L 2001 DRAINAGE - CITY OF CARROLLTON carrollton

FAXED: 5/11/01

PW#3

CARROLLTON

MEMORANDUM

FROM: Brenda L. Johnson, Executive Assistant
PUBLIC WORKS DEPARTMENT

DATE: April 18, 2001

SUBJECT: Drainage/Stormwater Utility Fee Survey TOWN OF ADDISON

We are conducting research regarding drainage fees imposed by neighboring Cities, and respectfully request your assistance in providing responses to the following survey questions:

1. What is the *monthly residential fee*? NONE
2. What is the *monthly commercial fee*? NONE
3. What is the *monthly industrial fee*? NONE
4. Does the City charge *school districts* a drainage fee? NO
5. Does the City allow *any exemptions* from the fees? If so, which entities are exempt? N/A
6. Is the fee based on area of impervious cover for commercial/industrial properties? N/A
7. Does the residential fee apply to apartments, or single-family? N/A
8. How is the fee for apartments calculated? N/A
9. What is the total annual revenue? NONE
10. What is the revenue from the fees used for (i.e., maintenance, capital improvements, other)? N/A

It would also be helpful to know how long it took to implement the fee, as well as the length of time the fee has been in place and assessed on a regular basis. N/A

The information being provided in this survey will be most helpful to us in completing our research, and we appreciate your cooperation in taking the time to provide the data. It would be beneficial to have your completed surveys returned to me, via E-mail or FAX, **by Thursday, April 19, 2001**. Should you have any questions or require additional information, please don't hesitate to contact my office. Again, thank you for your time.

BRENDA L. JOHNSON
Phone: (972) 466-4291
FAX: (972) 466-3193
brenda.johnson@cityofcarrollton.com

Addison!

MICHAEL E. MURPHY, P.E.
Director of Public Works
(972) 450-2878
(972) 450-2837 FAX
mmurphy@ci.addison.tx.us E-mail

Town of Addison 16801 Westgrove Dr. P.O. Box 9010, Addison, Texas 75001-9010

BRENDA,

SORRY FOR THE LATE RESPONSE.

PLEASE CALL WITH ANY QUESTIONS.

Mike

HP LaserJet 3200se

invent

TOALASERJET 3200
9724502837
MAY-11-2001 15:49

Fax Call Report

Job	Date	Time	Type	Identification	Duration	Pages	Result
757	5/11/2001	15:47:56	Send	99724663193	1:14	2	OK

Addison!

MICHAEL E. MURPHY, P.E.
Director of Public Works
(972) 450-2878
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Town of Addison 16801 Westgrove Dr. P.O. Box 9010, Addison, Texas 75001-9010

BRENDA,

SORRY FOR THE LATE RESPONSE.

PLEASE CALL WITH ANY QUESTIONS.

Mike

COPY

FYI

INTER OFFICE

MEMO

RECEIVED
MAY 30 13
ADDISON POLICE DEP

To: Chief James McLaughlin, Jr. Com#44
From: Lieutenant Bob McKitrick
Subject: Tunnel Information
Date: May 30, 1997

On May 22, 1997 Captain Davis, Captain McCarley, Communications Supervisor Joni Ramsey, and I met with City Engineer John Baumgartner in reference to the new tunnel proposed underneath the airport. Mr. Baumgartner gave us what information he currently has on the tunnel.

The proposed tunnel will be approximately 1,250 feet long and 20 feet high with two lanes, one in each direction. Each lane will be approximately 14 feet wide with a 3 foot walkway on both sides for emergency pedestrian traffic and maintenance. The total length of this project is 3,650 feet. Three unmanned toll booths are currently planned with several lanes feeding in and out of the area. According to information we have now, the tunnel is designed for toll tag vehicles only. It is still unknown what kind of turnaround areas will be used for vehicles.

The tunnel will be equipped with a ventilation system, a sump pump system, and a fire sprinkler system. Lighting will be inside the tunnel, decreasing and increasing in foot candle power according to need of interior and exterior light availability. Video surveillance is proposed, and may possibly be monitored at the Tollway DPS office.

At this time, we have expressed communications concerns with radios, cell phones, placement of emergency phones in the tunnel, and emergency response procedures. However, at this stage of the project, we don't have any absolutes.

On May 23, 1997 the Baytown Police Department, Fire Department, Emergency Management Division, and the city engineers were contacted by phone for information on the Baytown Tunnel. The police department advised the tunnel had been closed for over a year and a bridge had been built over it. They provided the following information:

- Accidents were common, especially head-on collisions due to no barrier between the two lanes of traffic.
- Clearing an accident took from 30 minutes to one hour depending on traffic.
- Four lane feeders in and out of the tunnel created a bottle neck during peak traffic hours.

Baytown Fire Department advised that car fires were difficult to deal with due to poor placement of stand pipes and hose cabinets. Even though the tunnel had a ventilation system, the fire department advised that black smoke would be everywhere after a car fire, making visibility difficult inside the tunnel. The tunnel normally has to be shut down afterwards to clean all the soot.

Assistant Fire Chief John Adkins advised that motorists using tunnel usually allowed an extra 30 minutes travel time due to the uncertain status of traffic. Baytown Fire Department further advised no hazardous materials were allowed in the tunnel. The Emergency Management Director, Mr. Howard Brister, advised tunnel was not used for any emergency evacuation planning due to traffic problems, plus the possibility of poor communication via cell phones, car radios, and emergency response personnel's radios. He agreed with other departments that accidents, stalled vehicles, and traffic delays were the biggest problem with the tunnel, and he was glad to see the bridge utilized to alleviate traffic congestion.

The Baytown City Engineer's Office was contacted and I spoke to Ms. Marla Stevens, Assistant City Engineer. She advised me that the Baytown Tunnel was under the management of the Texas Department of Transportation and the tunnel was 40 years old. Tunnel was monitored at both ends by the Texas Department of Transportation personnel who had wreckers stationed at each end. Tunnel was monitored by video 24 hours a day 7 days a week. The tunnel had red and green flashing lights with gate signage to open or close tunnel at any time. She stated the tunnel was approximately one mile long, had two traffic lanes (center stripped), and a two foot maintenance walkway with pipe chases on each side of the tunnel. Speed in the tunnel was 35 miles per hour. The Baytown Tunnel was not a toll tunnel and had no booths to impede traffic flow. Ms. Stevens advised that traffic volume was 30,000 to 40,000 vehicles a day. Tunnel did have turnaround areas at each end. She was given some base information on our proposed tunnel and gave the following recommendations.

1. Access doors on the sides of the tunnel leading into the tunnel for emergency pedestrian traffic, maintenance purposes, and an access point for emergency personnel responses.
2. Fire sprinkler system, ventilation system, and sump pump system
3. Communications equipment to enhance radio, telephone, or cell phone transmissions.
4. A second tunnel if feasible so each tunnel can have one-way traffic.
5. Gates, lights, and signage to open or close the tunnel and give motorists advanced warnings.
6. No admission of hazardous materials.
7. Video and sound equipment to monitor activities in the tunnel.
8. No pedestrian or bicycle traffic

RM/af

HUITT-ZOLLARS

cc: Chris Terry
Bruce Ellis

Dallas • Fort Worth • Houston • El Paso • Phoenix • Orange County

FACSIMILE TRANSMITTAL

Date: June 4, 1997 Fax No.: See List Below

H-Z Project No. 01-2013-01 No./Pages: 4 (Including Cover Sheet)

TO: See Distribution List Below

☐ URGENT X For Your Review ☐ Please Call Upon Receipt ☐ Original to Follow by Mail

Distribution List: CONSTRUCTION PROGRESS MEETING MINUTES - MEETING NO. 29

Bryant Nail - Columbus Realty Trust: 972/770-5129

Mark Brandenburg - Columbus Realty Trust: 972/866-6560

Jim Duffy - Columbus Realty Trust: 972/770-5147

Mark Person - Gibson & Associates, Inc.: 972/557-1552

* John Baumgartner & Bruce Ellis - Town of Addison: 972/450-2837

Ron Lee - Town of Addison: 972/450-2834

Saad Hineidi - Fugro-McClelland: 972/620-7328

Jerry Morgan - Construction Management & Consulting: 972/231-1342

FROM: David Meyers

SENT BY: Paula Powers TIME: 3:10 pm DATE: 6-4-97

If you have any problems receiving this Facsimile Transmittal, please contact Ms. Janet Wills or the individual listed above at (214) 871-3311. Thank you.

3131 McKinney Avenue • Suite 600 • Dallas, Texas 75204 • (214) 871-3311 • FAX (214) 871-0757

Huitt-Zollars, Inc. / 3131 McKinney Avenue / Suite 600 / LB 105 / Dallas, Texas 75204-2489 / 214/871-3311 / FAX 214/871-0757

CONSTRUCTION PROGRESS MEETING NO. 29
Addison Circle Phase I Public Infrastructure
June 4, 1997
Page 1

PRESENT: See Attached List

LOCATION: Columbus Realty Project Trailer
8:30 a.m.

DISCUSSIONS

1. A change order price for alternate street sign posts and mounting hardware has not yet been submitted by Gibson. A price should be submitted in the near future.

2. Modern Roundabout will be opened along with Addison Circle when street is cleared of all debris and construction materials. Columbus has scheduled to sweep the streets on Thursday of this week.

3. Signal Interconnect is still on hold awaiting decision from the Town.

4. Gibson now has direction from the Town on the location of the irrigation controller in the park.

5. Lone Star and SWBT lines on private property just east of Julian on the south side of Addison Circle are being addressed by the Town.

6. Bolts for Bega style poles will be made available once a decision is reached on the pole and fixture. Bega will also make available a metal template for the bolt patterns.

7. Town expects linkage between Building 'B' garage and Building 'A' to be complete for safe pedestrian passage prior to obtaining C.O. Mr. Baumgartner would like to see the link completely bricked with no tripping hazards. The Town would except the next priority to be the completion of sidewalks along the north side of Addison Circle, along the east side of Bosque Park and then Witt Place.

8. TUE should be contacted about getting power to the 30 foot street light on the NW quadrant of the roundabout. They also need to install the white gooseneck on the north side of Addison Circle just west of the roundabout.

   I contacted George Esqueda after the meeting and he will submit the work orders to complete the above mentioned work.

9. The two existing trees nearest the railroad tracks on the north side will be removed, followed by the necessary grading work in the median then the planting of new trees when they are available.

10. Columbus is scheduled to get new backflow prevention tests and reports today.

11. The Town wants a submittal from Gibson on the method and materials that will be used to repair some damaged edges on Witt Mews drop slabs.

g:\proj\0120130\cnst#29.min

12. The next construction meeting will be held on **Wednesday, June 25th at 8:30 a.m.** in the project construction trailer.

END OF MEETING

This report is assumed to be a true and accurate account of this meeting unless written notification to the contrary is received within three (3) days. Please distribute these meeting minutes to the appropriate personnel within your respective companies.

SUBMITTED BY:

HUITT-ZOLLARS, INC.

David E. Meyers, P.E.

cc: Bryant Nail, Mark Brandenburg, Jim Duffy-Columbus Realty Trust
Mark Person-Gibson & Associates, Inc.
John Baumgartner, Bruce Ellis, Ron Lee-Town of Addison
Saad Hineidi-Fugro-McClelland, Inc.
Jerry Morgan-Construction Management & Consulting

SIGN-IN SHEET
CONSTRUCTION PROGRESS MEETING NO. 29

PROJECT: ADDISON CIRCLE PHASE I PUBLIC INFRASTRUCTURE DATE: 6/4/97 8:30 A.M.

NAME	COMPANY	TELEPHONE/FAX NOS.
Daniel Meyer	Huitt-Zollars, Inc.	214 871-3311 / 214 871-0757
Mark Person	Gibson + Assoc Inc	972-557-1199 / 972-557-1552
Ron Lee	TOA	972-450-2851 / 972-450-2834
John Baumgartner	TOA	972.450-2871
Mark Brandenburg	CRT	726-0347

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT

Post Office Box 144 Addison, Texas 75001

(972) 450-2871

16801 Westgrove

June 3, 1997

Ms. Lisa Kissel
Fults Realty Corporation
14651 Dallas Parkway, Suite 101
Dallas, Texas 75240

Re: South Quorum Development Status

Dear Ms. Kissel:

The Town of Addison is continuing the planning process to provide another route of access to the developments south of Quorum and Landmark Drive. The proposed roadway will connect to Inwood Road and Landmark Drive. Currently access can only be made from Dallas Parkway. This letter describes the process that the Town is currently under going in order to expedite the project.

The Town of Addison is working with Parsons Transportation Group to select the optimum road alignment that will best serve the existing and proposed developments in the south Quorum area. At this time, three alignment alternatives have been developed. Alternate 2 is currently the preferred alignment since it provides the most efficient connection to Inwood Road. (I have included copies for each alignment alternative.) There are still a number of engineering design questions that need to be addressed for each alternative. The Town must reach various agreements with TU Electric, Union Pacific Railroad and the owners of the motor bank before any of the alignments can be constructed.

The Town of Addison has committed to invest 1.4 million dollars into the road system. At this time it is too early to determine the actual cost of the project, however, it is likely the cost to construct the road will exceed 1.4 million dollars. As the design process continues we will be able to estimate the probable construction cost of the project and need for private participation by the land owners. We will keep the affected land owners informed of any financial needs that may arise to construct the project. We are hopeful that the final alignment will be selected in September, which will allow for the acquisition of the right-of-way from the necessary properties.

I hope that this letter provides enough information to understand the process that the Town is currently going through in order to improve access to the Princeton. If you have any additional questions please call me at (972) 450-2860.

Sincerely,

Jeff Markiewicz
Project Manager

CC: John Baumgartner
Ron Whitehead

FAX TRANSMISSION

TO: FIRM NAME: Addison DATE 6/5/97

ADDRESS: _____ TIME _____

CITY _____ STATE _____

FAX NUMBER 972 450 2837 NO. OF PAGES IN TRANSMISSION INCLUDING THIS PAGE 2

ATTENTION: John Baumgartner

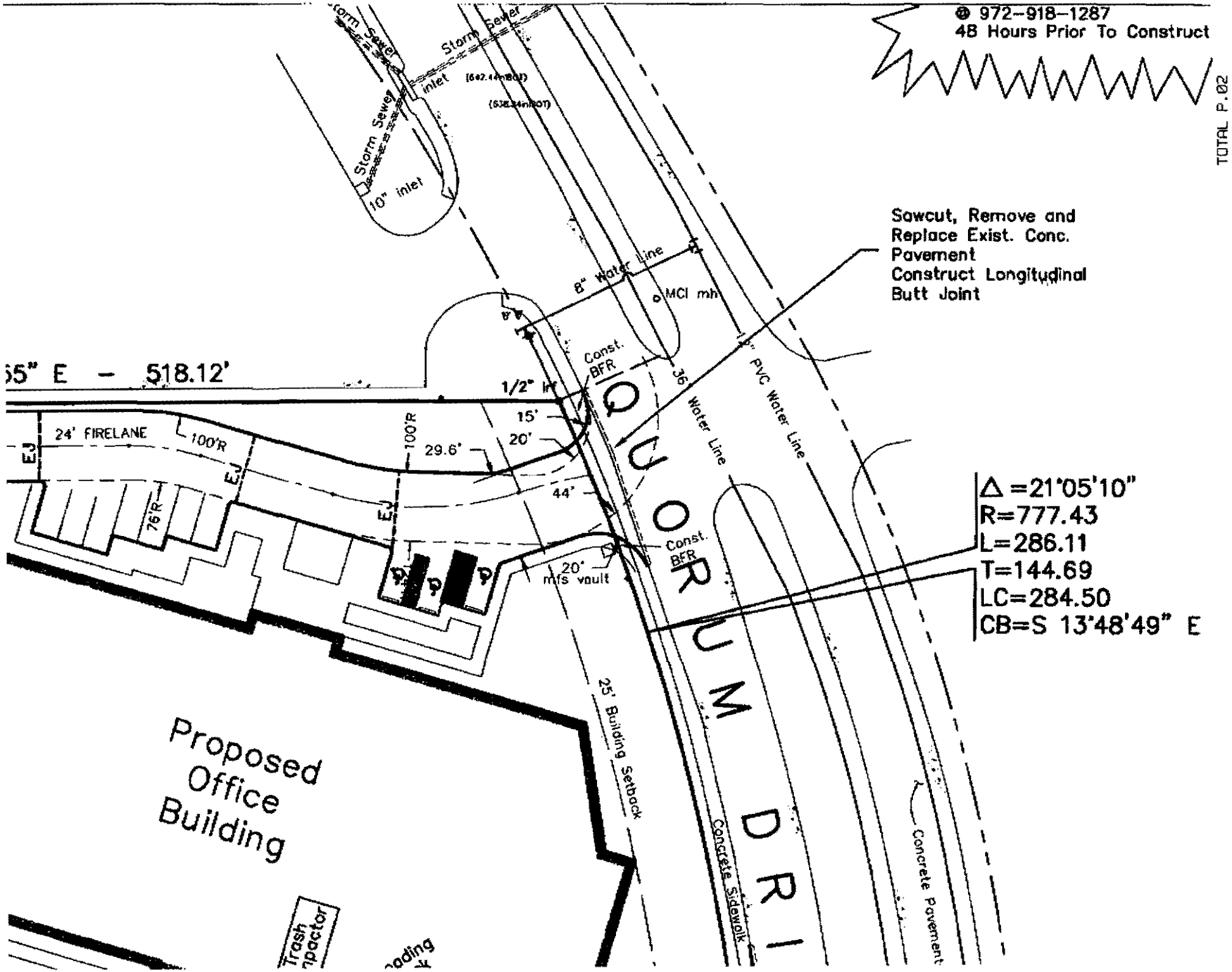
COMMENTS OR INSTRUCTIONS

Please
Review & Comment

Thanks

FROM: Wes Loerger PROJECT NO. C97138

BROCKETTE • DAVIS • DRAKE, inc.
consulting engineers
Civil & Structural Engineering • Surveying
4144 North Central Expwy. • Suite 1100 • Dallas, Texas 75204 • (214) 824-3647 • Civil/Survey Fax (214) 824-7064 • Structural Fax (214) 824-2588



REC'D MAY 1 4 1997

CARROLLTON

May 13, 1997

Mr. John Baumgartner, City Engineer
Town of Addison
P.O. Box 144
Addison, Texas 75001

Re: Lot 1, Block A, Beltwood North Phase 1

Dear Mr. Baumgartner:

We have completed the review of the proposed improvements for the above referenced project dated May 12, 1997 prepared by PCC Consulting Engineers, Inc. Based on our review, the proposed drainage improvements appear to be in compliance with the agreed upon requirements between the City of Carrollton and the Town of Addison.

We sincerely appreciate the opportunity to review proposed plans that could impact the City of Carrollton. If you have any questions, please contact me at (972) 466-3200.

Sincerely,

Joe Evans

Joe Evans, P.E.
Division Manager/Design

cc: File
Tim Tumulty, City Engineer
Sepehr Parnian
1120 Empire Central Place
Suite 308
Dallas, Texas 75247

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 144 Addison, Texas 75001 16801 Westgrove

MEMORANDUM

To: John Baumgartner

From: Robin Jones RJ

Date: May 7, 1997

Subject: Traffic Signal Problem - Letter from Sondra Voto

I reviewed the letter addressed to Ron Whitehead from Sondra Voto dated April 22, 1997. Since the intersection in question (Dallas Parkway/Kellers Springs Road) is in the City of Dallas, I called Ms. Voto for clarification of her complaint prior to contacting the City of Dallas Transportation Department.

Ms. Voto explained that her complaint was actually with the operation of the signal at Keller Springs Road and Noell Trail not Keller Springs and Dallas Parkway. She also explained that for the past week and a half the signal had been working much better. I suggested to her that because this traffic signal was a relatively new installation, that the City of Dallas probably had been in the process of fine tuning its operation.

I told Ms. Voto that I would contact the City of Dallas Transportation Department regarding her complaint and communicate her desire to see that this signal continues to function properly. I also gave Ms. Voto the Transportation Department phone numbers in case she has any future problems with this or any other City of Dallas traffic signal. She was very appreciative.

REC'D MAY 07 1997 amb

RECEIVED
APR 29 1997
ASST. TO THE CITY MANAGER

RECEIVED
APR 25 1997
CITY MANAGER

April 22, 1997

4-29-97
C
Please
Please
R

Ron Whitehead
Town of Addison
P.O. Box 144
Addison, Texas 75001

Dear Mr. Whitehead:

I just spoke with Andy at the City Hall of Addison and was questioning him on whom I could send this letter to voicing my complaint about the traffic lights at Dallas/Keller Springs and Keller Springs/Tollway. He explained to me that the City of Dallas controls those particular lights but to feel free to let you know my thoughts. Today is only one of the many days that I sat in that traffic for 15 minutes while those lights let approximately 4-5 cars through at a time. Traffic was backed up clear back to the bridge before you even approach the sets of apartments and condos.

Every since the light at Dallas & Keller Springs was set up, it has not been synchronized. One light may be green and letting cars through, but the other light will be red and causing a jam where the green light does no good to be green. All of this rambling may not make sense, but my nerves are still frazzled from this morning's traffic.

Again, let me stress that this is not an unusual occurrence. This is *every morning*. And very irritating!

Please forward my complaint to the appropriate persons. And let me know if I need to send a letter everyday to help get my point across.

Thank you.

Sincerely,

Sondra J. Voto

Sondra J. Voto

Sondra J. Voto ✦ One Norman Trail ✦ Rockwall, Texas 75087
972/772-3824 hm. ✦ 972/687-5816 wk.

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 144 Addison, Texas 75001 16801 Westgrove

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NOELL TRAIL
DALLAS

5/2

John -

Please review and lets discuss at our Monday CIP meeting.

Chris 2
Beltway

REC'D MAY 07 1997 amb

RECEIVED
APR 29 1997
ASST. TO THE CITY MANAGER

RECEIV
APR 25 1997
CITY MANAGER

April 22, 1997

4-29-97
C Lun
Please
attach
Ron

Ron Whitehead
Town of Addison
P.O. Box 144
Addison, Texas 75001

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Sondra J. Voto

Sondra J. Voto ✦ One Norman Trail ✦ Rockwall, Texas 75087
972/772-3824 hm. ✦ 972/687-5816 wk.

HUITT-ZOLLARS

Huitt-Zollars, Inc. / 3131 McKinney Avenue / Suite 600 / LB 105 / Dallas, Texas 75204-2489 / 214/871-3311 / FAX 214/871-0757

MEMORANDUM OF MEETING

Prepared By: **Andy Oakley, Huitt-Zollars, Inc.**

Issued: **April 29, 1997**

Regarding: **Addison Circle Phase II**
HZ Project No. 01-1822-21

Distribution: **Bryant Nail, Columbus Realty Trust**
Carmen Moran, Town of Addison
Attendees as Noted Below

A meeting was held at the Town of Addison Fire Prevention Bureau on Tuesday April 29, 1997 at 10:30 AM to discuss the Fire Department's comments on the Addison Circle Phase II Development Plan. The following persons participated in the meeting:

- **Andy Oakley, Huitt-Zollars, Inc.**
- **Mark Tuttle, RTKL Associates**
- **Gordon C. Robbins, Deputy Fire Chief, Town of Addison**

The following is a summary of the discussion and conclusions.

We reviewed the eight numbered comments made by Mr. Robbins during his review of the Phase II Development Plan, a copy of which are attached for reference.

1. Street M3 will be widened to 24 feet face-to-face to allow for a legitimate fire lane as requested.

2. The private drive behind the townhomes will not be made a fire lane. It was acknowledged that the group of units meets the requirements for fire coverage from the adjacent public streets (all parts of the building are within 150 feet of the street).

3. The entrance to the motorcourt on Building "M" does not have to be a fire lane. It was agreed that the building perimeter is entirely within 150 feet of a fire lane and that penetration by fire vehicles into the interior is not required.

4. We will work with the Town so that their design of the park in Addison Circle (Mildred) provides an additional six feet of unobstructed passage next to the travel lanes so that there is effectively 24 feet clear for fire vehicles. (This was discussed with Slade Strickland prior to meeting with the Fire Dept.) This may include an apron in the park that looks like plaza or sidewalk space but is actually capable of supporting 50,000 pounds. In this way, the driving lane can remain 18 feet wide to avoid the impression of multiple lanes that is such a problem on Westgrove. (The 18 foot width allows comfortable through movement in the presence of the angled head-in parking). Huitt-Zollars needs to review the potential solutions with appropriate City staff sufficiently to allow timely approval of the infrastructure construction plans which will precede the park design.

5. The entrance to the private garages in Building "M" does not have to be a fire lane. It was agreed that the building perimeter is entirely within 150 feet of a fire lane and that penetration by fire vehicles into the interior is not required.

6. The additional fire hydrant will be installed.

7. The additional fire hydrant will be installed.

8. Acknowledged.

In addition to the comments on Phase II, as submitted, we discussed the supplemental issues surrounding Block "Q" and the office tower. Mr. Robbins reiterated that he will require a fire lane around the office tower itself but will not require a fire lane along the south face of the parking garage.

The foregoing represents our understanding of the conclusions reached in the meeting. Please contact me within five days if any corrections are required.

TOWN OF ADDISON

FIRE DEPARTMENT

Post Office Box 144 Addison, Texas 75001

(972) 450-7200 FAX (972) 450-7208

4798 Airport Parkway

MEMORANDUM

Friday, April 04, 1997
TO: **Carmen Moran, Director of Development Services**
FROM: **Gordon C. Robbins, Deputy Fire Chief**
SUBJECT: **Addison Circle, Phase 2 site plan**

Gordon

Thank you for the opportunity to review the above submittal. I have the following comments.

1. M3 shall be a properly configured and constructed fire lane.

2. The private drive north of the Block N garage (between the garage and the townhouses) shall be a properly configured and constructed fire lane, 24 feet in width. (Submittal scales at 20 feet).

3. The entrance to the motor court on Building M shall be configured to fire lane specifications (minimum 24 feet wide and 14 feet of clear height) and shall be marked as a fire lane.

4. The "private garage" drive of Building M shall be constructed and marked as a fire lane.

5. Addison Circle where it splits around the park shall be a minimum of 24-feet in width. (Submittal scales at 20 feet).

6. A fire hydrant shall be installed on the east side of M2 South approximately 200 feet south of the intersection of M2 and Addison Circle.

7. A fire hydrant shall be installed on the east side of Spectrum approximately 150 feet south of the intersection of Spectrum and Addison Circle.

8. It is my understanding, after meeting with representatives from Columbus Realty Trust, that the "mini storage" portion of Building O will be of noncombustible construction. Fire Department approval of the site plan is contingent upon this. If the circumstances change further review of the submittal will be required.

If you have any question, please contact me at extension 7220.

John Baumgartner

MEMORANDUM

TO: MIS Executive Action Committee

From: Sheryl J. Carruth

Subject: Draft of RFP

Date: June 3, 1997

Below please find our comments or questions to TMG regarding the RFP draft and their response or resolution. **Please respond back as soon as possible.** Note: Dates have been moved back a week.

1. Omit all references to brand names. This includes hardware and software. Instead list performance and product criteria. The feeling is that we don't want to limit ourselves. May want to have an introductory paragraph that states we are open to other solutions. **RESOLUTION: Left brand names in places but added introductory paragraph - Pg 3. "The Town's planned quantity and/or specifications are provided for informational purposes only. The vendor is expected to utilize professional expertise to provide the Town with an optimum configuration. The vendor is instructed to replace the Town's language with their proposed specifications." This statement has also been added to Pg 22 and Pg 41.**
2. Will vendor talk to users to determine printer and type of PC (desktop or laptop) needs? Of the computers being replaced some may want laptops instead of desktops. Also why get rid of the printers at a person's desk until it breaks down. **RESPONSE: The RFP calls for 7 laptops as this is how many users currently have. TMG's thoughts were to replace desktops with desktops and laptops with laptops. We need to decide who want's what. Laptops due cost more, so TMG's cost estimate would change somewhat. Keep printers until they break down.**
3. Question arose of why replace 486 computers? **RESPONSE: In order for the network to run optimally, it is recommended that pentium's be used. The 486 the Town has are low end models with minimal processor and memory. It would cost more to upgrade the 486 than replace with pentium's. Some 486 will be used as servers, however.**
4. How will the general Government System integrate with Public Safety system? **RESPONSE: This is something the vendor will have to address and provide for.**
5. Will the Cost sheets be available on disk to the bidders? Need to remove the zeros and leave blanks. Provide place for breakout of operating cost and maintenance costs. Omit "Reserves and Contingencies" from the spreadsheets. **RESOLUTION: Added paragraph Pg 40. TMG did not feel that Reserves and Contingencies should be left off. This will be a fixed bid so any overrun in costs the vendor will have to incur themselves.**

6. The issue of payment. We don't want to pay until product is delivered. **RESPONSE: TMG' feels that the issue of payment is part of contract negotiations and should not be addressed in the RFP.**
7. Year 2000. Somewhere state that all new software and hardware should be year 2000 compliant or vendor will accept responsibility of making it year 2000 compliant. Also, the hardware and/or software that we keep can they test to see if we have a year 2000 problem. (I have talked to CCS and they say their software is ok due to PICK date being 5 digits, not mm/dd/yy.) **RESOLUTION: Statement added to Pg 4 stating all hardware/software will be 2000 compliant.**
8. Will there be CD-ROM drives in the new computers? **RESPONSE: Yes**
9. How can we provide for remote user access. **RESPONSE: If user's have computers at home they can access through modem. MIS department can keep some laptops on reserve to issue out to users who need to work from home.**
10. Clarify where you can get a copy of the Strategic Plan. **RESPONSE: This will be announced at the pre-bid meeting.**
11. On Pg 10 will virus software have artificial intelligence? **RESOLUTION: Reworded paragraph "Vendor will select a product that receives regular updates for detection of current and known viruses, as well as having the ability to detect unknown viruses.**
12. Public Safety platform is unknown at this time. **RESOLUTION: Reworded statement on Pg 10.**
13. Pg 19 Total PC's what does this number represent? **RESPONSE: Total devices that will be connected to the network.**
14. Define Intranet. Will it replace something we have? **RESOLUTION: Pg 18 - Paragraph has been reworded "Intranet is intended to eventually be used as the Towns groupware solution". In other words how we communicate and share information internally.**
15. Timeline on Pg 27, does this refer to months. Also, Public Kiosks in twice. **RESOLUTION: Added "24 month schedule" . Public kiosks is in two phases. Changed wording of first reference as "pilot" project.**
16. Change wording on pg 31. **RESOLUTION: Done.**
17. Explain pg 38 5.21. **RESPONSE: For every day that the vendor does not start the project after the stipulated start date, they will pay the town $1000 per day of delay.**
18. On cost sheets, break out unit costs and maintenance cost. **RESOLUTION: Done.**

Addison!®.

It's an exciting time at the Town of Addison

A Request for Proposal

A Partnership for Development of the Town's Technology Infrastructure

Proposal #: 97-19

Date Issued: Friday June 6, 1997

Date Due: Thursday July 3, 1997

TMG
CONSULTING, INC.

TABLE OF CONTENTS

1.0 INTRODUCTION

An brief synopsis and Invitation to submit proposals

1.1 THE TOWN OF ADDISON

The Town of Addison is located in the Dallas North Parkway area which has been referred to as the "golden corridor" of the Dallas metroplex. Aside from the Town of Addison, the area encompasses the Dallas suburbs of Carrollton, Farmers Branch, and Plano. The area, which developed rapidly during the late 1970's and early 1980's is home to affluent residential neighborhoods, over 1,200 million-dollar companies, scores of quality restaurants, and three spacious malls, including the prestigious Galleria. The area commands a central location in reference to Downtown Dallas, DFW airport, and the Plano Corporate Campus area.

Epitomizing the best features of the area is the Town of Addison. The Town places a special emphasis on quality of life which demands all development meet the most rigorous building requirements. The result of this philosophy has made Addison a cosmopolitan "downtown-uptown" distinguished from almost any other urban area in the nation.

Although it has only 11,000 residents, the Town serves an estimated 55,000 business persons, shoppers and visitors every day. The Town's blend of residential, retail, and office uses creates an open environment which avoids the claustrophobic effect usually associated with densely developed areas.

The Town's 1997 fiscal year budget totals $49.5 million with staffing of 232.6 full-time equivalent position.

1.2 INTENT OF THE RFP

The Town of Addison, Texas recently completed an Information Services Strategic Plan. The plan was approved by the Town Council with permission to proceed with the solicitation of proposals for the execution of various plan components.

This Request for Proposal (RFP) is intended to solicit responses from qualified Vendors and Implementers for the design, installation and ongoing support of all aspects of the Town's proposed technology infrastructure.

The Town is extremely interested in a single Vendor providing a comprehensive technology solution with the intent of forming a long-term business relationship and technology partnership with the Town.

The Town's planned quantity and/or specifications were used to develop the plan and associated project budgets. They are included in this document for informational

purposes only. The vendor is expected to utilize professional expertise and recommended products provide the Town with an optimum configuration.

All software/hardware proposed **must** be year 2000 compliant.

1.3 Events & Dates

The following sequence of events and tentative schedule dates have been established.

- **Request for Proposal Distributed - Friday June 6, 1997**

  Copies of this proposal can be obtained through the following media.

  Hardcopy: Clyde Johnson, C.P.M.
  Office of the Purchasing Manager
  Addison Finance Building
  5350 Belt Line Rd
  Addison, TX 75240
  Phone: 972-450-7090

- **Pre-Proposal Conference - Friday June 20, 1997**

  Vendors are asked to attend a non-mandatory pre-proposal conference.

  Location: 9:00 a.m. to 11:00 a.m.
  Addison Conference Center
  15650 Addison Road
  Addison, Texas 75248

- **Vendor Proposals Due - Wednesday July 9, 1997**

  Proposals will be received until Wednesday July 9, 1997 at 2:00 p.m., CDT.

  Submit to: Office of the Purchasing Manager
  Addison Finance Building
  5350 Belt Line Rd
  Addison, Texas 75240

1.4 Contact Information

Please direct all procurement and administrative questions to **Clyde Johnson the Towns Purchasing Manager at 972-450-7090.**

All other questions related to this procurement can be directed to **Greg Galluzzi of TMG Consulting at 512-288-2655 or email at TMGGreg@worldnet.att.net.**

1.5 A High Technology Procurement

The Town of Addison has determined that the Texas Statute on "High Technology" procurement applies to this proposed purchase. The statute provides for the

acquisition of certain goods or services through the use of competitive sealed proposals rather than competitive sealed bids.

2.0 Work Definition

A presentation of the infrastructure components and scope of work

2.1 Infrastructure Components

The Town's Information Services Strategic Plan is based on the following:

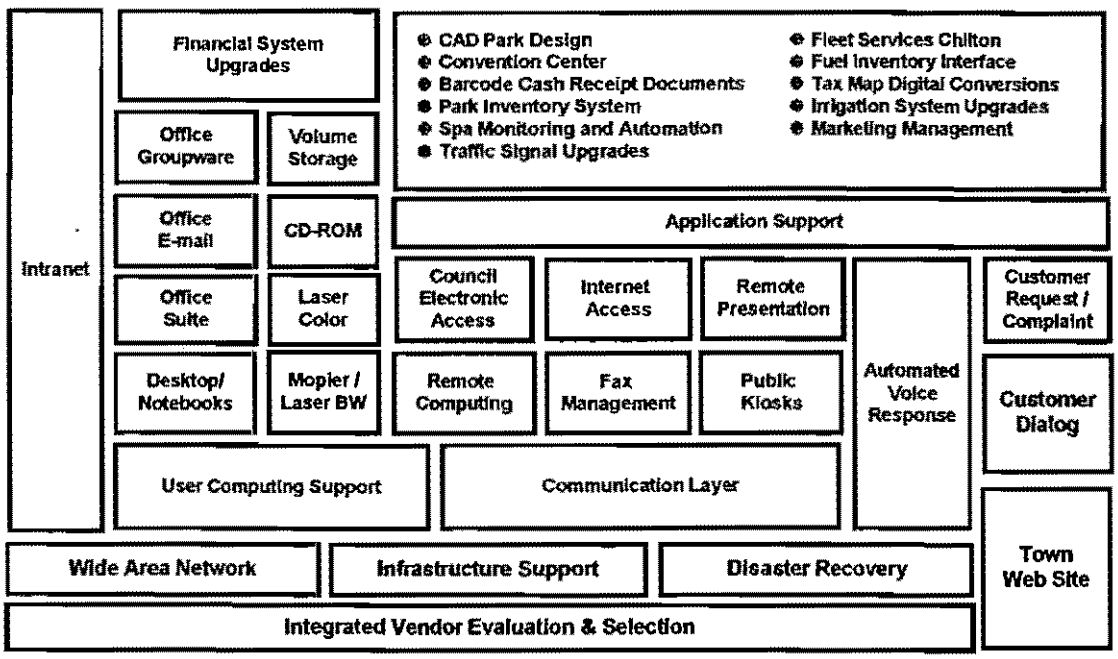
An industry concept of "Retooling the Professional" provides the setting for this technology blueprint.

Retooling promotes the Town's optimization and effective utilization of technology. It results in an increase in processing efficiencies thereby enabling Staff to continue providing the exceptional customer service, information and interaction which has become synonymous with the Town of Addison.

We strongly believe that "Retooling the Professional" represents a critical technology investment today which will enable the Town's future business success.

We are committed to the Optimization of Technology and its use in facilitating exceptional customer value.

The plan consists of the following major components.



2.2 Scope of Work

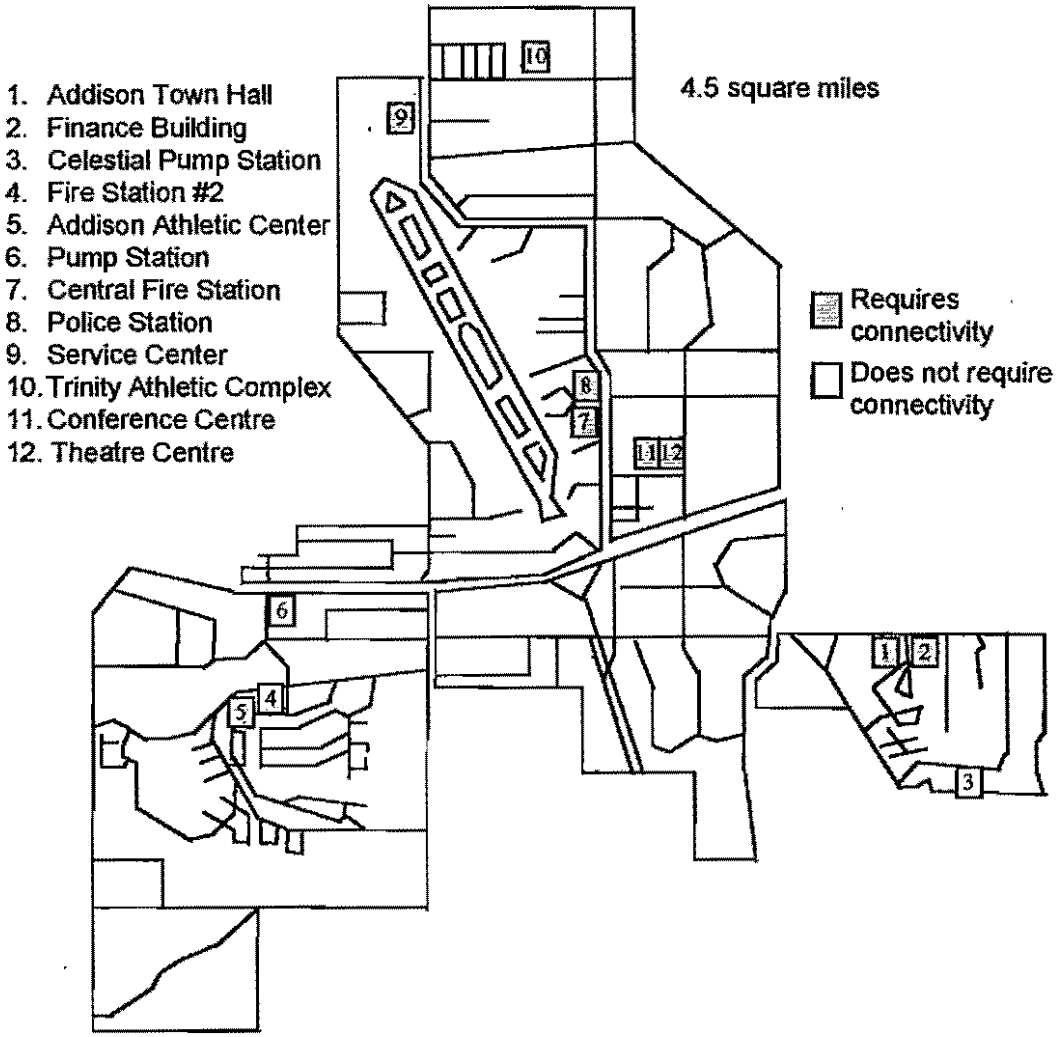
Within the plan, the following are considered infrastructure components within the scope of this RFP.

