Staff Report

STORM SEWER CONCERNS IN NORTHRIDGE PARKWAY SUBDIVISION

December 14, 2010

As was noted by Harry Hillaker, State Climatologist, in his Weather Summary Report of August 2010, "*The very wet weather pattern of June and July continued into the first two weeks of August. Central Iowa was hardest hit by rainfall with three consecutive nights of torrential rains on (August) 8th, 9th, and 10th. Ames had 9.61 inches. Record flooding impacted much of Story (County). This ranks as the second wettest summer among 138 years of records…second only to 1993*."

Following these events, record and near record flooding was experienced in Ames. In addition, extensive localized flash flooding was experienced across the community. One of the areas that went through flash flooding was Northridge Parkway Subdivision, most notably in the areas near and south of Valley View Road and Northridge Parkway. Several residents of this subdivision supplied information to City Council this October regarding their impressions of what transpired in August as well as some history following similar flash flooding that occurred in 1993. Staff was then directed "to brief City Council on the results of the meetings since 1994".

Following the 1993 precipitation and flooding events, staff was asked to develop various alternatives to upgrade the storm sewer system in this area to carry 100 year storm flows. Various combinations of detention and channel grading, as well as additional piping, were developed through interaction with the neighborhood. Alternatives were first presented to Council on **October 26, 1993**, and additional alternatives were presented again on **January 25, 1994**. At that time, these options ranged in estimated cost from $60,000 to $260,000. A motion was made "*to approve the Alternative #3 concept for storm sewer improvements in Northridge Subdivision, whereby partial detention is developed and a piping system is installed along County Road R-50 to Moore Park Pond.*" As stated in the motion, this alternative would have involved constructing only a portion of the planned detention areas in the rest of the subdivision, along with constructing intakes and pipes to carry the remainder of the 100 year flow. Following discussion, this motion failed 2-4. A motion was then made "*to direct Staff to recalculate design standards for the storm sewer systems to see if they met the five-year storm frequency plan; to provide corrective design standards if the five-year plan was not being met; to delay discussion of meeting other standards until the City Council established a design standard policy for Ames; and to make the recalculation information available to the Northridge Neighborhood Association*." This motion passed 6-0.

City staff and the firm Engineering Plus then independently analyzed the storm sewer system capacity and verified that the system met the 5 year storm design standard that was used at the time and is still the standard today. These calculations were provided to the neighborhood association. This was reported back to City Council on **April 26, 1994**, also noting that the City had not received any comments back from the neighborhood. A motion was made *"to accept the report on the design evaluation for Northridge Parkway Subdivision storm sewer and directing staff to include in low point drainage prioritizations."*

This motion passed 6-0. Priorities for the Residential Street Low Point Drainage Improvements program were then presented to Council on **September 13, 1994**. Subsequently, Northridge Parkway Subdivision was programmed for improvements in the 1995/96 fiscal year of the plan.

Following a meeting with the neighborhood, on **August 22, 1995** staff presented to City Council two alternatives for the Low Point Drainage project in Northridge Parkway Subdivision. One option was to install new intakes and pipe from Northridge Parkway to Moore Park pond, and the second included grading of additional storage and overland drainage between Northridge Parkway and Ridgetop Circle to Moore Park pond. Input received from five Northridge Parkway subdivision residents at the Council meeting can be generally summarized as follows:

- The neighbors feel the proposals offered by staff as solutions to the problem are too extreme. Perhaps we don't have to plan for a 100-year storm, and some compromise should be explored. Run-off should be diverted from the Moore Park parking lot to the pond without disturbing the homeowners' properties. A less dramatic detention basin should be constructed.
- The neighborhood association does not believe the surface water channelization option should be implemented; Staff should continue to study the problem and develop a solution based on the future development of Northridge and of the Taylor Farm (now Somerset).
- They do not want their backyards disrupted.
- The 48" sewer pipe, if installed properly and tied in to the current system, would be a feasible solution. However, as a taxpayer this citizen was concerned about the estimated cost of the 48" sewer pipe. He pointed out that the developers had made a commitment to help subsidize a program to correct the problem, yet no evidence of that commitment was reflected in the proposed alternatives.
- One resident felt the 48" sewer pipe would result in the same problems, and urged the City to tie development in the Taylor Farm (Somerset) to whatever solution is selected.

