Reaches II and III since the maintenance proposed at this time is confined to these reaches.

The estimated cost to correct the backlog is shown on Exhibit 11. Exhibit 12 shows the estimated cost for the fourth and subsequent years. Exhibit 13 is a summary of the annual expenditures proposed for Elm Creek maintenance.

The general thinking has been that this work would be done with City forces, and the costs are based on this approach. If it is found desirable to contract part of the work, the cost estimates would be good for that approach also.

C. Engineering Requirements

To execute a maintenance plan of this type will require engineering support and direction. An engineer should be assigned specific responsibility for the inventory, planning, execution and documentation of the creek maintenance effort. The engineering requirements include the following:

1. A hydraulic model of the creek must be created. Using this model, numerous "control" locations should be established on the creek. These locations should be established from engineering analysis and should be representative of each "subreach". At these locations, the desired waterway shape should be established, and the acceptable level of siltation and loss of waterway should be determined. This should be established as a standard and used as a control measure in maintenance execution.

2. A periodic inspection program should be instigated. Under the direction of the engineer-in-charge the drainage system should be inspected twice each year for the first three years. After that, annual inspections are proposed. The entire creek should be inspected and the "control" locations should be measured to monitor the degree of waterway loss that has occurred. The maintenance plan should be correlated to the inspection findings to optimize the level of maintenance obtained.
3. An accounting procedure should be set up to determine the effectiveness of various types of equipment and/or procedures. From these data, the maintenance program can be periodically revised to increase its cost effectiveness.

D. Right of Access

1. Existing Right of Way

The authority of the City to enter into the creek channel and perform the needed maintenance has been studied. The City Attorney has advised that within the City Limits this authority is granted by City Ordinance (Abilene City Code, Article IV. Creeks and Waterways, Sec. 32-95-100). This is based on State law which states, "If navigable, title to the bed of the stream is in the State...."



A navigable stream is defined as, "All streams so far as they retain an average width of 30 feet...without regard to navigability in fact." (Acts 1837, p. 63, Article 5302, V.C.S. 1925)

It is felt that work in the City Limits will be covered on this basis. Starting at the Winters Freeway near Ambler Avenue, and progressing downstream, the City is widening the creek and for this reason has obtained deeds or easements to the creek. These instruments establish the City's right for entering on and maintaining of the creek.

2. Additional Right of Way Needed for Maintenance Purposes

Within the City it is anticipated that there will be some isolated locations where small parcels of right of way will be needed to open up constrictions in the primary channel.

It is also anticipated that points of access will require some right of way so that the maintenance crews may have reasonable paths for ingress and egress to the creek.

E. Prerequisites

The level of detail in this plan is general in nature and the implementation of a plan will require considerably more detail.

The plan establishes that a creek maintenance plan is both necessary and obtainable by the City of Abilene. Several prerequisites are necessary to implement a creek maintenance plan:

1. The political decision and commitment must be made.
2. Favorable public opinion must be established, particularly with land owners that abut Elm Creek.
3. Financial resources must be committed.
4. The needed leadership and support personnel must be dedicated to this work.

## LIST OF EXHIBITS

1. Drainage Area Map of Elm Creek and its Tributaries
2. Elm Creek Reaches
3. Elm Creek
4. Natural Evolution of a Stream
5. Elm Creek Inlets and Storm Sewers
6. Elm Creek Storm Sewer - Typical Gate System
7. Proposed Channel Cleaning Illustration
8. Evolution of an Improved Channel
9. Proposed Schedule of Maintenance Activities
10. Inventory of Maintenance Backlog
11. Maintenance Requirements to Remove Backlog
12. Annual Maintenance Requirements
13. Summary of Proposed Expenditures
14. Article IV. Creeks and Waterways, Sec. 32-95 through 32-100

INVENTORY OF MAINTENANCE BACKLOG

REACH II (30,000 FEET) (inside the Loop)

Mowing, Brush Removal (Ac)	55 Acres
Siltation (CY)	7,500 C.Y.
Trees, Snags	14 acres
Slopes for Stabilization	(25 Locations) (40'x100)
Manholes	4
Inlets	18
Pipes 20-56"	1,408
30-54"	4,266
Flap Gates	6
Encroachments	15 Locations
Stabilize Slopes	1.8 Acres

REACH III (24,900 FEET) (20,000 FEET TO OLD ANSON ROAD)

Mowing, Brush Removal	27.5 Acres
Siltation	221 C.Y.
Slope for Stabilization	1.8 Acres

MAINTENANCE REQUIREMENTS TO REMOVE BACKLOG  
(3-Year Requirement)

REACH II (30,000 FEET) (5.7 MILES)

Brush Removal	55 Acres
Trees	12
Siltation	7,500 C.Y.
Manholes	4
Inlets	18
Pipes	24" to 36" = 1,408'
	36" to 54" = 4,266'
Outlets, Gates, Etc.	6
Stabilize Slopes	1.8 Acres

REACH III (24,900 FEET TOTAL - 20,000 TO OLD ANSON ROAD)

Brush Removal	27.5 Acres
Siltation	221,000 C.Y.
Stabilize Slopes	1.8 Acres

EXHIBIT 11

ANNUAL MAINTENANCE REQUIREMENTS  
(4th Year and Subsequent)

REACH II

Mowing and Brush Removal	7 Acres
Siltation	1,800 C.Y.
Manholes	4
Inlets	18
Pipes	24" to 36" 1,408
	36" to 54" 4,266
Outlets, Gates, Etc.	6
Stabilize Slopes	0.5

REACH III

Mowing	(102 Acres) X 3
Brush Removal	15 Acres
Siltation Removal	30,000 C.Y.
Stabilize Slopes	0.5 Acre

EXHIBIT 12

00105

PROPOSED EXPENDITURES

<u>Year</u>		<u>Proposed Expenditures</u>
1		\$184,000.00
2	To Complete Reach II	\$104,000.00
3		\$104,000.00
4	Spraying-Mowing (First 1/3 of Reach II)	\$ 65,000.00

EXHIBIT 13

#### ARTICLE IV. CREEKS AND WATERWAYS

##### Sec. 32-95. Application of article.

The provisions of this article shall apply to those parcels of property which extend into the channels of Big Elm, Little Elm, Catclaw, Buttonwillow, Lytle or Rainey Creeks, or their tributaries, and that area within fifty (50) feet of each side of the center line of any of the above named creeks.