- 1. Wide Area Network
- 2. Infrastructure Support
- 3. Disaster Recovery
- 4. Desktop / Notebooks
- 5. Office Suite
- 6. Office E-mail
- 7. Office Groupware
- 8. Mopier / Laser Printer
- 9. Laser Color Printer
- 10. CD-ROM
- 11. Volume Storage
- 12. Communication Layer
- 13. Remote Computing
- 14. Fax Management
- 15. Public Kiosks
- 16. Council Electronic Access
- 17. Internet Access
- 18. Remote Presentation
- 19. Automated Voice Response
- 20. Customer Request / Complaint
- 21. Intranet

Each of these components is described in more detail within the following sections.

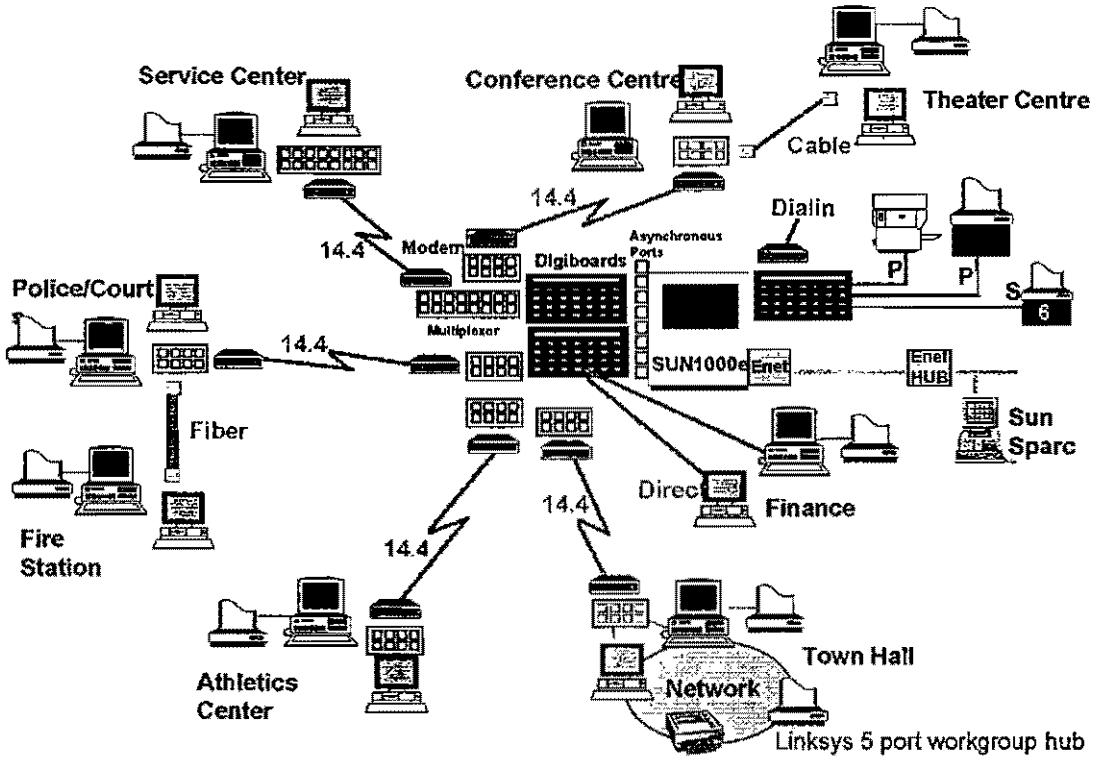
2.2.1 Wide Area Network

The Town of Addison occupies 12 facilities within 4.5 square miles of Addison proper. Connectivity is required at 9 of the 12 locations as identified in the following diagram.

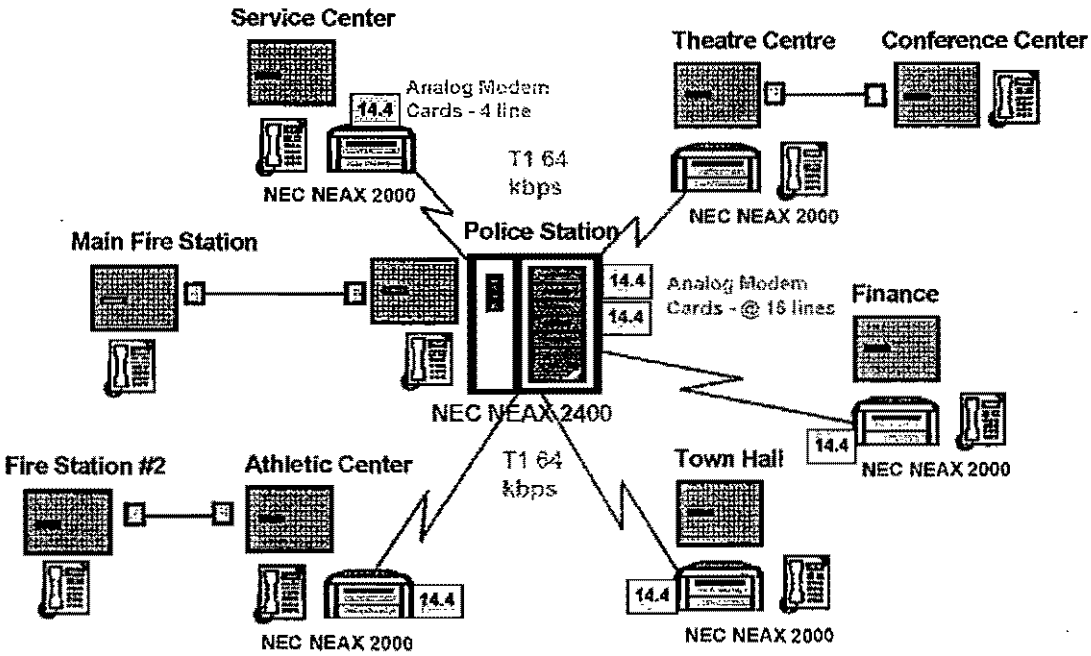


At this time connectivity is not required at the Celestial Pump Station (3), the Pump Station (6), or the Trinity Athletic Complex (10).

The following diagram identifies current access provided to the Town's locations.

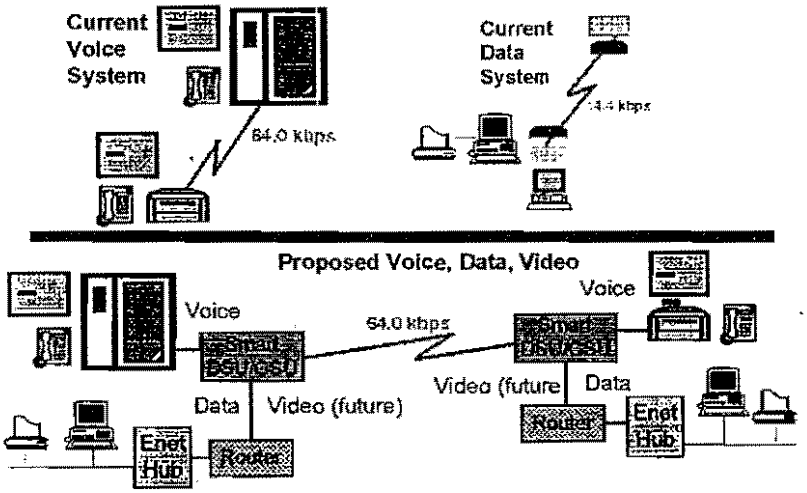


In addition, the Town utilizes a centrex-based telephone system with a computerized PBX system supplied by NEC. This digital phone system supports voice at T1 speeds of 64Kbps with analog modem support at 14.4 Kbps.

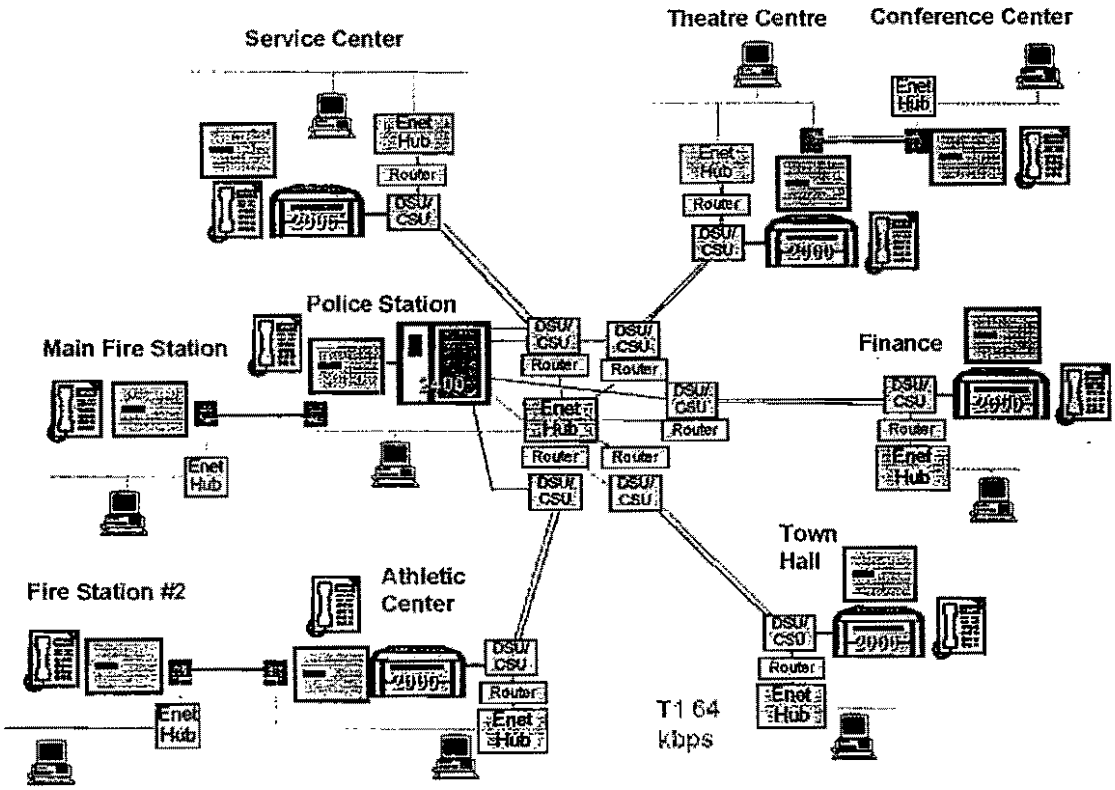


2.2.1.1 Network Connectivity

The plan for providing future connectivity is a blending of the Town's current voice system and it's current data system into a single integrated system supporting voice, data, and video.

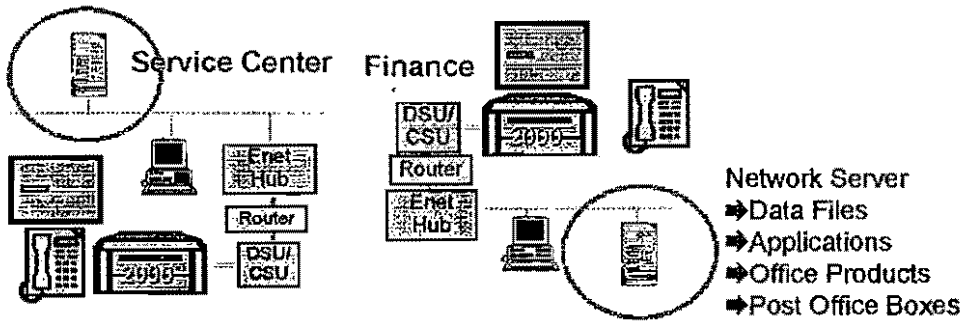


The Town's existing digital phone system utilizes T1 lines which provide an excellent medium for voice, data, and video. The network is planned to utilize fast Ethernet running at 100 Mbps, category 5 shielded twisted pair cable, and fast Ethernet 10/100Mb Network Interface Cards (NICs).



2.2.1.2 Network Servers

The solution requires a minimum of two high performance network file servers running Windows NT Server 4.0 with suggested locations at the Town's Service Center and the Finance Building. Additional network servers could be acquired and placed within other Town locations as identified by the Vendor. All servers will be accessible (security driven) from any workstation attached to the network.



The servers will provide fault-tolerance in the event one server becomes unavailable, users can access the network by attaching to a second server.

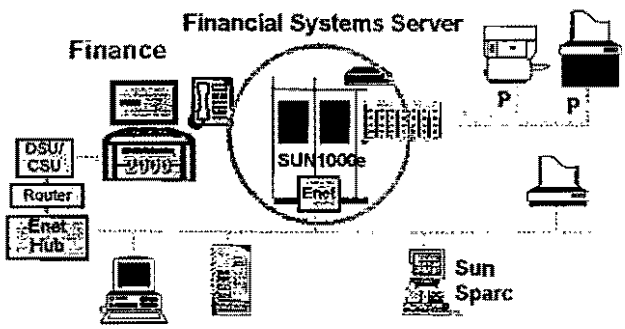
Virus protection is essential and a product such as Intel LANDesk Virus Protect will allow all servers and workstations attached to the network to be monitored for virus infection. The instant a virus is detected on any network device, the management system console is notified, the virus identified, and removed. The vendor will select a product that receives regular updates for detection of current known viruses, as well as having the ability to detect unknown viruses.

For data backup and recovery purposes the network will be equipped with a device(s) capable of backing up any network drive including network servers and key workstations.

Backup software such as Seagate's Backup Exec Tape Backup Software will be included to provide data backup & archive management.

2.2.1.3 Application Servers

The solution requires connection of the Town's Financial Systems and the Town's new Public Safety application running on a UNIX computing platform.

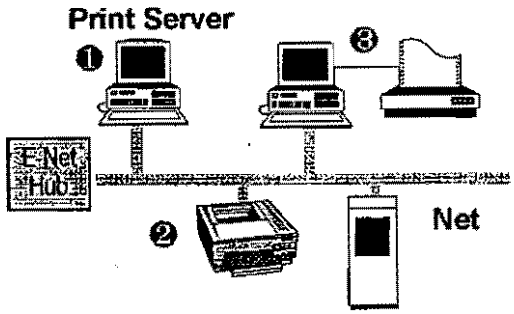


- Sun Sparcserver 1000E
- UNIX based operating system
- Unidata data base
- Dual 60 MHz processors
- 6 GB storage
- 128 MB memory
- 64 asynchronous ports
- 2 parallel ports
- 644 MB CD-ROM
- 14GB 8mm internal tape drive
- 1600 bpi ½ inch tape drive

The solution will connect these application servers via a Fast Ethernet card. At this time no gateways or front-end processors are planned.

2.2.1.4 Print Servers

Currently the Town has 6 printers serially attached to the SUN Sparcserver 1000E, 5 printers on the limited network at Town Hall, 11 printers on various print share devices, and 45 printers directly attached to individual PC's. At a minimum the solution must accommodate continued use of these printers.



❶ **Print Server**

- The solution may utilize older PC's as departmental print servers attached to the network.
- The solution may utilize a print server attached to the E-Net Hub within each department acting as a dedicated print server running software such as PSERVER.EXE. (maximum 7 attached to a E-Net Hub).

❷ **High Speed Quality Printing**

- The solution will utilize devices such as jet direct cards to attach new high speed laser printers to the network.

❸ **Workstation Printing**

- The solution will utilize specific workstations to directly attach existing printers.

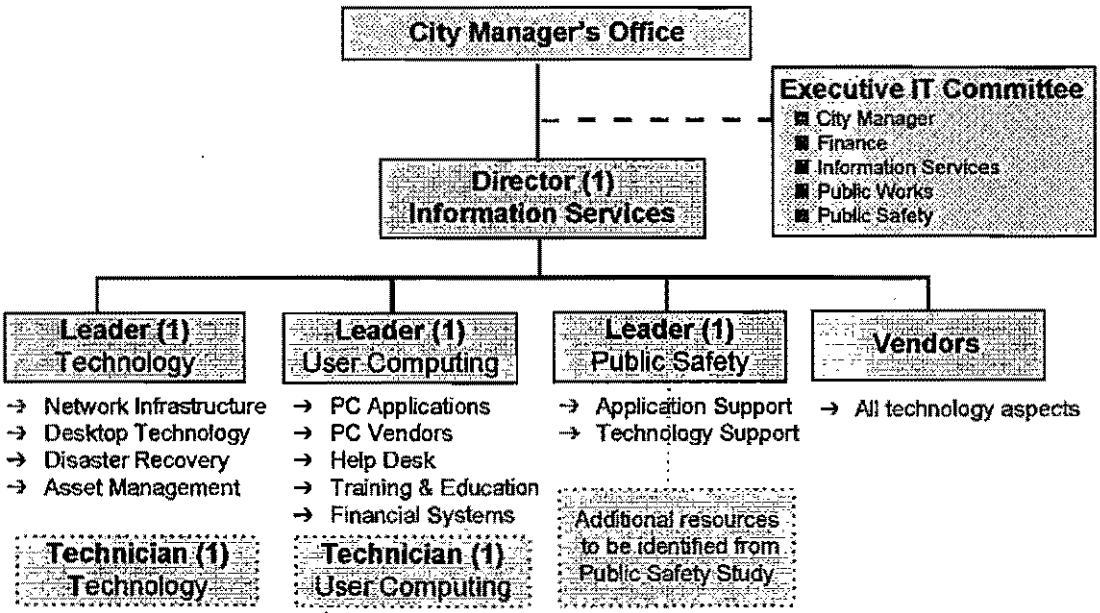
Workstations will have printers directly attached running software such as a memory resident executable called RPRINTER.EXE which allows connection to the Departmental Print Server. (maximum 16 workstations attached per print server).

2.2.2 Infrastructure Support

The plan indicates the need for an internal support infrastructure in addition to external vendor support offerings. The planned Information Services organizational structure is presented in the following diagram. This department will:

- Provide a single point of contact for recording, tracking and coordinating problem resolution.

- Responsible for the establishment and maintenance of the Town's Technology Infrastructure.
- Responsible for providing asset management and support services for the standardized desktop environment.
- Responsible for management & support of the network.
- Responsible for coordination of all technology training & education.
- Coordination with Vendors across all aspects of the technology environment.



The solution will provide help desk software such as Intel LANDesk Response and will provide appropriate training and education courses for IS personnel.

2.2.3 Disaster Recovery

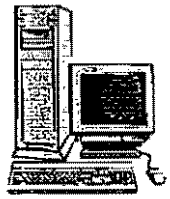
The solution will provide for a secondary recovery site to facilitate Town operations in the event of catastrophe and associated recovery activities. The plan is flexible in how this function is provided.

2.2.4 Desktop / Notebooks

The solution requires the replacement of 10 terminals, 13 386 computers, 1 MAC, and 28 486 computers resulting in a total of 52 new desktop computing devices.

The Town will retain it's 18 Pentium computers. The solution will retain the best of these computers to be used as print servers, network management consoles, etc.

Of the 52 new computers a total of 45 workstations are being requested. For planning purposes the following configuration was utilized:



- Processor: PentiumPro 200MHz, 32MB, 2.1GB,
- Windows 95/97
- Monitor: 17" (15" view)
- Ethernet card/Patch cable
- Warranty: 3 year
- Surge Protection

of the 52 new computers a total of 7 notebooks are being requested. For planning purposes the following configuration was utilized:

- Processor: Pentium 150MHz, 32MB, 12.1Active, 2.1GB
- Windows 95/97
- Network Card: Docking station Ethernet
- Warranty: 3 year
- Carrying Case
- Surge Protection

Connectivity

The workstations will utilize the existing Wintegrate emulation software from Unidata or similar software such as Reflections, Attachmate, Rumba, or Elite providing desktop access to the Financial Server and other servers as required (including the public safety server).

Workstations will require a fast Ethernet network interface card which will terminate into an Ethernet hub providing access to the network and associated devices.

Operating System

Standardization on the Windows 95-97 operating system providing 32-bit processing and integration with MS Windows NT Server 4.0. The desktop configuration will be powerful enough to support a decision to run Windows NT on the desktop..

2.2.5 Office Suite

The solution will include the Microsoft Office 97 standard desktop.

2.2.6 Office E-Mail

The solution will promote a Microsoft E-mail solution through Outlook 97.

2.2.7 Office Groupware

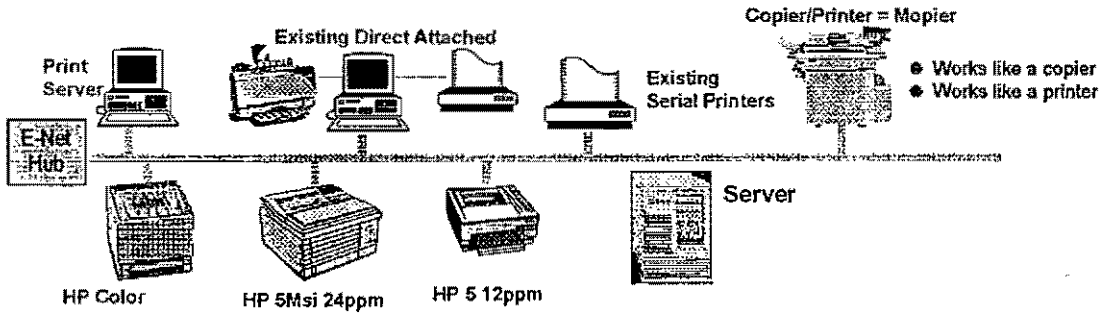
The solution should address the use of groupware, also known as workgroup computing or collaborative computing. The solution defines groupware as software targeted at supporting and facilitating a team or several teams in conducting unstructured or structured activities in pursuit of a common goal or objective.

The rapid growth of the Internet and Intranets has further clouded the definition of groupware and increased the number of solutions. It is clear that today's groupware products are moving toward complete Web integration. The Town is aware that Industry experts caution on spending a lot of money implementing a groupware strategy which may shortly become obsolete.

As a result, the solution will utilize the existing features of Microsoft Office 97 and Outlook 97. In addition, the Town is looking toward using MS Team Manager 97 to supplement project management needs across functional departments.

2.2.8 MOPIER / LASER PRINTERS

The solution will provide 10 new high speed quality laser printers (Service Center 2, Main Fire Station 1, Police Station 2, Athletic Center 1, Conference Center 1, Finance 2, Town Hall 1). And 2 new moderate speed quality laser (Theatre Center 1, Fire Station #2 1).



The solution will provide 2 "Mopier" type devices which combine network printing and copying into a single machine.

The solution will provide connection of the 6 existing serial printers to the network.

The solution will provide connection of up to 61 existing dot matrix, laser, and various printers to the network.

2.2.9 LASER COLOR PRINTERS

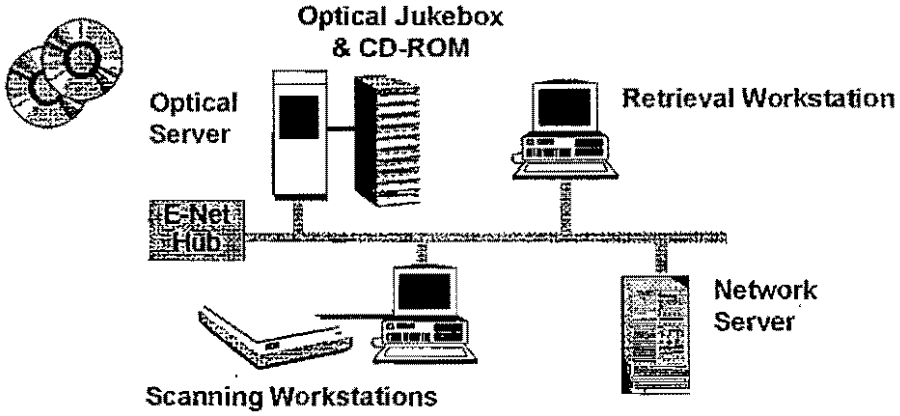
The solution will provide 7 new laser color printers.

2.2.10 CD-ROM

The solution supports the utilization of any CD-ROM device across the network through software such as CDNet Plus v6.0. This precludes numerous user requests to mount specific CD's, and promotes sharing and access of CD specific information.

2.2.11 VOLUME STORAGE

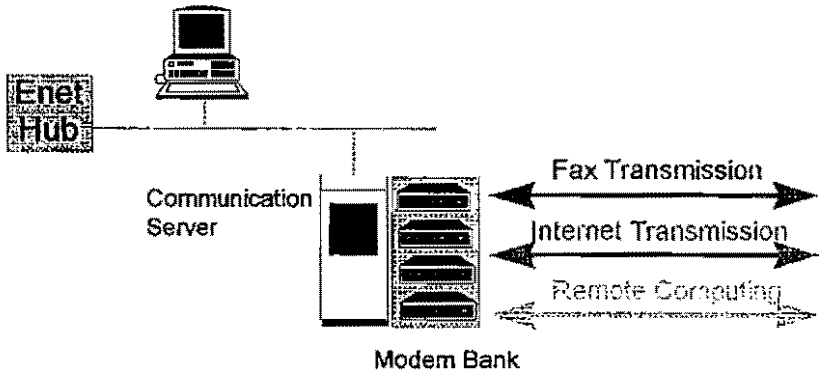
The solution supports the utilization of document imaging and optical storage capability allowing for the capture, categorization, labeling and storing of volumes of information.



A significant effort may be associated with backfile conversion of paper documents to optical storage.

2.2.12 COMMUNICATION LAYER

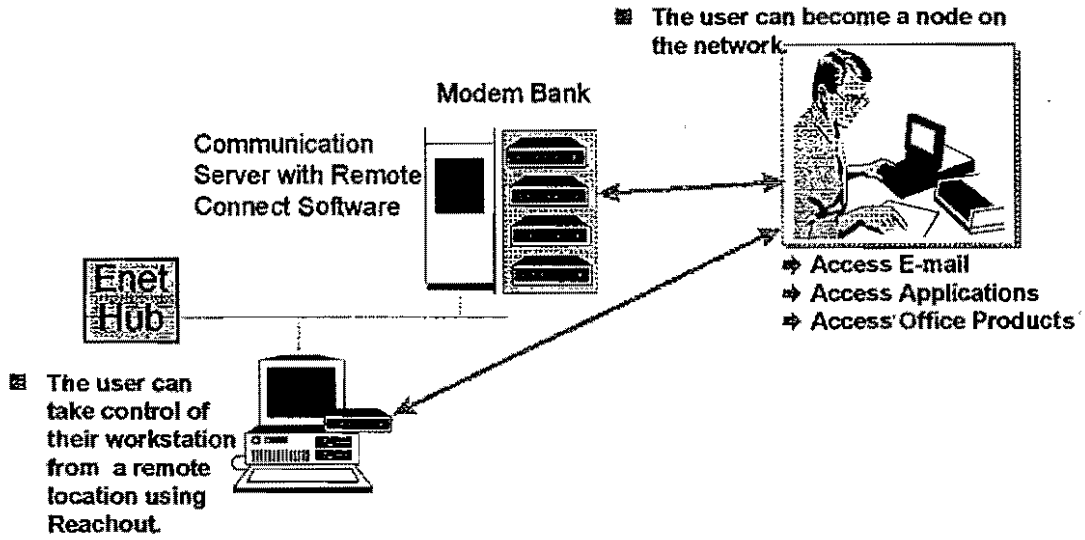
The solution will utilize a communication server to facilitate inbound and outbound communication related to facsimile transmission, Internet access, and remote computing.



Communications adapters such as those made by DigiBoard will be installed and phone lines attached.

2.2.13 REMOTE COMPUTING

The solution will provide remote computing connectivity through the communication server as the primary method, and secondarily through direct PC access.

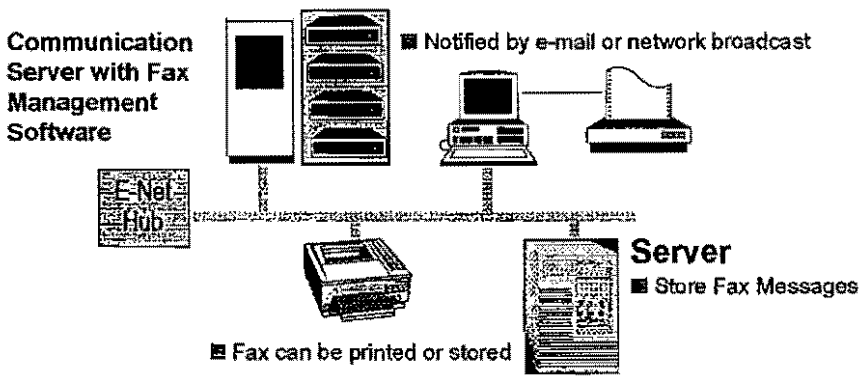


Occasionally it will be necessary for a specific user to have the ability to take control of their desktop PC from a remote location. The solution for this access involves loading software and installing a modem on the local and remote PC's.

Once a connection is established an individual has the ability of taking control of their PC at the office. Security is adhered to when the dial-back feature is implemented.

2.2.14 FAX MANAGEMENT

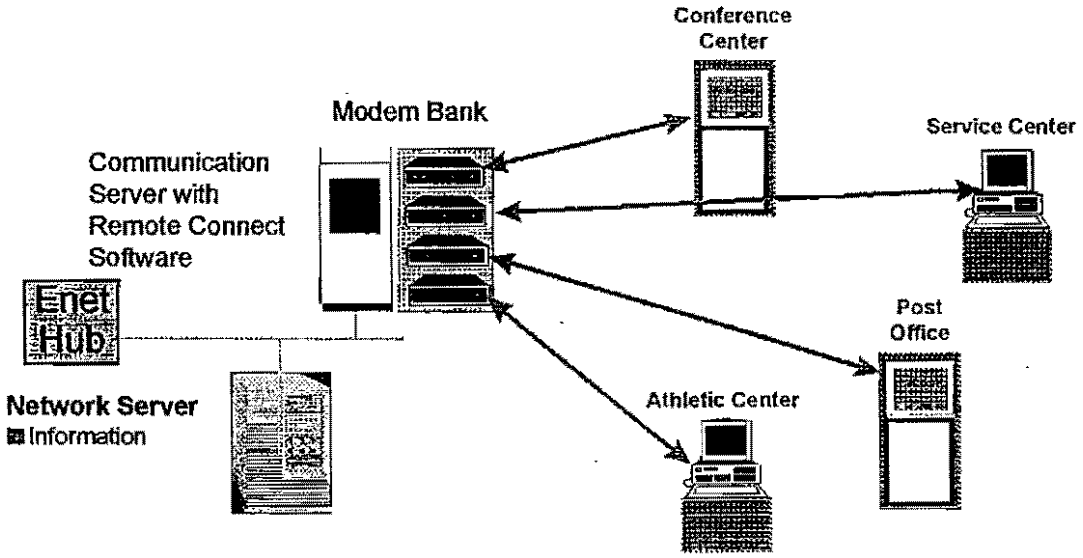
The solution will provide for the utilization of the communication server and the implementation of fax management software.



Fax management capabilities will allow users to send faxes from any network attached workstation, route received faxes directly to users, e-mail boxes, or network printers, support fax on demand and fax broadcast.

2.2.15 Public Kiosks

The solution will provide for the installation of public kiosks with connectivity via telephone dial-up through the communication server.



The solution will Implement workstations for public access in designated Town facilities with network connectivity.

2.2.16 Council Electronic Access

The solution will include wiring of the Council chambers and the purchase of an additional 7 notebook computers with appropriate software to facilitate remote communication for Town Council members (not included in the earlier count of 52 workstations).

2.2.17 Internet Access

Internet communication consists of Internet Access and Web Site Hosting.

- **Internet Access**
  - The solution will establish accounts with an Internet Service Provider.
  - The solution will Initially provide connection using the Town's communication server running top speed modems. If this becomes insufficient or inefficient the Town will need to modify either the connection method and/or the speed.
  - Given earlier recommendations regarding the use of Microsoft products it would make sense to pursue MS Internet Explorer as the desktop standard. However, Netscape Navigator would be more than acceptable as an alternative browser.

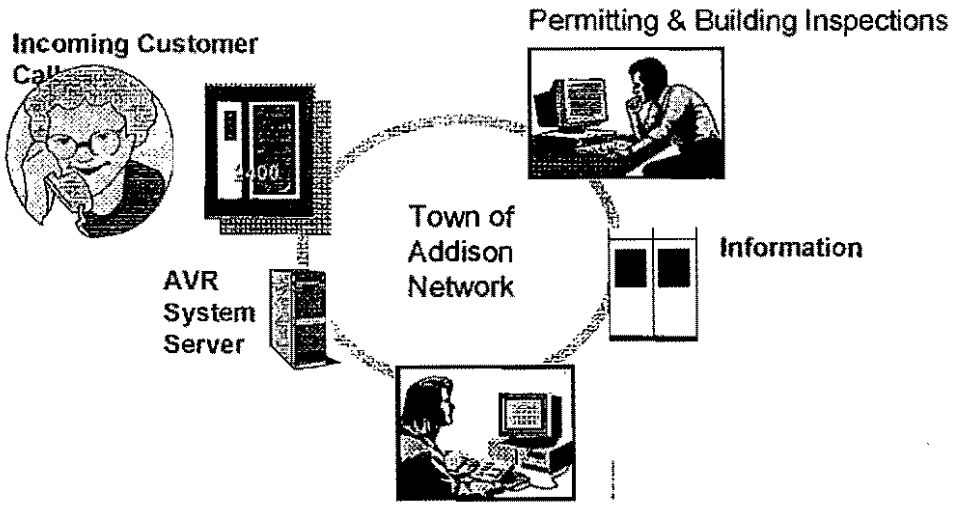
- **Web Site Hosting**
  - The solution will utilize an organization interested in hosting the Town's web site.
  - The Town will remain responsible for managing web content and populating the site.
  - At some point the Town may decide to implement a web server to host the site.

2.2.18 Remote Presentation

The solution will include remote presentation hardware such as the EPSON Powerlight 5000 LCD Projection Unit, mobile speakers, and a remote control device.

2.2.19 Automated Voice Response

The solution will provide for the installation of an Automated Voice Response capability in support of customer inquiries into account information, permit status, etc., and routing to appropriate department and/or person.



2.2.20 Customer Request / Complaint

The solution will include the purchase of a server based Citizen Request & Complaint Tracking software package.

2.2.21 INTRANET

The solution will promote an eventual Intranet capability through a Web server configured on the Town's network with appropriate security devices. The Intranet is intended to eventually be used as the Towns groupware solution.

2.3 PHYSICAL LOCATION SUMMARY

For purposes of this proposal the following locations and device counts will be utilized.

Location	Total PC's	New 24ppm LP	New 12ppm LP	New Color	Curr Prtrs	Mopier	Net Server	App Server
Athletic Center	10	1		1	2			
Conference Centre	4	1		1	1			
Finance Building	12	2		1	3		1	1
Fire Station Main	9	1		1	2			
Fire Station #2	2		1		1			
Police Station	35	2		1	8		1	1
Service Center	38	2		1	9	1	1	
Theater Centre	4		1		1			
Town Hall	16	1		1	4	1		
Totals	**130**	**10**	**2**	**7**	**31**	**2**	**3**	**2**

Cabling is required at all locations. For proposal purposes all other devices such as CD-ROM servers, volume storage devices, communication server, etc., will be located within the Finance Building.

The solution will include build out and wiring of the current computing room as required to house additional servers and network communication equipment.

The network will be required to support approximately 200 attached devices across all of the infrastructure components.

2.4 PRODUCTION SUPPORT

The solution will contain sufficient vendor resources to fully support the Town during startup activities and the first year of operation. This support is intended to facilitate the Town's IS technical support resources and to assist the Town's users in overcoming the learning curve typically associated with the utilization of any new technology.

The Vendor must understand that training and support are very important to the Town and are viewed as critical to the success of this effort.

3.0 Proposal Format

The Vendor will define the capabilities of its organization to supply and maintain the hardware and software and provide the services as outlined within this RFP.

The response should be prepared in a simple and straight-forward manner. The Vendor will provide one (1) original and nine (9) copies to the location specified within this RFP on or before the closing data and time for receipt of proposals.

The Vendor will segment their proposal into the following sections.

3.1) Executive Summary

The Vendor will provide an Executive Summary which presents in brief, concise terms, a summary level description of the contents of the Proposal.

The Vendor will detail all exceptions to the exact requirements imposed by this RFP.

The Vendor will indicate the proposal is firm for one-hundred and eighty (180) days after the due date for receipt of proposals or receipt of the last best and final offer submitted.

3.2) Vendor Profile

The Vendor will indicate the primary company assuming overall responsibility for successful completion of the project. In addition, the Vendor will indicate all other companies who will be providing products or services through a subcontracting arrangement with the Vendor or through a separate contract to be negotiated with the Town.

It is important to recognize the Town is looking for a single Vendor to assume primary responsibility for the successful implementation of the proposed solution from contract signing through formal acceptance of the infrastructure by the Town.

Vendor profile information will include such items as: the year established, business organization, office locations, financial history, nature of business, strategic direction, industry specialties, software products, hardware products, number of employees, number of client installations, outstanding litigation, and authorized negotiator(s).

3.3) Vendor Qualifications

The Vendor must demonstrate a proven track record in providing reliable technology solutions across a series of successful installation efforts.

The Vendor's record will reflect experience within a similar environment and of a similar nature and magnitude to that being proposed to the Town. Relevant experience must be associated with projects completed not more than three (3) years prior to the date of this RFP. The Vendor will provide a customer reference listing and related contact information for a minimum of five (5) customers for which the Vendor has completed a similar effort.

The Vendor is asked to provide a comprehensive list of customers for review by the Town.

3.4) THE SOLUTION

The Town recognizes that the implementation of an extensive technology infrastructure is a complex effort and that not all possible variables are provided for within this RFP document. Therefore, it is acknowledged that the Vendor may be required to make assumptions regarding the Town's environment or specific requirements. Any assumptions made by the Vendor in regard to this RFP should be documented in-line with the response.

Additional detailed review and design activities will take place with the Vendor finalist to refine elements of the proposal, prior to contract negotiation and approval.

3.4.1) THE PROJECT APPROACH

The vendor will present its methodology and approach to completing this project. Each major activity will be identified, discussed and project deliverables identified.

3.4.2) THE TECHNOLOGY COMPONENTS

The Vendor will segment their solution into the technology components described in the scope of work, and presented in the following paragraphs.

3.4.2.1 WIDE AREA NETWORK

The Vendor will present their proposal for the Town's network. Items may include:

- Network servers
- A UPS unit for each network server.
- A backup system for network drives including servers and key workstations.
- A network operating system, Windows NT 4.0 is planned
- A network management software product to supplement Windows NT 4.0
- Support services for the servers with priority onsite 3 year service.
- Network equipment e.g. T1 DSU/CSU's, Routers, HP AdvancStack Hubs.
- Category 5 cabling will be required across all Town locations with associated patch cords, racks and terminators.
- Network detailed design services.
- Network installation services.

- Cabling services.

3.4.2.2 Infrastructure Support

The Vendor will present their proposal for equipping and developing the Town's IS staff. Items may include:

- Help desk software.
- Various server and network training for 3 IS staff members.

3.4.2.3 Disaster Recovery

The Vendor will present their proposal for providing the Town with an effective Disaster Recovery method. Items may include:

- An initial service to establish the disaster recovery site, recovery plan, and readiness.
- Annual services to be provided.

3.4.2.4 Desktop / Notebooks

The Vendor will present their proposal for the Town's desktop. Items may include:

- Purchase and connectivity of 45 new desktop computers.
- Purchase and connectivity of 7 new notebook computers.
- Connectivity for 18 existing Pentium computers.
- Connectivity for 53 existing computers.
- Installation services for new computers.
- Installation services for existing computers.
- Required network client licenses.
- Required desktop operating system licenses.
- Required emulation software to access UNIX and Windows NT environments.