A motion was then made *"to direct Staff to explore other alternatives to solve the low point drainage problem in Northridge Subdivision, such as the diversion of water from the parking lot in Moore Park, increasing capacity of the Moore Park pond, and a detention area in the Taylor Farm area."* The motion passed 6-0.

Since that time, most of the Taylor Farm has developed as Somerset Subdivision. That area was developed with an overall grading and stormwater management plan that included a large storage facility (pond). That area drains towards Moore Park pond, and is designed to limit discharge from the subdivision. In the Moore Park area, small grading and stormwater quality improvements have been initiated.

Summary

As is evident from the attached information, this issue was considered by the City Council five times over a period of twenty-two months. After working with the residents throughout this process and developing a number of options to mitigate this storm water situation, no alternative was found to be acceptable to the residents or the City Council.

Item # 11
Date: August 22, 1995

COUNCIL ACTION FORM

SUBJECT: LOW POINT DRAINAGE PROGRAM - NORTHRIDGE PARKWAY SUBDIVISION IMPROVEMENTS.

BACKGROUND:

During heavy rainfalls, a number of locations across the community have become flooded at low points in City street grades. Council has directed Staff to implement a yearly Low Point Drainage program to deal with these problems. A yearly program budget of $100,000 is designated to come from General Obligation Bonds. The focus of this year's program is in Northridge Parkway Subdivision.

Intense rainfall events have caused excessive surface runoff in Northridge to collect in the low point on Northridge Parkway. In the past, this ponding water has caused private and public property damage as well as accessibility problems into and out of the subdivision.

At the Developer's request and with urging of the residents, City staff began developing alternatives to alleviate this problem in 1993. After numerous design sessions and public neighborhood meetings, the options have been narrowed to essentially three different courses of action.

48" Storm Sewer. This involves collecting the storm water in two double RA-8 intakes at the low point on Northridge Parkway. The water would be carried by a 48" RCP (storm pipe) east to R-50, then south to be outlet into Moore Memorial Park Pond. The advantage to this idea is that all of the water would be taken away underground. The major disadvantage is that no provisions are made to handle additional water if the flow is in excess of the intake and pipe capacities or if the intake and pipe becomes clogged. This would still result in short term low point flooding. The cost estimate for this alternative is $217,165.00. If constructed, this would be the first storm sewer pipe system with the City of Ames sized to carry the 100 year storm runoff.

Surface Water Channelization. A 6' walkway would be constructed or regraded from the Northridge Parkway low point, southerly and westerly through the open space to Moore Memorial Park Pond. A small stone retaining wall would be constructed at various locations along the proposed walkway. Construction would not take place on any of the private properties. Grading and landscaping work will take place along the entire route. At the July 11 meeting, Council was given packets containing Visual Imaging Photos of how the site would appear after improvements are completed. The walkway would be utilized to provide a positive storm water overland outlet, only when the existing sewer system cannot carry the flows. This solution would remain functional

independent of excessive rainfalls or limiting storm pipe capacities. It also provides a new paved biking and walking access to Moore Memorial Park Pond. Once water reaches Ridgetop Circle, it would tend to flow to the intakes at the low point east of the path. The disadvantage of this is that the water would have to pond approximately 11" before the walkway could again carry the water to Moore Memorial Park Pond. The ponded water would only slightly encroach on private property. The cost estimate for this alternative is $90,420.00. This includes purchasing a construction easement from the Homeowner's Association.

Do Nothing. These two previously mentioned solutions were presented to area residents at a public neighborhood meeting on July 13, 1995. This meeting was attended by Staff, the Developers, the Developers' Engineer, and property owners representing four or five of the directly affected lots. As an alternative to the construction projects, the residents at the meeting suggested that the City do nothing. The residents expressed desire that the City "stop harassing us" and "just leave us alone". They stated that they are aware of the problems extent and can live with this in lieu of construction taking place behind their lots. A few improvements to lessen the severity of the original situation are already in place. Four storm water detention ponds have been constructed by the developers in the northerly part of the drainage area to retard some of the flow reaching the low point on Northridge Parkway. This should help alleviate the accessibility and property damage problems during some storm events. Also, an entrance to George W. Carver Avenue has been constructed on Aspen Road which provides additional access into and out of the subdivision. Access and property damage were the major problems that made Northridge a top priority. The cost for this alternative is $0.00.