##### Sec. 32-96. Duty to clear, maintain channels.

Each owner of property within this city shall clear that portion of his property coming under the provisions of this article of all growths of trees, brush and weeds which materially obstruct or divert the flow of water in the creek channels, and shall maintain his property in such cleared condition.

##### Sec. 32-97. Exception.

In the event the property owner, or his predecessor in title, of property coming under the provisions of this article has granted the city a drainage maintenance easement in the channel of a creek, such owner shall not be required to clear the trees, brush or weeds within any such easement.

##### Sec. 32-98. Failure of owner, city may act.

In the event of failure or refusal by a property owner to remove the growth of trees, brush and weeds which materially obstruct or divert the flow of water from the channel of a creek, the city is authorized to remove and clear such obstructions and the reasonable expense of such clearing shall be charged against the abutting properties respectively.

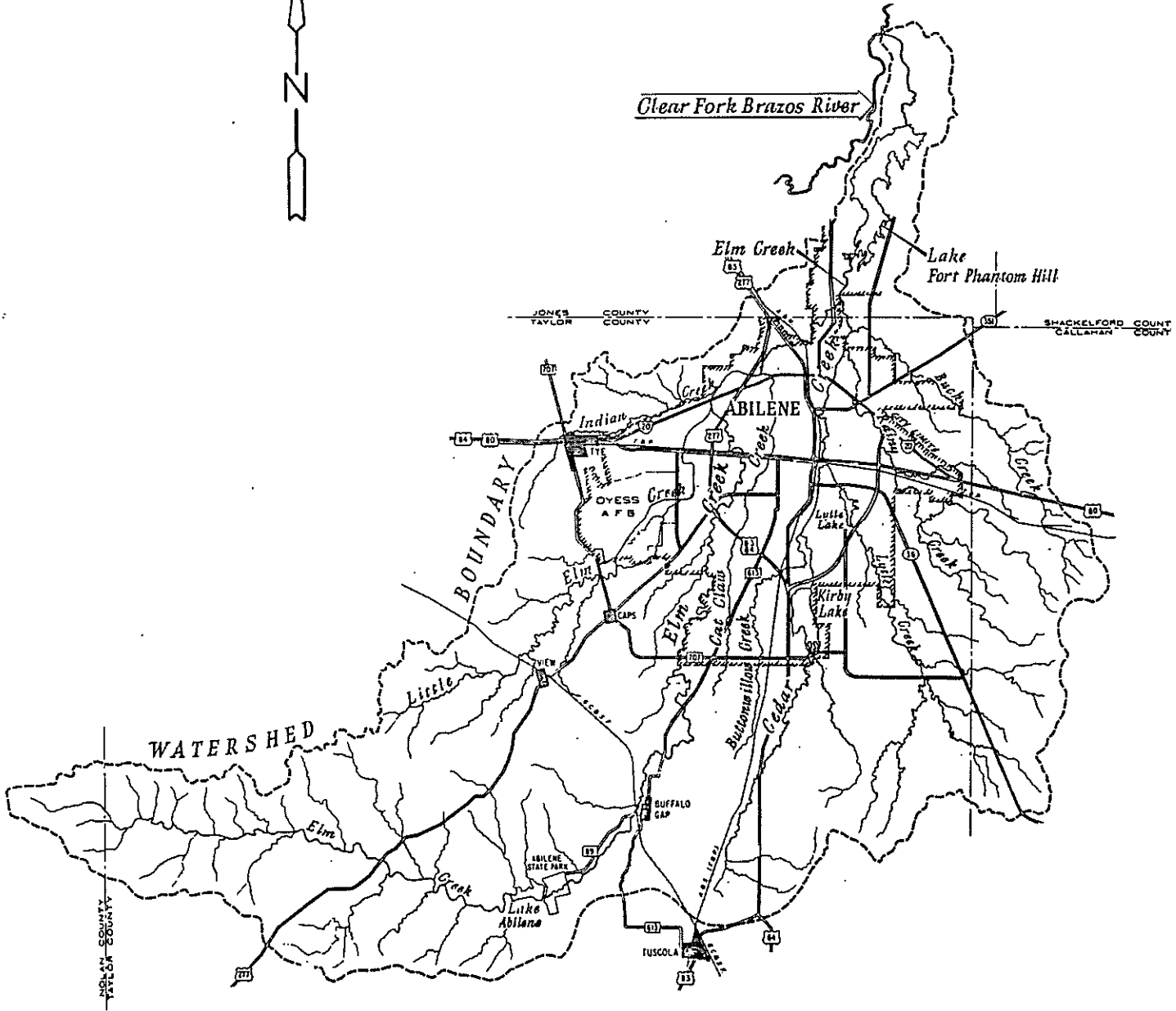
##### Sec. 32-99. Recovery of city's expenses.

The city attorney is authorized to proceed to collect the expenses of the city incurred under the provisions of this article and to affix them as a lien against the property affected in the manner and mode provided by law.

##### Sec. 32-100. Right of entry to inspect.

The city and its agents and employees shall have the right of access to inspect, within the city, the creek channels coming under the provisions of this article. No owner of property abutting such creeks, after being given reasonable notice, shall refuse an employee or agent of the city, in the discharge of his official duties, access to inspect the channels of such creeks.