3.4.2.5 Office Suite

The Vendor will present their proposal for Town's desktop office suite software. **The following is provided for informational purposes only. The vendor is expected to utilize professional expertise to provide the Town with an optimum configuration.** The Items may include:

- Purchase and installation MS Office 97 Pro with licensing to accommodate 123 computers (provide the most cost effective yet realistic licensing).
- Provide basic PC training and introduction classes to MS Word and MS Excel for 123 individuals.
- Installation services (may combine with the desktop delivery and installation).

3.4.2.6 Office E-Mail

The Vendor will present their proposal for the Town's E-Mail solution. Items may include:

- Microsoft (exchange) Server licensing.
- Assume using Outlook 97 on the client desktop.
- Provide basic E-Mail training classes for 120 individuals.
- Installation services (may be part of the desktop installation).

3.4.2.7 Office Groupware

The Vendor will present their proposal for the Town's Groupware solution. Items may include:

- Microsoft Team Manager 97 licensing to accommodate 123 computers (provide the most cost effective yet realistic licensing).
- Provide basic MS Team Manager 97 training classes for 123 individuals.
- Installation services (will not be part of day one installation).

3.4.2.8 Mopier / Laser Printer

The Vendor will present their proposal for the Town's Mopier/Laser Printer solution. Items may include:

- Purchase of 2 Mopiers
- Purchase of 10 Laser B/W printers 24ppm 600x600dpi minimum
- Purchase of 2 Laser B/W printers 12ppm 600x600 dpi minimum
- Installation services

3.4.2.9 Laser Color Printers

The Vendor will present their proposal for the Town's Color Laser Printer solution. Items may include:

- Purchase of 7 Color printers (vendor to recommend laser vs. inkjet vs. other)
- Installation services

3.4.2.10 CD-ROM

The Vendor will present their proposal for the Town's networked CD-ROM solution. Items may include:

- A network attached CD-ROM server

- A CD-ROM Tower
- CD-ROM software
- Installation services
- Support services for the server with priority onsite 3 year service.
- Training services for 1 person on the operation and maintenance of the CD-ROM equipment

3.4.2.11 Volume Storage

The Vendor will present their proposal for the Town's volume storage solution. Items may include:

- An optical server.
- An optical jukebox.
- A scanning station.
- A scanner.
- Installation services.
- Support services for the server with priority onsite 3 year service.
- Training services for 1 person on the operation and maintenance of the Volume Storage equipment.

3.4.2.12 Communication Layer

The Vendor will present their proposal for the Town's communication system. Items may include:

- A network attached communication server.
- A network operating system license.
- A UPS unit.
- Fax modems (24 units at 33.6 MHz minimum).
- Connectivity hardware (e.g. Digiboards).
- Virus Protection Software.
- Support services for the server with priority onsite 3 year service.
- Installation services.
- Training services for 1 person on the operation and maintenance of the Communication Server equipment.

3.4.2.13 Remote Computing

The Vendor will present their proposal for the Town's remote computing solution. Items may include:

- Access software allowing a remote user to become a network computer (e.g. WinFrame/Access). Allow for 7 laptop users.
- Access software allowing a remote user to take control of their network computer (e.g. Reachout). Allow for 7 laptop users.
- Installation services.
- Training services for 7 people on the use of remote access software.

3.4.2.14 Fax Management

The Vendor will present their proposal for the Town's fax management solution. Items may include:

- Fax management software (e.g. WinPort/FaxPort Network Software 50 user license)
- Installation services.
- Training services for 120 people on the use of fax management software.

3.4.2.15 Public Kiosks

The Vendor will present their proposal for the Town's public kiosk solution. Items may include:

- Purchase and configuration of 2 preconfigured modular Kiosk station.
- Installation services.
- Purchase and configuration of 2 workstations including hardware and software.
- Installation services
- Training services for 1 person on the operation and support of the Kiosks both the preconfigured and the workstation.

3.4.2.16 Council Electronic Access

The Vendor will present their proposal for enabling Town Councils electronic access. Items may include:

- Purchase of 7 new notebook computers
- Purchase of 7 licenses for all required software
- Installation services
- Training services for 7 persons

3.4.2.17 Internet Access

The Vendor will present their proposal for the Town's Internet access solution. Items may include:

- Internet browser licensing

- Internet service provider accounts (20 accounts to begin with)

3.4.2.18 REMOTE PRESENTATION

The Vendor will present their proposal for the Town's remote presentation solution. Items may include:

- Mobile LCD projection equipment (1 unit)
- Mobile speakers
- Remote control unit

3.4.2.19 AUTOMATED VOICE RESPONSE

The Vendor will present their proposal for the Town's automated voice response solution. Items may include:

- An AVR solution to support 3 line customer call-in capability
- Support services for the servers with priority onsite 3 year service.
- Installation services.
- Training services

3.4.2.20 CUSTOMER REQUEST / COMPLAINT SOFTWARE

The Vendor will present their proposal for the Town's customer request and complaint tracking software solution. Items may include:

- Software purchase.
- Installation services.
- Training services.

3.4.2.21 INTRANET

The Vendor will present their proposal for the Town's Intranet solution. Items may include:

- Intranet Server
- Network Operating System
- UPS
- Firewall and software
- Web Authoring Software
- Support services for the servers with priority onsite 3 year service.
- Installation services
- Training services

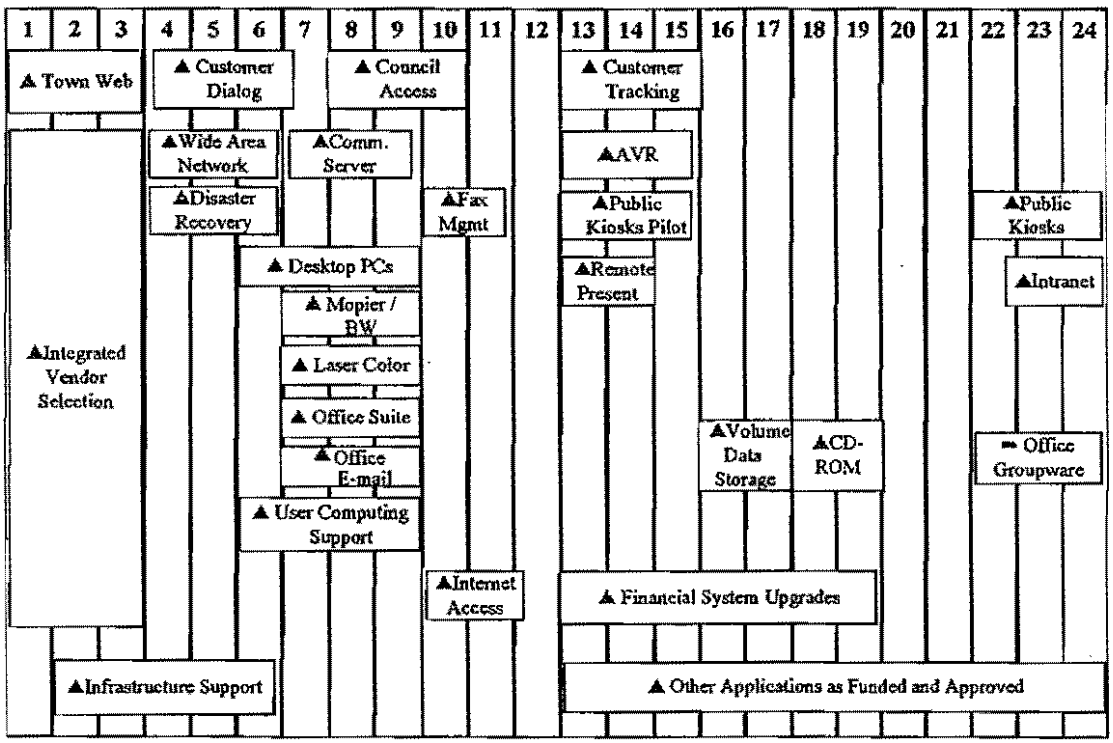
3.4.3) Ongoing Support

The Vendor will describe the approach to providing ongoing operation, support and maintenance across the installed infrastructure components. The Vendor is expected to present standard and extended service offerings.

The Vendor will specifically address the support to be provided during the first year of operation.

3.4.4) Solution Timeline

The Vendor will include an implementation schedule detailing major project activities and technology components across a proposed timeline. Activities should begin at the point of contract award through final user acceptance. The Town has identified a tentative 24 month schedule for the installation of each infrastructure component which is presented in the following diagram.



The Town is expecting the Vendor to propose a timeline which directly supports its project approach and overall solution.

3.4.5) Project Organization

The Vendor will provide an organizational chart and a schedule summarizing full time equivalents for Vendor Personnel and Town Personnel. The Town fully expects the Vendor to provide the majority of project resources.

3.4.6) Solution Costing

The Vendor will provide a detailed breakdown of all costs required for a successful installation of the proposed solution. The Town encourages the Vendor to fully identify costs. To minimize or hedge on costs will only serve to place the Town and the Vendor at a disadvantage.

Bundling of all costs under a single price administered through a primary Vendor is preferred but not required by the Town. Final configuration and pricing discussions may be conducted with Vendor finalists.

The Vendor is expected to provide a payment schedule tied to specific milestones with a retainage of up to 25%. The payment schedule and percent retainage will dictate the need for additional payment and performance bonds.

The Town is requesting the Vendor provide specific cost information as outlined within the attached cost tables. These cost tables must be completed and are mandatory to be considered responsive to the RFP.

3.5) Other Vendor Information

This section will include additional detail which will allow the Town to gain a greater appreciation for the proposed solution. Any information which is considered proprietary, should be clearly marked as such. The Town will assume no obligation or liability in the event proprietary information is disclosed.

5.0 PROPOSAL EVALUATION

The Town will conduct a comprehensive, fair, and impartial evaluation of all eligible and responsive Vendors submitting Proposals in response to this RFP. The procurement will comply with applicable Town policies. The successful Vendor will be selected by the Town based on evaluation factors outlined in this section.

5.1 SCHEDULE OF EVENTS

The Town has established the following sequence of events and tentative schedule dates for this solicitation.

Date	Day	Item	Project Activity
6/06/97	Friday	1	Request for Proposal Distributed
6/20/97	Friday	2	Pre-Proposal Conference & Written Questions Due
7/09/97	Wednesday	3	Vendor Proposals Due
8/16/97	Wednesday	4	Vendor Finalist Identified
8/22/97	Friday	5	Finalist Discovery Complete
9/05/97	Friday	6	Business Plan Complete
10/07/97	Tuesday	7	Contract Awarded By

5.1.1 REQUEST FOR PROPOSAL DISTRIBUTED

On Friday June 6, 1997 the Town will make this RFP available. Vendors may obtain copies from:

Hardcopy:
Clyde Johnson, C.P.M.
Office of the Purchasing Manager
Addison Finance Building
5350 Belt Line Rd
Addison, TX 75240
Phone: 972-450-7090

5.1.2 PRE-PROPOSAL CONFERENCE

The Town will conduct a conference with interested Vendors to answer questions and clarify RFP points. Conference attendance is not required in order for a Vendor to submit a Proposal, however, Vendors are encouraged to attend.

The non-mandatory pre-proposal conference will be conducted on Friday June 20th.

Location:
9:00 a.m. to 11:00 a.m.
Addison Conference Center
15650 Addison Road
Addison, Texas 75248

5.1.3 RFP CONTACTS

Technical questions regarding this RFP should be addressed to:

Greg Galluzzi
Senior Consultant
TMG Consulting, Inc.
9210 Honeycomb Dr.
Austin, TX 78737
Phone:512-288-2655
Fax: 512-288-2622
Email: TMGGreg@worldnet.att.net

Administrative questions regarding this RFP should be addressed to:

Clyde Johnson, C.P.M.
Office of the Purchasing Manager
Addison Finance Building
5350 Belt Line Rd
Addison, TX 75240
Phone: 972-450-7090

The Town will formally respond to all oral questions posed during the pre-proposal conference and all written questions received by the Office of the Purchasing Manager prior to 5:00 p.m., Friday June 20,1997.

The Town will package its responses into an RFP addendum and distribute to all Vendors recorded by the Town as having received the RFP.

5.1.4 VENDOR PROPOSALS DUE

Proposals must be completely sealed, contain the Vendor's name and address and must be labeled in the lower left hand comer with the Proposal Number and Proposal Name.

One (1) original and nine (9) copies of the proposal will be received until Wednesday July 9, 1997 at 2:00 p.m. CDT. Proposals received after this time will not be accepted and will be returned unopened.

Submit to: Office of the Purchasing Manager
Addison Finance Building
5350 Belt Line Rd
Addison, Texas 75240

Proposals will be accepted in person or by mail. Vendors are responsible for insuring their proposals are delivered in a timely manner to the Purchasing Department. Mailing of a proposal does not insure that the proposal will be delivered on time or delivered at all. If a Vendor does not hand deliver the proposal, it is suggested that he/she use some sort of delivery service that provides a receipt.

No proposals will be accepted by oral communication, telephone, electronic mail, telegraphic transmission, or telefacsimile transmission.

The Purchasing Department will record and time stamp receipt of the proposal. A formal bid opening will not occur.

5.2 Evaluation Criteria

The Vendor submitted proposals will be publicly opened and proposers names will be read, but no other information will be disclosed.

The contract may be awarded to the Vendor whose Proposal is determined to be the most advantageous to the Town. In rendering this decision, the following evaluation criteria may be utilized.

Item	Evaluation Category	Award
1	Solution Award	15%
2	Vendor Award	15%
3	Technical Award	15%
4	Cost Award	15%
5	Interview/Site Visit Award	15%
6	Risk Award	15%
7	Installation Award	5%
8	Responsiveness Award	5%
	Total Award	100%

▲ 5.2.1 Solution Award

Points may be awarded for the most complete, comprehensive and integrated solution. Vendors not capable of providing all of the requested products and services will form partnerships to provide the Town with a total solution. The Town will pay close attention to the installation, training and support services associated with the proposed solution.

▲ 5.2.2 Vendor Award

Points may be awarded based upon the Vendor's qualifications, installation experience, client references, and resource capabilities.

▲ 5.2.3 Technical Award

Points may be awarded based upon the Vendor's overall technical strategy and individual technology component solutions.

▲ 5.2.4 Cost Award

Points may be awarded based upon the reasonableness of the Vendors cost proposal, and the completeness, accuracy and level of cost detail provided. Cost detail must be submitted on the cost sheets provided in this RFP. The vendor will provide a total cost and a breakdown of costs by infrastructure component.

▲ 5.2.5 Interview/Site Visit Award

Points may be awarded based upon interviews conducted with the Vendor and/or site visits to Vendor customer sites.

▲ 5.2.6 Risk Award

Points may be awarded based upon proposals which minimize the risks associated with a project of this nature. The Town will consider factors such as: number of years in business, experience level, client references, resource availability, technical platforms, project approach, staffing levels, training hours, support levels and project timeline.

▲ 5.2.7 Installation Award

Points may be awarded based upon the Vendor's proposed approach, timeline, organization structure, and staffing levels.

▲ 5.2.8 Responsiveness Award

Points may be awarded based upon the Vendor's proposal completeness, level of detail, and conformance to Town instructions.

The Town will utilize judgment and common sense in identifying and selecting a Vendor solution. The award points are used to assist the Town in rendering a decision through empirical analysis, however, the Town reserves the right to conduct other evaluations and measurements of Vendor responses as may be required in order to render an informed and optimum decision.

5.0 Terms and Conditions

The terms and conditions under which the Proposal will be made are detailed within this section. The Town views this RFP as the framework to be used by the Vendor in preparing and submitting the proposal.

It is important for the Vendor to become familiar with the paragraph items within this section, as they will prevail in the event of any discrepancies or differences between project related or contractual documents.

5.1 Basis For Proposal

Only information supplied by the Town in writing through the Purchasing Office should be used in the preparation of Vendor Proposals.

Only replies by formal addenda shall be binding. Oral and other interpretations or clarifications shall not be binding. Vendors must acknowledge all addenda by signing and including such documents in the Proposal.

5.2 Vendor Terms and Conditions

The Vendor must submit a complete set of any additional terms and conditions that they propose to have included in a contract negotiated with the Town.

5.3 Disclosure of Proposal Contents

Proposals shall be opened in a manner that avoids disclosure of the contents to competing Vendors and keeps the proposals secret during negotiations. All proposals are open for public inspection after the contract award, but trade secrets and confidential information in the proposals may not be open for public inspection. Such data must be stamped **"proprietary"** or **"confidential"** on each page on which they appear, must be readily separable from the proposal and may be subject to review by the Attorney General of Texas in accordance with the Texas Open Records Act.

Vendors are advised that the confidentiality of their proposals will be protected by the Town to the extent permitted by law. Vendors are advised to consider the implications of the Texas Open records Act, particularly after the proposal process has ceased, and a contract has been awarded. While there is provision to protect proprietary information under section 3(9) and section 3(10) of the Act, where the vendor can meet certain evidentiary standards, please note that a ruling on whether these standards have been met will not be determined by the Purchasing Office of the Town of Addison but by the office of the Attorney General of Texas.

5.4 Late Proposals

Proposals must be returned in sufficient time so as to be received and date/time stamped at the specified location on or before the published proposal date and time specified. Any proposal received after the time and date set for receipt of proposals is late and cannot be considered.

5.5 Signing of Proposals

The submission and signature of a Proposal shall indicate the intention of the Vendor to adhere to the provisions described in this RFP.

1. Proposals which are signed for a partnership shall be signed in the firm's name by at least one partner or in the firm's name by an attorney-in-fact. If signed by an attorney-in-fact, there should be attached to the Proposal, a Power of Attorney evidencing authority to sign Proposals, dated the same date as the Proposal and executed in accordance with the legal requirements of the firm.
2. Proposals which are signed for a corporation shall have the correct corporate name thereon and signature of the president or a vice-president manually written below the corporate name. Any other signature must be accompanied by a resolution of the Board of Directors authorizing such signature to contract in the company's name. The title of the office held by the person signing for the corporation shall appear below the signature of the officer.
3. Proposals which are signed by an individual doing business under a firm name shall be signed in the name of the individual doing business under the proper firm name.

5.6 Cost of Proposal

This Request for Proposal does not commit the Town to pay any costs incurred by any Vendor in preparation and/or submission of a Proposal, or for procuring or contracting for the items to be furnished under the RFP. All costs directly or indirectly related to responding to this RFP (including all costs incurred in supplementary documentation) will be borne by the Vendor.

Each Vendor will be responsible for all costs incurred in preparing or responding to this RFP. The Vendor agrees to bear all risks for loss, injury, or destruction of goods and materials (ordered or supplied as the result of the eventual contract) which might occur prior to delivery to the Town; and such loss, injury, or destruction shall not release the Vendor from any obligations under this RFP or any resulting contract.

5.7 Conflict of Interest, Non Collusion and Anti Lobbying

The Vendor promises that it's officers, employees or agents will not attempt to lobby or influence a vote or recommendation related to the firm's proposal response;

directly or indirectly, through any contact with Town Council members or other Town officials between the proposed submission date and award by the Town Council and that there will be non-collusion and non-conflict of interest.

5.8 Ownership of Proposals

All documents submitted in response to this Request for Proposal shall become the property of the Town of Addison.

5.9 Disqualification or Rejection of Proposals

Vendors may be disqualified for any of the following reasons:

- There is reason to believe that collusion exists among the Vendors;
- The Vendor is in arrears on an existing contract or has defaulted on a previous contract with the Town;
- The Vendor lacks financial stability;
- The Vendor has failed to perform under previous or present contracts with the Town;
- The Vendor has failed to use the Town's required forms;
- The Vendor has failed to adhere to one or more of the provisions established in this RFP;
- The Vendor has failed to submit its Proposal in the format specified herein;
- The Vendor has failed to submit its Proposal on or before the deadline established herein;
- The Vendor has failed to adhere to generally accepted ethical and professional principles during the Proposal process;

Proposals may be rejected if they show any alteration of words or figures, additions not called for, conditional or uncalled-for alternate proposals, incomplete proposals, erasures, or irregularities of any kind, or contain any unbalanced values.

5.10 Right to Waive Irregularities

Proposals shall be considered as being "irregular" if they show any omissions, alterations of form, additions, or conditions not called for, unauthorized alternate proposals, or irregularities of any kind.

The Town reserves the right to waive minor irregularities and mandatory requirements provided that all responsive proposals failed to meet the same mandatory requirements and the failure to do so does not otherwise materially affect the procurement. This right is at the sole discretion of the Town of Addison.

5.11 Withdrawal of Proposals

Proposals may be withdrawn by written or telegraphic notice received by the Purchasing Office prior to the exact hour and date specified for receipt of bids. A bid may also be withdrawn in person by a bidder or his authorized representative, provided his identity is made known and he signs a receipt for the bid, but only if the withdrawal is made prior to the exact hour and date set for the receipt of bids.

5.12 Amending of Proposals

An Vendor must submit an amended proposal before the deadline for receipt of proposals. Such amended proposals must be complete replacements of a previously submitted proposal and must be clearly identified as such in the transmittal letter. The Town will not merge, collate, or assemble proposal materials.

5.13 Proposal Offer Firm

Responses to this RFP, including cost, will be considered firm for one-hundred and eighty (180) days after the due date for receipt of proposals or receipt of the last best and final offer submitted. All Proposals must include a statement to that effect.

5.14 Exceptions to RFP Specifications

Although the specifications stated in the RFP represent the Town's anticipated needs, there may be instances in which it is in the Town's interest to permit exceptions to specifications and accept alternatives.

It is extremely important that the Vendor make very clear where exceptions are taken to the specifications and how the Vendor will provide alternatives. Therefore, exceptions, conditions, or qualifications to the provisions of the Town's specifications must be clearly identified as such together with reasons for taking exception, and inserted into the Proposal. If the Vendor does not make clear that an exception is being taken, the Town will assume the Proposal is responding to and will meet the specification as written.

Where the Vendor does not agree with the Town's terms and conditions, we require the proposal to enumerate the specific clauses which the Vendor wishes to amend or delete and suggest alternative wording. Any minimum terms to which the Town will have to agree to in order to enter into a contract with the Vendor and which the Vendor considers to be a "deal breaker" **MUST BE SUBMITTED WITH THE PROPOSAL.**

5.15 Consideration of Proposals

Discussions may be conducted with responsible Vendors capable of being selected for award for the purpose of clarification to assure full understanding of, and

responsiveness to, the solicitation requirements. In conducting discussions, there shall be no disclosure of any information derived from proposals submitted by competing Vendors.

Until award of the contract is made by the Town, the right will be reserved to reject any or all proposals and waive technicalities, to re-advertise for new proposals, or to proceed with the work in any manner as may be considered in the best interest of the Town.

5.16 Termination

The Town's City Manager reserves the right, at his sole and unqualified discretion, to cancel this RFP at any time. The Town reserves the right to reject any or all proposals submitted in response to this RFP.

5.17 Governing Law

The Contract will be governed by the laws of the State of Texas. All duties of both parties shall be performed in Dallas County, Texas. The applicable law for any legal dispute arising out of the Contract shall be the law of the State of Texas.

5.18 No Obligation

This procurement in no manner obligates the Town or any of its agencies to the eventual rental, lease, or purchase of any software or services offered until confirmed by an executed written contract.

5.19 Award of Contract

The Town reserves the right to withhold final action on Proposal for a reasonable time, not to exceed ninety (180) days after the date of opening proposals, and in no event will an award be made until further investigations have been made as to the responsibility of the proposed Vendor .

The award of the contract, if an award is made, will be to the most responsible and responsive Vendor whose Proposal meets the requirements and criteria set forth in the Request for Proposal. The Town reserves the right to abandon, without obligation to the Vendor , any part of the project or the entire project, at any time before the Vendor begins any work authorized by the issuance of a Notice to Proceed by the Town.

The award of the contract shall not become effective until the contract has been executed by the Vendor and the Town.

5.20 Execution of Contract

The Town Council shall authorize award of a contract to the successful Vendor and shall designate the successful Vendor as the Town's Vendor . The Town will require the Vendor to sign the necessary documents entering into the required Contract with the Town and to provide the necessary evidence of insurance as required under the contract documents.

No contract for this project may be signed by the Town without the authorization of the Addison Town Council. No Contact shall be binding on the Town until it has been approved as to form by the Town Attorney, and executed by the Town's City Manager.

5.21 Notice to Proceed

The Vendor shall not commence work until authorized in writing to do so by the Town. Should the Vendor fail to commence work on the project within the time stipulated in the written authorization, it is agreed that the Vendor will forfeit $1000 per scheduled vendor full-time-equivalent delayed.

5.22 Payment and Performance Bonds

As a condition, precedent to the Town's execution of a final contract, the successful Vendor may be required to provide the Town with both payment and performance bonds whose penal amount equals the total installed purchase price of the hardware, software and services under contract. Bonding companies must be listed in the latest U.S. Treasury Department, Circular 570, be licensed in the State of Texas, and have underwriting limitation equal to or greater than a penal sum of each bond.

5.23 Insurance

The Vendor shall maintain the following commercial insurance policies for the period of time and limits specified:

1. Commercial General Liability Insurance with a combined bodily injury and property damage per occurrence limit of not less than $600,000. The policy shall, at a minimum, have a $1,000,000 annual aggregate. The policy shall contain blanket contractual liability, products and completed operations coverage, and independent Vendor s coverage. Coverage shall be endorsed to provide aggregate limits of insurance per project.
2. Automobile Insurance Policy. The policy shall be maintained for the duration of this Agreement at the following limits and for the coverage specified:
   - Liability Bodily Injury - each person $250,000, each accident $500,000;
   - Property Damage - each accident $100,000 (or equivalent if written on a combined single limit basis);

- Medical Payments - each person $10,000;
- Personal Injury Protection - each person $2,500;
- Uninsured/Underinsured Motorist - Bodily Injury each person $20,000, each accident $40,000; Property Damage each accident $15,000.

❸ Statutory Workers' Compensation and Employers' Liability (EL) insurance:

- $500,000 each accident;
- $500,000 disease - policy
- $500,000 disease - each employee.

❹ Professional Liability coverage of not less than $1,000,000 per claim to cover errors in programs or in systems design and consulting operations. Coverage shall be continuous for not less than 24 months following completion of services under this Agreement.

Prior to commencing any work under this Agreement, the Vendor shall deliver to the Town of Addison insurance certificate confirming the existence of the insurance required by this Agreement.

5.24 Scope of Insurance and Special Hazard

The insurance required under the preceding paragraphs shall provide adequate protection for the Vendor and his sub-contractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him.

5.25 State Sales Tax

On a contract awarded by the Town of Addison, an organization which qualifies for exemption to the provisions of Article 20.04(H) of the Texas Limited Sales, Excise, and Use Tax Act, the Vendor may purchase, rent or lease all materials, supplies, and equipment used or consumed in the performance of this contract by issuing an exemption certificate to his supplier in lieu of the tax, said exemption certificate to comply with State Comptroller's Ruling .007. Any such exemption issued by the Vendor in lieu of the tax shall be subject to and shall comply with the provisions of the State Comptroller's Ruling .011, and any other applicable State Comptroller ruling pertaining to the Texas Limited Sales, Excise, and Use Tax Act.

6.0 Cost Sheets

The Vendor is required to complete and return the cost sheets as part of their proposal. The attached costs sheets are included as examples, an electronic copy will be made available for those vendors seriously considering submitting a bid. To obtain an electronic copy contact:**Greg Galluzzi of TMG Consulting at 512-288-2655 or email at TMGGreg@worldnet.att.net.**

Solution Cost Worksheet

Welcome to the Detailed Costing Worksheet

Enter the name of your ogranization and/or the project name.

Town of Addison, Technology Infrastructure Project

Complete the following Cost Worksheets

Table 1 Detailed Cost Schedule

Table 2 Installation Cost by Vendor

Table 3 Ongoing Costs for 5 Years

Table 4 Payment Schedule

Town of Addison, Technology Infrastructure Project

This table is used to reflect total system installation costs.

- **A** Number which uniquely identifies the detailed cost component.
- **B** Description of the major cost category or detailed cost component
- **C** FYI to the Vendor, the Town's planned quantity and/or specification. This is provided for informational purposes only. The vendor is expected to utilize professional expertise to provide the Town with an optimum configuration. **The vendor is instructed to replace the Town's language with their proposed specification**
- **D** Name of the vendor providing the product or service
- **E** Number of item units (qty, hrs, etc) being provided
- **F** Unit cost of the item
- **G** Number of items times the unit cost per item
- **H** Yearly maintenance amount

Use the following cost sheet as a template and tailor to your response.

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
1	Wide Area Network					$0	$0
	Server	Planned with 2 but possibly 3 servers; 200MHz Pentium Pro, 96-128Mb memory, 8-9GB Storage, PCI network card		0	$0.00	$0	$0
	UPS	Planned with an HP PowerWise UPS 1000 VA unit		0	$0.00	$0	$0
	Tape Backup System	Planned with an Intel StorageWorks 5 Cartridge DLT Mini Library 100GB		0	$0.00	$0	$0
	Network Operating System	Planned with Windows NT Server v4.0		0	$0.00	$0	$0
	Network Management Software	Planned with Intel LANDesk Server Manager v2.5		0	$0.00	$0	$0
	Support Services	Planned with priority onsite 3 year period for servers		0	$0.00	$0	$0
	DSU/CSU's	Planned with 10 units		0	$0.00	$0	$0
	Routers	Planned with 10 units CISCO Router or HP AdvanceStack Router		0	$0.00	$0	$0

1. Detailed Cost Schedule

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
	Hubs	Planned with priority onsite 3 year period for servers		0	$0.00	$0	$0
	Network Design Services	Vendor to specify		0	$0.00	$0	$0
	Network Installation Services	Vendor to specify		0	$0.00	$0	$0
	Cabling Hardware	Planned using Category 5 cable with up to 18,000 feet		0	$0.00	$0	$0
	Cabling Installation Services	Vendor to specify		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
2	Infrastructure Support					$0	$0
	Help Desk Software	Planned with Intel LANDesk Response		0	$0.00	$0	$0
	Infrastructure Training Courses	Planned for 3 IS persons (see org chart)		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
3	Disaster Recovery					$0	$0
	Initial Service Setup			0	$0.00	$0	$0
	Ongoing Annual Service	Planned with 5 year contract		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
4	Desktop / Notebooks					$0	$0
	Desktop Computers	Planned with 45 PentiumPro 200 MHz, 32MB, 2.1GB, Win95/97, 17" monitor, CD-ROM Drive, Ethernet card and patch cable, 3 year warranty, surge protection.		0	$0.00	$0	$0
	Notebook Computers	Planned with 7 Pentium 150 MHz, 32MB, 12.1 Active, 2.1GB, Win 95/97, CD-ROM Drive, Ethernet Docking stations, 3 year warranty, carrying case, surge protection.		0	$0.00	$0	$0
	Connectivity for Existing Desktops	Planned to setup and connect 18 existing Pentium desktops with Ethernet card and patch cable.		0	$0.00	$0	$0

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
	Connectivity for Existing Desktops	May require 53 other existing desktops with Ethernet card and patch cable.		0	$0.00	$0	$0
	Installation for new computers	Planned with 52 new computers for delivery, setup, connection, haul away boxes, also backup old desktop data and load onto new desktop..		0	$0.00	$0	$0
	Network Client Software License	Planned with MS NT client licenses					
	Emulation Software	Planned with 70 emulation software licenses for UNIX / Windows NT access					
	Emulation Software 2	May require additional 53 emulation software licenses for UNIX/Windows NT access.		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
5	Office Suite					$0	$0
	Desktop Office Suite	Planned with MS Office 97 Pro including Word, Excel, PowerPoint, Outlook, Access, etc., either individual 70 copies or server license at 40.		0	$0.00	$0	$0
	Desktop Office Suite 2	May require additional 53 copies or server license at 21		0	$0.00	$0	$0
	Office Suite Training	Planned with 70 persons for 3 days of classes covering basic PC skills, introduction to Word and Excel		0	$0.00	$0	$0
	Office Suite Training 2	May require additional 53 persons to be trained		0	$0.00	$0	$0
	Installation services	Vendor to provide-may be included with desktop		0	$0.00	$0	$0
				0	$0.00	$0	$0
6	Office E-Mail					$0	$0
	E-Mail Server Software License	Planned with MS Exchange Server Licensing		0	$0.00	$0	$0
	E-Mail Client Software License	Planned with MS Outlook 97 as part of the MS Office Suite		0	$0.00	$0	$0
	Installation services	Vendor to provide-may be included with desktop		0	$0.00	$0	$0
	Training services	Planned as part of office suite training		0	$0.00	$0	$0
				0	$0.00	$0	$0
7	Office Groupware					$0	$0
	Groupware Software	Planned with MS Team Manager 97 either individual 70 copies or server license at 40		0	$0.00	$0	$0

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
	Installation services	Vendor to provide		0	$0.00	$0	$0
	Training services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
8	Mopier/Laser Printer					$0	$0
	Mopier	Planned with 2 HP Mopiers		0	$0.00	$0	$0
	Laser B/W Printers 24 ppm	Planned with 10 HP 5 MSI 24ppm 600x600dpi		0	$0.00	$0	$0
	Laser B/W Printers 12 ppm	Planned with 2 HP 5 12ppm 600x600dpi		0	$0.00	$0	$0
	Connect Existing 61 Printers	Vendor to provide		0	$0.00	$0	$0
	Connect Existing 6 Serial Printers	Vendor to provide		0	$0.00	$0	$0
	Installation services	Vendor to provide		0	$0.00	$0	$0
	Support services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
9	Laser Color Printer					$0	$0
	Laser Color Printers	Planned with 7 HP color laser printers		0	$0.00	$0	$0
	Installation services	Vendor to provide		0	$0.00	$0	$0
	Support services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
10	CD-ROM					$0	$0
	CD-ROM Server	Planned with 1 Pentium workstation		0	$0.00	$0	$0
	CD-ROM Tower	Planned with OmniTower - Blackbox Ethernet 7 drive CD Tower for NT		0	$0.00	$0	$0
	CD-ROM Software	Vendor to provide		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Support Services	Vendor to provide					
	Training Services	Vendor to provide					
				0	$0.00	$0	$0
11	Volume Storage					$0	$0
	Optical Server	Planned with network attached Pentium workstation		0	$0.00	$0	$0
	Optical Jukebox	Planned with Surestore Optical 40ST Jukebox with 2 drives		0	$0.00	$0	$0
	Scanning Station	Planned with network attached Pentium workstation with SCSI drive 20"		0	$0.00	$0	$0
	Scanner	Planned with Fujitsu Simplex Scanner, Lightining Card SNCR Accelerator, SCSI Cable		0	$0.00	$0	$0

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
	Installation Services	Vendor to provide					
	Support Services	Vendor to provide					
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
12	Communications					$0	$0
	Server	Planned a 200MHz Pentium Pro, 96-128Mb memory, 8-9GB Storage, PCI network card		0	$0.00	$0	$0
	UPS	Planned with an HP PowerWise UPS 1000 VA unit		0	$0.00	$0	$0
	Tape Backup System	Planned with an Intel StorageWorks 5 Cartridge DLT Mini Library 100GB		0	$0.00	$0	$0
	Network Operating System	Planned with Windows NT Server v4.0		0	$0.00	$0	$0
	Network Management Software	Planned with Intel LANDesk Server Manager v2.5		0	$0.00	$0	$0
	Fax Modems	Planned with 24 US Robotics Fax Modems 33.6					
	Connectivity Hardware	Planned with Digiboards 4 - 8 port					
	Virus Protection Software						
	Installation Services	Vendor to provide delivery, configuration and startup		0	$0.00	$0	$0
	Support Services	Planned with priority onsite 3 year period for servers		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
13	Remote Computing					$0	$0
	Remote Access Software	Planned with WinFrame/Access Remote Access Software 2 units		0	$0.00	$0	$0
	Remote Access Software	Planned with Reachout Access Software 7 units		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
14	Fax Management					$0	$0
	Fax Management Software	Planned with WinPort/FaxPort Network Software 50 user license		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
				0	$0.00	$0	$0
15	Public Kiosks					$0	$0
	Preconfigured Kiosks	Planned with custom cabinet, 20 in touch screen, Pentium, 33.6 modem. Windows 95/97, Impact printer,		0	$0.00	$0	$0
	Kiosk Workstations	Planned with Pentium workstation same specs		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
16	Council Electronic Access					$0	$0
	Notebook Computers	Planned with 7 Pentium 150MHz, 32MB, 12.1 Active, 2.1GB, Windows 95/97, CD-ROM, Ethernet Docking Station, 3 year warranty, carrying case, surge protection		0	$0.00	$0	$0
	Notebook Software	Planned with 7 copies of NT Client and MS Office 97		0	$0.00	$0	$0
	Remote Access Software	Planned with 7 copies of Reachout / Access software		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to proivde for 7 persons		0	$0.00	$0	$0
				0	$0.00	$0	$0
17	Internet Access					$0	$0
	Browser Software	Planned with Netscape Navigator		0	$0.00	$0	$0
	ISP Accounts	Planned with 10 accounts		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
18	Remote Presentation					$0	$0
	Mobile LCD Projection	Planned with EPSON Powerlight 5000 14.1 pds 150w metal halide, 450 lumens		0	$0.00	$0	$0
	Mobile Speakers			0	$0.00	$0	$0
	Remote Control Unit	Planned with Logic Remote Mouse		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
19	Automated Voice Response					$0	$0

1. Detailed Cost Schedule

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
	AVR Solution	Planned to support 3 line customer call-in		0	$0.00	$0	$0
	Support Services	Vendor to provide		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
20	Customer Request / Complaint Software					$0	$0
	Software Product	Vendor to provide		0	$0.00	$0	$0
	Installation Services	Vendor to provide		0	$0.00	$0	$0
	Training Services	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
21	Intranet					$0	$0
	Intranet Server	Planned a 200MHz Pentium Pro, 96-128Mb memory, 8-9GB Storage, PCI network card		0	$0.00	$0	$0
	Network Operating System	Planned with Window NT 4.0		0	$0.00	$0	$0
	UPS	Planned with an HP PowerWise UPS 1000 VA unit		0	$0.00	$0	$0
	Firewall and Software			0	$0.00	$0	$0
	Web Authoring Software	Planned with MS Frontpage 97					
	Support Services	Vendor to provide					
	Installation Services	Vendor to provide					
	Training Services	Vendor to provide					
				0	$0.00	$0	$0
22	First Year Support					$0	$0
	Comprehensive support plan	Planned with FTE of 2 resources		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
23	Project Management					$0	$0
	Project Management	Vendor to provide		0	$0.00	$0	$0
	Quality Management	Vendor to provide		0	$0.00	$0	$0
	Project Administration	Vendor to provide		0	$0.00	$0	
				0	$0.00	$0	$0
				0	$0.00	$0	$0

1. Detailed Cost Schedule

A	B	C	D	E	F	G	H
Item #	Cost Category or Item	Specification	Vendor	Units	Unit Cost	Total Amount	Yearly Maint Amt
24	Reserves & Contingencies					$0	$0
	Project Reserves	Vendor to provide		0	$0.00	$0	$0
	Bonding	Vendor to provide		0	$0.00	$0	$0
	Primary Contractor Fee	Vendor to provide		0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
25	Other Vendor Costs					$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
				0	$0.00	$0	$0
	Total Cost					$0	$0

Town of Addison, Technology Infrastructure Project

This table is used to reflect the total installation costs by vendor

- **A** Number uniquely identifying the major cost category
- **B** Description of the major cost category
- **C** Total installation costs summarized from Table 1
- **D-H** Installation Costs by Vendor

The Vendor will segment cost items into major categories as identified in the table.

A	B	C	D	E	F	G	H
ITEM #	COST CATEGORY OR ITEM	INSTALL COST	VENDOR1 (insert name)	VENDOR2 (insert name)	VENDOR3 (insert name)	VENDOR4 (insert name)	VENDOR5 (insert name)
1	Wide Area Network	$0					
2	Infrastructure Support	$0					
3	Disaster Recovery	$0					
4	Desktop / Notebooks	$0					
5	Office Suite	$0					
6	Office E-Mail	$0					
7	Office Groupware	$0					
8	Mopier/Laser Printer	$0					
9	Laser Color Printer	$0					
10	CD-ROM	$0					
11	Volume Storage	$0					
12	Communication Layer	$0					
13	Remote Computing	$0					
14	Fax Management	$0					
15	Public Kiosks	$0					
16	Council Electronic Access	$0					
17	Internet Access	$0					
18	Remote Presentation	$0					
19	Automated Voice Response	$0					
20	Customer Request/Complaint	$0					
21	Intranet	$0					
22	First Year Support	$0					
23	Project Management	$0					
24	Reserves & Contingencies	$0					
25	Other	$0					
	Total	$0					

Town of Addison, Technology Infrastructure Project

This table is used to reflect the total annual costs for a 5 year timeframe.