Other concerns and comments were expressed at the July 13 meeting, mostly involving the regraded walkway option. The property owners did not like the stone retaining wall aspect of the walkway. Comments about the wall included "it's a gouge", "it just looks ugly", and "it's not our caliber". Tree removal or relocation was an additional concern for the residents. They were also convinced that the regraded walkway "would only transfer the problem from one location to another". A general consensus was reached by the property owners present that, if a construction project is carried through, they strongly urge that the 48" storm sewer be the chosen option.

Staff is asking that Council review these alternatives and provide direction on which project should be developed further. Council will still have the usual process of review once the alternative to be developed is chosen. This review process includes establishing contract dates, the public hearing on the plans and specifications, and the award of contract.

MANAGER'S RECOMMENDED ACTION:

Since it is staff's responsibility to develop the most cost effective engineering solution to address the problem, the City Manager recommends that the City Council direct staff to pursue development of the surface water channelization alternative. This alternate will involve the purchase of easements from the Homeowners Association and a private owner. Construction is expected to be undertaken in the spring of 1996.

If Council does not wish to pursue the surface water channelization alternative, then it is recommended that the do nothing alternative is selected. The flooding situation has changed due to the further development of the area upstream of Northridge Parkway and it now appears that flooding to create property damage and isolation of the area is less likely. If the do nothing alternative is chosen, the next priority in the low point drainage program list would be examined yet this fiscal year.

COUNCIL ACTION:

Excerpt of minutes from the September 13, 1994, City Council meeting:

PRIORITIES FOR LOW POINT DRAINAGE: City Manager Steve Schainker noted Council had previously approved the criteria to evaluate low points in the street grade where stormwater flooding occurs. He said Staff's report was the result of applying those criteria to the problem areas, to determine priority rankings.

Public Works Director Paul Wiegand said a number of areas were studied, including those identified in the Capital Improvement Program. He reviewed the staff report, which listed the following seven criteria: 1) Value of property exposed to potential damage, 2) Emergency vehicle access, 3) Number of people affected, 4) Number of structures exposed to potential damage, 5) Street classification affected, 6) Land use of affected area, and 7) Benefits adjacent areas. He said some of the areas were not ranked, because if there was no structure involved, Potential Damage (Criteria #4) was not determined. He noted Northridge Parkway and Thackeray/College Creek areas received the highest priority rating, primarily because of the higher point totals in terms of number of people affected and number of structures affected. He said Staff will start developing projects to address concerns in the priority order, based on the budgeted funds available.

Coun. Hoffman noted the CIP allocated $100,000 per fiscal year for the construction work to alleviate these problems, and asked how long it might take to accomplish all the projects. There was discussion regarding how a number of alternatives might exist to solve each problem area.

Coun. Tedesco asked whether the 1300 block of Jefferson Project might move up in priority with the Bloomington Road project, and Mr. Wiegand said Staff intended to try to link associated projects.

Coun. Wirth asked how the number of structures involved was determined, and whether Staff had talked to the property owners. Mr. Wiegand described the process used by Staff.

Mr. Wiegand noted a correction to the Priority Rating as contained in the Council Action Form, citing 10 structures exposed in the Thackeray/College Creek area.

Coun. Wirth asked whether residents had been notified of this information. Mr. Wiegand said in areas where Staff had a neighborhood contact, the information was sent last week.

Helen Silverthorn, 1725 Burnett, said her home sustained structural damage from the storm last year and she felt more than 5 structures in that area had been involved as well. She said there was much drainage in the area from Meeker School.

Mr. Wiegand said the 1993 flood was not used as a design alternative because it was such an exceptional year. He said the 100-year water level was used to establish the criteria.

Annamae McLaughlin, 1813 Burnett, said she has been a resident there for 12 years, and this was not a one-time occurrence. She said there are 10 acres of property at Meeker School that

drain down into one drain. She said it was a major problem.

Linda Kelly, 1721 Burnett, said the problems occurred not just in one 300-year flood, but any time there was a major storm.

Glenn Bastiaans, 2506 Ridgetop, said the members of the Northridge Homeowners Association have been working with City staff for the past year, trying to clear up some of that area's flooding problems. He said he thought this was a step in the right direction.