**DRAINAGE AREA MAP  
OF  
ELM CREEK  
AND  
ITS TRIBUTARIES**

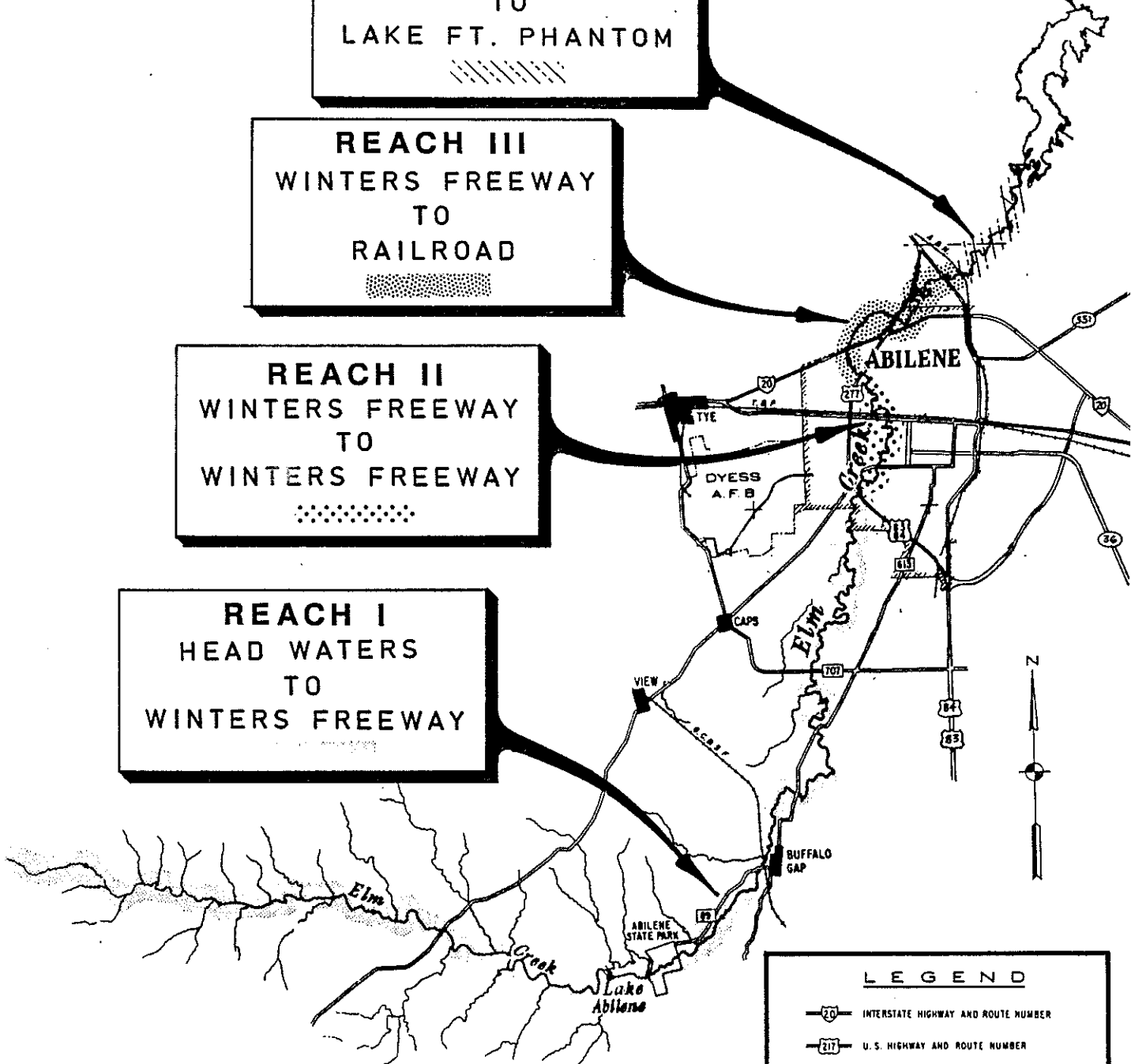
**REACH IV**  
RAILROAD  
TO  
LAKE FT. PHANTOM

**REACH III**  
WINTERS FREEWAY  
TO  
RAILROAD

**REACH II**  
WINTERS FREEWAY  
TO  
WINTERS FREEWAY

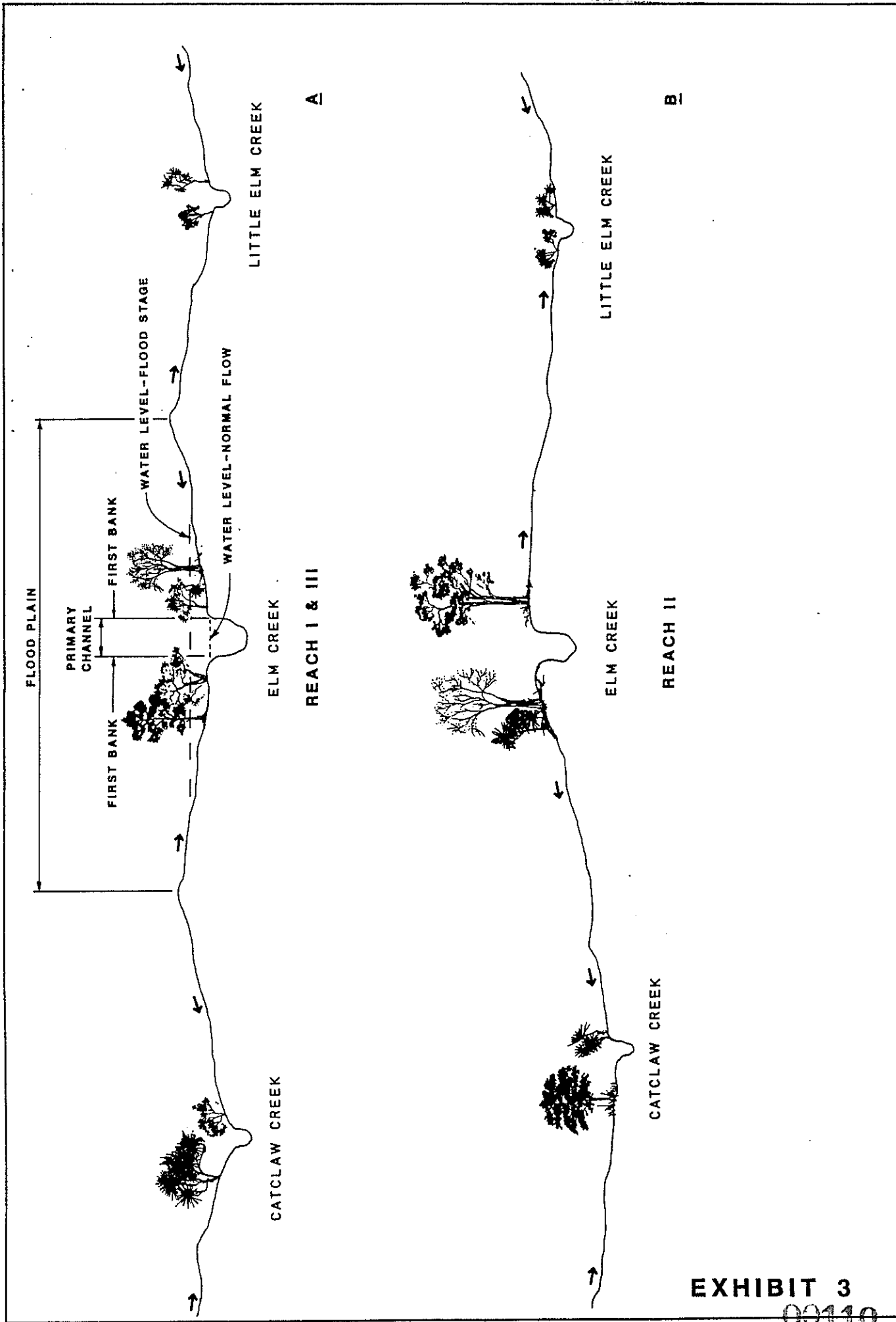
**REACH I**  
HEAD WATERS  
TO  
WINTERS FREEWAY