- **A** Number uniquely identifying the major cost category
- **B** Description of the major cost category
- **C** Total annual costs summarized from Table 1
- **D-H** Ongoing annual operating costs.

The Vendor will segment cost items into major categories as identified in the table.

A	B	C	D	E	F	G	H	
ITEM #	Solution Component	Annual Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Total Period Cost
1	Wide Area Network	$0						$0
2	Infrastructure Support	$0						$0
3	Disaster Recovery	$0						$0
4	Desktop / Notebooks	$0						$0
5	Office Suite	$0						$0
6	Office E-Mail	$0						$0
7	Office Groupware	$0						$0
8	Mopier/Laser Printer	$0						$0
9	Laser Color Printer	$0						$0
10	CD-ROM	$0						$0
11	Volume Storage	$0						$0
12	Communication Layer	$0						$0
13	Remote Computing	$0						$0
14	Fax Management	$0						$0
15	Public Kiosks	$0						$0
16	Council Electronic Access	$0						$0
17	Internet Access	$0						$0
18	Remote Presentation	$0						$0
19	Automated Voice Response	$0						$0
20	Customer Request/Complaint	$0						$0
21	Intranet	$0						$0
22	First Year Support	$0						$0
23	Project Management	$0						$0
24	Reserves & Contingencies	$0						$0
25	Other	$0						$0
	Total	$0	$0	$0	$0	$0	$0	$0

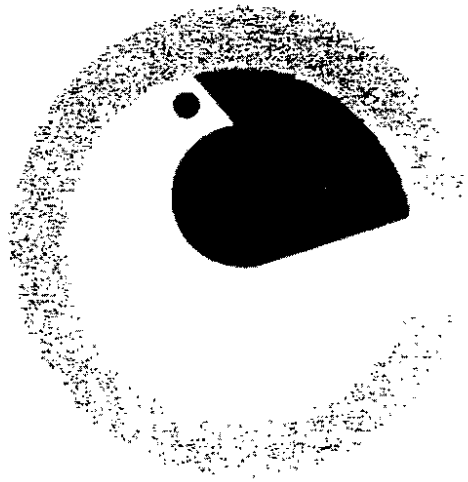
Town of Addison, Technology Infrastructure Project

This table is used to reflect the expected payment schedule

- A Line item number
- B Vendor name and major cost category.
- C Installation cost from table 1
- D Total amount due upon award of the contract
- E Total amount due as services are incurred or products provided
- F Total amount due at specific project milestones (identify the milestone)
- G Total amount due upon formal acceptance

Vendor will provide a breakdown of total cost into a payment schedule within the following table

A	B	C	D	E	F	G
ITEM #	Solution Components	Install Cost	Due At Contract Execution	Due As Incurred	Due At Milestone	Due At Formal Acceptance
1	Wide Area Network	$0				
2	Infrastructure Support	$0				
3	Disaster Recovery	$0				
4	Desktop / Notebooks	$0				
5	Office Suite	$0				
6	Office E-Mail	$0				
7	Office Groupware	$0				
8	Mopier/Laser Printer	$0				
9	Laser Color Printer	$0				
10	CD-ROM	$0				
11	Volume Storage	$0				
12	Communication Layer	$0				
13	Remote Computing	$0				
14	Fax Management	$0				
15	Public Kiosks	$0				
16	Council Electronic Access	$0				
17	Internet Access	$0				
18	Remote Presentation	$0				
19	Automated Voice Response	$0				
20	Customer Request/Complaint	$0				
21	Intranet	$0				
22	First Year Support	$0				
23	Project Management	$0				
24	Reserves & Contingencies	$0				
25	Other	$0				
	Total	$0	$0	$0	$0	$0



CARROLLTON

STORMWATER

AND

FLOOD PROTECTION ORDINANCE

MAY, 1987

ORDINANCE NO. 1375

INDEX

ARTICLE 7 - SPECIAL DRAINAGE FACILITIES

ARTICLE 8 - FLOODPLAIN GUIDELINES

TABLES

FIGURES

ORDINANCE NO. 1375

AN ORDINANCE OF THE CITY OF CARROLLTON, TEXAS, PROVIDING FOR COMPREHENSIVE DRAINAGE AND FLOOD PROTECTION IN THE CITY OF CARROLLTON; PROVIDING A TITLE; LISTING FINDINGS OF FACT; DECLARING PURPOSES; STATING SCOPE OF AUTHORITY; DESCRIBING THE ORGANIZATION OF THIS ORDINANCE; DEFINING TERMS; DESCRIBING GENERAL PROVISIONS; EXPLAINING RUNOFF CALCULATIONS; SETTING STANDARDS FOR THE DESIGN OF LOCAL DRAINAGE SYSTEMS; ESTABLISHING STANDARDS FOR SPECIALTY DRAINAGE FACILITIES; PROVIDING FLOODPLAIN GUIDELINES; REPEALING ORDINANCE 905 AND 1051; PROVIDING A PENALTY; AND PROVIDING AN EFFECTIVE DATE.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CARROLLTON, TEXAS:

ARTICLE 1

SECTION 1

TITLE, FINDINGS OF FACT, STATEMENT OF PURPOSE, AND SCOPE OF AUTHORITY

ORGANIZATION OF THIS ORDINANCE

SECTION A. Title

This Ordinance shall be known as the "Official Stormwater and Flood Protection Ordinance" of the City of Carrollton, and shall consist of a ninety-two (92) page document attached hereto and made a part of this Ordinance.

SECTION B. Findings of Fact

1. The drainage ways and flood hazard areas of the City of Carrollton, Texas, are subject to periodic inundation which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety, and general welfare.

2. These flood losses are created by the cumulative effect of obstructions in floodplains that increase flood heights and velocities and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed, or otherwise protected from flood damage.

SECTION C. Statement of Purpose

This ordinance sets forth the minimum requirements necessary to provide and maintain a safe, efficient, and effective drainage system within the City of Carrollton and to establish the various public and private responsibilities for the provision thereof. Further, it is the purpose of this ordinance to:

(1) Protect human life, health, and property;

(2) Minimize expenditure of public money for drainage related projects;

(3) Minimize damage due to drainage to public and private facilities and utilities such as water and gas mains, electric service, telephone and sewer lines, streets and bridges;

(4) Help maintain a stable tax base and preserve land values;

(5) Insure that potential buyers are notified that property is in an area of special flood hazard;

(6) Insure that those who occupy the areas of special flood hazard assume responsibility for their actions.

(7) Preserve the natural beauty and aesthetics of the community.

(8) Control and manage all stormwater runoff and drainage from points and surfaces within subdivisions.

(9) Establish a reasonable standard of design for development which prevents potential flood and stormwater damage.

SECTION D. Scope of Authority

Except as exempted by Article 9, Section A, any person, firm, corporation, or business proposing to develop land or improve property within the City of Carrollton is subject to the provisions of this ordinance. This ordinance also applies to individual building structures, subdivisions, excavations and fill operations, and similar activities.

SECTION E. Organization of This Ordinance

This ordinance combines the provisions of the former "Official Drainage and Stormwater Control Ordinance" (Ordinance No. 1051) with the "Flood Hazard Prevention Ordinance" (Ordinance No. 905). Further, it expands and clarifies various aspects of these ordinances. The following list is a synopsis of the contents of each article.

Article 1 - discusses the purposes, scope, and authority of this ordinance, and provides a penalty for noncompliance with this ordinance.

Article 2 - lists and defines various terms used in this ordinance.

Article 3 - states general provisions related to implementation and enforcement of this ordinance.

Article 4 - overviews the administrative procedures to be followed for obtaining the necessary City drainage approvals related to building on or improving property.

Article 5 - explains the methodologies to calculate runoff quantities.

Article 6 - gives the design standards for building local drainage systems (i.e., enclosed storm sewers).

Article 7 - states additional design standards for specialty drainage system items.

Article 8 - presents the floodplain regulations, including the requirements to be met when reclaiming floodplain land.

SECTION F. Related Ordinances

In addition to this ordinance, the City of Carrollton has other ordinances, regulations, and specifications pertaining to drainage and storm sewer facilities. These other documents include the zoning and subdivision ordinances, the Standard Specifications for Public Works Construction by the North Central Texas Council of Governments as amended by the City of Carrollton, and the General Design Standards for the City of Carrollton, and shall remain in full force and effect. If there is any conflict between such prior ordinance and this ordinance, this ordinance shall prevail.

SECTION 2

That Ordinance 1051 and Ordinance 905 are hereby repealed.

SECTION 3

Penalty for Violation. That any person, firm, or corporation violating any of the terms and provisions of this ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be fined in the amount not to exceed $1,000.00. Each such violation shall be deemed a separate offense and shall be punishable as such hereunder.

SECTION 4

That this ordinance shall become effective from and after its passage.

PASSED AND APPROVED MAY 12, 1987.

City of Carrollton, Texas

By: Milburn R. Gravley
Milburn R. Gravley, Mayor

ATTEST:

Janice Garrison
City Secretary

Approved as to form:

Karen A Bixby
City Attorney

ARTICLE 2

DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted to give them the meaning they have in common usage and to give this ordinance its most reasonable application:

1. Angle of Flare

   Angle between direction of a wingwall and centerline of culvert or storm drainage outlet or inlet.

2. Appeal

   A request for review or interpretation of any provisions of this ordinance or a request for a variance.

3. Area of Shallow Flooding

   A designated AO or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; and the path of flooding is unpredictable and indeterminate.

4. Area of Special Flood Hazard

   The land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year.

5. Base Flood

   The flood having a one percent chance of being equalled or exceeded in any given year, determined based upon FEMA guidelines and as shown in the current effective Flood Insurance Study.

6. Base Flood Elevation

   The water surface elevation resulting from the base flood.

7. Conduit

   Any closed device for conveying flowing water.

8. Critical Feature

An integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.

9. Design Flood

The flood having a one percent chance of being equalled or exceeded in any given year based upon fully developed watershed conditions.

10. Detention Basin

A dry basin or depression constructed for the purpose of temporarily storing stormwater runoff and discharging all of that water over time at a reduced rate than would have otherwise occurred.

11. Developer/Builder

A person, partnership, or corporation engaged in the development of land and/or building of structures and not excluded by exemption sections of this ordinance.

12. Development

Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling operations, grading, or clearing.

13. Elevated Building

In the case of Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, an "elevated building" includes a building elevated by means of fill so that the finished floor of the building is at least two feet above the water surface elevation of the design flood.

14. Entrance Head

The head required to cause flow into a conduit or other structure; it includes both entrance loss and velocity head.

15. Entrance Loss

Head lost in eddies or friction at the inlet to a conduit, headwall, or structure.

16. Equal Conveyance

Principle of reducing stream conveyance for a proposed alteration with a corresponding reduction in conveyance to the opposite bank of the stream. The right of equal conveyance applies to all owners and uses and may be relinquished only by written agreements.

17. Existing Construction

For the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of Ordinance 905. "Existing construction" may also be referred to as "existing structures."

18. Federal Emergency Management Agency (FEMA)

Federal agency which administers National Flood Insurance Program.

19. Flood or Flooding

A general and temporary condition of partial or complete inundation of normally dry land areas from:

(1) The overflow of inland waters and/or

(2) The unusual and rapid accumulation or runoff of surface waters from any source.

20. Flood Insurance Rate Map (FIRM)

The official map on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

21. Flood Insurance Study

The official report in which the Federal Emergency Management Agency has provided flood profiles, the water surface elevation of the base flood, as well as the Flood Boundary-Floodway Map.

22. Floodplain or Flood-prone Area

Any land area susceptible to being inundated by water from any source (see definition of flooding).

23. Flood Protection System

Those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed specifically

to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards.

24. Flume

Any open conduit on a prepared grade, trestle, or bridge.

25. Freeboard

The distance between the design flood elevation and the top of an open channel, dam, levee, or detention basin to allow for wave action, floating debris, or any other condition or emergency without overflowing the structure.

26. Functionally Dependent Use

A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities.

27. Highest Adjacent Grade

The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

28. Hydraulic Gradient

A line representing the pressure head available at any given point within the drainage system.

29. Levee

A man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

30. Levee System

A flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.

31. Lowest Floor

The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violoation of the applicable non-elevation design requirements of FEMA 60.3.

32. Manning Equation

The uniform flow equation used to relate velocity, hydraulic radius, and energy gradient slope.

33. Manufactured Home

A structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For floodplain management purposes, the term "manufactured home" also includes park trailers, travel trailers, and other similar vehicles placed on a site for greater than 180 consecutive days. For insurance purposes, the term "manufactured home" does not include park trailers, travel trailers, and other similar vehicles.

34. Mean Sea Level

For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

35. Manufactured Home Park or Subdivision

A parcel or contiguous parcels of land divided into two or more manufactured home lots for rent or sale.

36. Natural Drainage

The dispersal of surface waters through ground absorption and by drainage channels formed by the existing surface topography which exists at the time of adoption of this ordinance or formed by any man-made change in the surface topography.

37. Natural Floodway

The effective area of a channel of a river or other water course and the adjacent land areas that must be reserved in order to discharge the

"design flood" without cumulatively increasing the water surface elevation. This floodway differs from the FEMA "regulatory floodway."

38. New Construction

Structures for which the "start of construction" commenced on or after the effective date of Ordinance 905.

39. Open Channel

A channel in which water flows with a free surface.

40. Other Municipal Ordinances

Ordinances such as, but not limited to, zoning, subdivision, and erosion.

41. Probable Maximum Flood

Upper limit of a flood likely to occur as determined by Corps of Engineers' criteria.

42. Rational Formula

The means of relating runoff with the area being drained and the intensity of the storm rainfall.

43. Regulatory Floodway

The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the "base flood," as calculated by the Federal Emergency Management Agency, without cumulatively increasing the water surface elevation more than a designated height. This floodway is used by FEMA to determine compliance with its regulations.

44. Retention Basins

A pond or other water body which has been designed to have both a conservation pool for holding some water indefinitely and a flood storage pool for storing stormwater runoff on a temporary basis for the purpose of reducing the peak discharge from the basin.

45. Standard Project Flood

Flood that has a magnitude of approximately one half of the probable maximum flood, as determined on a case-by-case basis using Corps of Engineers' current criteria.

46. Start of Construction

For a structure, "start of construction" includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction of a structure does not include land preparation, such as clearing, grading, and filling, nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

47. Structure

A walled and roofed building, a manufactured home, a gas or liquid storage tank, or a substation that is principally above ground.

48. Substantial Improvement

Any combination of repairs, reconstructions, or improvements of a structure, the cumulative cost of which equals or exceeds 50 percent of the initial market value of the structure either:

(1) before the first improvement or repair is started, or

(2) if the structure has been damaged and is being restored, before the damage occurred.

For the purpose of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. Incremental improvements over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement."

The term does not, however, include either:

(1) any project for improvement of a structure to comply with existing State or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions or,

(2) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

49. Surety

A corporation surety bond, cash, certificate of deposit, or an irrevocable letter of credit.

50. Time of Concentration

The estimated time in minutes or hours required for a drop of water to flow from the most remote point in the drainage area to the point at which the flow is to be determined.

51. Use

Any purpose for which a building or other structure or a tract of land may be designed, arranged, intended, maintained, or occupied; or any activity, occupation, business, or operation carried on, or intended to be carried on, in a building or other structure or on a tract of land.

52. Use Permit

The permit required before any use may be commenced.

53. Variance

A grant of relief to a person from the requirements of this ordinance when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this ordinance.

54. Violation

The failure of a structure or other development to be fully compliant with this ordinance. A structure or other development without the elevation certificate, other certifications, or other evidence as required by the City Manager, is presumed to be in violation until such time as that documentation is provided.

55. Watershed

The area drained by a stream or drainage system.

56. Water Surface Elevation

The height, in relation to the NGVD or 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of riverine areas.

ARTICLE 3

GENERAL PROVISIONS

SECTION A. Lands to Which This Ordinance Applies

This ordinance shall apply to all areas of land within the jurisdiction of the City of Carrollton, Texas. Certain provisions of this ordinance apply only to special flood hazard areas within the jurisdiction of the City of Carrollton, while other provisions exempt certain other tracts. These limited areas of application are explained in the applicable provisions (See Article 8, Section A).

SECTION B. Basis for Establishing the Areas of Special Flood Hazard

The areas of special flood hazard identified by the Federal Emergency Management Agency in a scientific and engineering report entitled "The Flood Insurance Study for the City of Carrollton," dated July 16, 1980, with accompanying Flood Insurance Rate Maps and Flood Hazard Boundary-Floodway Maps and any revision thereto are hereby adopted by reference and declared to be a part of this ordinance. The Flood Insurance Study is on file in the office of the City Engineer.

SECTION C. Penalty Clause

Any person, firm or corporation violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and, upon conviction, shall be punished by a penalty or fine not to exceed the sum of One Thousand Dollars ($1,000.00) for each offense, and each and every day such offense is continued shall constitute a new and separate offense. In addition, the violator shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the City of Carrollton from taking such other lawful action as is necessary to prevent or remedy any violation. Article 4, Section C.3 states an additional penalty against persons proceeding with construction without obtaining the necessary permits from the City of Carrollton.

SECTION D. Repealing Clause

The "Official Drainage and Stormwater Control Ordinance" (Ordinance No. 1051) and the "Flood Hazard Prevention Ordinance" (Ordinance No. 905), heretofore adopted by the City Council of Carrollton, Texas, shall be and the same are hereby expressly repealed. All provisions of all ordinances conflicting with the provisions hereof are hereby repealed. All other ordinances and provisions of such ordinances not expressly in conflict with the provisions hereof shall remain in full force and effect.

SECTION E. Abrogation and Greater Restrictions

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and

other ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

SECTION F. Interpretation

In the interpretation and application of this ordinance, all provisions shall be:

(1) Considered as minimum requirements;
(2) Liberally construed in favor of the governing body; and,
(3) Deemed neither to limit nor repeal any other powers granted under State statutes.

SECTION G. Warning and Disclaimer of Liability

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the area of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of the City of Carrollton, any officer or employee thereof or the Federal Emergency Management Agency for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder.

SECTION H. Severability

If any section, paragraph, clause, phrase, or provision of this ordinance shall be adjudged invalid or held unconstitutional, the same shall not affect the validity of this ordinance as a whole or any part or provision thereof, other than the part so decided to be invalid or unconstitutional; nor shall such unconstitutionality or invalidity have any effect on any other ordinances or provisions of ordinances of the City of Carrollton.

ARTICLE 4

ADMINISTRATION

SECTION A. Duties of City Officials

1. Duties of the City Manager

The City Manager is hereby appointed to administer and implement the floodplain management portions of this ordinance, including Article 8 and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management. The duties of the City Manager or his designee shall include but not be limited to:

- Review and approval of all Development Permits to determine that the permit requirements of this ordinance have been met and that all necessary State and Federal permits have been obtained;

- Obtain and record the actual elevation in relation to mean sea level of the lowest habitable floor, including basement of all new or substantially improved structures, and whether or not the structure contains a basement;

- Maintain for public inspection all records pertaining to the provisions of this ordinance, including floodproofing certifications;

- Notify adjacent communities and the Texas Water Commission prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency;

- Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood-carrying capacity is not diminished;

- Make interpretations, where needed, as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions); and

- Obtain, review, and reasonably utilize any base flood elevation data available from a Federal, State or other source, in order to administer this ordinance when base flood elevation data has not been provided.

2. Duties of the City Engineer

The City Engineer is hereby appointed to administer and implement the storm drainage system portion of this ordinance, and to assist the City Manager with the technical aspects of the floodplain management portions of this ordinance.

SECTION B. Responsibilities of Owners

The owner or developer of property to be developed shall be responsible for all storm drainage flowing through or abutting such property. This responsibility also includes drainage directed to that property by ultimate development as well as the drainage naturally flowing through the property by reason of topography. It is the intent of this ordinance that provision be made for storm drainage at such time as any property affected is proposed for development, use, or modification.

Where the improvement or construction of a storm drainage facility is required along a property line common to two or more owners, the owner hereafter proposing development of the property shall be responsible for the required improvements at the time of development, including the dedication of all necessary rights-of-way or easements, to accommodate the improvements.

Where a property owner proposes development or use of only a portion of the property, provision for storm drainage shall only be required in that portion of the property proposed for immediate development, except as construction or improvements of a drainage facility outside that designated portion of the property is deemed essential to the development of that designated portion.

Owners shall provide for stormwater runoff and design drainage related facilities in accordance with and/or in a compatible manner with any City of Carrollton master drainage plan in effect at the time when plans for drainage facilities are submitted to the City for approval.

In addition, owners may be required to provide at their expense a preliminary drainage study for the total area to be ultimately developed. This study shall be submitted to the City Engineer as a part of the submitted data for consideration of preliminary plat or site plan approval for the portion of the property proposed for immediate development.

SECTION C. Permits

The City of Carrollton has several permits related to storm drainage. Some of these permits are listed below and explained in detail in the following paragraphs. Permits required by other ordinances may also be needed.

- Development Permit
- Floodplain Alteration Permit, formerly called the Fill Permit

1. Development Permit

All developers, owners, or builders shall obtain and submit for approval a Development Permit application for new construction, placement of fill, new manufactured home sites, alteration of a waterway, substantial improvements to existing structures or manufactured homes, or improvements to existing structures, or manufactured homes in the floodplain of the design flood that will result in increasing the overall outside dimensions of the structure or manufactured home. The application form can be obtained from the City Engineer's office. The City Engineer uses this form, along with duplicate copies of the accompanying engineering or

architectural plans, to identify those construction or renovation projects that would occur in a flood hazard area. As a minimum, the engineering or architectural plans shall show, to scale:

a. The nature, location, dimensions, and elevations in relation to mean sea level of the area in question.

b. The elevation in relation to mean sea level and the location of existing or proposed structures, fill, storage of materials, and/or drainage facilities.

c. The elevation in relation to mean sea level to which an existing non-residential structure shall be floodproofed, the location of the foregoing.

d. Any off-site facilities or conditions that may either affect on-site conditions or be affected by on-site conditions.

If an existing non-residential structure is proposed for floodproofing, then a certificate sealed by a registered professional engineer in the State of Texas shall be submitted stating that all of the floodproofing criteria listed in Article 8, Section B will be met. Construction or renovation projects cannot begin until the City issues the Development Permit.

2. Floodplain Alteration Permit

Developers, owners, or builders shall obtain a Floodplain Alteration Permit prior to filling in a floodplain; channelizing, impounding, realigning, deepening, or otherwise modifying a natural drainage way; making improvements, substantial or otherwise, to existing structures or manufactured homes in a floodplain if the improvements result in the increase of the overall outside dimensions of the structures or manufactured homes; or otherwise reclaiming floodplain land. A Floodplain Alteration Permit application form can be obtained from the City Engineer's office. This form along with duplicate copies of the engineering plans, reports, etc., shall be used by the City Engineer in reviewing the permit application. Article 4, Section D.2 identifies the information that must be submitted to the City Engineer. No floodplain alterations shall begin until a permit is issued by the City Engineer.

3. Proceeding Without the Applicable Permits

Any developer, owner, or builder who fails to obtain the applicable Development, and/or Floodplain Alteration permit before beginning the subject project is in violation of this ordinance. In addition to the penalties outlined in Article 3, Section C, no Building Permit, plat, site plan, or Certificate of Occupancy shall be issued for any construction, reconstruction, or development upon any land where such construction, reconstruction, or development is not in conformity with the requirements and intent of this ordinance. Any one who violates any of the terms and provisions of this ordinance shall be denied a Building Permit, etc., until the violation is corrected.

4. Deviations from Permit Terms

Permits may be revoked by the City Engineer if, upon periodic inspection, he determines that the work is not progressing in accordance with specifications of the approved plan and permit.

Field changes to storm sewer plans can be made only upon approval by the City Engineer. Record drawings shall be submitted to the City Engineer at the completion of the project.

SECTION D. Plan Requirements

Plan requirements for stormwater drainage systems and floodplain alterations are listed below. All engineering plans shall be sealed by a professional engineer who is registered in the State of Texas and experienced in civil engineering work. The total cost for such engineering plans and specifications shall be borne by the owner or the developer and shall be furnished to the City Engineer for review and approval.

1. Drainage Plans

As part of the platting process, drainage plans shall be prepared. These plans shall include drainage facilities for both off-site and on-site drainage so that the proper transition between the two can be maintained. Criteria for on-site development shall also apply to off-site improvements.

The construction of all improvements shall be in accordance with the current Standard Specifications for Public Works Construction by the North Central Texas Council of Governments as amended by the City of Carrollton, and Design Standards of the City of Carrollton.

The drainage plans shall include:

a. Drainage Area Map

1. Use 1"=200' scale for the development and up to 1"=2000' for creeks and off-site areas, provided that the scale is adequate for review, and show match lines between any two or more maps.
2. Show existing and proposed storm sewers and inlets.
3. Indicate sub-areas for each alley, street, off-site, etc.
4. Indicate contours on map for on- and off-site.
5. Indicate zoning on drainage area.
6. Show points of concentration.
7. Indicate runoff at all inlets, dead-end streets and alleys, or to adjacent additions or acreage.
8. Provide runoff calculations for all areas showing acreage, runoff coefficient, inlet time, and storm frequency.
9. Indicate all crests, sags, and street and alley intersections with flow arrows.
10. Show limits of each plan profile sheet.

b. Plan Profile Sheets

1. Show plan and profile of all storm sewers on separate sheets from paving plans.
2. Indicate concrete cushions where applicable.
3. Specify reinforced concrete Class III pipe unless otherwise noted. Use heavier pipe where crossing railroads, deep fill or heavy loads.
4. Indicate property lines along storm sewer and show easements with dimensions.
5. Show all existing utilities in plan and profile of storm sewers.
6. Indicate existing and proposed ground line and improvements on all street, alley, and storm sewer profiles.
7. Show hydraulic gradient with computations.
8. Show laterals on trunk profile with stations.
9. Number inlets according to the number designation given for the area or sub-area contributing runoff to the inlet.
10. Indicate size and type of inlet on plan view, lateral size and flow line, paving station and top of curb elevation.
11. Indicate quantity and direction of flows at all inlets, stubouts, pipes and intakes.
12. Show future streets and grades where applicable.
13. Show water surface at outfall of storm sewer, velocity, and typical section of receiving water body.
14. Where fill is proposed or trench cut in creeks or outfall ditches, specify compacted fill and compaction criteria.
15. Show size of pipe, length of each pipe size, stationing at one hundred foot intervals in the plan view.
16. Begin and end each sheet with even or fifty foot stationing.
17. Show diameter of pipes, physical grade, discharge, capacity of pipe, slope of hydraulic gradient, and velocity in the pipe in the profile view.
18. Show elevations of flow lines at 100-foot intervals on the profile.
19. Give bench mark information.
20. Show capacities, flows, velocities, etc., of the existing system into which the proposed system is being connected.
21. Show details of all connection boxes, headwalls on storm sewer, flumes or any other item not a standard detail.
22. Provide lateral profiles where utilities are crossed and show all utilities in profile.
23. Show headwalls and specify type for all storm sewers at outfall.
24. Show if curbing in alleys is needed to add extra capacity.
25. Provide flat grade alleys and streets to discharge into streets.
26. Show curve data for all storm sewers.
27. Tie storm sewer stationing with paving stations.
28. On all dead-end streets and alleys, show grades for drainage overflow path on the plan and profile sheets, and show erosion controls.
29. Specify concrete strength for all structures.

30. Provide sections for road, railroad and other ditches with profiles and hydraulic computations. Show design water surface on profile.

c. Bridge Plans

1. Show the elevation of the lowest member of the bridge and 100-year water surface elevation.
2. Indicate borings on plans.
3. Provide soils report.
4. Show bridge sections upstream and downstream.
5. Provide hydraulic calculations on all sections.
6. Provide structural details and calculations with dead load deflection diagram.
7. Provide vertical and horizontal alignment.

d. Creek Alteration and Channel Plans

1. Show stationing in plan and profile.
2. Indicate flow line, banks, design water surface, and freeboard. Show hydraulic computations.
3. Indicate nature of banks such as rock, earth, etc.
4. Provide cross-sections with ties to property lines and easements.
5. Show side slopes of creek, channels, etc.
6. Specify compacted fill where fill is proposed.
7. Indicate any adjacent alley or street elevations on creek profile.
8. Show any temporary or permanent erosion controls.
9. Indicate existing and proposed velocities.
10. Show access and/or maintenance easements.
11. As necessary, show ground elevations parallel to the top of bank to show how runoff is prevented from overland flow into the creek or channel.

e. Detention and Retention Facilities

1. Show plan view of detention/retention area and outlet structure.
2. Delineate limits of conservation pool, sediment storage area, flood storage pool, and/or freeboard.
3. Indicate size, dimension, total capacity, design discharge and velocity of the outlet structure.
4. Show any erosion control features at the discharge point of the outlet structure.
5. Specify side slopes of basin and outlet structure.
6. Show existing or proposed structures or other facilities downstream of the outlet structure and emergency spillway, and provide information sufficient to show that the downstream facilities will not be inundated or otherwise affected by the discharge from the basin.
7. Indicate locations and quantities of all inflows to the basin.
8. State the design time to empty the basin.

f. Levees

1. Show location, extent, nature, dimensions, etc., of levee embankments and associated interior and exterior drainage facilities.
2. Provide engineering analysis addressing potential erosion of the levee embankments during flood events.
3. Provide engineering analysis of levee embankment stability and seepage through the levee during flood events.
4. Demonstrate that future settlement of the levee embankments will not result in freeboard dropping below the minimum requirements.
5. Analyze interior drainage concerns. Identify sources of interior flooding, and extent and depth of such flooding, assuming a joint probability of interior and exterior flooding. Consider capacity of pumps and other drainage devices for evacuating interior waters.
6. Write an operations manual which discusses the flood warning system to trigger closures; closure operations, procedures, and personnel; operation plans for interior drainage facilities; at least an annual inspection program; and maintenance plans, procedures, and frequency.
7. Provide all other information required in Article 7, Section C, and any other information requested or required by the City Engineer and/or the Federal Emergency Management Agency.

2. Floodplain Alteration Plans

The materials listed below shall be submitted as part of the application for a Floodplain Alteration Permit. It is recommended that applicants coordinate the application materials listed below with those needed for other City of Carrollton permits and with the data requirements of the Federal Emergency Management Agency. Such coordination will facilitate staff review and drawings could be combined so as to save the applicant from multiple drawings.

a. An engineering report consisting of at least:

1. Project description.

2. Description of the hydrologic and/or hydraulic analyses used, including method used to determine historic rainfall and stream data, soils reports used to determine erosive velocity values, and discharges and water surface elevations for both the design and base floods.

3. Vicinity map.

4. Evaluation of the "natural floodway" and floodplain limits for the design flood. The "natural floodway" differs from the FEMA "regulatory floodway." The "natural floodway" is established to allow the City of Carrollton to effectively manage floodplain areas. FEMA requirements for the "regulatory floodway" must also be met by applicants.

5. If hydraulic analyses are being submitted, then a table of values for existing and proposed water surface elevations and velocities must be included.

6. Documentation that the principle of equal conveyance has been achieved.

7. Copies of computer input and output data for existing and proposed conditions for both the base flood and design flood discharges.

b. Engineering drawings consisting of at least:

1. Water surface profile, including channel flow line, existing and proposed water surface elevations, recorded high water marks, and location and number designation of cross-sections.

2. Plan view on 24" x 36" paper, including

a. Scale and north arrow.
b. Title block.
c. Boundary lines and nearest street intersections.
d. Existing and proposed contours.
e. Existing and proposed floodplain limits, and limits of the "natural floodway" and the "regulatory floodway."
f. Area to be removed from the floodplain or area to be altered.
g. Top and toe of fill and/or side slopes and the numerical slope of the fill and/or side slopes labeled.
h. Location of all other associated improvements or alterations to the creek and/or floodplain, such as check dams, swales, channel modifications, etc.
i. Location of cross-sections.
j. Location of all existing and proposed easements and dedications.
k. Site vicinity map.

3. Plots of cross-sections, including:

a. Scale.
b. Title block.
c. Existing and proposed ground elevations.
d. Cut and/or fill areas labeled.
e. Limits of and numerical values for existing and proposed "n" values.
f. Equal conveyance removed from both sides.

SECTION E. Maintenance Bonds

The Contractor shall guarantee the work which he does against defective workmanship and materials for a period of two (2) calendar years from the date of final acceptance by the City.

Where defective workmanship and/or materials are discovered requiring repairs

to be made under this guarantee, all such repair work shall be done by the Contractor at his own expense within ten (10) calendar days after written notice of such defect has been given to him by the City. Should the Contractor fail to make repair or correct such defective workmanship and/or materials within ten (10) calendar days after being notified, the City may make the necessary repairs and charge the Contractor with the actual cost of all labor and materials required.

The Contractor shall provide a maintenance bond in the amount of 10% of the contract price, for a period of two (2) years after the date of acceptance of the work to cover his guarantee as set forth above.

SECTION F. Appeals and Variance Procedure

1. Appeal

   Any person aggrieved by a decision of the City Engineer or City Manager may appeal from any order, requirement, decision or determination of the City Engineer to the Planning and Zoning Commission. An appeal from a determination of the Planning and Zoning Commission may be made directly to the Court of Appeal.

2. Variances

   The Planning and Zoning Commission as established by the City of Carrollton shall hear and decide requests for variances from the requirements of this ordinance.

   Variances concerning Development Permits may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this section.

   Variances shall not be issued within any designated natural or regulatory floodway if any increase in flood elevations during the design flood discharge would result.

   Variances shall be issued only upon a determination that the variance is the minimum necessary to afford relief considering the flood hazard, drainage problems, and soil loss.

   Variance shall be issued only upon meeting all three of the following criteria:

   1. A showing of good and sufficient cause.

   2. A determination that failure to grant the variance would result in exceptional hardship to the applicant; and,

   3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

Any applicant to whom a variance for building or renovating in a floodplain is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the design flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

In considering variance requests, the Planning and Zoning Commission shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and the:

- Danger that materials may be swept onto other lands to the injury of others;

- Danger to life and property due to drainage, flooding, or erosion damage;

- Susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

- Importance of the services provided by the proposed facility to the community;

- Necessity to the facility of a waterfront location, where applicable;

- Availability of alternative locations for the proposed use which are not subject to flooding damage.

- Compatibility of the proposed use with existing and anticipated development.

- Relationship of the proposed use to the comprehensive plan and floodplain management program of that area.

- Safety of access to the property in times of flood for ordinary and emergency vehicles;

- Expected heights, velocity, duration, rate of rise, and the effects of wave action, if applicable, expected at the site; and,

- Costs of providing governmental services during and after storm events, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and streets and bridges.

Upon consideration of the factors listed above and the purposes of this ordinance, the Planning and Zoning Commission may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.

The City Manager shall maintain the records of all appeal actions, including technical information, and report any variances of the floodplain management portions of this ordinance to the Federal Emergency Management Agency upon request.

ARTICLE 5

RUNOFF CALCULATIONS

The selection of which method to use for calculating runoff depends upon the size of drainage area contributing runoff at a most downstream point of a project. The "Rational Method" is acceptable for situations in which the drainage area is less than 160 acres. A unit hydrograph method is required for situations with larger drainage areas.

No matter which method is used to calculate runoff, a developer or builder of property greater than one acre in size shall develop the property so that the rate of runoff created by the development as it leaves the property does not exceed the rate of runoff that would have been created if the property had developed as single-family residential property. Article 7, Section D discusses design criteria for detention facilities.

Runoff computations shall be based upon fully developed watershed conditions in accordance with the land use projections in the latest comprehensive land use plan for the City of Carrollton. The design engineer shall size drainage facilities by disregarding the detention effects of upstream property and calculating the runoff as if the off-site property was developed without any detention. If an approved regional detention/retention facility is in operation, the design engineer may size downstream drainage facilities based on consideration of the detention effects of the regional facility.

SECTION A. Procedure for Drainage Areas Less Than 160 Acres.

1. Rational Method

Computation of Storm Water Runoff for drainage areas less than 160 acres shall be by the "Rational Method," which is based on the principle that the maximum rate of runoff from a given drainage area for an assumed rainfall intensity occurs when all parts of the area are contributing to the flow at the point of discharge. The formula for calculation of runoff by the "Rational Method" is:

(Equation 1)

$$Q = CIA$$

Where: Q = the maximum rate of discharge, expressed in cubic feet per second.

C = a runoff coefficient which varies with the topography, soil, land use and moisture content of the soil at the time the runoff producing rainfall occurs. This runoff coefficient shall be based on the ultimate use of the land as recommended by the Master Plan for the City of Carrollton and shall be selected from Table 1 herein on the basis of the use shown on land use and zoning map of the Comprehensive Zoning Ordinance for the City of Carrollton. If an area has had a change of Zoning to give the area land use for which the "C" in Table 1 is higher

than use shown on land use and zoning maps, the higher "C" factor shall be used.

A = The drainage area, expressed in acres, contributing to the runoff at the point in question. Calculation of the drainage area shall be made from an accurate topographic map, a copy of which shall be submitted with the engineering plans for approval.

I = Rainfall intensity in inches per hour for the time period that it takes for flow from the farthest point of the drainage area to reach the point of design. The rainfall intensity is found by referring to the applicable curves of Figure 1. Time of Concentration or Duration of Rainfall for use in Figure 1 shall be calculated by velocity data shown in Table 2.

Time of concentration is the longest time, without interruption of flow by detention devices, that a drop of water takes to flow from the farthest point of the drainage area to the point of concentration (i.e., the point of design). The time of concentration is composed of the "inlet time" and the flow time in a conduit or channel to the point of design. Equation 2 shows how to calculate the time of concentration.

(Equation 2)

$$T_c = \text{Inlet Time} + \frac{L}{V \times 60 \text{ sec/min}}$$

Where: T_c = Time of concentration in minutes.

Inlet time = 10 minutes for property zoned multiple family, loca. business, central business, commercial, or industrial

or

15 minutes for property zoned for parks, cemeteries, agricultural, schools, and single family residential.

L = Length of conduit or channel in feet.

V = Velocity of flow in conduit or channel in feet per second.

When designing inlets and laterals, the time of concentration is simply equal to the inlet time. In certain circumstances, the design engineer may choose not to use the above specified inlet times and to actually calculate the inlet time by computing the flow time overland and along the gutter to the first inlet. The Manning equation, along with the velocity information in Table 2 (or other acceptable procedures such as the SCS method), shall be used to determine flow time to the inlet. If calculating inlet time, in no case shall a longer inlet time be used than 10 minutes for multiple family, commercial, industrial and business areas and 15 minutes for parks, cemeteries, agricultural, schools, and single-family areas.

When sizing storm sewers and channels, the time of concentration shall be calculated by adding inlet time to flow time in the conduit and/or channel.

SECTION B. Procedure for Drainage Areas Greater than 160 Acres.

For drainage areas in excess of 160 acres where the use of the "Rational Method" does not provide reliable results, the use of a unit hydrograph method shall be made. The use of a unit hydrograph calculation will be based upon standard and accepted Engineering Principles normally used in the Profession subject to the approval of the City Engineer. Acceptable methods include the Soil Conservation Service (SCS) Technical Release Number 55 for drainage areas from 160 acres to 2,000 acres, and SCS's TR20 or the Corps of Engineers HEC-1 models for drainage areas 160 acres or more.

The unit hydrograph method shall be based upon fully developed watershed conditions assuming no effects from the small on-site detention facilities for maintaining the rate of runoff as if the property was developed as single family residential uses. The detention effects of large regional detention facilities can be taken into account in unit hydrograph methods.

Circumstances that may require the use of a unit hydrograph method include sizing open channels, reclaiming floodplains, creating lakes, or building other types of drainage-related facilities on major drainage courses. Design engineers of these types of facilities should be aware that the requirement of designing for fully developed watershed conditions will mean that they will have to calculate these fully developed flows instead of using the flows calculated in the Federal Emergency Management Agency's (FEMA) flood insurance studies for Carrollton. FEMA's flows cannot be used because the flows are based upon existing watershed conditions (For more information, see Article 7 on the sizing of channels and other major drainage facilities and Article 8 for floodplain alteration procedures). Use of the rational method is allowed for design of storm sewers within the project area.