Coun. Hoffman suggested the School District might take some steps to prevent the runoff into the neighborhood, as was the situation with the Sawyer School area earlier this year. Mr. Wiegand said contacts had been made with the School District earlier this spring, and said Staff would follow up on that contact. Coun. Wirth suggested the neighbors also write to the School District.

Coun. Campbell asked if there had been miscalculations on the number of properties affected on Burnett that would reprioritize that area. Coun. Wirth said perhaps Staff hadn't heard how often the problem recurred there, which would affect the equation used to determine its priority ranking. Mr. Wiegand explained the frequency multiplier used, and said a frequency of once every three years had been used in the Burnett area. He said Staff could recheck the numbers used the Burnett area, and Coun. Wirth requested they do so.

Item # 46
Date: September 13, 1994

COUNCIL ACTION FORM

SUBJECT: SUMMARY OF LOW POINT DRAINAGE STUDY

BACKGROUND:

During heavy rainfalls, a number of streets become flooded at low points in the street grade. In some areas, this flooding has extended onto private property and caused damage to that property.

The 1994/99 Capital Improvement Program allocates $100,000 per fiscal year for the next five years for construction work to alleviate these low point flooding problems. Council has adopted a rating system to prioritize the problem areas. Thirteen locations were analyzed for the initial low point drainage study. The results of this study have been summarized and a table of the priority ranking system has been created. Please note the attachment.

After acceptance of the summary, staff will further evaluate the highest priority locations in order of priority to come up with proposed solutions and cost estimates. As many areas will be addressed as the fiscal budget will allow.

ALTERNATIVES:

1. Accept the summary and priority rankings of the problem areas and direct staff to design solutions and develop cost estimates for the top priority locations.

2. Modify the priority rankings.

3. Reject the summary and priority rankings.

MANAGER'S RECOMMENDED ACTION:

It is the recommendation of the City Manager that the City Council accept the Summary of Low Point Drainage Study and the priority rankings and direct staff to further analyze the top priority areas in order to design solutions and develop cost estimates for these problem locations. The prioritized projects will then be included in the 1995/2000 Capital Improvement Plan.

COUNCIL ACTION:

SUMMARY OF 1994
LOW POINT DRAINAGE STUDY

Drainage problems occur at various locations in the community where stormwater ponds at low points in city streets during heavy rainfall. This happens when there is not adequate storm sewer capacity, overland outlet flow, or a combination of both to handle the excess surface runoff. A number of areas, including those identified in the Capital Improvement Program, were studied. Because all areas cannot be addressed during the 1994/95 budget year, the problem locations were evaluated according to the priority rating system established by the City Council.

The priority rating system consists of evaluating the problem locations according to seven categories and assigning points in each category.

1. **Potential Damage** - Any property which has been subject to structural or property damage because of flooding is considered in this category. The City Assessor's value of the property is used to assign monetary damage for each location.

2. **Emergency Vehicle Access** - The problem area was checked for flood waters prohibiting police, fire, or ambulance access to any location.

3. **Number of People Affected** - This represents the extent of people affected by the flooding in any manner. This could be by property damage, ponded water in front of the home, or persons who do not have access to and from their property. The number is arrived at by using the demographics of the area to come up with the population affected. A value of two to three persons per household is typical.

4. **Number of Structures Exposed** - Any structure which has its property line encroached by the stormwater is included in this category; including, but not limited to, those structures which have experienced damage in the past.

5. **Street Classification** - The street classification reflects the number of people affected by the fact that more motorists use an arterial than a local street.

6. **Land Use** - This represents the nature of the property use and the relative severity of damage which may be created by flooding. Recreation facilities and parks would be less affected by flooding than land used for schools or hospitals.

7. **Benefits to Adjacent Areas** - This category reflects whether improving the problem location will help open up adjacent areas for further growth and development. This item is viewed as having a lower importance than the other six categories.

Each of the identified low point flooding areas was analyzed using these seven criteria and assigned points according to the attached policy sheet. The points were then totalled and adjusted by using a multiplier which is based on the frequency that the flooding occurs in each area.

For the purpose of this initial year's study, only those areas which have experienced property damage were considered for the priority ranking. These areas were deemed most critical because of the fact that monetary damage has occurred.

A table listing each area along with its point total and priority ranking, if appropriate, is attached.

Each of the remaining areas will be considered for improvement funds with the following years' study. Any new low point flooding areas which are brought to the City's attention will be considered along with the previously identified areas.