Lake  
Fort Phantom Hill

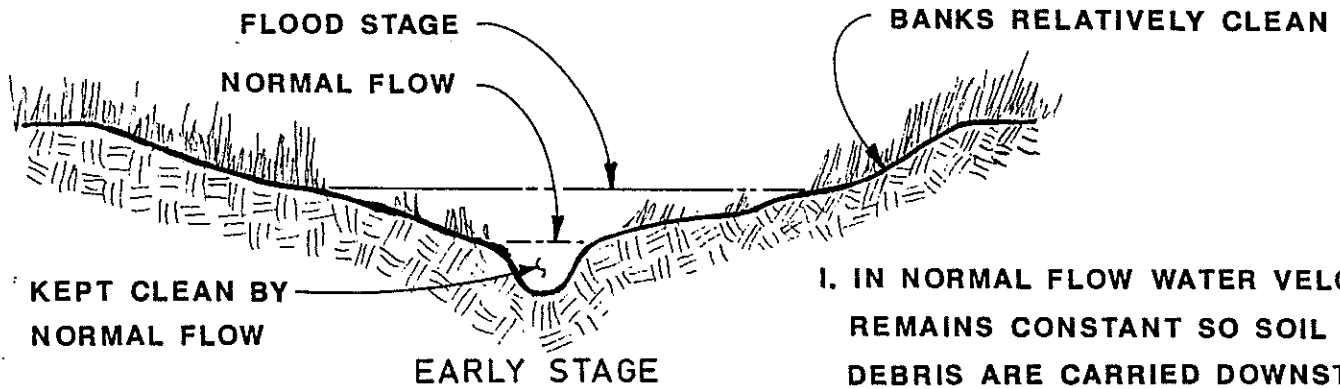


**ELM CREEK  
MAINTENANCE  
REACHES**

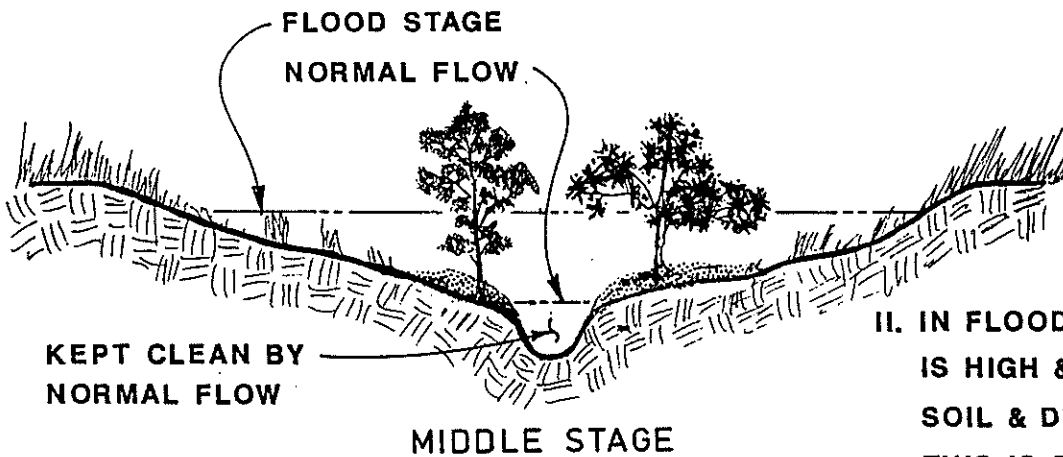
LEGEND	
	INTERSTATE HIGHWAY AND ROUTE NUMBER
	U. S. HIGHWAY AND ROUTE NUMBER
	STATE HIGHWAY AND ROUTE NUMBER
	FARM TO MARKET HIGHWAY AND ROUTE NUMBER
	CITY BOUNDARY
	MILITARY BOUNDARY
	RAILROAD