ARTICLE 6

DESIGN OF LOCAL DRAINAGE SYSTEMS

SECTION A. Design Storm Frequencies

The calculations of runoff quantities that must be accommodated in drainage facilities require the selection of the design storm frequency. The design storm frequencies for various drainage structures are given below.

DRAINAGE FACILITY	DESIGN RECURRENCE INTERVAL
Closed Storm Sewer Systems	10-year with 100-year positive overflow for Inlets on Grade in streets such that the depth of flow in the street does not exceed one inch above the top of curb.
Closed Storm Sewer Systems and Inlets at Street Low Point or Sag	100-year
Culverts and Bridges	100-year
Concrete-lined Channels	100-year
Earthen Channels	100-year
Levees	Standard Project Flood
Dams Above Natural Ground/ Spillways	Spillway design flood varies with the class of structure (see Article 7, Section B).

The approved drainage system shall provide for positive overflow at all low points. The term "positive overflow" means that when the inlets do not function properly or when the design capacity of the conduit is exceeded, the excess flow can be conveyed overland along a paved course. Normally, this would mean along a street or alley, but it can require the dedications of special drainage easements on private property.

SECTION B. Street and Alley Capacities

1. Streets

Assuming parkway slopes to be 1/4 inch per foot behind the curbs, the depth of flow in the streets shall not exceed one inch above the top of curb. Figure 2 shows the capacity of streets with a straight cross slope that varies from 1/8 inch per foot to 1/2 inch per foot, which are the minimum and maximum allowable street cross slopes. Figures 3 and 4 show the capacity of streets with parabolic crowns. These curves do not

include the additional street or parkway capacity in the area one inch above the top of curb.

2. Alleys

The flows created by the 100-year storm shall be contained within the capacity of all paved alleys. Figure 5 shows the capacity of various alley sections.

Alley capacities shall be checked at all alley turns and "T" intersections to determine if curbing is needed or grades should be flattened.

Curbing shall be required for at least 10 feet on either side of an inlet in an alley and on the other side of the alley so that the top of the inlet is even with the high edge of the alley pavement.

3. Finished Floor Elevations in Relation to Alleys and Streets

The first floor elevations of all residential and other structures shall be set at a minimum elevation of the lower of either 1.5 feet above the alley invert or one foot above the top of the street curb elevation, and with positive drainage provided away from the structure.

SECTION C. Placement of Inlets

Storm sewer inlets shall be built along paved streets at such intervals that the depth of flow, based upon the 100-year storm, does not exceed one inch above the top of curb. Inlets shall be located as necessary to remove the flow based on a 10-year storm. If in the opinion of the design engineer the flow in the gutters would be excessive using the above design criteria, the storm sewers or inlet locations could be altered to relieve adverse conditions.

Inlets shall be placed upstream from an intersection whenever possible. At any intersection, only one street shall be crossed with surface drainage and this street shall be the lower classified street. When an alley intersects a street, inlets shall be placed in the alley whenever flow down that alley would cause the capacity of the intersecting street to be exceeded.

SECTION D. Inlet Capacities and Sizes

Figure 6 shows the various types of inlets allowed for use along various kinds of streets. Other types of inlets may be used upon the approval of those inlets by the City Engineer. The minimum inlet size shall be eight feet. Figures 7 through 21 show how to determine the capacity of inlets. No more than 20 feet of inlets shall be placed along one gutter.

Minimum sizes of laterals shall be 18-inches for use with 8-foot inlets, and 21-inch laterals with 10-foot, 14-foot, and drop inlets. Where laterals tie into trunk lines, place the laterals on a 60° angle with the trunk line and connect them so that the longitudinal centers intersect.

SECTION E. Pipe Design Standards

1. The Manning Equation

Storm sewer conduit shall be sized to flow full. Manning's Equation shall be used to determine the conduit size. Manning's equation is expressed as:

(Equation 3)

$$Q = \frac{1.486}{n} (A) (R)^{2/3} (S)^{1/2} \text{ or } V = \frac{1.486}{n} (R)^{2/3} (S)^{1/2}$$

Where: Q = Flow in cubic feet per second.

V = Velocity of flow in conduit in feet per second.

A = Cross-sectional area of the conduit in square feet.

R = Hydraulic radius of the conduit, which is the area of flow divided by the wetted perimeter (R = A/P).

S = Slope of the hydraulic gradient.

n = Roughness coefficient of the conduit.

P = Wetted perimeter.

Figure 22 is a graphical solution of Manning's Equation, which allows sizing of concrete pipe, assuming an "n" value of 0.013.

2. Minimum and Maximum Velocities in Pipes

The minimum velocities in conduit shall be 2.5 feet per second. The minimum slopes for various pipe sizes that will maintain this minimum velocity are given in Table 3. The recommended maximum velocities of flow in the conduit and channels are given in Table 4.

The maximum discharge velocities in the pipe shall also not exceed the permitted velocity of the receiving channel or conduit at the outfall to prevent erosive conditions, as shown in Table 4. The maximum outfall velocity of a conduit in partial flow shall be computed for partial depth and shall not exceed the maximum permissible velocity of the receiving channel unless controlled by an appropriate energy dissipator.

3. Roughness Coefficients for Conduits

In general, storm water shall be carried in concrete pipe conduit, but other types of conduit can be used to carry storm water. However, prior permission to use metal conduit must be obtained from the City Engineer. Table 5 shows recommended roughness coefficients for various types of conduits. If, in the opinion of the design engineer, other values for

the roughness coefficient should be used, the different value can be used with the permission of the City Engineer. Appropriate notes of the approved roughness coefficient shall then be shown on the engineering plans.

4. Hydraulic Gradient of Conduits

Conduits must be sized and slopes must be set such that runoff flows smoothly down the drainage system. To insure this smooth passage, the hydraulic gradient must be at the proper elevations.

The proper starting elevation of the hydraulic gradient shall be set according to the applicable criteria listed below:

1. When a proposed conduit is to connect to an existing storm sewer, the hydraulic gradient of the proposed storm sewer should start at the elevation of the hydraulic gradient of the existing storm sewer. This criterion will be used for existing systems whether or not they are adequately designed.

2. When a proposed conduit enters an open channel, creek, or flood control sumps, the hydraulic gradient of the proposed conduit should start at the 10-year water surface elevation of the channel or creek when the ratio of the drainage area of the receiving creek (at the development) to the development area is 15 or greater. For ratios of less than 15, the 100-year water surface will be used on the receiving creek.

Not only is it important to use the proper starting elevation for the hydraulic gradient, but proper hydraulic gradient elevations must be maintained for the length of the conduit. The inside top of the conduit should be at or below the hydraulic gradient. However, effort should be made to keep the top of the pipe as close to the hydraulic gradient as possible so that deep excavations to lay pipe are not required.

When the conduit is flowing partially full, the hydraulic gradient shall be shown at the inside crown of the conduit.

The hydraulic gradient shall be kept two feet below the top of curb. If this cannot be obtained, the hydraulic gradient shall be at least 1.5 $V_1^2/2g$ feet below the gutter line, where V_1 is the velocity in the lateral.

5. Minor Head Losses

When establishing the hydraulic gradient of a storm sewer, minor head losses at points of turbulence shall be calculated and included in the computation of the hydraulic gradient.

Entrance Losses

Entrance losses to a closed storm sewer system from an open channel or lake shall be calculated using Equation 4.

(Equation 4)

$$H_L = K_e \frac{V_1^2}{2g}$$

Where: H_L = Head loss in feet.

V_1 = Velocity in the downstream pipe in feet per second.

K_e = Head loss coefficient (see Table 6).

The resulting hydraulic gradeline shall be compared to inlet control conditions for the storm sewer as described in Section F. The higher of the two values will be used as the controlling upstream hydraulic grade line.

Expansion Losses

For pipe size expansions, head loss shall be calculated using the following equations:

(Equation 5)

$$H_L = \left(1 - \left(\frac{D_1}{D_2}\right)^2 \right)^2 \frac{V_1^2}{2g}$$

Where: H_L = Head loss in feet.

V_1 = Upstream velocity in feet per second.

D_1 = Upstream pipe diameter.

D_2 = Downstream pipe diameter.

Manhole and Bend Losses

Head losses associated with manholes for pipe direction changes and bends in pipes of equal diameter shall be calculated using:

(Equation 6)

$$H_L = K_b \frac{V_2^2}{2g}$$

Where: H_L = Head loss in feet.

V_2 = Velocity in the downstream pipe in feet per second.

K_b = Head loss coefficient from Table 7.

Junction Losses

Head losses associated with wye connections or manholes with branch laterals entering the main line can be calculated by using Equation 7.

(Equation 7)

$$H_L = \frac{V_2^2}{2g} - K_j \frac{V_1^2}{2g}$$

Where: H_L = Head loss in feet.

V_1 = Velocity in the upstream pipe in feet per second.

V_2 = Velocity in the downstream pipe in feet per second.

K_j = Head loss coefficient from Table 7.

6. Outfalls to Open Channels and Lakes

The flow lines of storm sewer conduits that discharge into open channels shall match the flow line of the channel. One exception to this requirement of matching the flow line is when a storm sewer discharges into a concrete-lined channel, or when the outfall is submerged below the normal water surface of a lake. In the case of a pipe discharging to a lined channel, the outlet must be below the top of the channel lining. The second exception pertains to storm sewer discharge that must cross wide floodplain areas. Under this condition, the storm sewer could discharge into a lined ditch which would convey runoff to the flow line of the channel without creating an erosive condition. Permissible velocities within the ditch will be based on the type of lining used and the velocities provided in Table 4. Flumes to bring the discharge down to the flow line of earthen creeks shall not be permitted. Drop structures shall be allowed upon written approval of the City Engineer.

The velocity at the discharge end of the conduit shall be computed based on partial flow depth and shall be sufficiently low so as to not cause downstream erosion problems. Table 4 shows the maximum velocities allowed in various types of channels, which are then the maximum discharge velocities at storm sewer outfalls.

In some circumstances, the configuration of the storm sewer in relation to the flow line of the creek may cause excessive velocities to be reached unless provisions are made to slow the velocity. One recommended method of slowing the velocity is to have the last length of pipe (a length of at least ten times the diameter) be on a slope that will reduce the partial flow outlet velocity to the values shown in Table 4 for the receiving stream. Stilling basins shall also be allowed to reduce discharge velocities.

The discharge pipe shall also intersect minor creeks at an angle not to exceed 60 degrees. Minor creeks are defined as those creeks, channels, or drainageways where the distance from the pipe outlet to the opposite

creek bank at the bottom of the channel is twenty (20) feet or less. Pipes may intersect major creeks (greater than 20 feet to opposite bank) at a 90-degree angle. The City Engineer may require that pipes intersect major creeks at an angle not to exceed 60 degrees, when a 90-degree angle would result in an erosive condition.

Figure 23 shows how a storm sewer should be configured to discharge into a creek.

7. Easements for Enclosed Storm Sewers

All storm sewer conduits to be dedicated to the City of Carrollton shall be located in an easement dedicated to the City of Carrollton at the time of final platting of the property. The easement shall be at least 15 feet wide or wider if the City Engineer requires it for maintenance or other purposes.

SECTION F. Culvert Design Standards

Culverts shall be designed in accordance with the Texas Highway Department Hydraulic Manual, Chapter 4 - Culverts. The calculation of hydraulic gradelines will consider both inlet and outlet control for the culvert. Starting water surface elevations for gradeline calculation will be the same as required for storm sewers; see Section E.

ARTICLE 7

SPECIAL DRAINAGE FACILITIES

SECTION A. Channels

1. Channel Design

Open channels may be used instead of enclosed systems when the drainage area of contributing flow to the channel is greater than 160 acres. Open channels shall not be permitted when the drainage area is less than 160 acres unless approved by the City Engineer. Table 4 shows the maximum velocities allowed for certain types of channels. Roughness coefficients for the design of open channels are provided in Table 8. The following criteria shall be used in determining the nature of the open channel.

- For channels with a contributing drainage area of 160 to 320 acres:

  a. If the natural channel is to be replaced by an improved channel, the flow from the 100-year design flood must be contained within the improved channel while allowing for one foot of freeboard.

  b. Improved channels shall be concrete-lined if the design velocity is greater than eight feet per second. Other types of linings, like gabions, may be used upon approval of the City Engineer. Improved channels with design velocities of less than the permissible velocities shown in Table 11 may be earthen if the channels are revegetated properly.

  c. For lined channels, all of the channel bottom and at least the first three feet (vertical height) of the side slopes up from the channel bottom shall be lined.

  d. Earthen sides above the concrete lining or totally earthen channels shall be on at least a four horizontal to one vertical slopes and shall have approved ground cover to prevent erosion.

  e. The developer or owner shall use low maintenance vegetation for vegetative cover, as approved by the City Engineer prior to planting. The selection of materials shall comply with either the current ground cover listing for North Central Texas furnished through the Texas Agricultural Extension Service or Table 9 in this ordinance.

- For channels with a contributing drainage area of greater than 320 acres:

  a. The channel shall be left in its natural, unimproved state and all land within the 100-year floodplain of the design flood, and any required maintenance easement (see paragraph 3 below) shall be dedicated to the City of Carrollton as a permanent drainage right-of-way and open space corridor.

  b. Alternatively, if the property owner so desires, the City of Carrollton may allow an improved channel capable of carrying the 100-year design flood while maintaining a freeboard of one foot. An

improved channel shall only be allowed if it meets the floodplain alteration regulations presented in Article 8.

c. Unless shown to be feasible in a soils report sealed by a registered professional engineer in the State of Texas, and approved by the City Engineer, improved channels shall have minimum side slopes of:

- 4 feet horizontal to 1 foot vertical for earthen grassed side slopes.

- 1.5 feet horizontal to 1 foot vertical for side slopes in rock.

2. Starting Water Surface Condition

When performing hydraulic analyses for channel or drainageway design, the starting water surface shall be based on the following criteria.

a. When the ratio of the drainage area of the receiving creek (at the confluence location) to the drainage area of the channel or drainageway being designed is 15 or greater, the 10-year water surface of the receiving creek shall be used as the starting water surface for hydraulic design calculations. For creeks where the 10-year water surface is not available, the slope-area method will be used for starting design calculations.

b. When the ratio of the drainage area is less than 15, the 100-year elevation on the receiving creek shall be used as the starting water surface for design calculations.

3. Easements Required for Open Channels

Drainage and/or floodway easements for all open channels, creeks and flumes shall be dedicated to the City of Carrollton. Easements shall encompass all areas having a ground elevation below the higher of one foot above the water surface elevation associated with the design flood or the top of the high bank or channel edge. In all cases, the easement shall also include at least a 15-foot wide maintenance strip along both sides of the channel or, if the City Engineer so allows, at least a 20-foot wide maintenance strip along one side of the channel. Streets, alleys, bike paths, etc., alongside the channel can serve as all or part of the maintenance easement.

Drainage easements for flumes shall be located with sufficient width to permit future maintenance accessibility, and in no case shall be less than 15 feet wide.

SECTION B. Lakes and Dams

In the event that a property owner or developer desires to modify an existing pond or lake or desires to impound storm water by filling or constructing an above-ground dam, thereby creating a lake, pond, lagoon or basin as part of the planned development of that property, the criteria listed below shall be met before City approval of the impoundment can be given. Ponds or lakes created by excavation of a channel area without erecting a dam above natural

ground elevation or instream, low water checkdams are also subject to the criteria listed below, with the exception of spillway capacity requirements. The City Engineer has the final authority to determine the design criteria for a proposed dam, checkdam or excavated lake. The requirements of the State of Texas must also be met for the construction of dams, lakes, and other impoundments.

The design criteria for a dam is dependent on the size and hazard classification of the dam. The size and hazard classification will be based on the Recommended Guidelines for Safety Inspection of Dams (ER 1110-2-106, September 26, 1979) prepared by the U.S. Army Corps of Engineers, and will be determined by the City Engineer based on information furnished by the owner. The following criteria will be used to classify a dam:

1. Size

The classification for size is based on the height of the dam and storage capacity, whichever gives the larger size category. Height is defined as the distance between the top of the dam (minus the freeboard) and the existing streambed at the downstream toe. Storage is defined as the maximum water volume impounded at the top of the dam (minus the freeboard).

Size Classification

Category	Impoundment Storage (acre-feet)	Height (feet)
Minor	<100	<10
Small	≥ 100 and < 1,000	≥ 10 and < 40
Intermediate	≥ 1,000 and < 50,000	≥ 40 and < 100
Large	≥ 50,000	≥ 100

2. Hazard Potential

The hazard potential for a dam is based on the potential for loss of human life and property damage downstream from a dam in the event of failure. The following categories will be used:

Hazard Potential Classification

Category	Loss of Life (Extent of Development)	Economic Loss (Extent of Development)
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agricultural, industry, or structures)
High	More than few	Excessive (Extensive community, industry, or agriculture)

3. Spillway Design Flood

The classification of a dam based on the above criteria will be used to determine the Spillway Design Flood (SDF). The total capacity of a dam structure, including principal and emergency spillways, shall be adequate to pass the SDF without exceeding the top dam elevation. The SDFs for various dam classifications are as follows:

Spillway Design Flood

Hazard	Size	SDF
Low	Minor	100-year
	Small	100-year
	Intermediate	500-year
	Large	SPF
Significant	Minor	100-year
	Small	500-year
	Intermediate	SPF
	Large	PMF
High	Minor	500-year
	Small	SPF
	Intermediate	PMF
	Large	PMF

In all cases, the minimum principal spillway design capacity is the 100-year design flood. In certain cases, a dam breach analysis may be required to determine the proper classification of the structure. For all structures requiring a spillway design flood equal to the PMF, a dam breach analysis is required to determine the downstream consequences of a failure. All dams shall be constructed with a freeboard of two feet above the SDF elevation.

4. Additional Design Requirements

a. An engineering plan for such construction, accompanied by complete drainage design information and sealed by a registered professional engineer, shall have been approved by the City of Carrollton;

b. The spillway and any emergency overflow areas shall be located so that flood waters will not inundate any buildings, roadways, or other structures.

c. All Federal, State and County laws pertaining to impoundment of surface water shall have been complied with, including the design construction and safety of the impounding structure. Copies of any Federal, State, and County permits issued for the proposed impoundments shall be submitted to the City Engineer.

d. Any existing structure, which is included in the project area shall be improved to comply with the applicable Federal, State, County and City safety requirements for structures.

e. Before removing, enlarging, or altering any existing lake, the Owner will furnish a study of the effects of the alteration upon flooding conditions both upstream and downstream. The study shall be prepared by a professional Engineer and submitted to the City for approval prior to making the proposed alteration. Compensatory storage shall be provided in some manner such that equal or comparable flood retention capacity is maintained.

f. Any improvements to existing dams or lakes or construction of new impoundments shall be made at the expense of the developer, prior to acceptance of the adjacent street, utilities and drainage improvements as provided for under the Subdivision Ordinance.

5. Maintenance and Liability Criteria

a. The owner or developer shall have agreed to retain private ownership of the lake, pond, or lagoon or basin constructed and to assume full responsibility for the protection of the general public from any health or safety hazards related to the lake, pond, or lagoon constructed.

b. The owner or developer shall have agreed to assume full responsibility for the maintenance of the lake, pond, or lagoon or basin constructed. The owner or developer shall keep the Director of Public Works advised of the current responsible agent for this maintenance.

SECTION C. Levees

In the event that developers or owners wish to build levees to protect an area from flooding, applicable FEMA and State of Texas guidelines and the following criteria apply:

1. Levees shall be designed to have four feet of freeboard above the Standard Project Flood for the fully developed watershed flows.

2. Levees shall be designed according to the Corps of Engineers design criteria whether or not they are federally authorized levees.

3. Levee systems shall be designed with interior drainage systems to prevent flooding from local runoff contained within the system for the 100-year design flood.

4. Levee systems shall have written operation procedures that address gate closure conditions and emergency warning plan. A copy of these procedures shall be furnished to the City Engineer and the Director of Public Works.

5. Automated gate closure systems shall have power from two independent sources and shall be capable of being operated manually.

6. Ring levees protecting individual structures proposed for construction after the enactment date of this ordinance shall not be permitted.

7. All new levee systems shall have permanent positive closures to the required design elevation. Temporary closures involving sandbagging or other procedures requiring manual operations shall not be permitted.

8. Provisions shall be made for ensuring the permanent maintenance of levees either by a flood control district or similar governmental organization or by the existing property owner and all future owners, heirs, or assigns.

9. Additional plan requirements include water surface profiles for the design flood and SPF; top of levee profile, definition of interior drainage facilities, including pump station and ponding areas; location of gravity outlets, gatewells and closure structures; and elevation-duration data on the receiving system.

SECTION D. Detention and Retention Facilities

As previously described in Article 5 of this ordinance, runoff rates shall be limited to the rates that would be produced from single family residential areas. Detention/retention facilities to reduce runoff rates will be provided within approved levee districts as deemed necessary by the City Engineer. Detention/retention facilities shall be designed for the 100-year design flood according to the following criteria.

1. The minimum amount of storage volume of the detention basin shall be that volume required to reduce runoff rate to a single-family rate. Dedicated detention/retention basins shall also include an additional one foot of freeboard and two feet of sediment storage. The volume of runoff storage for drainage areas greater than 160 acres shall be computed using unit hydrograph procedures. Acceptable unit hydrograph procedures include the Soil Conservation Service Dimensionless Unit Hydrograph and Snyder's Unit Hydrograph. Manual methods or use of the computer programs TR20, HEC-1, and NUDALLAS are allowed for runoff hydrograph computation and flood routings.

   For drainage areas less than 160 acres, the above methods are recommended; however, an approximate routing method based on the rational formula is allowable, as outlined in Figure 24.

2. Detention areas in parking lots shall not be:

   - In required parking spaces but in extra spaces.

   - Behind speed bumps unless the speed bumps are made with reinforced concrete.

   - Deeper than six inches unless warning signs are posted.

3. Drainage easements shall be provided for all regional detention/retention facilities and for other detention/retention facilities where two or more owners are involved.

4. Detention/retention facilities shall be designed to empty in less than 24 hours, unless it is also serving as an erosion control facility.

5. Detention/retention facilities shall not be counted as an erosion control technique unless (1) the basins are designed to empty a minimum of 24 hours from the storm event and (2) adequate sediment storage areas in the basin have been set aside and are maintained. Other municipal ordinances

   give additional details as to how to design multi-purpose detention/ retention facilities.

6. Detention/retention facilities shall be maintained by the owner unless the facilities are dedicated to the City of Carrollton.

SECTION E. Flumes

The use of flumes is not recommended for widespread use. Flumes shall not be permitted when the purpose of a permanent flume is to carry runoff down the sides of earthen channels. A flume may be used to direct overflow runoff along property lines until the runoff can be intercepted by streets or conduit flows. Flumes crossing sidewalks shall be covered or bridged such as to minimize danger to pedestrians.

SECTION F. Connections from Buildings to Storm Sewers

Drainage from residential areas, such as roof tops, should be allowed to flow overland before joining the storm sewer system.

Seepage into basements that is pumped to ground level, seepage from springs, and runoff from roof drains on non-residential buildings that would flow onto or across driveways, sidewalks, or other areas commonly crossed by pedestrians can create hazards or nuisances to pedestrians. Thus, if hazards or nuisances would be created, the basement and rooftop drains shall be tied directly to the nearest storm sewer, provided that pumped lines from basements have back-flow preventers.

ARTICLE 8

FLOODPLAIN GUIDELINES

SECTION A. Lands to Which This Article Applies

A person shall comply with the requirements of this article for floodplain areas before making substantial improvements to or increasing the outside dimensions of an existing structure or developing land within the design flood line of a creek or stream having a contributing drainage area of 160 acres or more, whether or not the land has been formally designated as a floodplain. Floodplain areas shall also include all areas inundated by the design flood and shown as Areas of Special Flood Hazard on the Flood Insurance Study's maps.

SECTION B. General Floodplain Regulations

1. Permitted Uses of Floodplain Areas

To minimize possible losses of life and property, the following uses are permitted in a floodplain area provided they are also permitted in the underlying zoning district:

- Farm or ranch;
- Local utilities, electrical substation, water reservoir or pumping station, and water treatment plant;
- Public park or playground, private recreation club or area, private community center, and golf course;
- Outside commercial amusement approved by a specific use permit;
- Helistop approved by a specific use permit; and
- Radio, television, or microwave tower, and amateur communications tower with a special use permit.

Structures customarily associated with the above uses may be constructed within a floodplain area only if the proposed structure meets the same engineering requirements applicable to filling in a floodplain (See Article 8.C).

Open private recreation clubs or areas and private community centers, without exterior walls which would incur structural damage during flood conditions, are permitted in floodplain areas. Private facilities listed above, with enclosed walls that would incur damage, are not permitted in floodplain areas.

Uses and structures other than those mentioned above shall not be permitted in floodplain areas.

2. Residential Construction

New construction in reclaimed floodplain areas and "substantial improvements" of any existing residential structure in floodplain areas shall have the lowest floor, including basements or fully enclosed areas, elevated to at least two feet above the design flood elevation. Fill elevations shall be one foot above the elevation of the design flood. Incremental improvements, either at one time or over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement." New residential structures on stilts or behind ring levees serving individual lots shall not be permitted.

Improvements to an existing structure that increase the outside dimensions, but do not result in a "substantial improvement," must meet the requirements of Article 8.C.

Table 10 presents a synopsis of the requirements for residential construction in floodplain areas.

3. Non-residential Construction

New construction in reclaimed floodplain areas and "substantial improvement" of any existing commercial, industrial, or other non-residential structure in floodplain areas shall either have the lowest floor, including basements, elevated to at least two feet above the design flood elevation; or, together with attendant utility and sanitary facilities, shall:

- Be floodproofed so that below two feet above the design flood elevation the structure is watertight, with walls substantially impermeable to the passage of water;

- Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and

- Be certified by a registered professional engineer or architect that the standards of this subsection are satisfied. Such certifications shall be provided to the offical set forth in Article 4, Section A.1.

Incremental improvements, either at one time or over a period of time, the cumulative cost of which equals or exceeds 50 percent of the market value at the time of the first improvement, shall be considered as a "substantial improvement." Improvements to an existing commercial, industrial or other non-residential structure that increase the outside dimensions, but do not result in a "substantial improvement," must meet the requirements of Article 8.C.

Table 10 presents a synopsis of the requirements for nonresidential structures in floodplain areas.

4. Manufactured Homes

a. All manufactured homes shall be anchored to resist flotation, collapse, or lateral movement by providing over-the-top and frame ties to ground anchors. Special requirements shall be that:

- Over-the-top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring one additional tie per side;

- Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side;

- All components of the anchoring system be capable of carrying a force of 4,800 pounds; and,

- Any additions to the manufactured home be similarly anchored.

b. For all new manufactured homes, new manufactured home parks and manufactured home subdivisions; for expansions to existing manufactured home parks and manufactured home subdivisions; for existing manufactured home parks and manufactured home subdivisions where the repair, reconstruction or improvement of the streets, utilities and pads is planned; and for manufactured homes not placed in a manufactured home park or manufactured home subdivision; for new manufactured homes moved into an old site in an existing manufactured home park; and for substantial improvements to a manufactured home, require that:

- Stands or lots are elevated on compacted fill so that the lowest floor of the manufactured home will be at least two feet above the design flood elevation;

- Adequate surface drainage and access for a hauler are provided; and,

- No new manufactured homes shall be placed in a floodplain, except on a pad site created by compacted fill in an existing manufactured home park, in which the new pad site is elevated at least two feet above the design flood elevation.

Table 10 overviews the requirements for placing manufactured homes in flood hazard areas.

5. Streets, Parking Lots, and Bridges

The top of curb of all new streets to be built in reclaimed floodplain areas shall be at least one foot above the design flood elevation. The low beam of all new bridges to be constructed across floodplains shall be a minimum of one foot above the design flood elevation. All new private bridges to individual homes shall have their low beams at one foot above

the design flood elevation. Parking lots associated with residential, commercial and industrial uses in reclaimed floodplain areas shall be at least at the design flood elevation. Parking lots for public parks or playgrounds, private recreation club or area, private community center and golf courses may be located below the design flood elevation.

6. Utilities

All new and replacement water supply systems, sanitary sewer facilities, and other public utilities shall be designed to minimize or eliminate flood damage and infiltration of flood waters into the system.

7. Fences

Fences (Private and Public Screening) shall be constructed such that blockage of surface water flow does not occur. Fences shall not be allowed in floodplain area. This includes the requirement that erosive conditions shall not be created around, under or near a fence structure.

8. Additional Construction Standards for Structures

All improvements and construction permitted in a floodplain area must comply with the following requirements:

a. Structures must be securely anchored to the foundation to prevent flotation and collapse during inundation and designed to prevent damage to nonstructural elements during inundation.

b. Thermal insulation used below the first floor elevation must be of a type that does not absorb water.

c. Adhesives must have a bonding strength that is unaffected by inundation.

d. Doors and all wood trim must be sealed with a waterproof paint or similar product.

e. Mechanical, electricial, and utility equipment shall be located above the design flood elevation. Water heaters, furnaces, electrical distribution panels, and other critical mechanical or electrical installations must not be placed in basements. Electrical circuits for basements shall be separate from circuits serving floors above the basement, and circuits for basements shall be installed lowered from above.

f. Basements are permitted for non-residential structures only if they are designed to preclude inundation by the design flood elevation, either by:

    1. The elimination of exterior openings below the design flood elevation; or

2. The use of water-tight closures, such as bulkheads and flood shields. However, no basements are permitted in soils whose permeability meets or exceeds the minimum local standards of permeability established for the installation of individual sewage disposal systems.

g. Plywood used at or below the lowest floor elevation must be of an "exterior" or "marine" grade and of a water-resistant or waterproof variety.

h. Wood flooring used at or below the lowest floor elevation must be installed to accommodate a lateral expansion of the flooring, perpendicular to the flooring grain, without incurring structural damage to the building.

i. Basement ceilings for non-residential structures must be of sufficient wet strength and be so installed as to survive inundation.

j. Paints or other finishes used at or below the lowest floor elevation must be capable of surviving inundation.

k. All air ducts, large pipes and storage tanks located at or below the lowest floor elevation must be firmly anchored to prevent flotation.

l. Tanks must be vented at a location above the design flood elevation.

SECTION C. Floodplain Alterations

As stated previously in Article 8, Section B, no new construction is allowed in floodplain areas, but construction is allowed in those areas that can be reclaimed from the floodplain. The City of Carrollton has adopted a "natural floodway" that differs from the "regulatory floodway" established by FEMA. The "natural floodway" consists of the natural channel and floodplain that is effective in conveying the design flood. Areas of ineffective flow around bridges, topographic constrictions, and other constrictions are excluded from the "natural floodway." The effective flow area and limits of the "natural floodway" are determined using 4:1 flow expansions downstream of constrictions and 1:1 flow expansions upstream of constrictions. Figure 25 displays an example of effective flow areas at a typical bridge location.

A Floodplain Alteration Permit for floodplain reclamation or other types of alterations shall be allowed only if all of the following criteria are met:

1. Alterations of the floodplain and "natural floodway" shall not increase the water surface elevation of the design flood of the creek.

2. Alterations shall be in compliance with FEMA guidelines.

3. Alterations of the floodplain shall not create an erosive water velocity on or off-site.

4. Alterations of the floodplain shall not significantly increase downstream discharges.

5. The effects of existing improvements or public and private improvements for which a future commitment has been made by the City of Carrollton or county, state, or federal agencies, shall be used in determining water surface elevations and velocities.

6. Any alteration of floodplain areas shall not cause any additional expense in any current or projected public improvements.

7. The floodplain shall be altered only to the extent permitted by equal conveyance on both sides of the natural channel. The right of equal conveyance applies to all owners and uses, including greenbelt, park areas, and recreational usages. Owners may relinquish their right to equal conveyance by providing a written agreement to the City of Carrollton.

8. Maximum slopes of filled areas shall not exceed three to one. Slopes of any excavated areas not in rock shall not exceed four to one. Fill slopes, vertical walls, terracing, and other slope treatments may be considered provided no unbalancing of stream flow results and only as a part of a grading permit application.

9. A grading permit shall be required so that proper provisions for protecting against erosion losses will be made.

These criteria shall be met before a Floodplain Alteration Permit can be issued for a proposed project. Typical projects requiring a Floodplain Alteration Permit include placing fill whether or not it actually raises the property out of the floodplain, constructing a dam, straightening channel sections, making improvements, substantial or otherwise, to existing structures in a floodplain in which the existing outside dimensions of the structure are increased, and temporary storage of fill materials, supplies, and equipment.

The required submittals for a Floodplain Alteration Permit are listed in Article 4, Section D.2. In general, the information needed for the application can be obtained by running a backwater model, such as HEC-2, and a flood routing model, such as TR-20 or HEC-1. Both models shall be run by permit applicants. The backwater information shall be used to determine that upstream water surface elevations and erosive velocities have not increased. Starting water surface conditions for backwater calculations are outlined in Article 7, Section A.2. Flood routing information shall be used to insure that the cumulative effects of the reduction in floodplain storage of floodwaters will not cause downstream increases in water surface elevations and erosive velocities.

Applicants can obtain copies of the existing conditions backwater models and flood routing where available from the City Engineer. The City Engineer shall keep the models current with modifications to the floodplain.

SECTION D. Verification of Floodplain Alterations.

Prior to final acceptance by the City of utilities and street construction for projects involving floodplain alterations or adjacent to defined floodplains, creeks, channels and drainageways, a certified statement shall be prepared by

a Registered Public Surveyor showing that all lot elevations, as developed within the subject project, meet or exceed the required minimum finished floor elevations shown on the final plat of the subdivision. This certification shall be filed with the City Engineer.

In addition, at any time in the future when a building permit is desired for existing platted property which is subject to flooding or carries a specified or recorded minimum finished floor elevation, a Registered Public Surveyor shall survey the property prior to obtaining a building permit. The certified survey data showing the property to be at or above the specified elevation shall be furnished to the City Engineer for approval. Certificate of compliance with the provisions of this ordinance pertaining to specified finished floor elevations shall be required.

The owner/developer shall furnish, at his expense, to the City Engineer sufficient engineering information to confirm that the minimum floor elevations proposed are as required by this paragraph. Construction permits will not be issued until (1) a conditional letter of map revision or amendment has been issued by FEMA, and (2) lots and/or sites are certified by a Registered Public Surveyor and are elevated from the floodplain according to the FEMA-approved revisions to the floodplain and the requirements of this ordinance.

TABLE 1

VALUES OF "C" FOR USE IN "RATIONAL METHOD" FORMULA Q = CIA

Slope	Land Use from Master Plan	Value of "C" (Runoff Coefficient)
Flat 0% to 1%	Park areas - No developable land	0.20
	Park and School land Tract	0.30
	Single Family Residential	0.45
	Duplex	0.50
	Multiple Family	0.55
	Local Business	0.65
	Central Business	0.80
	Commercial	0.80
	Industrial	0.75
Moderate 1% to 3.5%	Park areas - No developable land	0.30
	Park and School land Tract	0.40
	Single Family Residential	0.55
	Duplex	0.60
	Multiple Family	0.70
	Local Business	0.70
	Central Business	0.85
	Commercial	0.85
	Industrial	0.80
Steep 3.5% and over	Park areas - No developable land	0.35
	Park and School land Tract	0.45
	Single Family Residential	0.65
	Duplex	0.70
	Multiple Family	0.80
	Local Business	0.90
	Central Business	0.90
	Commercial	0.90
	Industrial	0.90

TABLE 2

AVERAGE VELOCITY FOR USE IN DETERMINING TIME OF CONCENTRATION

Description of Water Course	0% to 3% V. in f.p.s.	4% to 7% V. in f.p.s.	8% to 11% V. in f.p.s.	Over 12% V. in f.p.s.
Surface Drainage	5	9	13	15
Channels	Determine V. by Manning's Equation			
Storm Sewers	Determine V. by Manning's Equation			

TABLE 3

MINIMUM SLOPES FOR CONCRETE PIPES

(n = .013)

Pipe Diameter (inches)	Slope (Feet/100 Feet)	Pipe Diameter (inches)	Slope (Feet/100 Feet)
		51	.045
18	.180	54	.041
21	.150	60	.036
24	.120	66	.032
27	.110	72	.028
30	.090	78	.025
33	.080	84	.023
36	.070	90	.021
39	.062	96	.019
42	.056	102	.018
45	.052	108	.016
48	.048		

TABLE 4

MAXIMUM VELOCITIES IN CONDUITS FLOWING FULL AND CHANNELS

Flow Through:	Maximum Velocity (fps)
Culverts	12.5
Inlet Laterals	10
Storm Sewers	12.5
Earthen Channels	See Table 11
Concrete Channels	12
Shale	6
Rock	6 - 10*

* Depends upon exact type of vegetative cover, soil, or rock for the location in question.

TABLE 5

ROUGHNESS COEFFICIENTS FOR CLOSED CONDUITS

Materials of Construction	Recommended Roughness Coefficient "n"
Concrete Pipe Storm Sewer	
Good Alignment, Smooth Joints	.013
Fair Alignment, Ordinary Joints	.015
Poor Alignment, Poor Joints	.017
Concrete Pipe Culverts	.012
Monolithic Concrete Culverts & Conduit	.012
Corrugated Metal Pipe	.024
Corrugated Metal Pipe (Smooth Lined)	.013

TABLE 6

ENTRANCE LOSS COEFFICIENTS

$$\text{Entrance head loss } H_L = K_e \frac{V_1^2}{2g}$$

Type of Structure and Design of Entrance	Coefficient K_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, square cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
End-section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
End-section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwall parallel (extension of sides)	
Square-edged at crown	0.7
Side- or slope-tapered inlet	0.2

TABLE 7

VELOCITY HEAD LOSS COEFFICIENTS FOR CLOSED CONDUITS

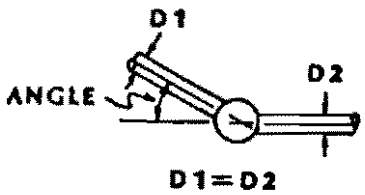
MANHOLE AT CHANGE IN PIPE DIRECTION		
DESCRIPTION	ANGLE	HEAD LOSS COEFFICIENT Kj
	90°	0.55
	60°	0.48
	45°	0.42
	30°	0.30
	0°	0.05
BENDS IN PIPES		
DESCRIPTION	ANGLE	HEAD LOSS COEFFICIENT Kj
	90°	0.50
	60°	0.43
	45°	0.37
	30°	0.25

TABLE 7, continued

VELOCITY HEAD LOSS COEFFICIENTS FOR CLOSED CONDUITS

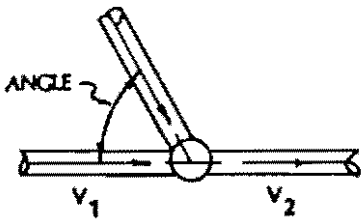
JUNCTION		
DESCRIPTION	ANGLE	HEAD LOSS COEFFICIENT Kj
	22 1/2°	0.75
	45°	0.50
	60°	0.35
	90°	0.25

TABLE 8

ROUGHNESS COEFFICIENTS FOR OPEN CHANNELS FLOW AREAS

Channel Description	Roughness Coefficient Minimum	Normal	Maximum
MINOR NATURAL STREAMS (Top Width at Flood Stage Less Than 100 Feet)			
Moderately Well-Defined Channel			
Grass and Weeds, Little Brush	0.025	0.030	0.033
Dense Weeds, Little Brush	0.030	0.035	0.040
Weeds, Light Brush on Banks	0.030	0.035	0.040
Weeds, Heavy Brush on Banks	0.035	0.050	0.060
Weeds, Dense Willows on Banks	0.040	0.060	0.080
Irregular Channel with Pools and Meanders			
Grass and Weeds, Little Brush	0.030	0.036	0.042
Dense Weeds, Little Brush	0.036	0.042	0.048
Weeds, Light Brush on Banks	0.036	0.042	0.048
Weeds, Heavy Brush on Banks	0.042	0.060	0.072
Weeds, Dense Willows on Banks	0.048	0.072	0.096
Floodplain, Pasture			
Short Grass, No Brush	0.020	0.030	0.035
Tall Grass, No Brush	0.025	0.035	0.050
Floodplain, Cultivated			
No Crops	0.025	0.030	0.035
Mature Crops	0.030	0.040	0.050
Floodplain, Uncleared			
Heavy Weeds, Light Brush	0.035	0.050	0.070
Medium to Dense Brush	0.070	0.100	0.160
Trees with Flood Stage Below Branches	0.080	0.100	0.120
MAJOR NATURAL STREAMS (Top Width at Flood Stage Greater Than 100 Feet)			
The roughness coefficient is less than that for minor streams of similar description because banks offer less effective resistance.			
Moderately Well Defined Channel	0.025	---	0.060
Irregular Channel	0.035	---	0.100

TABLE 8, continued

Channel Description	Roughness Coefficient Minimum	Normal	Maximum
MANMADE VEGETATED CHANNELS			
Mowed Grass, Clay Soil	0.025	0.030	0.035
Mowed Grass, Sandy Soil, or Easily Erodible Soils	0.025	0.030	0.035
MANMADE NON-VEGETATED CHANNELS			
Clean Gravel Section	0.022	0.025	0.030
Shale	0.025	0.030	0.035
Smooth Rock	0.025	0.030	0.035
LINED CHANNELS			
Smooth Finished Concrete	0.013	0.015	0.020
Riprap (Larger Pieces)	0.030	0.040	0.050

TABLE 9.A

TEMPORARY VEGETATION

Temporary Vegetation - The following plants are commonly used for temporary cover in Texas. For optimum planting dates and adaptations for a specific soil or site, contact your local field office of the USDA, Soil Conservation Service.