9/94

Low Point Drainage Prioritization Policy

Locations where drainage has been a problem will be prioritized in accordance with the following assignment of points:

1. Value of property exposed to potential damage.

Damage	Points
$ 0 - $50,000	1
$ 50,001 - 100,000	2
$ 100,001 - 200,000	3
$ 200,001 - 500,000	4
> $ 500,000	5

2. Emergency vehicle access.

Access	Points
Possible to all structures	0
Impossible to one or more structures.	5

3. Number of people affected.

People	Points
0 - 8	1
9 - 15	2
16 - 25	3
26 - 40	4
>40	5

4. Number of structures exposed to potential damage.

Number of Structures	Points
0 - 1	1
2 - 3	2
4 - 6	3
7 - 10	4
> 10	5

5. Street Classification affected.

Street Class	Points
Local	1
Collector	3
Arterial	5

6. Land Use of affected area.

Use	Points
Undeveloped/agricultural	0
Recreation facilities/parks	1
Industrial	3
Commercial	3
Residential	4
Hospital, nursing homes, emergency services, day-care, schools	5

7. Benefits adjacent areas.

No specific benefits	0
Permits development	3

The points are totaled for the above categories and then a multiplier is applied based on the frequency of occurrence using once in five years as equal to a multiplier of one. The frequency will be determined by local observation, public maintenance records, and calculated capacity.

Frequency	Multiplier
More than 1 per year	2.0
Every year	1.8
Every 2 years	1.6
Every 3 years	1.4
Every 4 years	1.2
Every 5 years	1.0
Greater than 5 years	0.8

Low Point Drainage

Priority Rating

Target Area Description	Potential Damage		Emerg. Veh. Access		People Affected		Structures Exposed		Street Classification		Land Use		Benefit to Adj. Area		Sub-Total	Multiply	Total	Priority
	Amount	PT.	Yes/No	PT.	Number	PT.	Number	PT.	Class	PT.	Use	PT.	Yes/No	PT.				
Northridge Parkway	162,000	3	Yes	0	>40	5	>10	5	Collect	3	Res.	4	No	0	20	1.8	36	1
1700 Block Burnett	155,000	3	Yes	0	20	3	5	3	Local	1	Res	4	No	0	14	1.4	20	4
2000 Block Dull Avenue	105,000	3	Yes	0	9	2	3	2	Art	5	Res	4	No	0	16	1.6	26	3
Ash Avenue	122,000	3	Yes	0	16	3	5	3	Collect	3	Res	4	No	0	16	1	16	5
Quebec Street	83,000	2	Yes	0	15	2	6	3	Local	1	Res	4	No	0	12	1.2	15	7
1300 Block Jefferson	73,000	2	Yes	0	9	2	4	3	Local	1	Res	4	No	0	12	1.2	15	8
1500 Block Johnson	0	1	Yes	0	10	2	5	3	Local	1	Res	4	No	0	11			
800 Block Hunziker	0	1	Yes	0	22	3	>10	5	Local	1	Res	4	No	0	14			
Thackeray/ College Creek	98,000	2	No	5	>40	5	1	1	Collect	3	Res	4	No	0	20	1.4	28	2
Coolidge Drive(S)	0	1	Yes	0	20	3	8	4	Local	1	Res	4	No	0	13			
Westwood Drive	95,000	2	Yes	0	15	2	5	3	Local	1	Res	4	No	0	12	1.2	15	6
1400 Block Kellogg	0	1	Yes	0	20	3	8	4	Local	1	Res	4	No	0	13			
Coolidge Drive (N)	0	1	Yes	0	10	2	4	3	Local	1	Res	4	No	0	11			

Excerpt of minutes from the April 26, 1994, City Council meeting:

REPORT ON DESIGN EVALUATION FOR NORTHRIDGE PARKWAY SUBDIVISION STORM SEWER: Moved by Tedesco, seconded by Campbell to approve motion to accept report on design evaluation for Northridge Parkway Subdivision storm sewer and directing staff to include in low point drainage prioritizations.

Mr. Schainker asked the staff to re-look at the calculations regarding a five-year storm water runoff in Northridge Subdivision. It has been designed to meet that requirement. The Staff has shared that information with the Northridge residents and have not received any comments back from the neighborhood.

Paul Wiegand reports that individuals on the board looked at variables and responded that they did not see any problem with design.
Vote on Motion: 6-0. Motion declared carried unanimously.