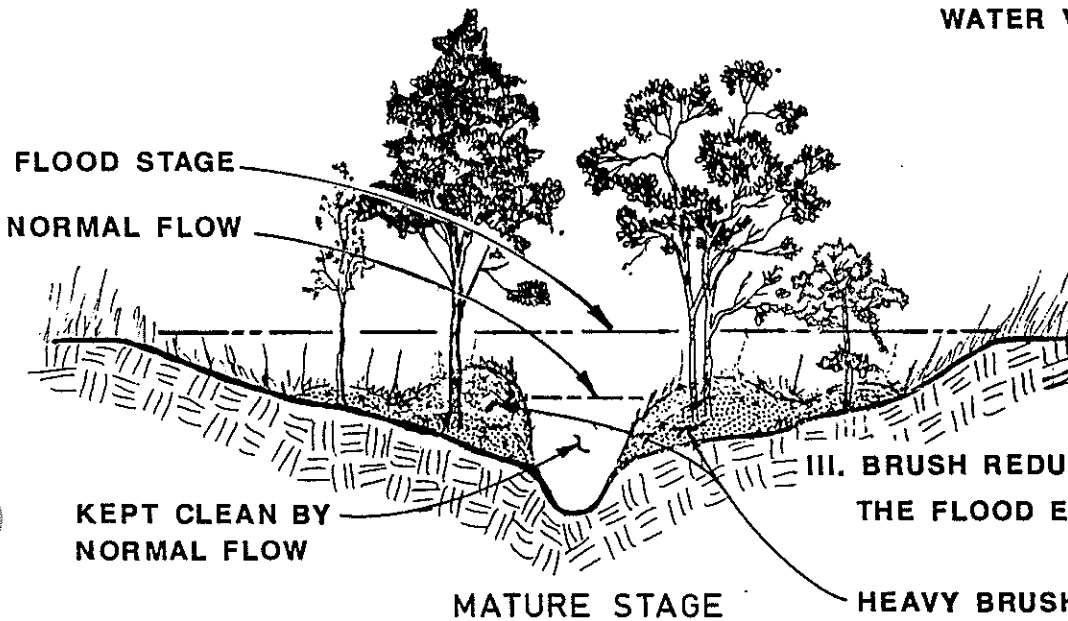
# NATURAL EVOLUTION OF A STREAM



I. IN NORMAL FLOW WATER VELOCITY REMAINS CONSTANT SO SOIL & DEBRIS ARE CARRIED DOWNSTREAM.

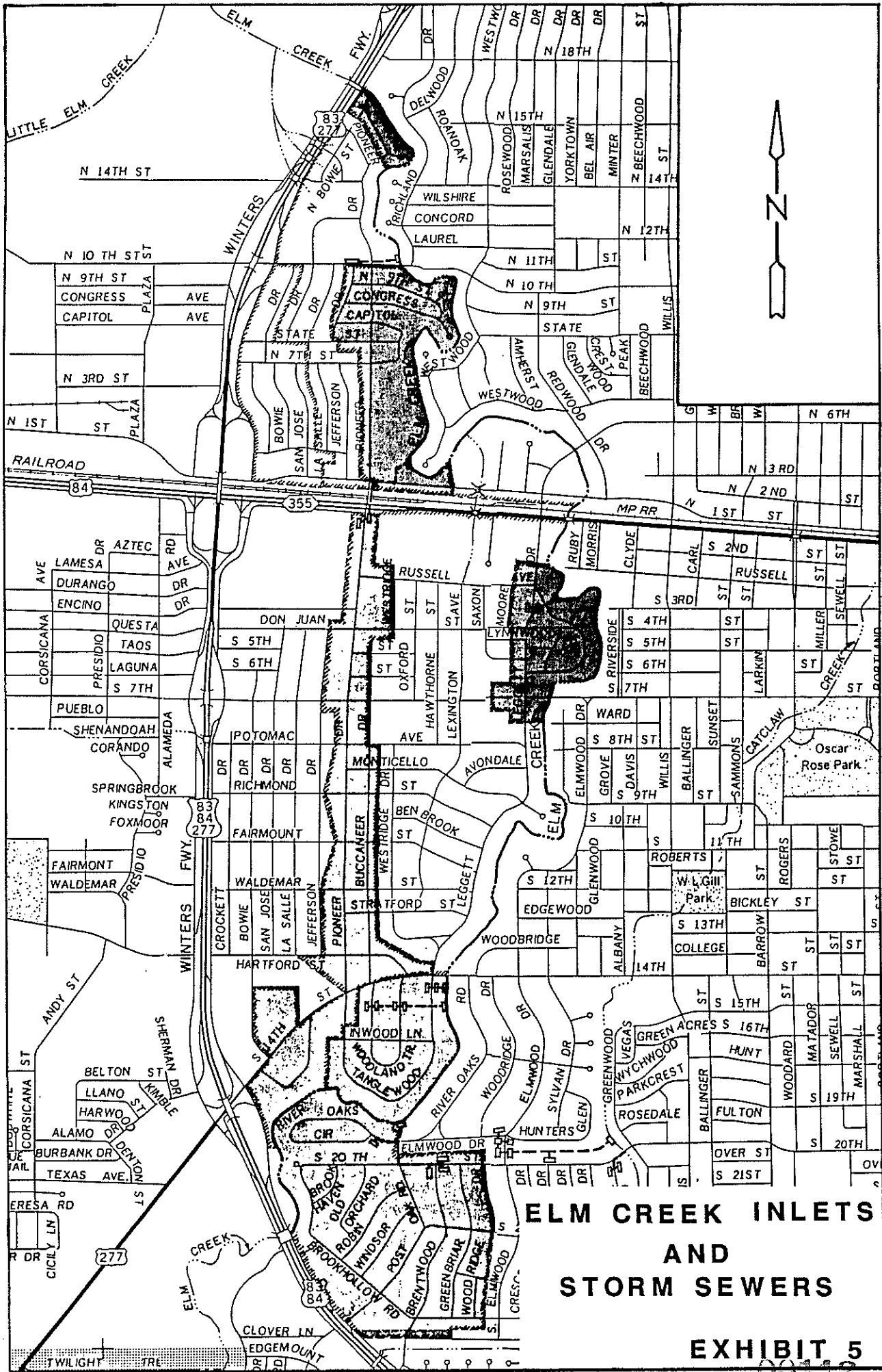


II. IN FLOOD STAGE THE VELOCITY IS HIGH & LARGE AMOUNTS OF SOIL & DEBRIS ARE PICKED UP. THIS IS THEN DROPPED WHERE WATER VELOCITIES ARE REDUCED