Species	Planting Rate/Acre[1]	Planting Date[2]	Source[3]
Cane, Redtop	30#/S	8/15-9/30	C
Millet, German	40#/s	4/1-5/15	C
Oats	3 bu/S	8/15-9/30	C
Panicum, Texas	25#/S	3/15-5/15	C
Prosomillet	40#/S	4/1-5/15	C
Rye, Elbon	1-1/2 bu/S	8/15-9/30	C
Ryegrass, Annual	30#/S	8/15-9/30	C
Sprangletop, Green	3.4#PLS/S	2/1-5/15	C
Sudangrass	40#/S	4/1-5/15	C

[1]Planting Rate/Acre: S - # Commercial Seed/AC, bu - bushels/AC, #PLS - Pure Live Seed/AC

[2]Planting Date: This represents a statewide spread in planting dates. Refer to local guides for specific dates.

[3]Source: C - Commercial

TABLE 9.B

PERMANENT VEGETATION - LOW AREAS

Permanent Vegetation - Because of wide variations in growing conditions within a planned area, permanent vegetation has been selected for the following conditions. For optimum planting dates and adaptations for a specific soil or site, contact your local field office of the USDA, Soil Conservation Service.

Note: Low areas are subject to ephemeral and intermittent flows.

Species	Moisture Tolerance[1]	Planting Rate/Materials[2]	Planting Date[3]	Source[4]
Bermudagrass, Coastal or				
Selection 3	A/2	50 cu.ft/Ac/Sp	12/1-5/30	C
Common	A/2	4.6#/Ac/S	3/1-5/30	C
Buffalograss	A/3	32#/Ac/S	1/1-4/30	C or PMC
Bushy Beard Grass	C/3	---	Spring	-
Cordgrass, Prairie	B/2	1/sq.ft/R	1/1-5/30	L
Eastern Gammagrass	C/3	---	Spring	-
Knotgrass	A/2	1/sq.ft/R&St	2/1-5/30	L
Marshmillet	B/1	1/sq.ft/R	4/1-5/30	L
Reedgrass, Common	A/2	1/sq.ft/R	2/1-5/30	L or PMC
Vine-mesquite	A/2	1/sq.ft/St	2/1-1/30	L

[1]Moisture Tolerance:

Total Submergence	Soil Saturation
A - 20 days or more	1 - Require a saturated soil
B - 10 - 20 days	2 - Will tolerate prolonged saturation and frequent drought
C - Less than 10 days	3 - Will not tolerate a constantly saturated soil.

[2]Planting: Rate - #PLS/AC, Plant Parts/sq.ft.
Materials - S - Seed, R - Rhizomes, Sp - Sprigs, St - Stolons

[3]Planting Date: This represents a statewide spread in planting dates. Refer to local guides for specific dates.

[4]Source: C - Commercial, L - Locally Collected, PMC - Plant Material Center (as available)

TABLE 9.C

PERMANENT VEGETATION - SIDE SLOPES

Species	Soils[2]	Planting Rate/Materials[3]	Planting Date[4]	Source[5]
Grasses				
Bermudagrass,				
Common	All	4.6#/Ac/S	3/1-5/30	C
Selection 3 or Coastal	All	50 cu.ft/Ac/Sp	12/1-5/30	C
Bluestem,				
K.R.*	M-F	4#/Ac/S	12/1-5/30	C
Old World*	M-F	2.4#/Ac/S	2/1-5/30	PMC
Buffalograss*	M-F	32#/Ac/S	1/1-5/15	C or PMC
Dallisgrass	M-F	7#/Ac/S	2/1-5/30	C
Knotgrass[1]	All	1/sq.ft/R&St	2/1-5/30	L
Vine-mesquite	All	1/sq.ft/St	2/1-4/30	L
Wildrye	All	25#/Ac/S	9/1-10/1	L
Forbs:				
Bushsunflower*	All	10#/Ac/S	4/1-5/20	L or PMC
Englemandaisy*[1]	All	30#/Ac/S	9/1-2/30	L or PMC
Legumes:				
Trailing wildbean*	C-M	25#/Ac/S	2/15-5/15	L or PMC
Vetch*	All	20#/Ac/S	9/1-10/1	C

*Mixtures only: Reduce rates according to percentage of mixture desired.
[1]Lower portion of slope only, frequently inundated.
[2]Soils: C - Coarse, M - Medium, F - Fine
[3]Planting: Rate - #PLS/AC, Plant Parts/sq.ft.
Materials - S - Seed, R - Rhizomes, Sp - Sprigs, St - Stolons
[4]Planting Date: This represents a statewide spread in planting dates. Refer to local guides for specific dates.
[5]Source: C - Commercial, L - Locally Collected, PMC - Plant Material Center (as available)

TABLE 9.D

PERMANENT VEGETATION

BERMS, SPOIL BANKS, AND SIMILAR AREAS

Species	Soils[1]	Planting Rate/Materials[2]	Planting Date[3]	Source[4]
Grasses				
Bermudagrass,				
Common	All	4.6#/Ac/S	3/1-5/30	C
Selection 3 or Coastal	All	50 cu.ft/Sp	12/1-5/30	C
Bluestem,				
Caucasian*	M-F	4#/Ac/S	12/1-5/30	C
K.R.*	M-F	4#/Ac/S	12/1-5/30	C
Little*	All	6.8#/Ac/S	2/1-5/15	C
Buffalograss*	All	6#/Ac/S	2/1-5/15	C
Fescue	M-F	20#/Ac/S	9/1-10/30	C
Hardinggrass "Wintergreen"	M-F	6#/Ac/S	9/1-10/30	C
Indiangrass*	All	9#/Ac/S	2/1-5/30	C
Kleingrass, "Selection 75"*	M-F	4#/Ac/S	1/1-5/30	C
Wildrye*	All	30#/Ac/S	9/1-10/1	L
Wintergrass, Texas*	M-F	30#/Ac/S	9/1-10/30	C
Forbs:				
Bushsunflower*	All	10#/Ac/S	4/1-5/30	L or PMC
Englemandaisy*	All	30#/Ac/S	9/1-2/30	L or PMC
Partridgepea*	C-M	10#/Ac/S	2/15-5/15	C or PMC
Sunflower, Maximilian*	All	16#/Ac/S	4/1-5/30	L or PMC

TABLE 9.D, continued

Species	Soils[1]	Planting Rate/Materials[2]	Planting Date[3]	Source[4]
Legumes:				
Clover,				
Crimson*	M	20#/Ac/S	9/1-10/30	C
White*	M-F	3#/Ac/S		C
Trailing wildbean*	C-M	10#/Ac/S	2/15-5/15	PMC
Vetch*	All	20#/Ac/S	9/1-10/1	C

*Mixtures only: Reduce rates according to percentage of mixture desired.

[1]Soils: C - Coarse, M - Medium, F - Fine

[2]Planting: Rate - #PLS/AC, Plant Parts/sq.ft.
Materials - S - Seed, R - Rhizomes, Sp - Sprigs, St - Stolons

[3]Planting Date: This represents a statewide spread in planting dates. Refer to local guides for specific dates.

[4]Source: C - Commercial, L - Locally Collected, PMC - Plant Material Center (as available)

TABLE 10

SYNOPSIS OF REQUIREMENTS

TO PROTECT STRUCTURES FROM FLOODING

	Is a Development Permit Req'd?	Is a Floodplain Alteration Permit Required?	Is Lowest Floor Req'd To Be 2 Feet Above Design Flood Elev.?	Is Floodproofing Allowed as an Alternative to Lowest Floor Requirement?
RESIDENTIAL				
New Structure	Yes	Yes, if new structures are being placed in a proposed floodplain reclamation area.	Yes	No
Substantial improvement (i.e., value of renovation of existing structure is greater than 50% of the structure).	Yes	Yes, if structure is subject to flooding.	Yes	No
Renovation valued at less than 50% of the structure's value, with no expansion of outside dimensions.	No	No	No	Floodproofing is allowed, but not required.
Renovation valued at less than 50% of the structure's value, but including expansion of outside dimensions.	Yes	Yes, if structure is subject to flooding.	No	Floodproofing is allowed, but not required.

TABLE 10, continued

	Is a Development Permit Req'd?	Is a Floodplain Alteration Permit Required?	Is Lowest Floor Req'd To Be 2 Feet Above Design Flood Elev.?	Is Floodproofing Allowed as an Alternative to Lowest Floor Requirement?
NON-RESIDENTIAL				
New Structure	Yes	Yes, if new structures are being placed in a proposed floodplain reclamation area.	Yes	Yes
Substantial improvement (i.e., value of renovation of existing structure is greater than 50% of the structure).	Yes	Yes, if structure is subject to flooding.	Yes	Yes
Renovation valued at less than 50% of the structure's value, with no expansion of outside dimensions.	No	No	No	Floodproofing is allowed, but not required.
Renovation valued at less than 50% of the structure's value, but including expansion of outside dimensions.	Yes	Yes, if structure is subject to flooding.	No	Floodproofing is allowed, but not required.

TABLE 10, continued

	Is a Development Permit Req'd?	Is a Floodplain Alteration Permit Required?	Is Lowest Floor Req'd To Be 2 Feet Above Design Flood Elev.?	Is Floodproofing Allowed as an Alternative to Lowest Floor Requirement?
MANUFACTURED HOMES				
New home placed at any pad site	Yes	Yes, if new homes are being located in a proposed floodplain reclamation area.	Yes	No
Expansion of an existing home park	Yes	Yes, if the park is in a floodplain area.	Yes	No
New home park	Yes	Yes, if the new park is being located in a proposed floodplain area.	Yes	No
Substantial improvements to an existing manufactured home	Yes	Yes, if the pad site for the home is in a flood hazard area and the pad is being raised or expanded.	Yes	No
Renovation valued at less than 50% of the manufactured home's value, with no expansion of the home's or pad's outside dimensions.	No	No	No	No
Renovation valued at less than 50% of the manufactured home's value, but including expansion of its outside dimensions.	Yes	Yes, if structure is subject to flooding.	No	No

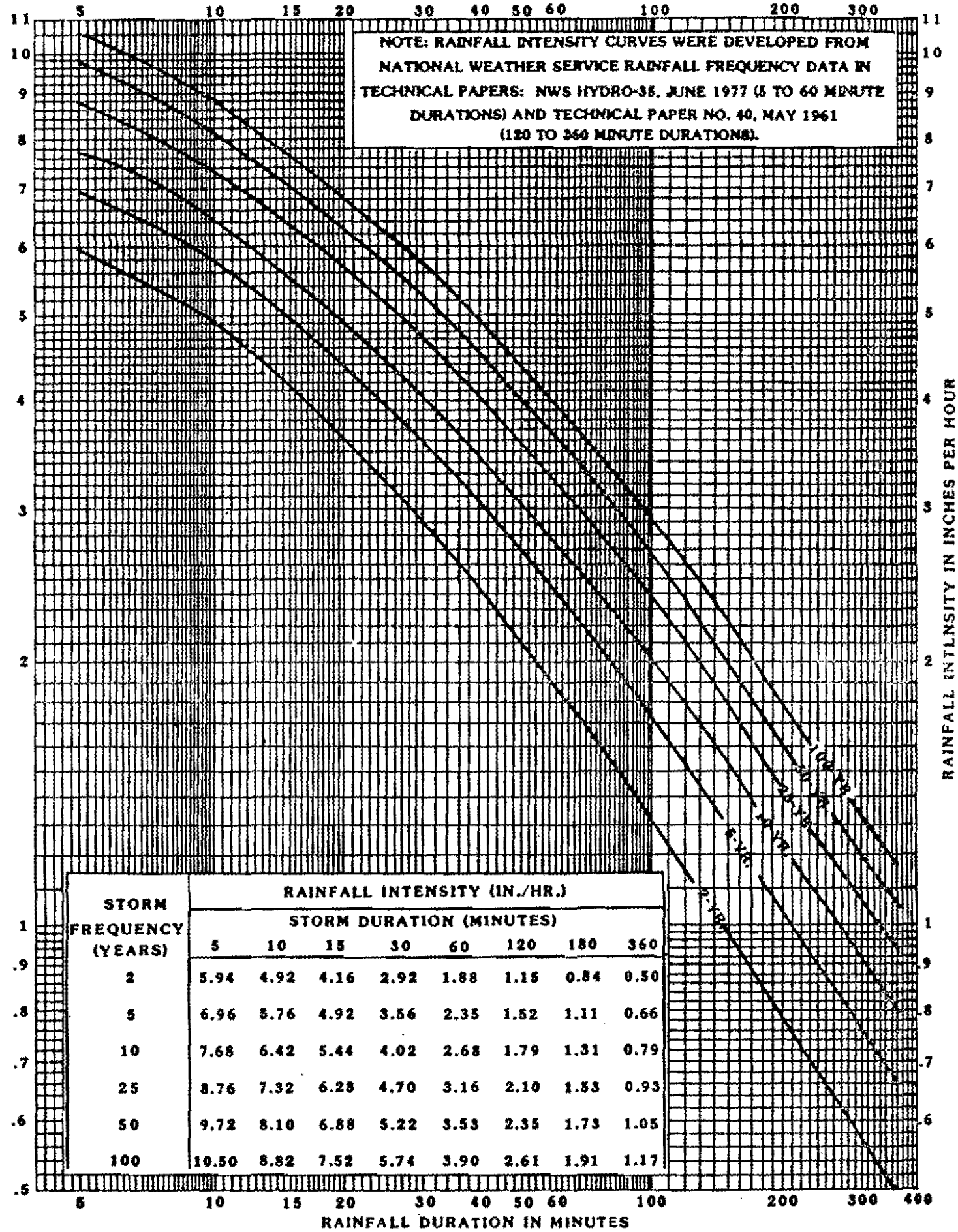
TABLE 11

PERMISSIBLE VELOCITIES FOR CHANNELS LINED WITH GRASS

COVER	Slope Range, %	Permissible Velocity, fps	
		Erosion-resistant Soils	Easily Eroded Soils
Bermuda Grass	0-5	8	6
	5-10	7	5
	>10	6	4
Buffalo grass, Kentucky bluegrass, smooth brome, blue grama	0-5	7	5
	5-10	6	4
	>10	5	3
Grass mixture	0-5	5	4
	5-10	4	3
	Do not use on slopes steeper than 10%		
Lespedeza sericea, weeping love grass, ischaemum (yellow bluestem), kudzu, alfalfa, crabgrass	0-5	3.5	2.5
	Do not use on slopes steeper than 5%, except for side slopes in a combination channel.		
Annuals - used on mild slopes or as temporary protection until permanent covers are established, common lespedeza, Sudan grass	0-5	3.5	2.5
	Use on slopes steeper than 5% is not recommended.		

Remarks: The values apply to average, uniform stands of each type of cover. Use velocities exceeding 5 fps only where good covers and proper maintenance can be obtained.

FIGURE 1
CITY OF CARROLLTON RAINFALL INTENSITY VALUES



STORM FREQUENCY (YEARS)	RAINFALL INTENSITY (IN./HR.) STORM DURATION (MINUTES)							
	5	10	15	30	60	120	180	360
2	5.94	4.92	4.16	2.92	1.88	1.15	0.84	0.50
5	6.96	5.76	4.92	3.56	2.35	1.52	1.11	0.66
10	7.68	6.42	5.44	4.02	2.68	1.79	1.31	0.79
25	8.76	7.32	6.28	4.70	3.16	2.10	1.53	0.93
50	9.72	8.10	6.88	5.22	3.53	2.35	1.73	1.05
100	10.50	8.82	7.52	5.74	3.90	2.61	1.91	1.17

CAPACITY OF TRIANGULAR GUTTERS

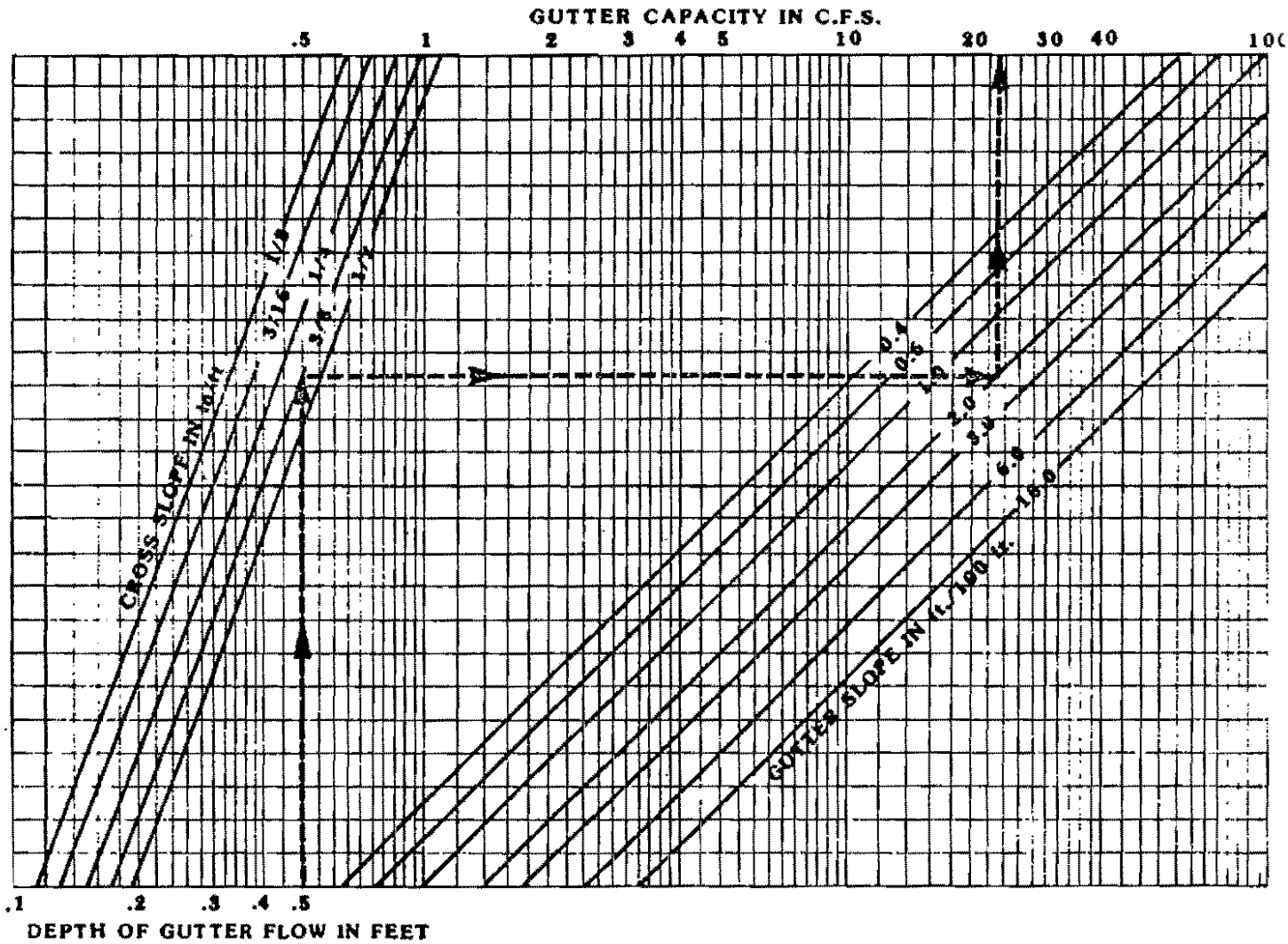
FIGURE 2

EXAMPLE

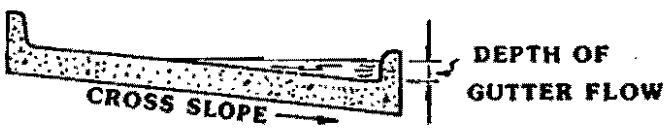
KNOWN :
- MAJOR THOROUGHFARE, TYPE M6D
- PAVEMENT WIDTH : 33'
- GUTTER SLOPE : 2.0%
- PAVEMENT CROSS SLOPE : 3/8"/1'
- DEPTH OF GUTTER FLOW : .5'

FIND:
- GUTTER CAPACITY

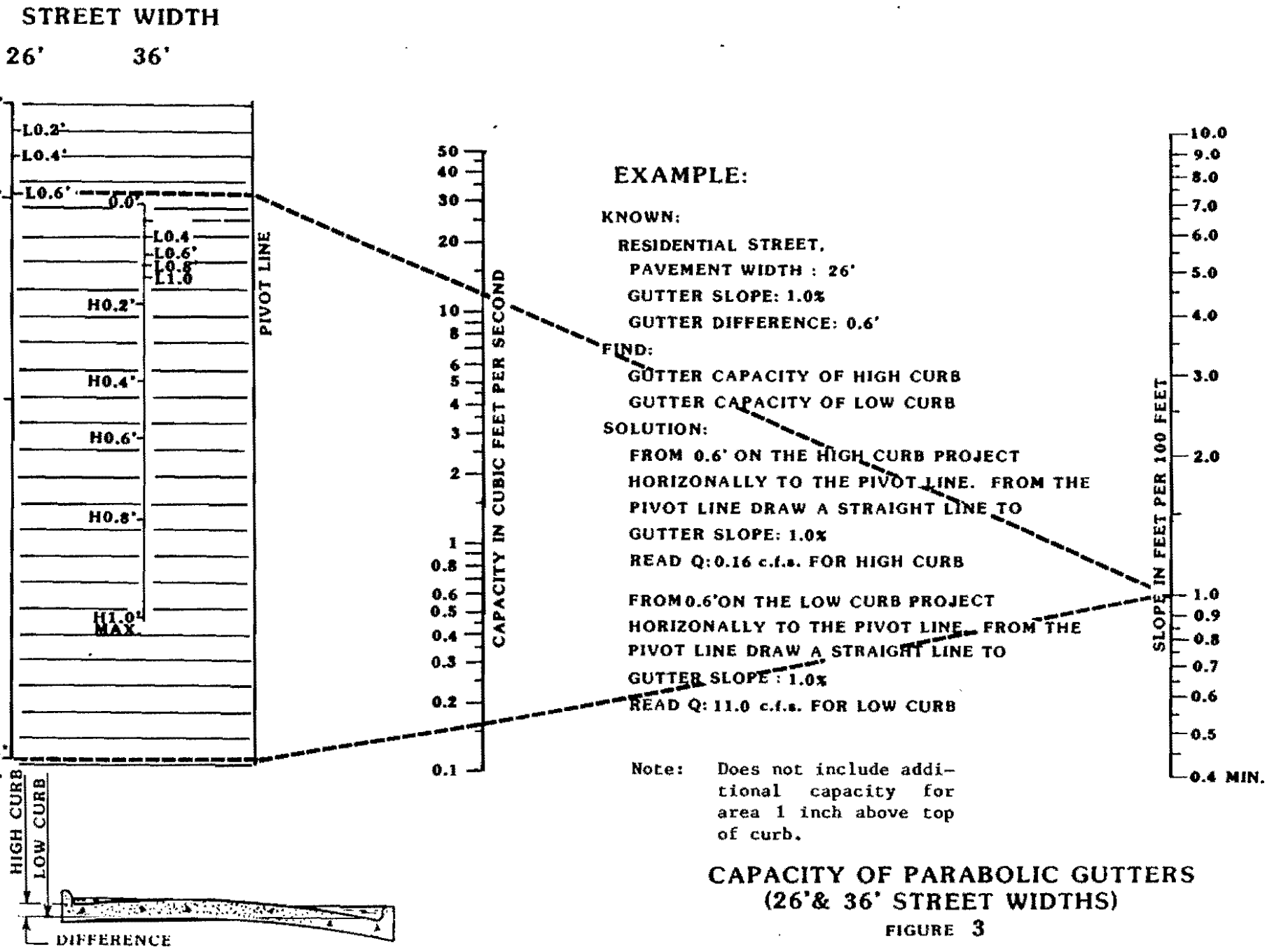
SOLUTION:
- ENTER GRAPH AT .5'
- INTERSECT CROSS SLOPE : 3/8"/1'
- INTERSECT GUTTER SLOPE : 2.0%
- READ GUTTER CAPACITY : 23.5 c.f.s.



Note: Does not include additional capacity for area 1 inch above top of curb.



(ROUGHNESS COEFFICIENT n : .0175)



EXAMPLE:

KNOWN:

RESIDENTIAL STREET,

PAVEMENT WIDTH : 26'

GUTTER SLOPE: 1.0%

GUTTER DIFFERENCE: 0.6'

FIND:

GUTTER CAPACITY OF HIGH CURB

GUTTER CAPACITY OF LOW CURB

SOLUTION:

FROM 0.6' ON THE HIGH CURB PROJECT HORIZONALLY TO THE PIVOT LINE. FROM THE PIVOT LINE DRAW A STRAIGHT LINE TO GUTTER SLOPE: 1.0%

READ Q: 0.16 c.f.s. FOR HIGH CURB

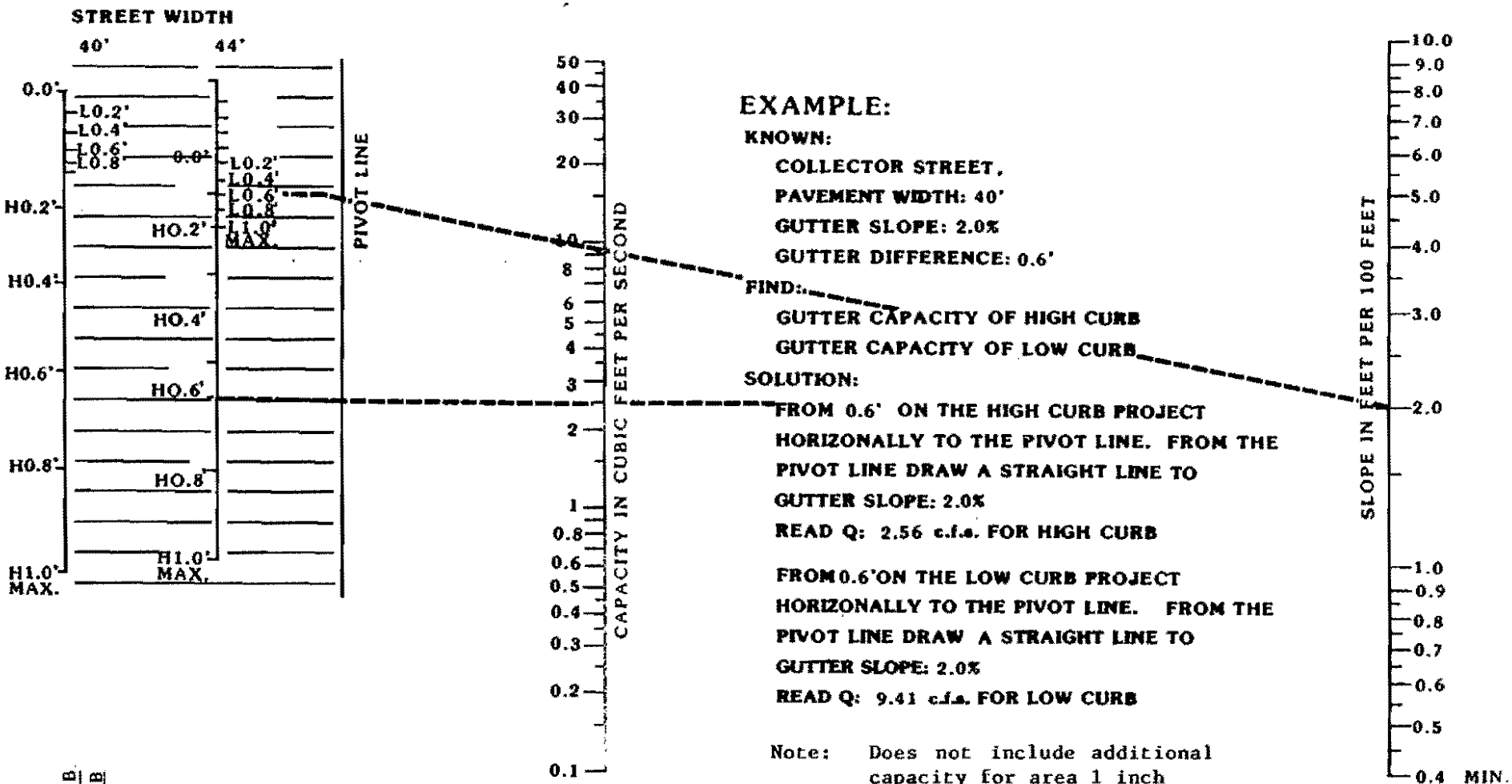
FROM 0.6' ON THE LOW CURB PROJECT HORIZONALLY TO THE PIVOT LINE. FROM THE PIVOT LINE DRAW A STRAIGHT LINE TO GUTTER SLOPE : 1.0%

READ Q: 11.0 c.f.s. FOR LOW CURB

Note: Does not include additional capacity for area 1 inch above top of curb.

CAPACITY OF PARABOLIC GUTTERS (26'& 36' STREET WIDTHS)

FIGURE 3



EXAMPLE:

KNOWN:

COLLECTOR STREET,
PAVEMENT WIDTH: 40'
GUTTER SLOPE: 2.0%
GUTTER DIFFERENCE: 0.6'

FIND:

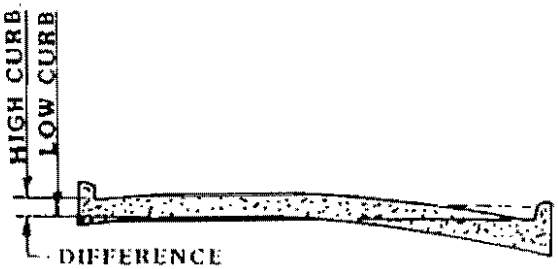
GUTTER CAPACITY OF HIGH CURB
GUTTER CAPACITY OF LOW CURB

SOLUTION:

FROM 0.6' ON THE HIGH CURB PROJECT HORIZONALLY TO THE PIVOT LINE. FROM THE PIVOT LINE DRAW A STRAIGHT LINE TO GUTTER SLOPE: 2.0%
READ Q: 2.56 c.f.s. FOR HIGH CURB

FROM 0.6' ON THE LOW CURB PROJECT HORIZONALLY TO THE PIVOT LINE. FROM THE PIVOT LINE DRAW A STRAIGHT LINE TO GUTTER SLOPE: 2.0%
READ Q: 9.41 c.f.s. FOR LOW CURB

Note: Does not include additional capacity for area 1 inch above top of curb.



CAPACITY OF PARABOLIC GUTTERS (40'& 44' STREET WIDTHS)

FIGURE 4

CAPACITY OF ALLEY SECTIONS

n:0.0175

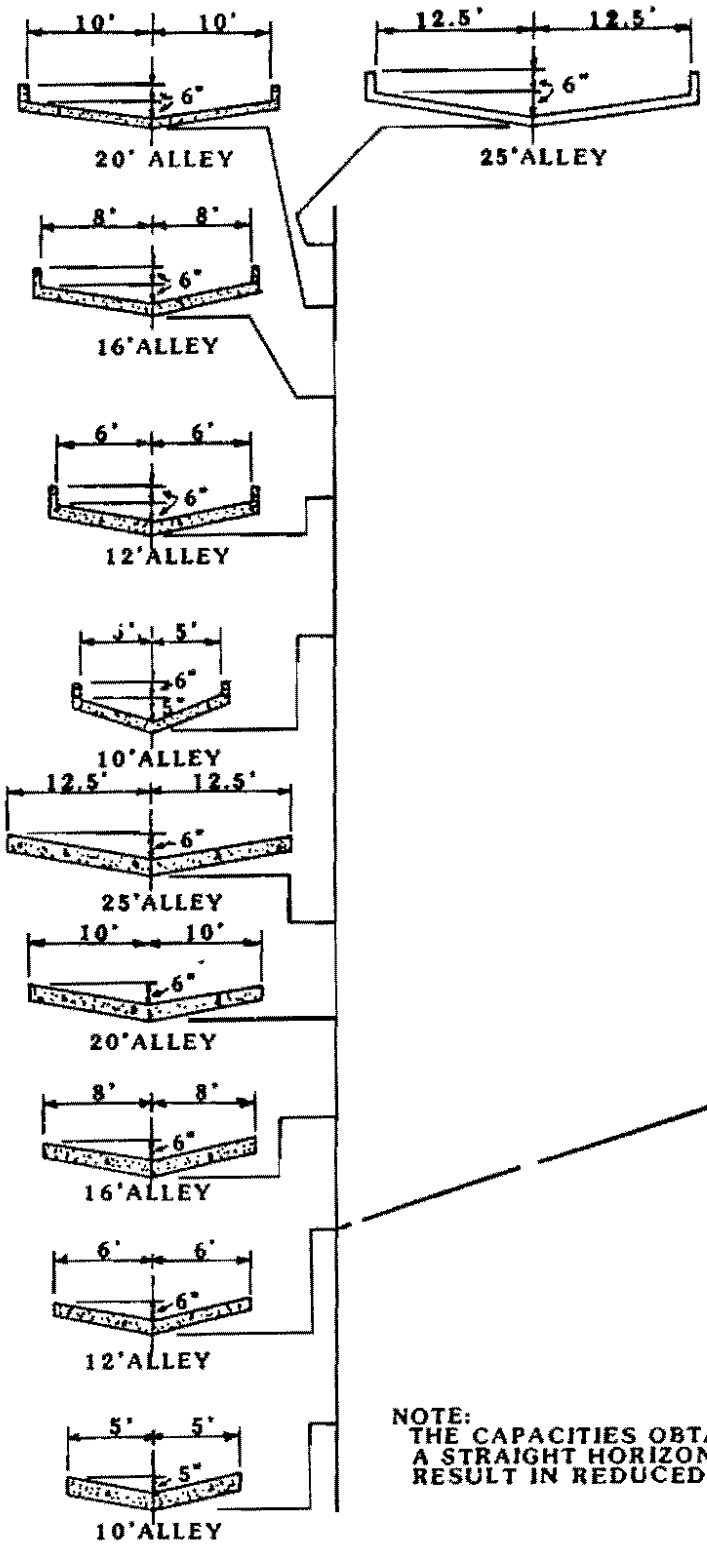
FIGURE 5

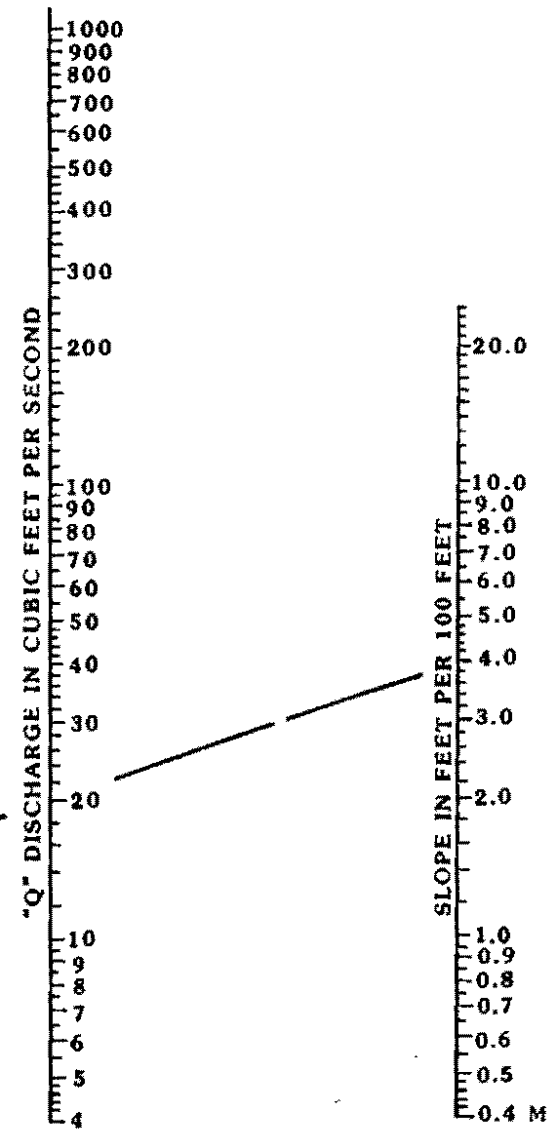
EXAMPLE :

KNOWN:
- ALLEY WIDTH: 12'
- ALLEY DEPRESSION: 6"
- GUTTER SLOPE: 4.0%

FIND:
- GUTTER FLOW (Q)

SOLUTION:
- CONNECT THE 12' ALLEY SECTION WITH SLOPE: 4.0%
- READ Q: 20.5 c.f.s.





NOTE:
THE CAPACITIES OBTAINED FROM THIS NOMOGRAPH ARE BASED ON A STRAIGHT HORIZONAL ALIGNMENT. CURVED ALIGNMENTS MAY RESULT IN REDUCED CAPACITY.

FIGURE 6

STORM DRAIN INLETS

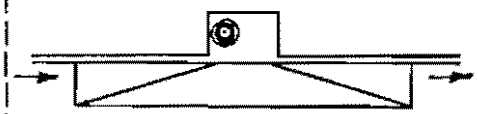
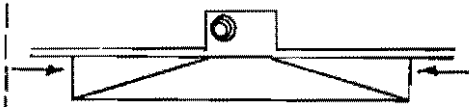
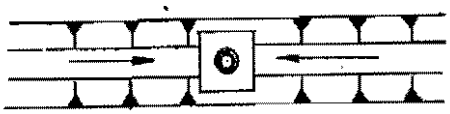
INLET DESCRIPTION	AVAIL. INLET SIZES	WHERE USED	DESIGN CURVES
 STANDARD CURB OPENING INLET ON GRADE	8' 10' 12' 14'	Residential Street, Collector Street - Types C2UA and C2UB; Alley	Figures 7 Through 11
 STANDARD CURB OPENING INLET AT LOW POINT	8' 10' 12' 14'	Residential Street, Collector Street - Types C2UA and C2UB; Alley	Figure 12
 RECESSED CURB OPENING INLET ON GRADE	8' 10' 12' 14'	Collector Street, Type C4U Major Streets - Types M4U, M4D, M6D, Principal Streets (P6D)	Figures 7 Through 11
 RECESSED CURB OPENING INLET AT LOW POINT	8' 10' 12' 14'	Collector Street, Type C4U Major Streets - Types M4U, M4D, M6D, Principal Streets (P6D)	Figure 12

FIGURE 6, continued

INLET DESCRIPTION	AVAIL. INLET SIZES	WHERE USED	DESIGN CURVES
 COMBINATION INLET ON GRADE	8'	Combination Inlets to be Used Where Space Behind Curb Prohibits Other Inlet Types	Figures 13 Through 15
 COMBINATION INLET AT LOW POINT	8'	Combination Inlets to be Used Where Space Behind Curb Prohibits Other Inlet Types	Figure 16
 GRATE INLETS	2 GRATE 3 GRATE 4 GRATE 5 GRATE	Grate Inlets to be Used Where Space Restrictions Prohibit Other Inlet Types or At Locations with No Curb.	Figures 17 Through 20
 DROP INLET	2' x 2' 3' x 3' 4' x 4'	Open Channels	Figure 21

RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES ON GRADE

FIGURE 7

EXAMPLE

KNOWN:

PAVEMENT WIDTH : 26'

GUTTER SLOPE: 2.0 %

4" PARABOLIC CROWN

GUTTER FLOW: 5.2 c.f.s.