LOW POINT DRAINAGE POLICY: Moved by Brown, seconded by Parks, to adopt RESOLUTION NO. 94-163 accepting proposed low point drainage policy and directing staff to apply policy to low point drainage areas.

Council Member Campbell inquired as to how criteria was arrived at. Is 1-4 a pecking order? Mr. Schainker stated there is a need to establish a standardized policy and shall rank them in the capital improvement plan to remedy problem areas.

Paul Wiegand stated there is no relationship to priorities; all have equal weights, except for No. 7. He did try to recognize the cause of the problems in drainage areas. There is concern that the interpretation of the list gives more credence to assessed properties of more value. Council Member Hoffman doesn't agree with criteria #1 (assessed property value). Council Member Campbell is concerned with message it might send. Council Member Hoffman feels #3 and #4 (number of people affected and number of structures exposed to damage) should be placed at a higher priority. Mayor Curtis feels it won't provide an imbalance on any projects. Considerable discussion was held on the weighing of assessed total dollars attached to property and evaluating points. Council Member Parks feels it's a fairly balanced approach. It was stated that the evaluation system could be changed after trying. Mr. Wiegand stated there is a multiplier representing the frequency of problem areas.
Roll Call Vote: 6-0. Resolution declared carried unanimously, signed by the Mayor, and hereby made a portion of these minutes.

COUNCIL ACTION FORM

Item # 34
Date: April 26, 1994

SUBJECT: Report on design evaluation for Northridge Parkway Subdivision storm sewer.

BACKGROUND:

During discussion of drainage problems along Northridge Parkway, the design frequency storm that the storm sewer system could carry was questioned. The standard policy is to have the underground storm sewer pipe system meet the requirements of a five-year design storm.

The storm sewer system design is undertaken by Engineering Division personnel after field survey information is provided by the Developer's engineer. No grading plans are required so assumptions have to be made by the individual doing the design. The design process packet is attached for review. Many items are taken into account during the design process which include:

- Areas of impervious development - streets, houses, driveways, etc.
- Areas of pervious development - lawns, open spaces, etc.
- Soil types
- General slope of the land
- Length of flow channel to point of collection into the storm sewer system
- Rainfall intensity
- Time of concentration of the runoff to a specific point
- Slope of the street serving the subarea
- Cross-slope or crown of the street
- Interception rate of the intake, which is dependent upon the flow coming to the intake, the longitudinal slope of the street, and the cross-slope of the street.

Using the above information and the design charts, the pipes are sized to carry the flow. The result of that design process created a storm sewer system that can carry 120 cubic feet per second (cfs). As a check to that process, the engineering staff completed an independent review of the design by utilizing another design method called the Rational Method. That review is attached.

As noted, the Rational Method is much less detailed and does not utilize as many of the real variables that affect stormwater runoff. It also provides a more conservative design

(more runoff) than the original design method. The Rational Method indicated that the pipe carrying capacity for the 5-year runoff should be 131 cfs. The difference between the two methods of design (120 vs 131) represents a 9.2% difference, which is well within the accuracy of the process.

The Public Works Department staff feels that the existing storm sewer system meets the established design standard of having sufficient carrying capacity for a 5-year runoff event. Copies of the original design and the design check were made available to the Northridge Homeowners Association in mid-February for their review. No comments have been received.

ALTERNATIVES:

1. Accept the report and direct staff to include the Northridge Parkway low point drainage situation with others for priority determination.

2. Accept the report and direct staff to develop a project to provide relief to the problem.

3. Reject the report.

MANAGER'S RECOMMENDED ACTION:

It is recommended by the City Manager that the City Council accept the report and direct staff to include the Northridge Parkway low point drainage problem in the priority determinations with other such locations.

COUNCIL ACTION:

CITY OF AMES

ENGINEERING DEPARTMENT

URBAN DRAINAGE STORM SEWER SIZING AND RETENTION POND DEVELOPMENT INCORPORATING STREET FLOW SPREADS AND INTAKE MODIFICATION POSSIBILITIES UTILIZING URBAN DRAINAGE SHORT COURSE MATERIAL ACCUMULATED FROM ARR(AUSTIN-RING-ROSSMILLER) SEMINAR RELATING TO SAME.