III. BRUSH REDUCES AVELOCITY & CAUSE THE FLOOD ELEVATION TO BE HIGHER.

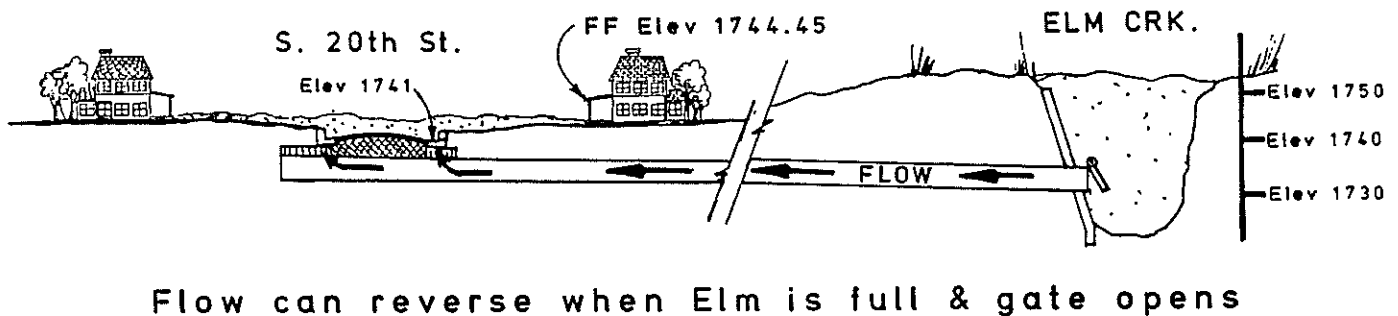
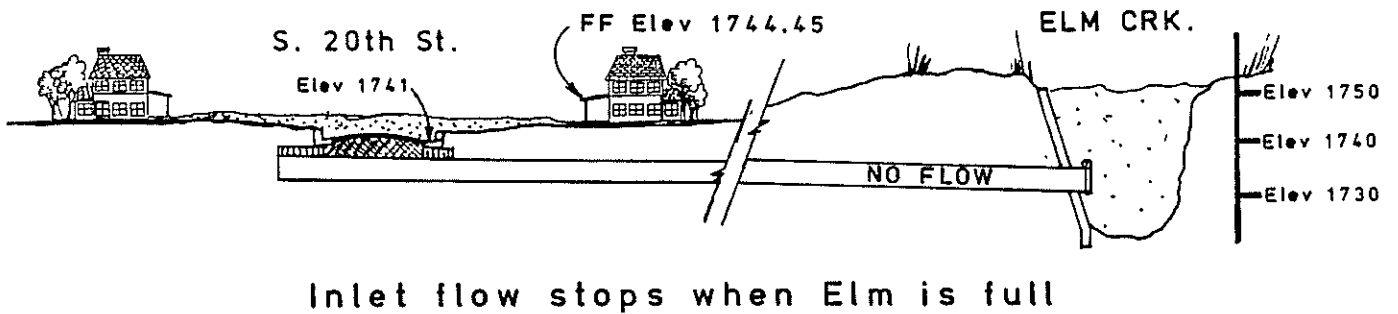
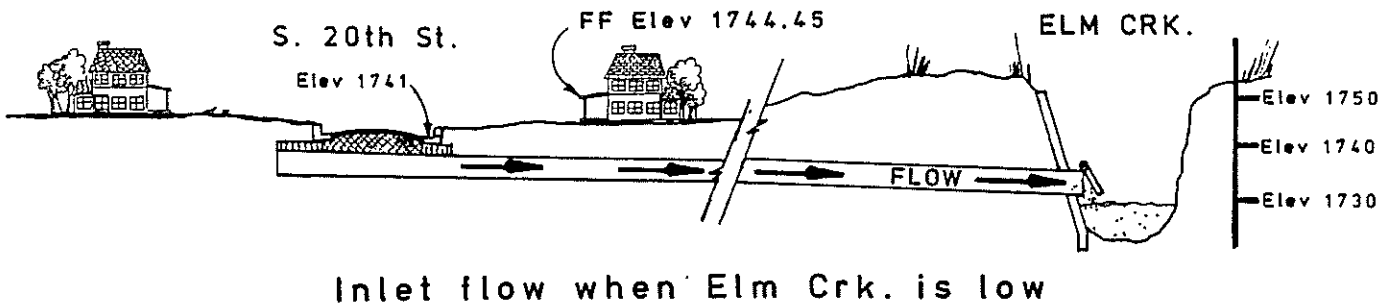
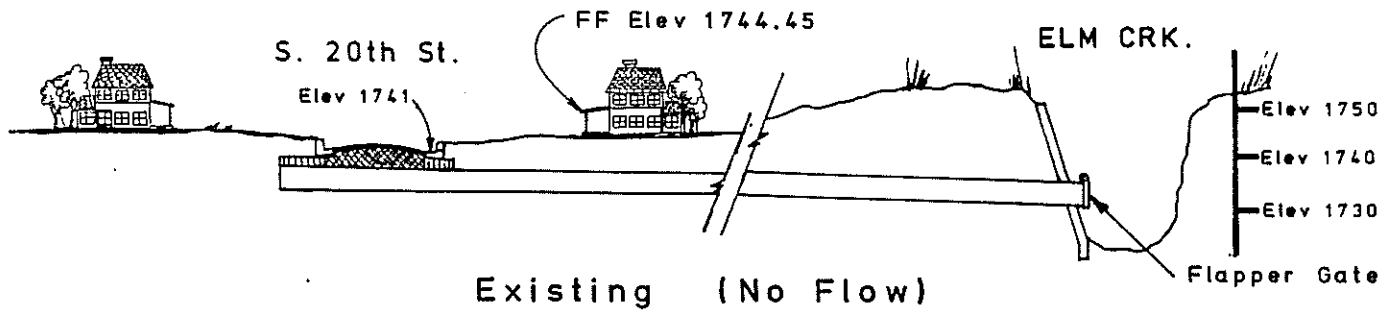
HEAVY BRUSH SLOWS WATER VELOCITY & SUSPENDED SILT IS DROPPED CAUSING BUILDUP IN THIS AREA.



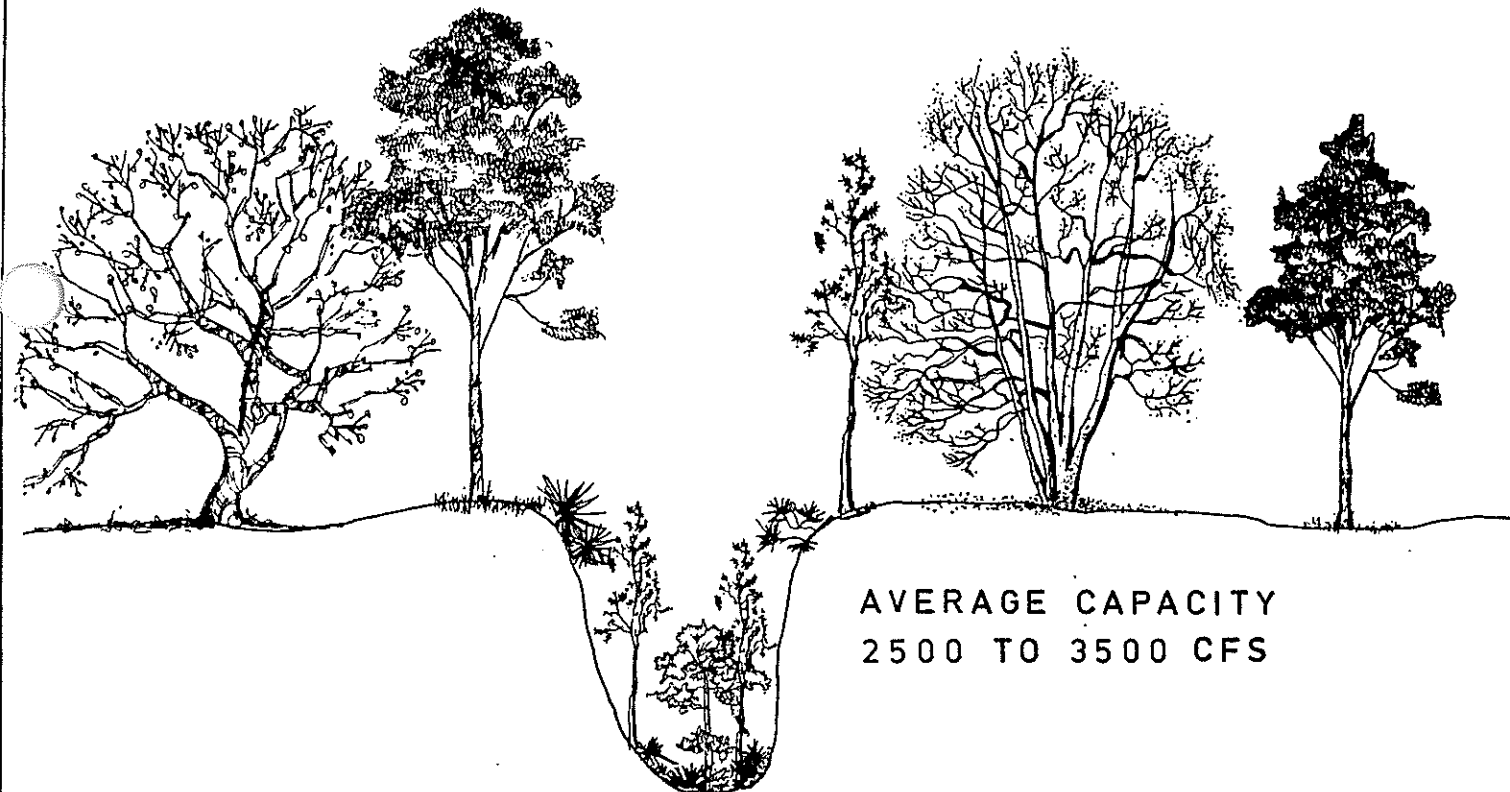
**ELM CREEK INLETS  
AND  
STORM SEWERS**