FIND:

LENGTH OF INLET REQUIRED

SOLUTION:

ENTER GRAPH AT 5.2 c.f.s.

INTERSECT SLOPE: 2.0 %

READ L_i : 8.7'

DECISION:

1. USE 10' INLET

NO FLOW REMAINS IN GUTTER

2. USE 8' INLET

INTERCEPT ONLY PART OF FLOW

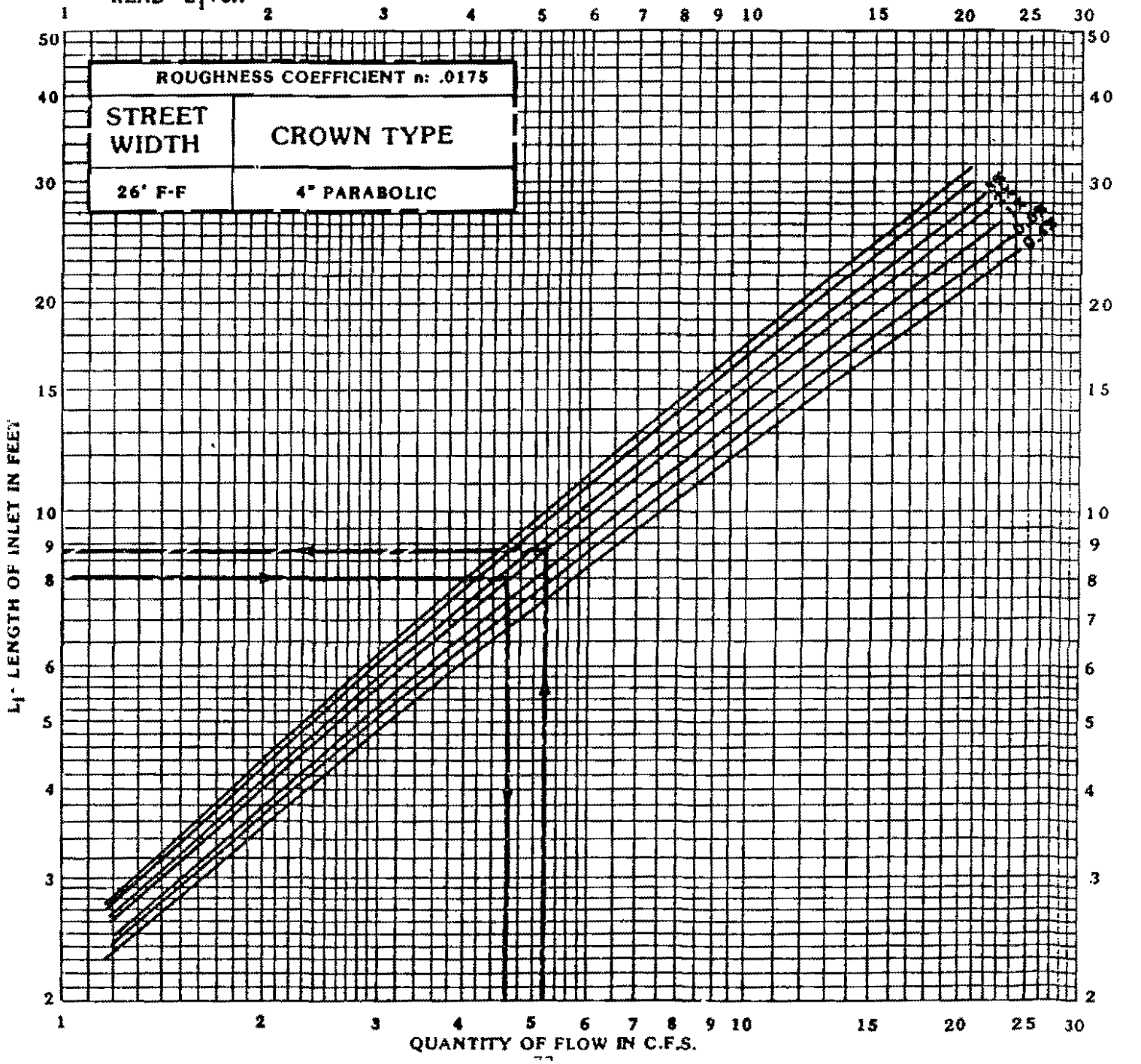
USE 8' INLET

ENTER GRAPH AT L_i : 8'

INTERSECT SLOPE: 2.0 %

READ Q: 4.6 c.f.s.

REMAINING GUTTER FLOW: 5.2 c.f.s.-4.6 c.f.s. : .6 c.f.s.



RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES ON GRADE

FIGURE 8

EXAMPLE

KNOWN:

PAVEMENT WIDTH : 36'

GUTTER SLOPE: 3.0%

6" PARABOLIC CROWN

GUTTER FLOW: 5.2 c.f.s.

FIND:

LENGTH OF INLET REQUIRED

SOLUTION:

ENTER GRAPH AT 5.2 c.f.s.

INTERSECT SLOPE: 3.0%

READ L_I: 8.8'

DECISION:

1. USE 10' INLET

NO FLOW REMAINS IN GUTTER

2. USE 8' INLET

INTERCEPT ONLY PART OF FLOW

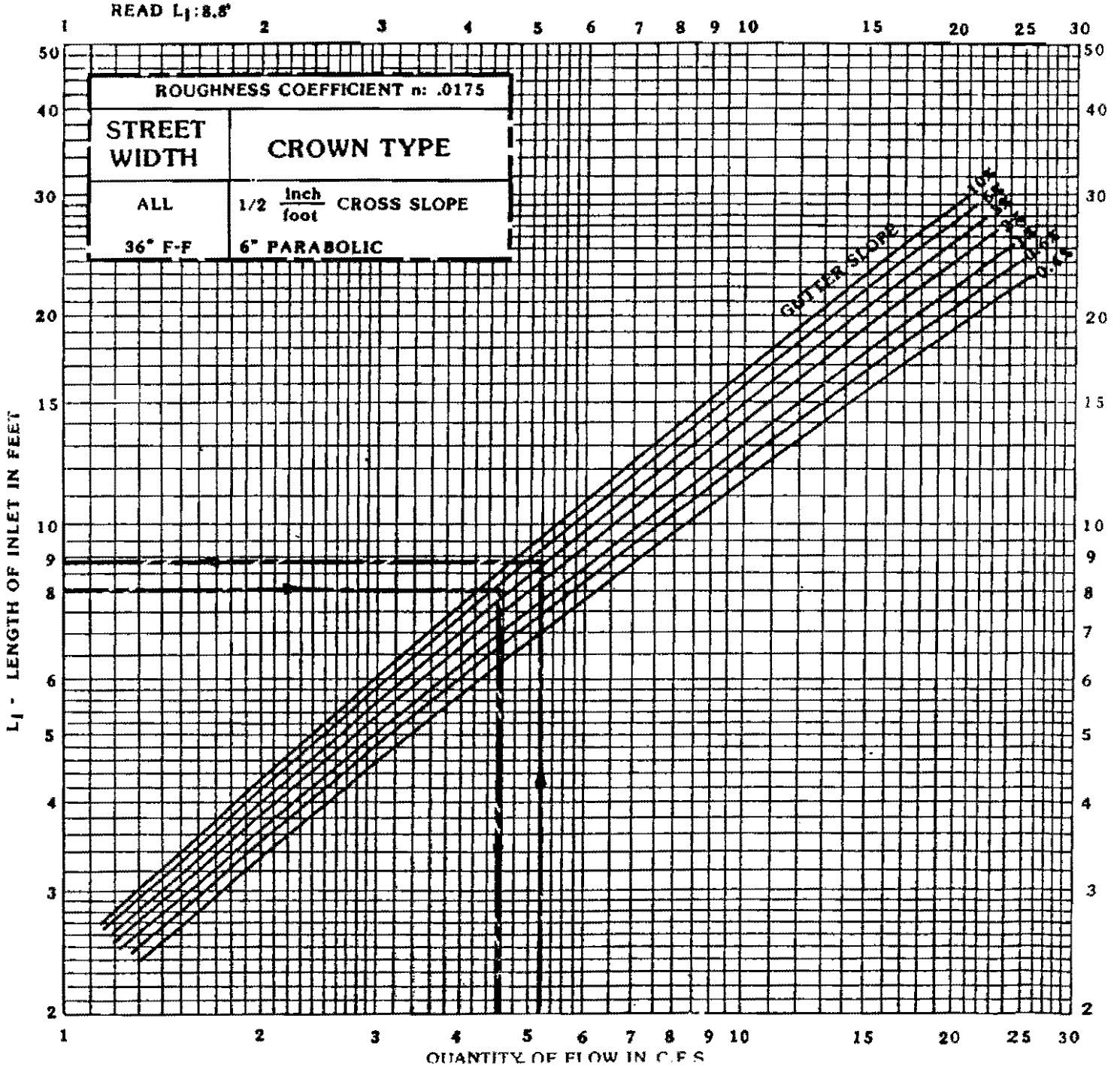
USE 8' INLET

ENTER GRAPH AT L_I: 8'

INTERSECT SLOPE: 3.0%

READ Q: 4.6 c.f.s.

REMAINING GUTTER FLOW: 5.2 c.f.s. - 4.6 c.f.s. : 0.6 c.f.s.



RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES ON GRADE

FIGURE 9

EXAMPLE

KNOWN:

PAVEMENT WIDTH : 28'

GUTTER SLOPE: 3.0%

PAVEMENT CROSS SLOPE: 1/4"/1'

GUTTER FLOW: 4.8 c.f.s.

FIND:

LENGTH OF INLET REQUIRED

SOLUTION:

ENTER GRAPH AT 4.8 c.f.s.

INTERSECT SLOPE: 3.0 %

READ L_i : 9.5'

DECISION:

1. USE 10' INLET

NO FLOW REMAINS IN GUTTER

2. USE 8' INLET

INTERCEPT ONLY PART OF FLOW

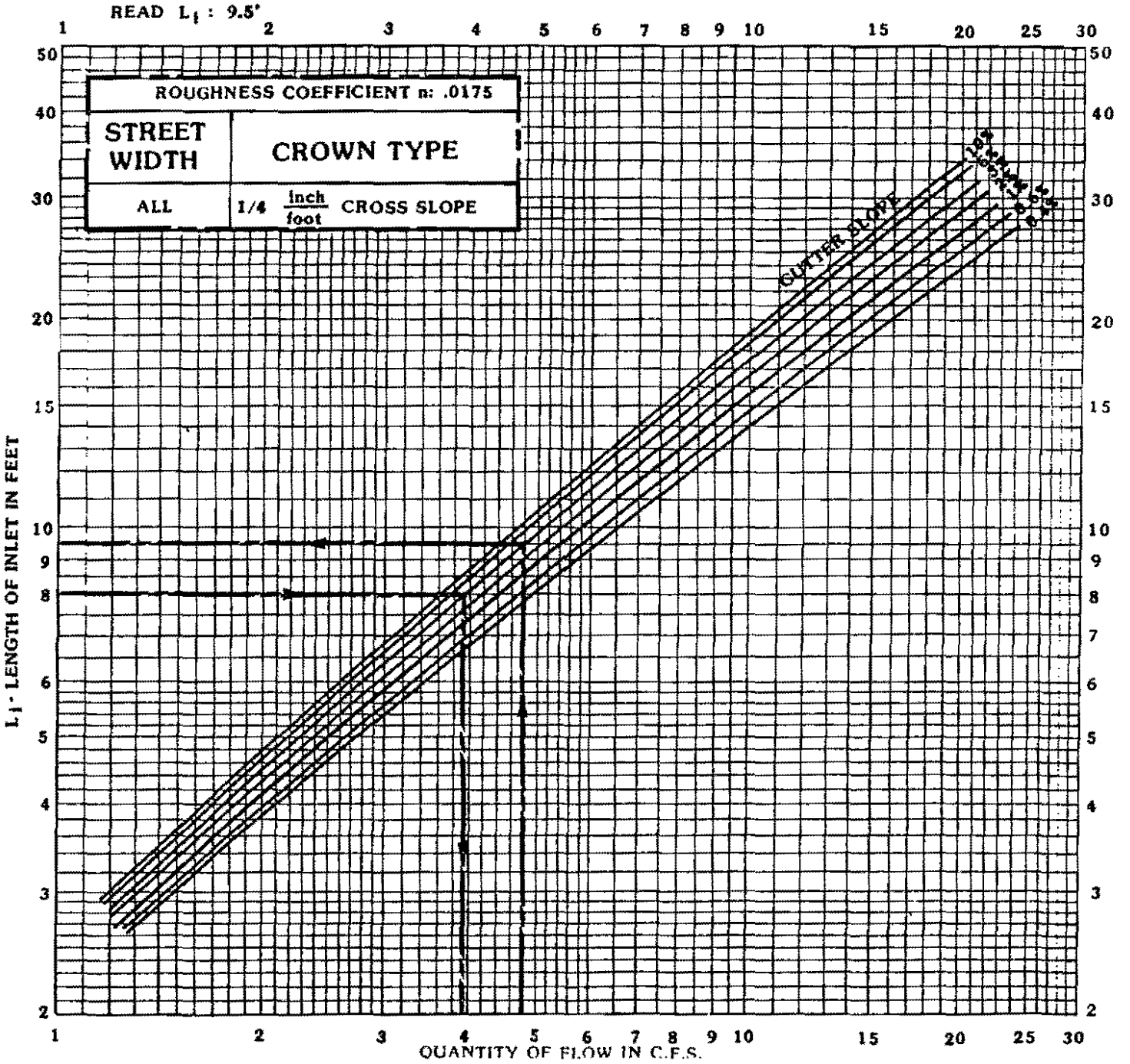
USE 8' INLET

ENTER GRAPH AT L_i : 8'

INTERSECT SLOPE: 3.0%

READ Q: 3.9 c.f.s.

REMAINING GUTTER FLOW: 4.8 c.f.s.-3.9 c.f.s.=0.9 c.f.s.



RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES ON GRADE

FIGURE 10

EXAMPLE

KNOWN:

PAVEMENT WIDTH : 40'

GUTTER SLOPE: 1.0%

6" PARABOLIC CROWN

GUTTER FLOW: 6.5 c.f.s.

FIND:

LENGTH OF INLET REQUIRED

SOLUTION:

ENTER GRAPH AT 6.5 c.f.s.

INTERSECT SLOPE: 1.0 %

READ L_I : 10'

DECISION:

1. USE 10' INLET

NO FLOW REMAINS IN GUTTER

2. USE 8' INLET

INTERCEPT ONLY PART OF FLOW

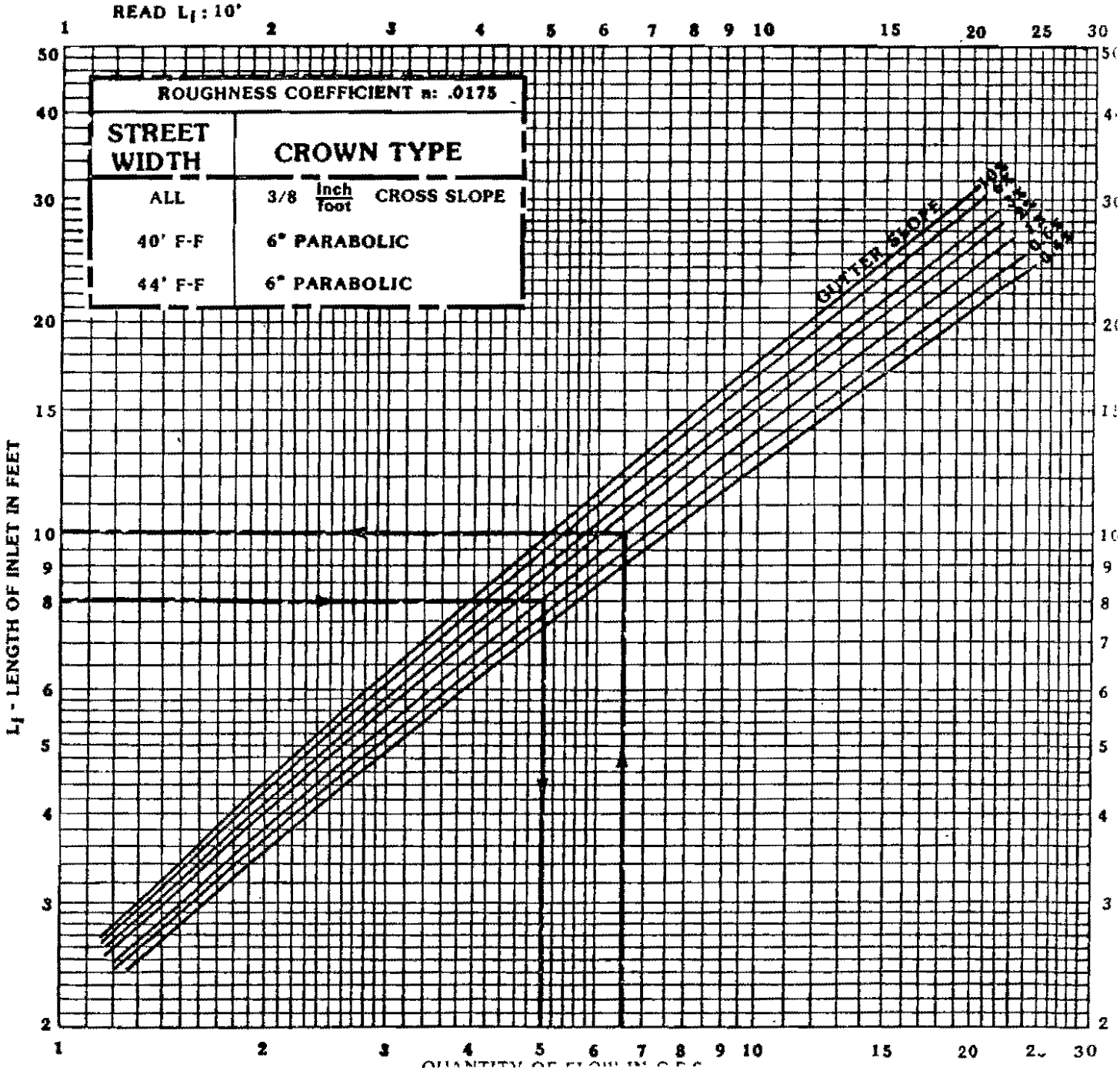
USE 8' INLET

ENTER GRAPH AT L_I : 8'

INTERSECT SLOPE: 1.0%

READ Q: 5.0 c.f.s.

REMAINING GUTTER FLOW: 6.5 c.f.s. - 5.0 cfs :1.5 c



RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES ON GRADE

FIGURE 11

EXAMPLE

KNOWN:

PAVEMENT WIDTH : 12'

ALLEY SLOPE: 0.4%

QUANTITY OF FLOW: 10.5 c.f.s.

FIND:

LENGTH OF INLET REQUIRED

SOLUTION:

ENTER GRAPH AT 10.5 c.f.s.

INTERSECT SLOPE: 0.4%

READ L_i : 13.0 ft.

DECISION:

1. USE 14' INLET

NO FLOW REMAINS IN GUTTER

2. USE 10' INLET

INTERCEPT ONLY PART OF FLOW

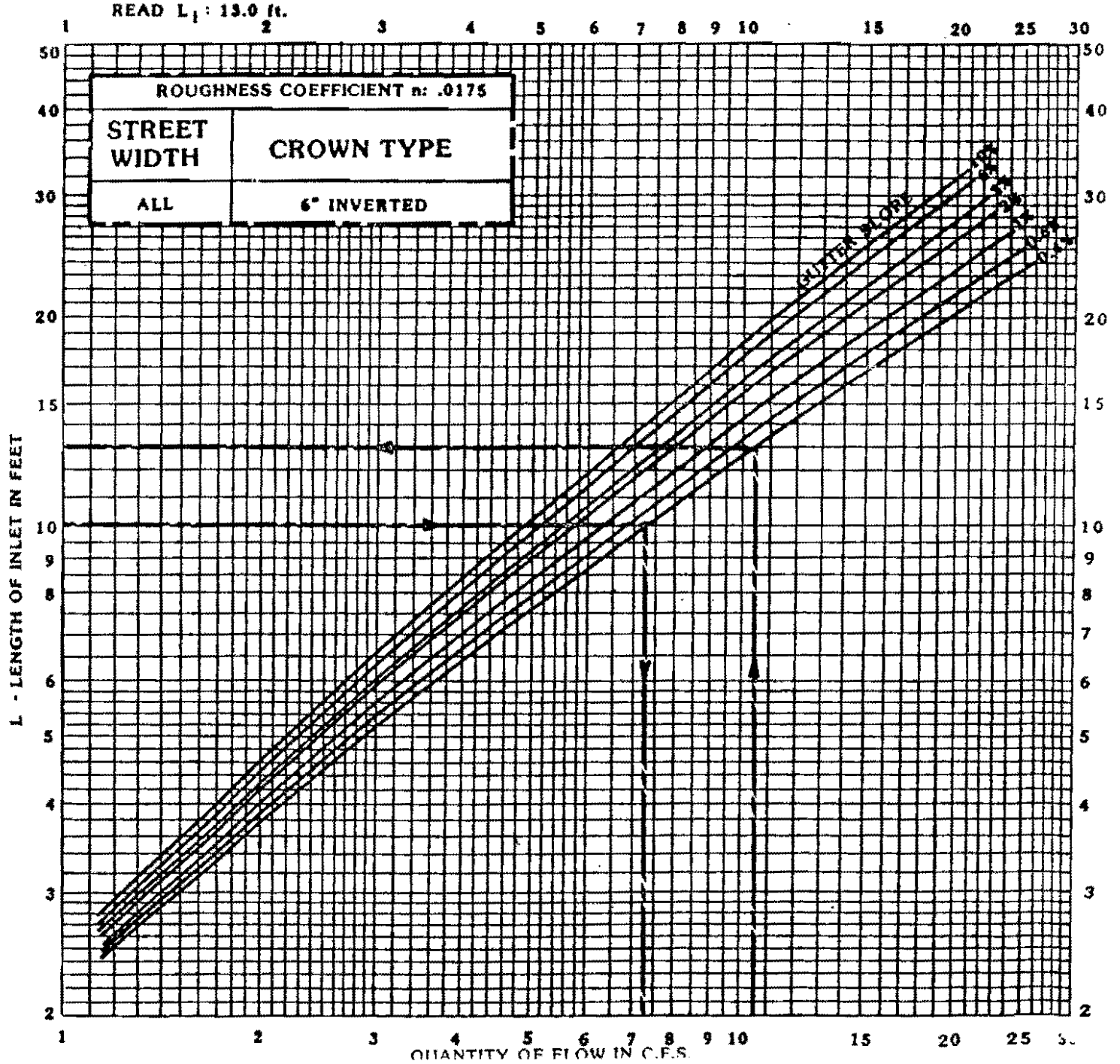
USE 10' INLET

ENTER GRAPH AT L_i : 10'

INTERSECT SLOPE: 0.4%

READ Q: 7.3 c.f.s.

REMAINING FLOW IN ALLEY : 10.5 c.f.s. - 7.3 c.f.s. : 3.2 c.f.s.



RECESSED AND STANDARD CURB OPENING INLET CAPACITY CURVES AT LOW POINT

FIGURE 12

EXAMPLE

KNOWN:

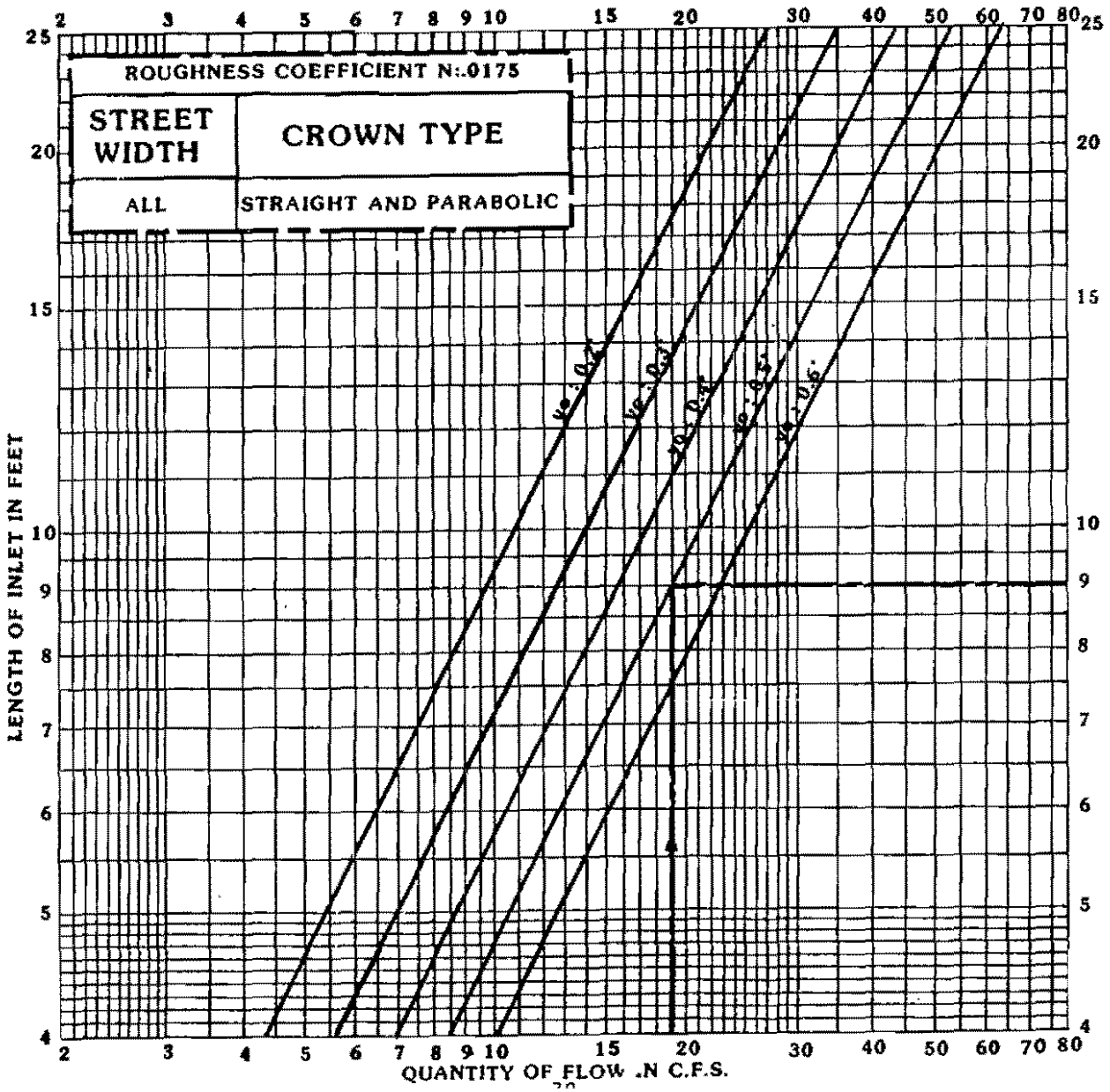
QUANITY OF FLOW: 19.0 c.f.s.
MAXIMUM DEPTH OF FLOW DESIRED IN GUTTER AT LOW POINT (y_o): 0.5'

FIND:

LENGTH OF INLET REQUIRED (L_i)

SOLUTION:

ENTER GRAPH AT 19 c.f.s.
INTERSECT y_o: 0.5'
READ L_i: 9.0'
USE 10' INLET



TWO GRATE COMBINATION INLET CAPACITY CURVES ON GRADE

FIGURE 13

EXAMPLE

KNOWN:

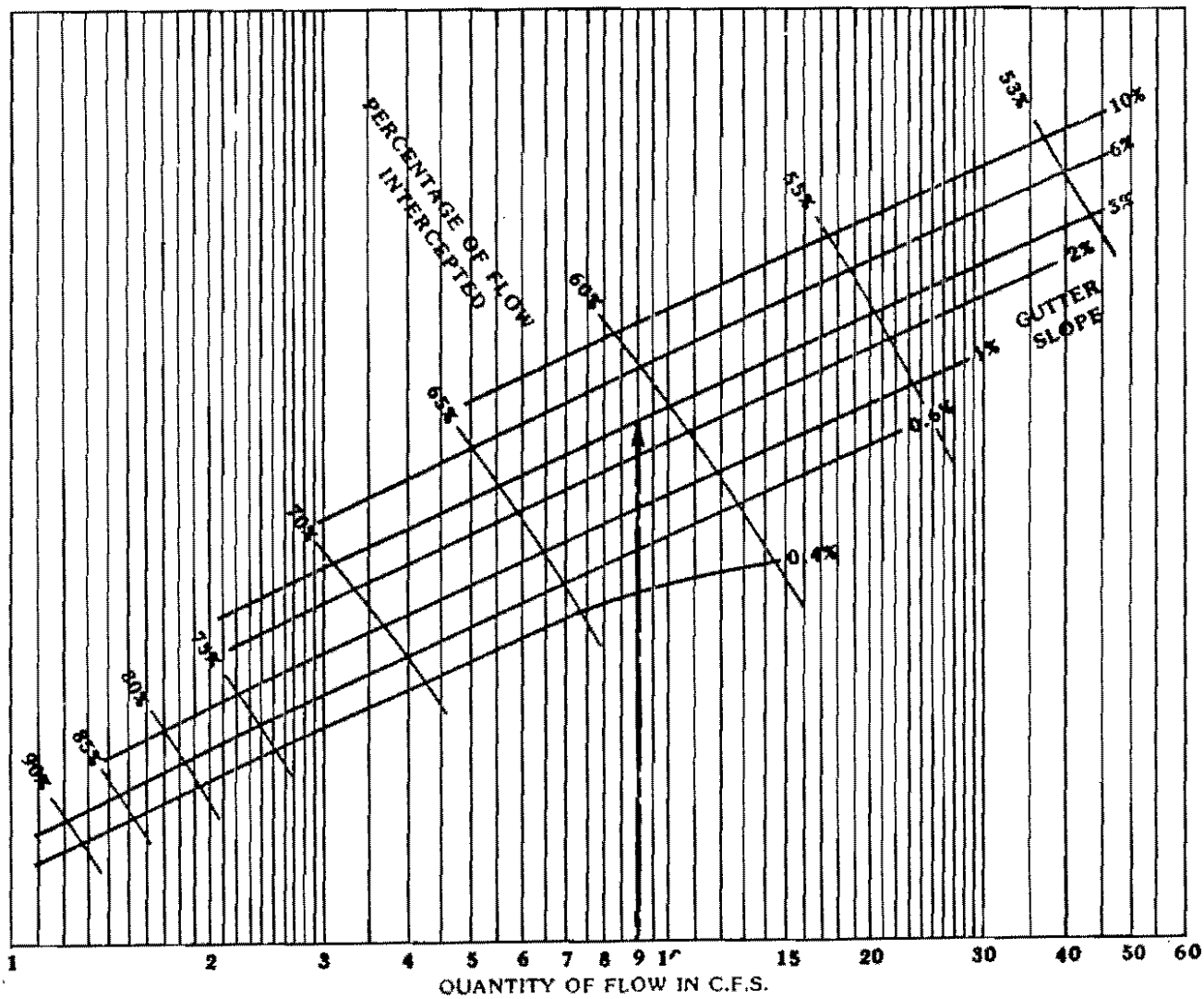
QUANITY OF FLOW: 9 c.f.s.
GUTTER SLOPE: 3.0%

FIND:

CAPACITY OF TWO GRATE COMBINATION INLET

SOLUTION:

ENTER GRAPH AT 9.0 c.f.s.
INTERSECT SLOPE: 3.0 %
READ PERCENT OF FLOW INTERCEPTED: 61%
61% OF 9.0 c.f.s. : 5.5 c.f.s.
AS CAPACITY OF TWO GRATE COMBINATION INLET
REMAINING GUTTER FLOW:
9.0 c.f.s. - 5.2 c.f.s. : 3.8 c.f.s.



THREE GRATE COMBINATION INLET
CAPACITY CURVES ON GRADE

FIGURE 14

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 15 c.f.s.

GUTTER SLOPE: 2.0 %

FIND:

CAPACITY OF THREE GRATE INLET

SOLUTION:

ENTER GRAPH AT 15 c.f.s.

INTERSECT SLOPE: 2.0 %

READ PERCENT OF FLOW

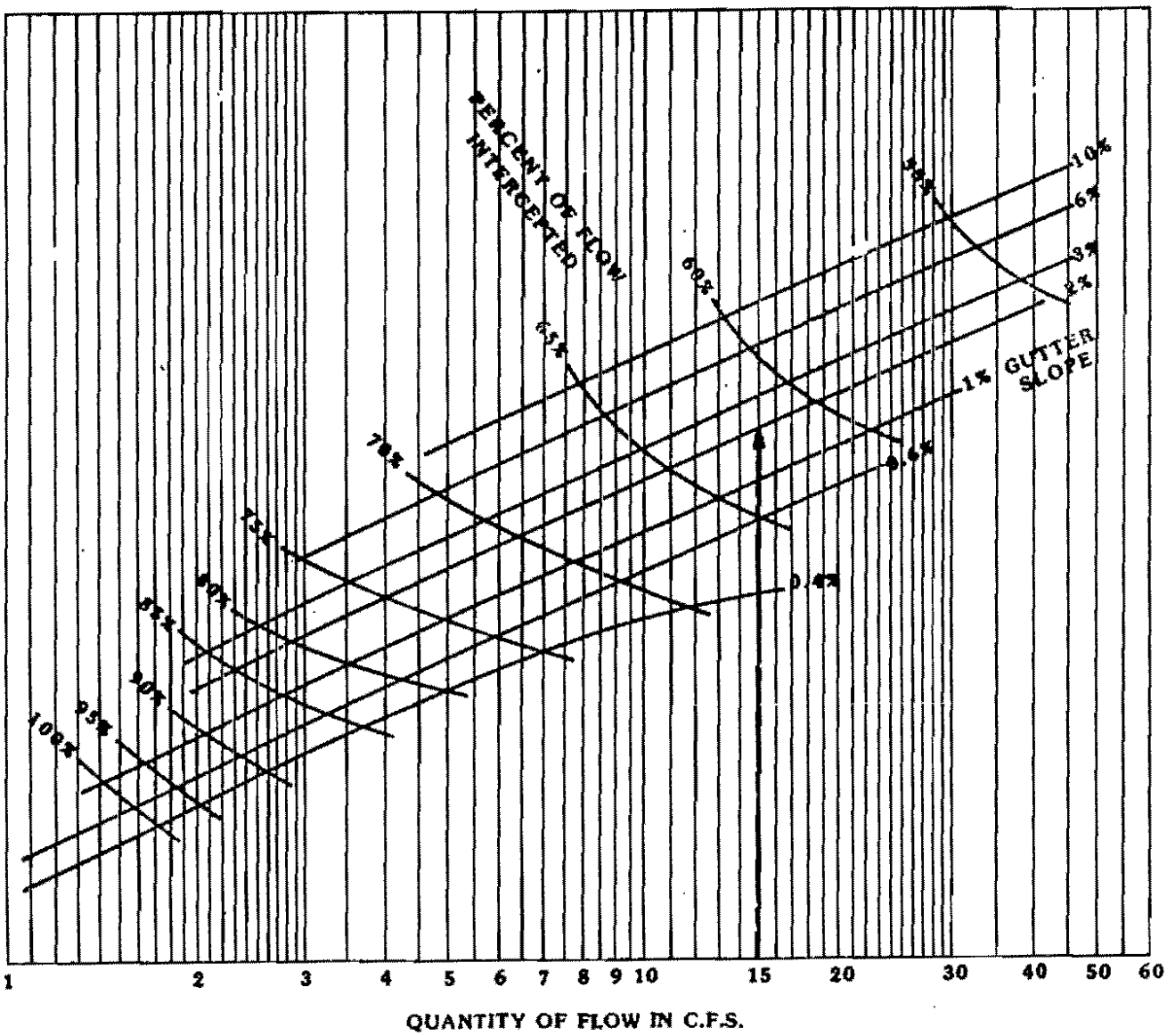
INTERCEPTED: 62%

62 % OF 15 c.f.s.: 9.3 c.f.s.

AS CAPACITY OF THREE GRATE INLET

REMAINING GUTTER FLOW:

15 c.f.s.-9.3 c.f.s. : 5.7 c.f.s.



FOUR GRATE COMBINATION INLET
CAPACITY CURVES
ON GRADE

FIGURE 15

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 12 c.f.s.

GUTTER SLOPE: 2.0 %

FIND:

CAPACITY OF FOUR GRATE COMBINATION INLET

SOLUTION:

ENTER GRAPH AT 12 c.f.s.

INTERSECT SLOPE: 2.0 %

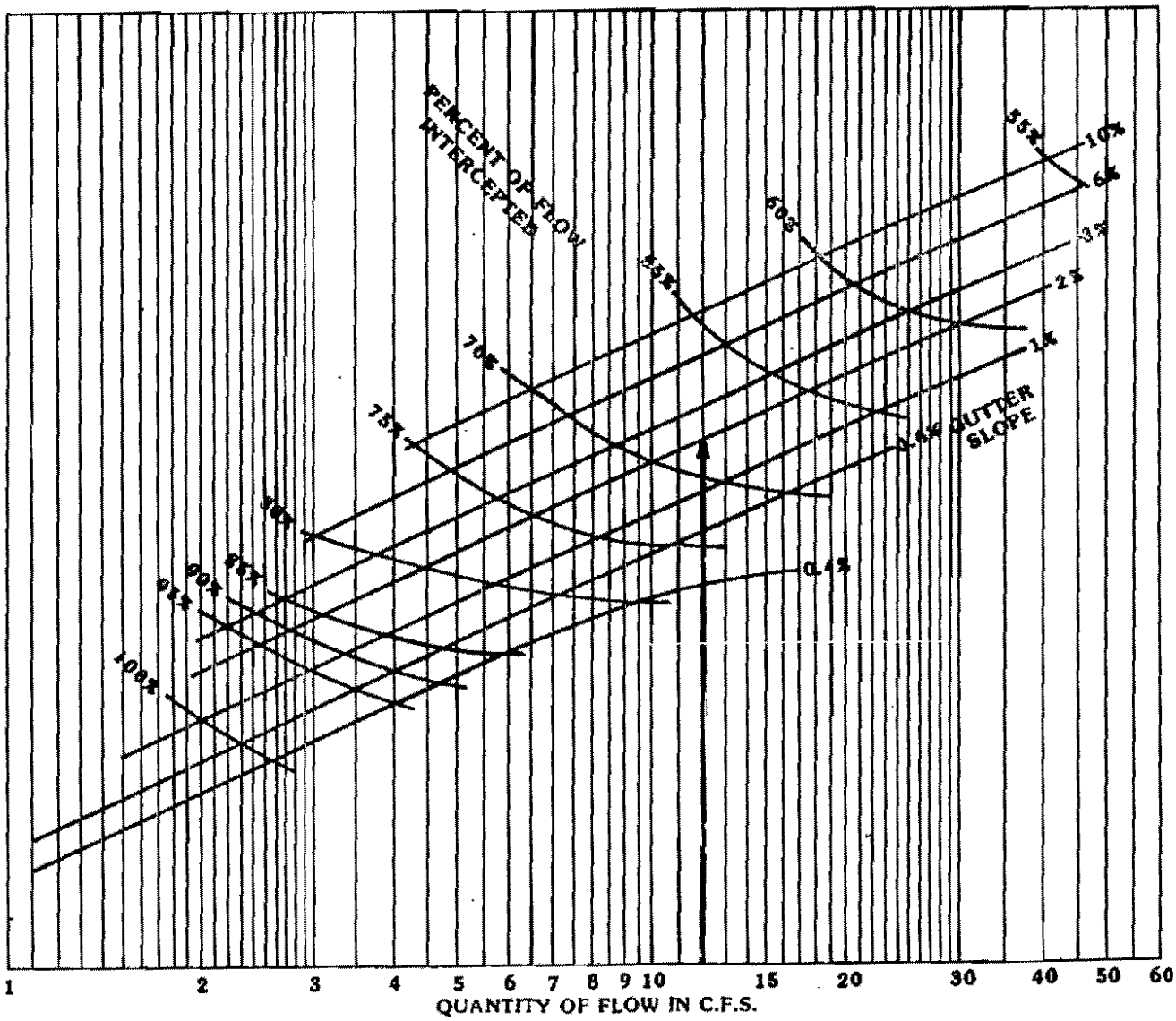
READ PERCENT OF FLOW INTERCEPTED: 68 %

68 % OF 12 c.f.s.: 8.2 c.f.s.