**EXHIBIT 5**

00112

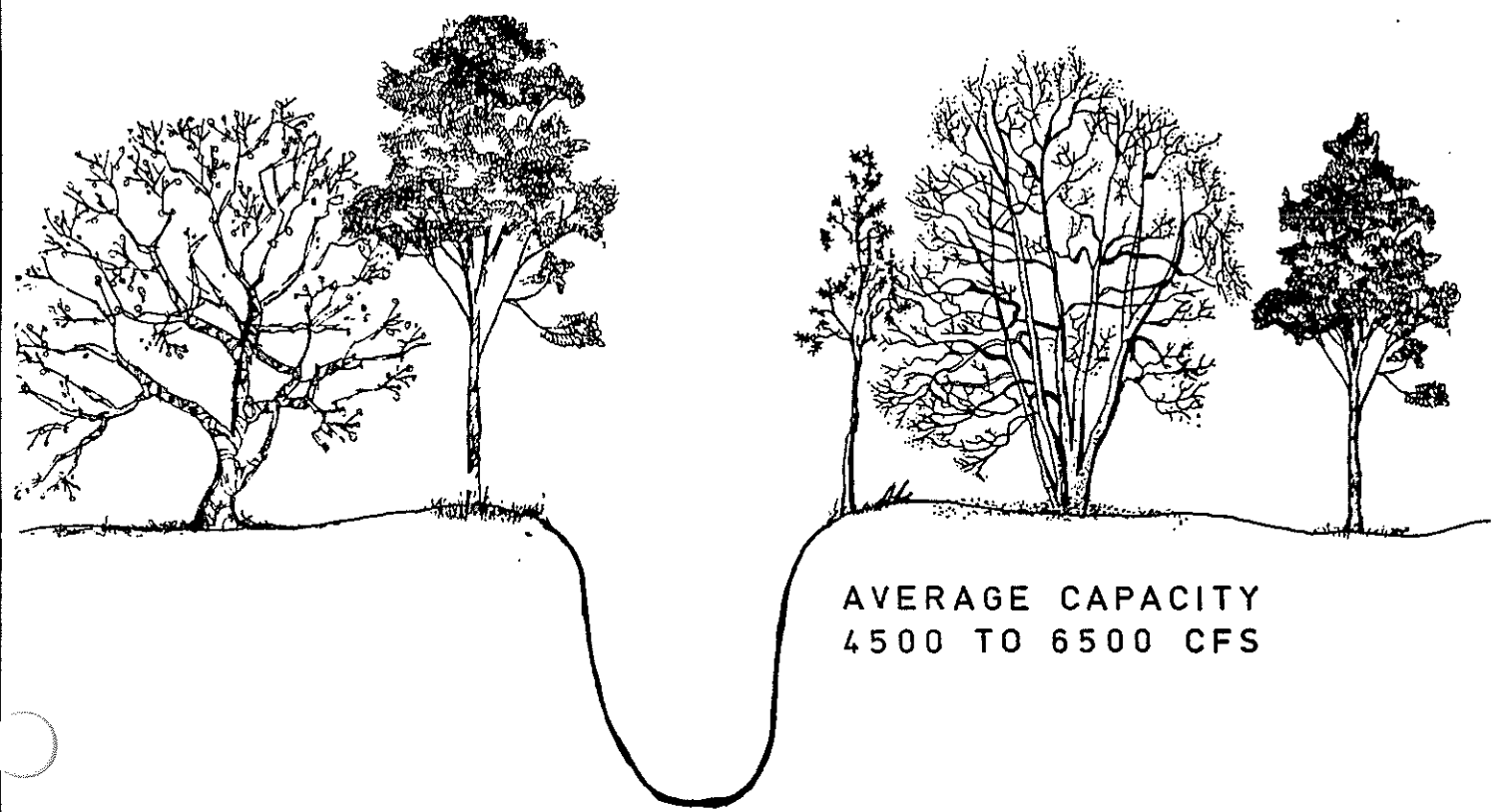


**ELM CREEK STORM SEWER  
TYPICAL GATE SYSTEM**



AVERAGE CAPACITY  
2500 TO 3500 CFS

**EXISTING CHANNEL**



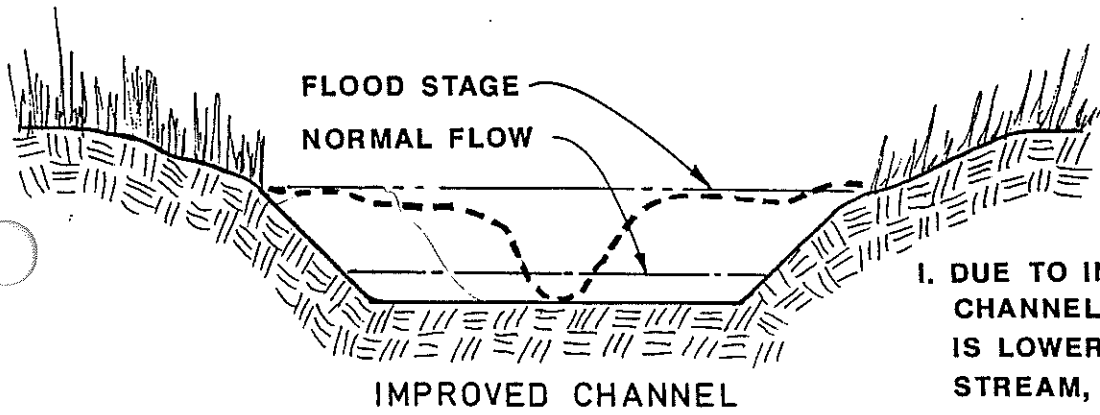
AVERAGE CAPACITY  
4500 TO 6500 CFS

**PROPOSED CHANNEL  
CLEANING.**

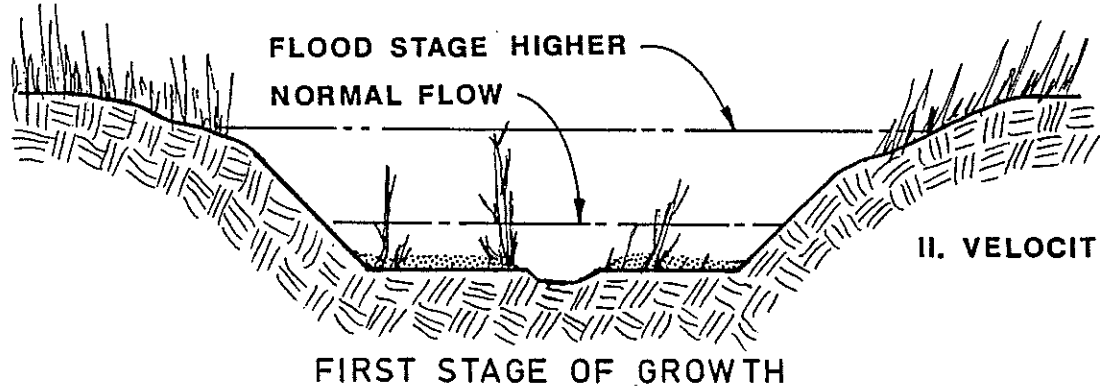
**REACH II**

**EXHIBIT 7**

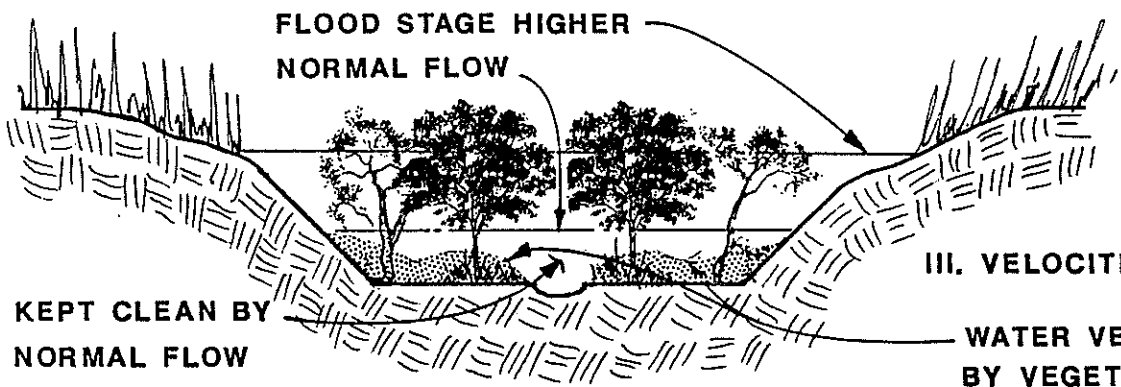
# EVOLUTION OF AN IMPROVED STREAM WITH OUT MAINTENANCE



I. DUE TO INCREASED AREA OF CHANNEL THE FLOOD ELEVATION IS LOWERED FROM UNIMPROVED STREAM, VELOCITIES ARE HIGHER

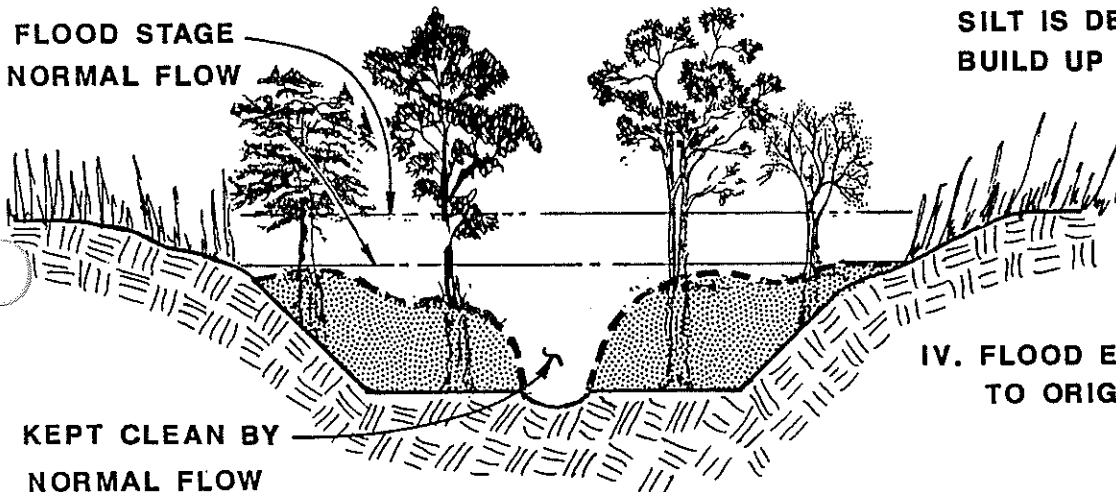


II. VELOCITIES BEGIN TO SLOW



III. VELOCITIES ARE SLOWER

WATER VELOCITY IS SLOWED BY VEGETATION AND SUSPENDED SILT IS DEPOSITED CAUSING BUILD UP IN THIS AREA



IV. FLOOD ELEVATION RETURNS TO ORIGINAL STAGE



ACTIVITY	1 ST YEAR												2 ND YEAR												3 RD YEAR												4 TH YEAR													
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
MOW - REMOVE BRUSH																																																		
REMOVE SILTATION, TREES, ETC.																																																		
STABILIZE SLOPES																																																		
INLETS, PIPES, ETC.																																																		
ENCROACHMENTS																																																		
INSPECTION & INVENTORY																																																		

ELM CREEK  
PROPOSED SCHEDULE  
OF  
MAINTENANCE ACTIVITIES

00115