AS CAPACITY OF 4 GRATE COMBINATION INLET

REMAINING GUTTER FLOW:

12 c.f.s.-8.2 c.f.s. : 3.8 c.f.s.



COMBINATION INLET CAPACITY CURVES AT LOW POINT

FIGURE 16

EXAMPLE

KNOWN :

QUANTITY OF FLOW : 20.0 c.f.s.

MAXIMUM DEPTH OF FLOW DESIRED AT LOW POINT (yo) : 0.5'

FIND :

LENGTH OF INLET REQUIRED (LI)

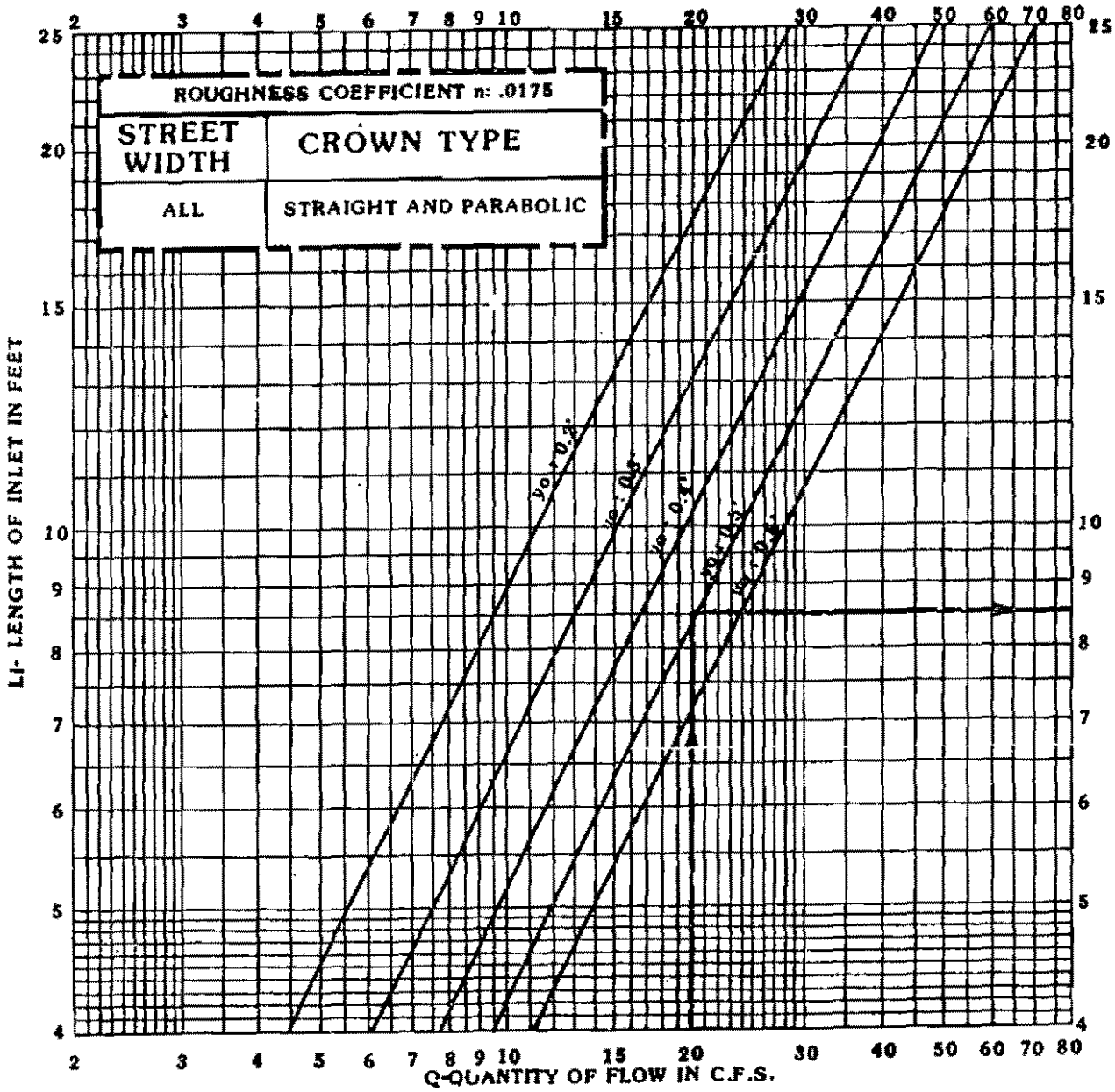
SOLUTION :

ENTER GRAPH AT 20.0 c.f.s.

INTERSECT yo : 0.5'

READ LI : 8.4

USE 10' INLET



TWO GRATE INLET CAPACITY CURVES ON GRADE

FIGURE 17

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 5.0 c.f.s.

GUTTER SLOPE: 0.6 %

FIND:

CAPACITY OF TWO GRATE INLET

SOLUTION:

ENTER GRAPH AT 5.0 c.f.s.

INTERSECT SLOPE: 0.6 %

READ PERCENT OF FLOW

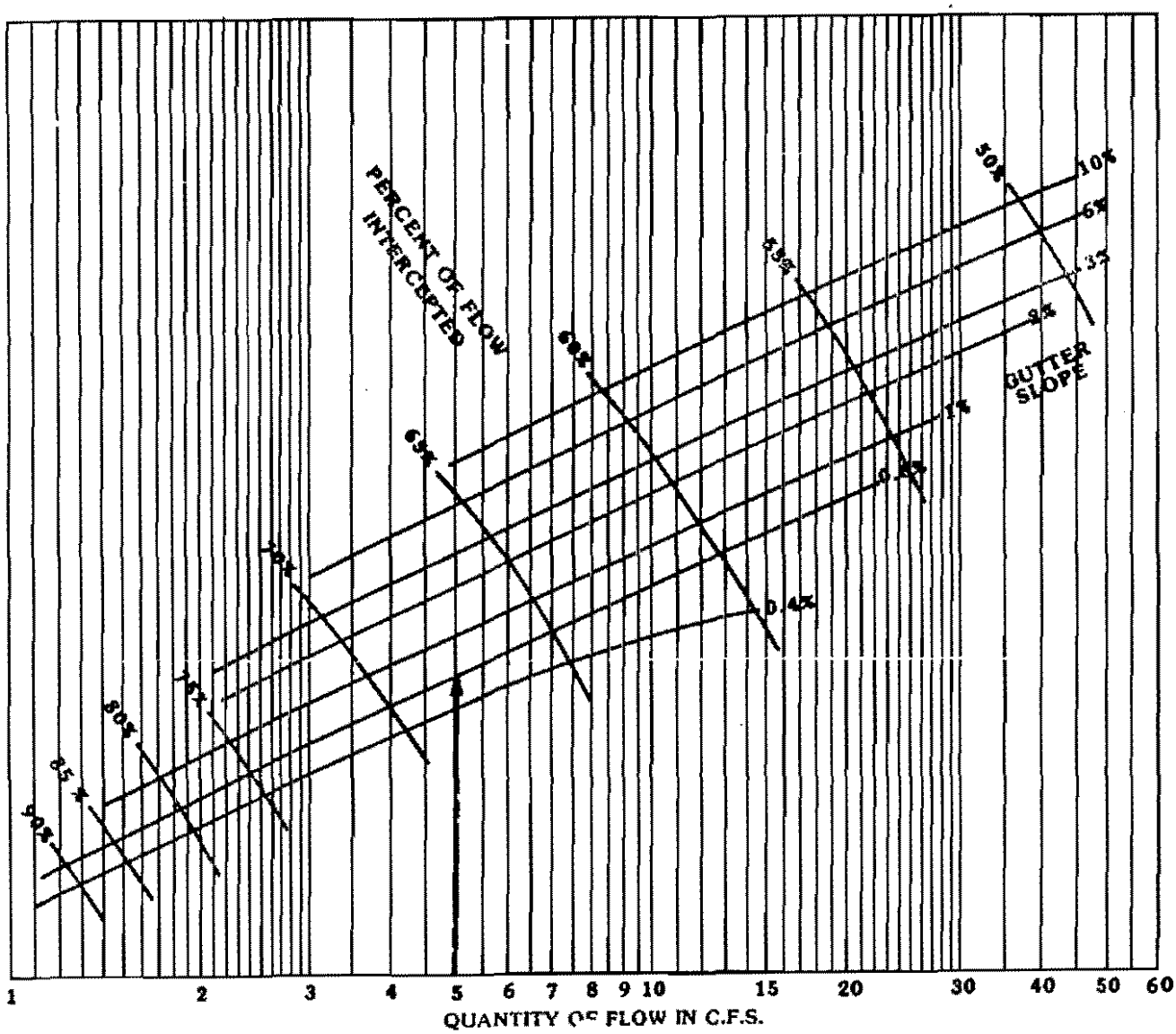
INTERCEPTED: 63%

63 % OF 5.0 c.f.s. : 3.2 c.f.s.

AS CAPACITY OF TWO GRATE INLET

REMAINING GUTTER FLOW:

5.0 c.f.s. -3.2 c.f.s. : 1.8 c.f.s.



FOUR GRATE INLET CAPACITY
CURVES ON GRADE

FIGURE 18

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 20 c.f.s.

GUTTER SLOPE: 1.0 %

FIND:

CAPACITY OF FOUR GRATE INLET

SOLUTION:

ENTER GRAPH AT 20 c.f.s.

INTERSECT SLOPE: 1.0 %

READ PERCENT OF FLOW

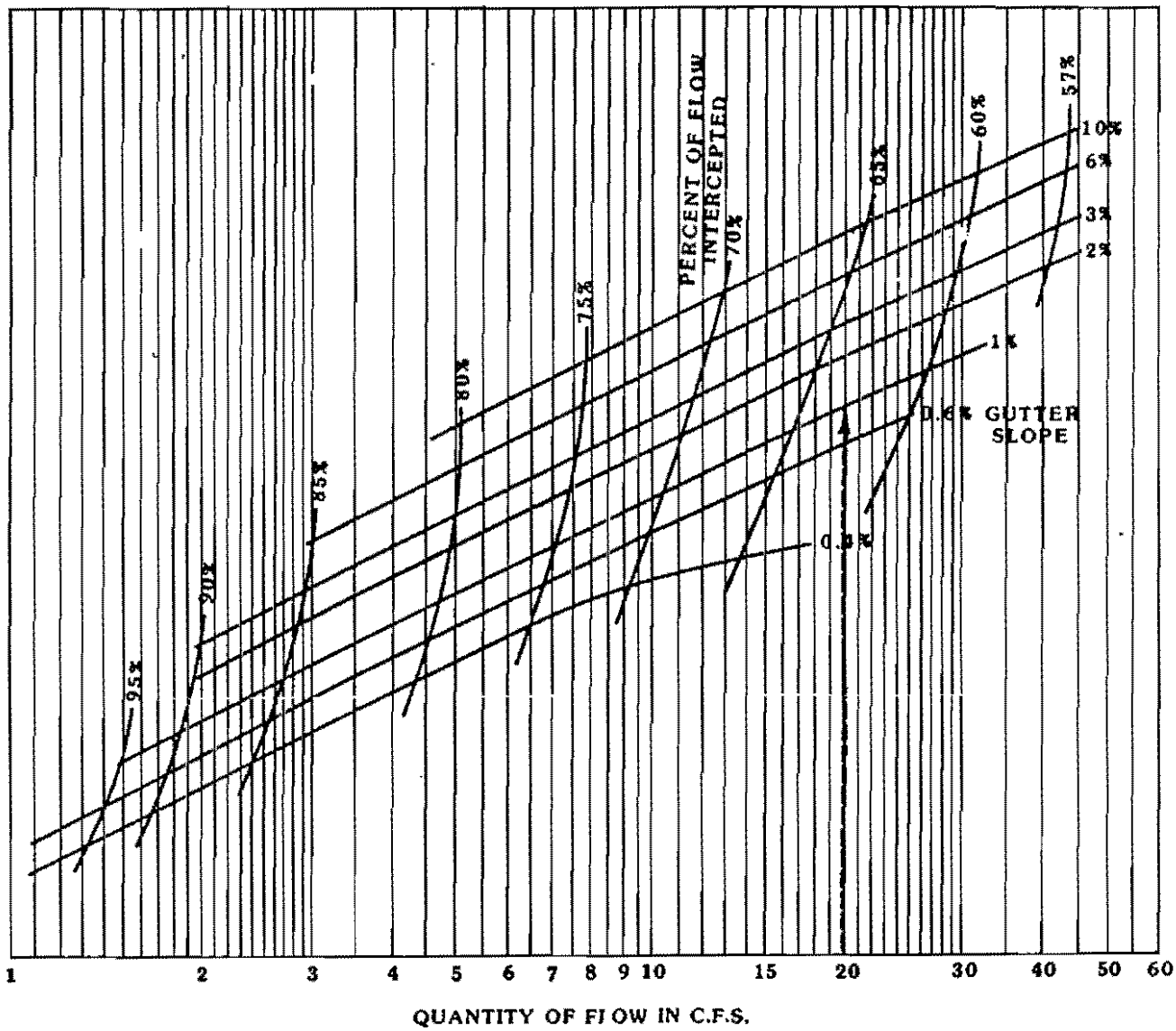
INTERCEPTED: 63 %

63 % OF 20 c.f.s.: 12.6 c.f.s.

AS CAPACITY OF FOUR GRATE INLET

REMAINING GUTTER FLOW:

20.0 c.f.s. − 12.6 c.f.s. = 7.4 c.f.s.



SIX GRATE INLET CAPACITY CURVES ON GRADE

FIGURE 19

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 4.0 c.f.s.

GUTTER SLOPE: 3.0 %

FIND:

CAPACITY OF SIX GRATE INLET

SOLUTION:

ENTER GRAPH AT 4.0 c.f.s.

INTERSECT SLOPE: 3.0 %

READ PERCENT OF FLOW

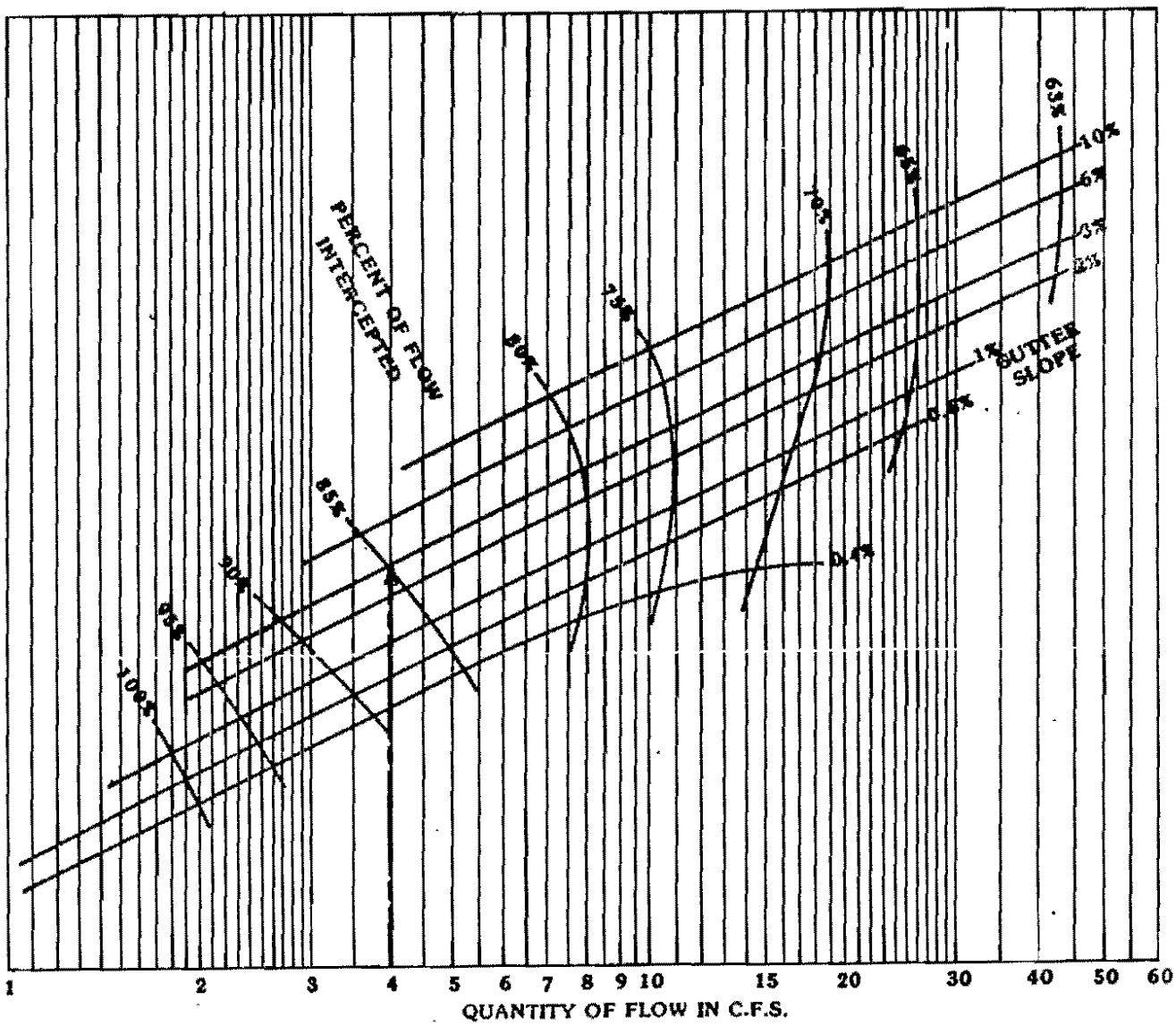
INTERCEPTED: 85%

85% OF 4.0 c.f.s.: 3.4 c.f.s.

AS CAPACITY OF SIX GRATE INLET

REMAINING GUTTER FLOW:

4.0 c.f.s. - 3.4 c.f.s. : 0.6 c.f.s.



GRATE INLET
CAPACITY CURVES AT LOW POINT

FIGURE 20

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 4.8 c.f.s.

MAXIMUM DEPTH OF FLOW DESIRED AT LOW POINT: 0.4'

FIND:

INLET REQUIRED

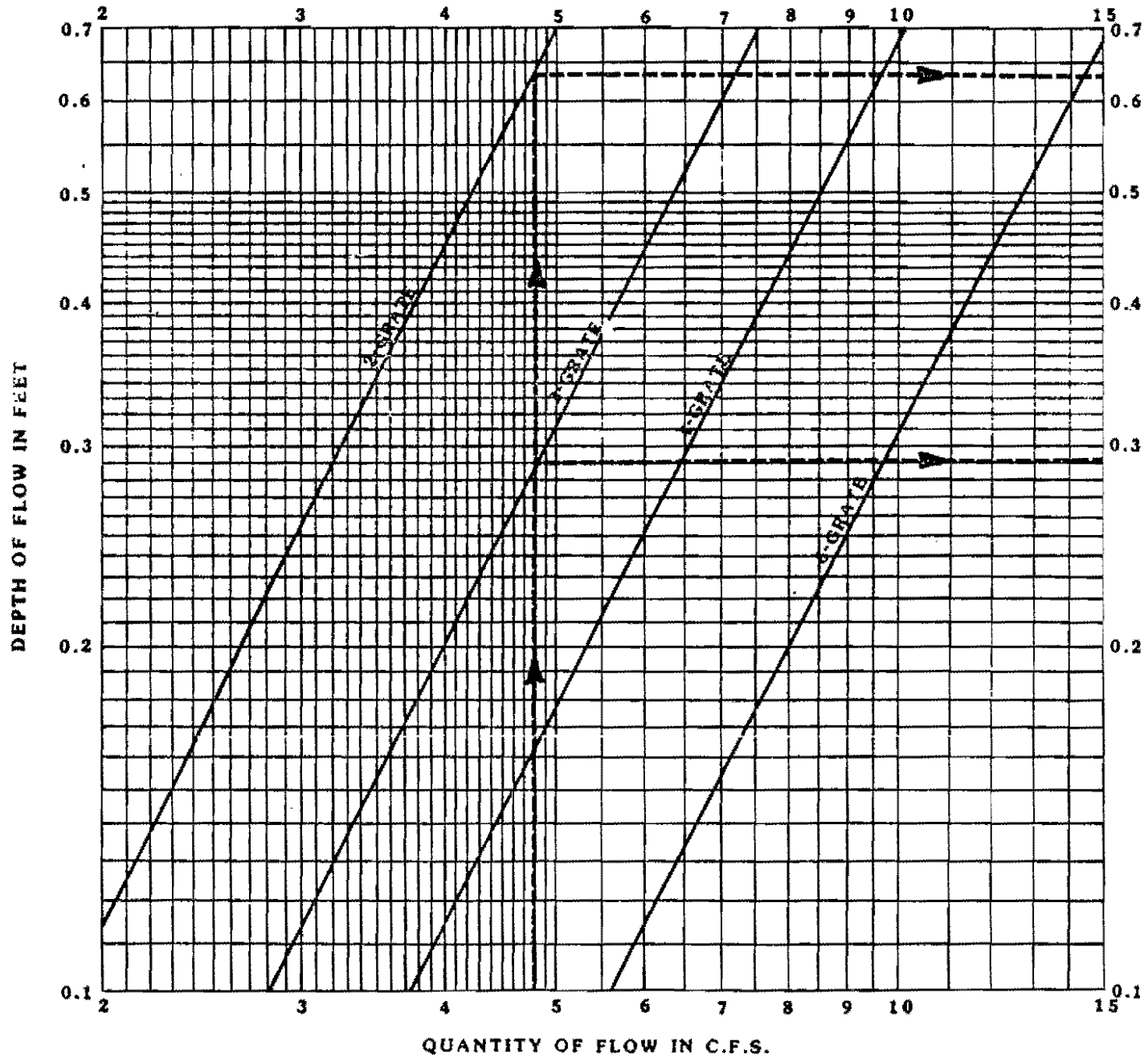
SOLUTION:

ENTER GRAPH AT 4.8 c.f.s.

INTERSECT 3 - GRATE AT 0.28'

INTERSECT 2 - GRATE AT 0.63'

USE 3 - GRATE



DROP INLET
CAPACITY CURVES AT LOW POINT

FIGURE 21

EXAMPLE

KNOWN:

QUANTITY OF FLOW: 12 c.f.s.

MAXIMUM DEPTH OF FLOW DESIRED (yo): 0.5'

FIND:

LENGTH OF INLET OPENING REQUIRED (L_i)

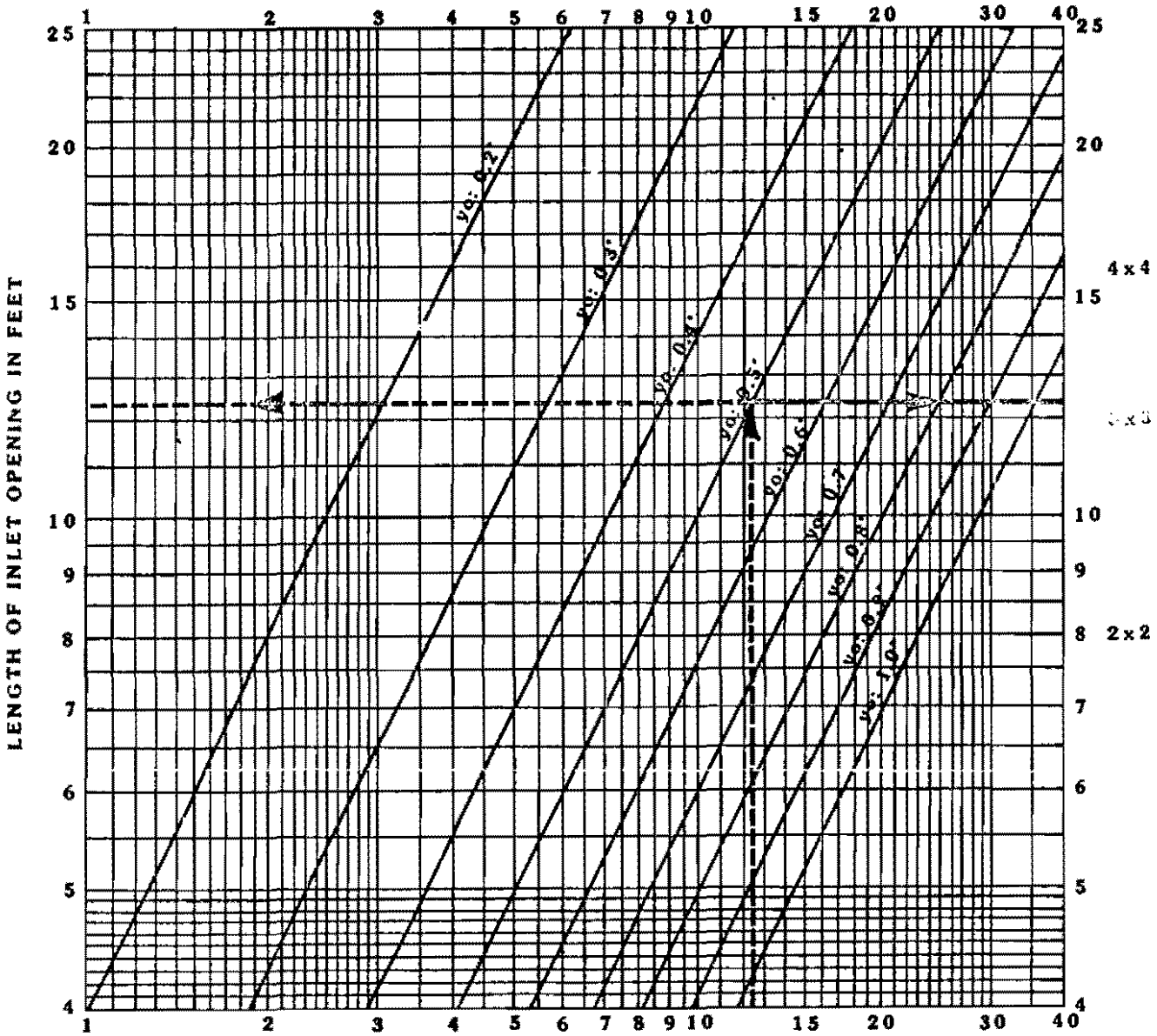
SOLUTION:

ENTER GRAPH AT 12 c.f.s.

INTERSECT yo: 0.5'

READ L_i: 12.3

USE 12.3 OF INLET 4x4



STANDARD DROP INLET SIZES: 2'x 2', Li:8' 3'x 3', Li:12' 4'x 4', Li:16'

CAPACITY OF CIR

PIPES FLOWING F

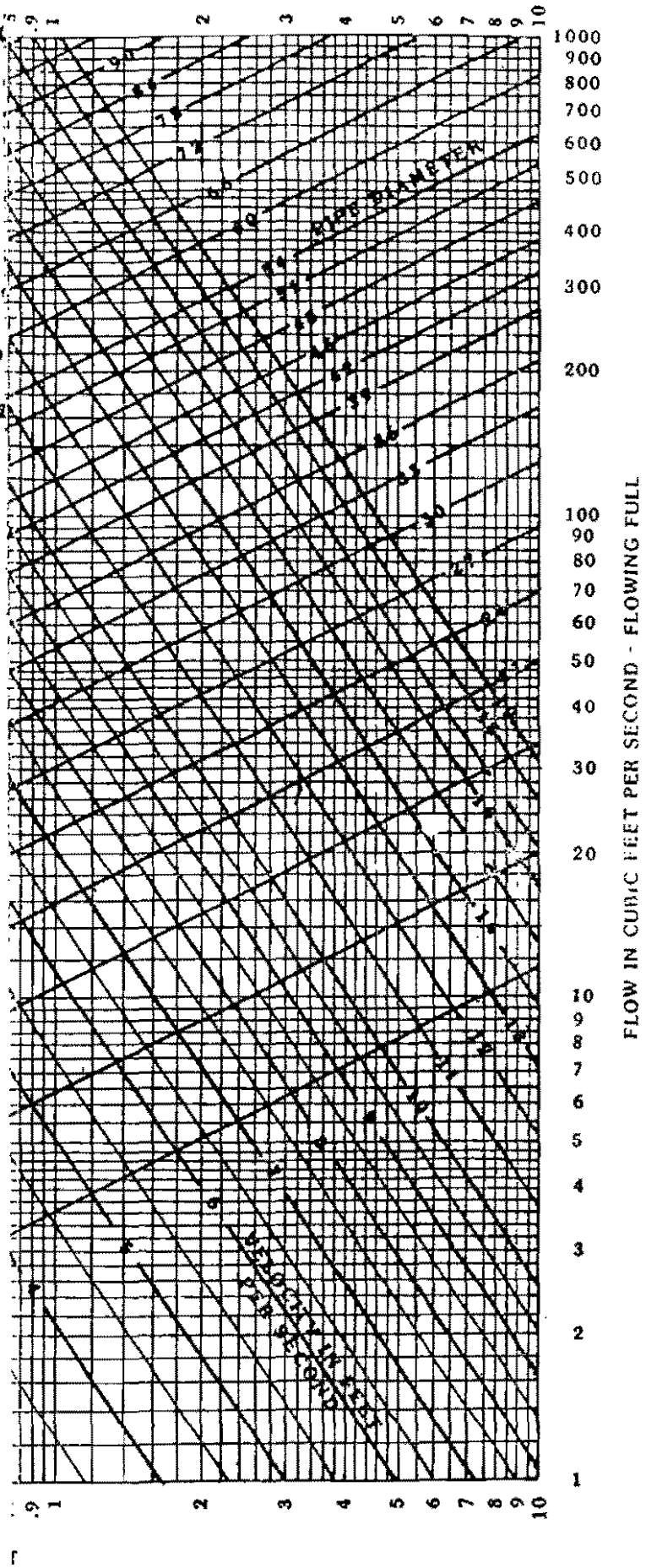
FIGURE 22

A GRAPHICAL SOLUTI
OF
MANNING'S EQUATIO

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

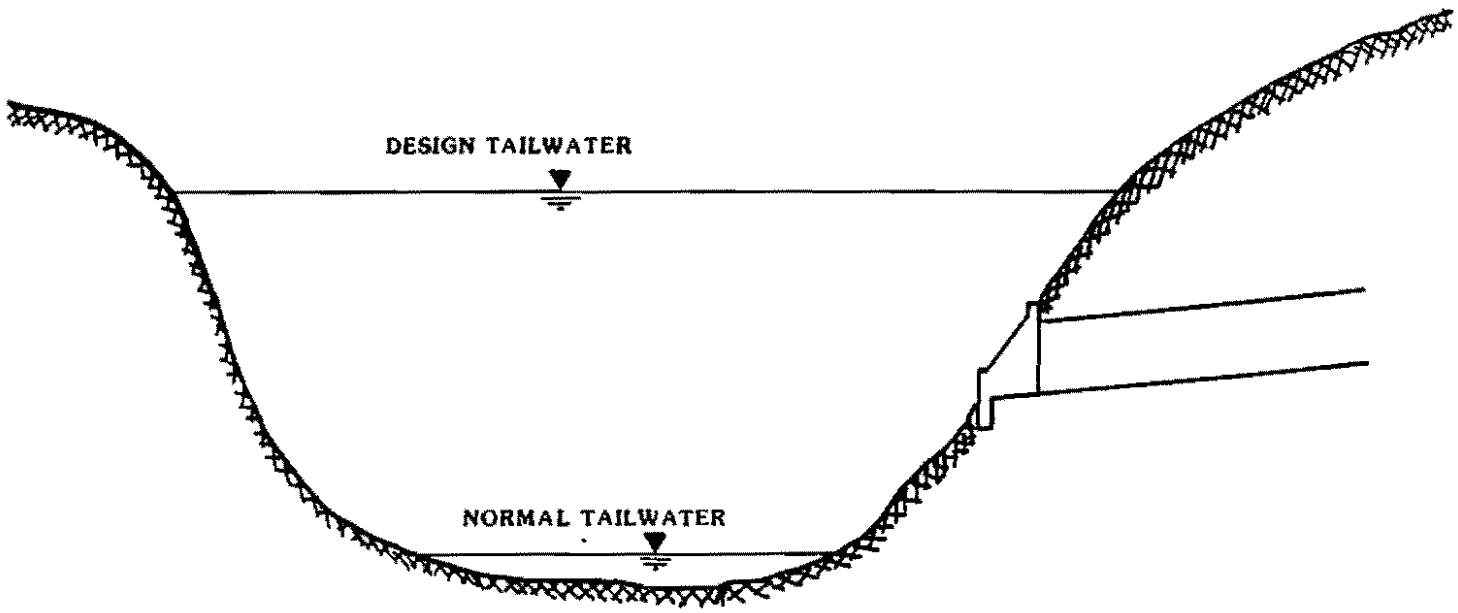
n : 0.013

Q : C.I.A. (C.F.S.)
C : COEFFICIENT
I : INTENSITY
A : AREA

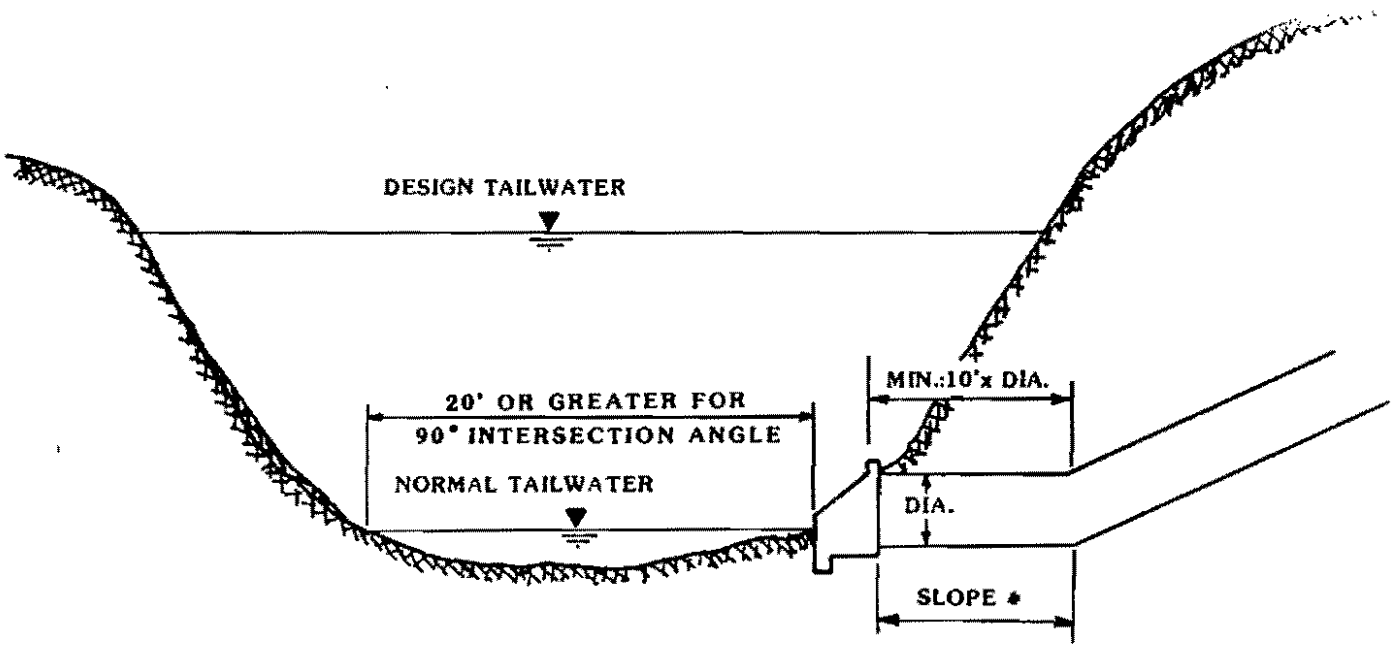


OUTFALL OF A STORM SEWER INTO A CHANNEL

FIGURE 23



(NOT ALLOWED)

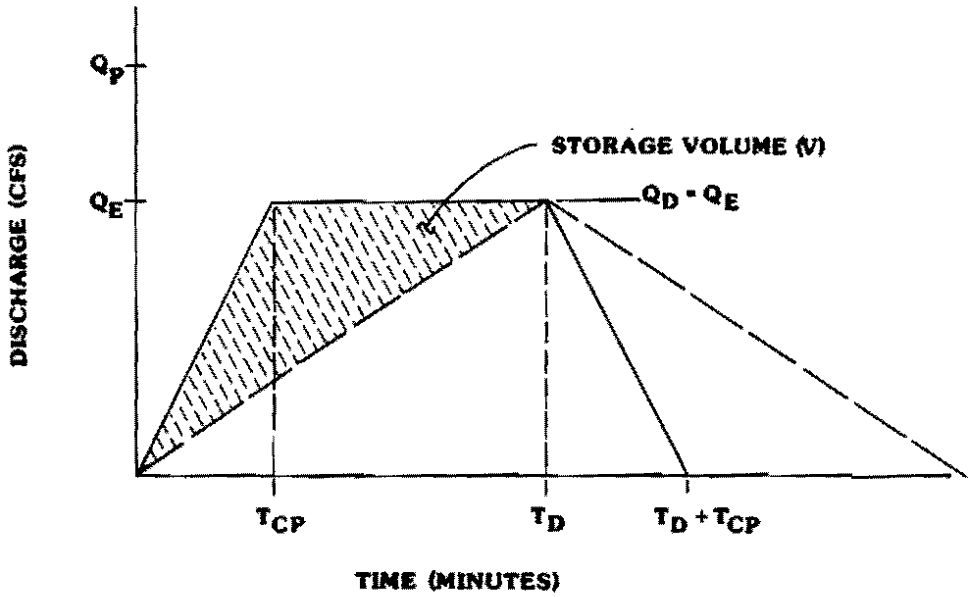


(ALLOWED)

* OUTFALL SLOPE SUCH THAT NONEROSIVE EXIT VELOCITIES WILL OCCUR.

FIGURE 24

Approximate Routing Method
for Watersheds < 160 Acres



$$V = \left(\frac{60}{43560}\right) \left[\left(Q_D \left[(T_D - T_{CP}) + (T_D + T_{CP})\right]/2 \right) - \left(Q_E \left[T_{CP} + T_D\right]/2\right) \right]$$

in acre-feet.

Where: Q_P - Peak discharge in cfs for developed watershed using storm duration equal to T_{CP}.

Q_E - Peak discharge in cfs for existing watershed, assuming full residential development and corresponding T_C.

Q_D - Peak discharge in cfs for developed watershed based on a storm duration that yields the existing discharge for C_P and A:

T_{CP} - Time of concentration in minutes for proposed development.

T_D - Storm duration in minutes corresponding to I_D.

I_D - Rainfall intensity (inches/hour) for a storm duration that produces Q_D and is calculated using the following formula:

$$I_D = \frac{Q_D}{(C_P\ A)}$$

Where:

C_P - Rational "C" for developed condition.

A - Drainage area in acres.

FIGURE 24, continued

Detention Basin Example:

Development Data:

Drainage Area = 160 acres
Residential C = 0.55
Residential T_{CR} = 15 minutes
Developed C_P = 0.70
Developed T_{CP} = 10 minutes

For the 100-year storm:

I_{RES} = 7.52 in/hour (from Figure 1)
I_P = 8.82 in/hour.

$Q_E = Q_D = 0.55\ (7.52)\ (160) = 662$ cfs

$Q_P = 0.70\ (8.82)\ (160) = 988$ cfs

$$I_D = \frac{Q_D}{(C_P\ A)} = \frac{662}{(.7)\ (160)} = 5.91 \text{ in/hour}$$

From Figure 1, for I_D = 5.91 in/hour,

T_D = 28 minutes

$$V = \left(\frac{60}{43,560}\right) [\ (\ 662\ [\ (28 - 10) + (28 + 10)\ ]\ /2\ ) - (662\ [28 + 10]\ /2\ )\ ]$$

$$V = \left(\frac{60}{43,560}\right) [\ (\ 662\ [56]\ /2) - 662\ [38]\ /2)\ ]$$

V = 8.21 acre-feet