STEP BY STEP INSTRUCTIONS

TABLE ONE IN SUMP CONDITIONS SPLIT SUB-AREA

1 - SUBAREA. Designation of areas previously determined. Be sure to split sub-areas when in sump conditions.

2. - INTERCONNECTED AREAS. Area of streets in individual subareas.

3. - OTHER AREAS. Houses, drives, garages, etc. Take type of housing(patio home is 1900 sq. ft.), get percent of lot which is in subarea. This gives you Sq.ft. (convert to acres) for column 3.

4. - TOTAL. 2 and 3 added together.

5. - TOTAL AREA. Total area of each predetermined subarea.

6. - IMPERVIOUSNESS.(%). 4 divided by 5.

TABLE TWO

DRAINAGE COMPUTATIONS FROM BILLS FORM:(TABLE 2)

CN
98 x 0.32 = 31.36
61(1 - 0.32) = 61 x 0.68 = 41.48
31.36 + 41.48 = 72.84

CN = 72.84 (Call it 73)

$$\frac{S}{\frac{1000}{73}} - 10 = 13.7 - 10 = 3.70$$

S = 3.70

LAG (From Appendix P.34)

Find length at top of graph (310')
Come down to slope (3.50)
Go right to CN no. (73)
Go down to lag in hours

Lag = 0.08

$$\frac{TC}{\frac{60(0.08)}{0.6}}$$ or 60 divided by 0.6 = 100 x lag

I
From IDF chart for Des Moines(1903-1951) showing up to 24 hours.
(5 year storm for minor areas.)

TABLE THREE

SUBAREA
Previously designated on tables one and two.

C
From table 7, rational method runoff coefficients (Pro-rated)

i
Previously determined on table 2

A
Previously determined from table 1.

Q
Go back to old faithful formula, Q=CIA

TABLE FOUR

INTAKE NUMBER
As designated by designer during subarea assembly

SUBAREA
As previously designated

Q
From table 3

S_o
Street grade upstream from inlet

$Q/\sqrt{so}$
Q divided by square root of S_o

d(depth) & w(width)
Use conveyance curve for appropriate street width and crown.
Find $QV\overline{S}$ on bottom, go up to curve, then left for d and right for w.

Note; In sump conditions subareas should have been split for ease of computing.

TABLE FIVE
INTAKE NUMBER - Previously designated

Peak Q - From table 4

QB - Bypass from far right

QT - Q + QB

S_o - From table 4

d & w - From table 4 (recompute if you change intake type or size)

TABLE FIVE (CONTINUED)

S_x - $.35(d)2.67(\frac{V\sqrt{S_o}}{QT})$

$\frac{Qi}{Q}$ - City standard intake chart page IV - 7, top chart.

Qi

$\frac{Qi}{Q}$ column x Q_t column x 0.8 safety factor x 0.8 (If using std. intake) Last 0.8 reflects a type "D" intake being 4/5ths as big as one used on chart.

Q_B

$Q_T - Q_i$ (This gives you bypass that goes on to the next intake.

TABLE SIX

(1) - From drainage area & general layout plat and street plan/profile.

(2) - From table 5.

(3) - From plan/profile of streets.

(4) - Computed from (2) (5) and concrete pipe design manual.

(5) - Computed from top of curb elevations given at (1) and length at (3)

(6) - Computed from (5) and (7)

(7) - Computed from (4) and (5)

TABLE SEVEN

STRUCTURE - Structure number as previously determined.

TYPE - Type(Intake, manhole, etc.) from table 6.

SIZE(in.) - From table 6.

Q (CFS) - From table 6

A(Sq.ft.) - From table 6.

V(FPS) - From table 6.

K - From conveyance factor table(figure G-612)

S_F - $\left(\frac{Q}{K}\right)^2$ from this table

L - From table 6.

H_F - $(S_F)(L)$, from this table.

TABLE EIGHT

① - From table 7

② - From table 7

③,④,⑤,⑧&⑨ - Explained in footnotes.

⑥ - From table 6

⑦ - From table 7

⑩ - ⑫+⑪

⑪ - $\frac{⑥}{64.4}$

⑫ - ⑩-⑪

⑬&⑭ - Established at outlet structure

EXAMPLE OF PRORATING "C" FOR TABLE THREE

CALCULATIONS OF "C" FOR SUBAREAS S - GG(SANDY SOIL) IN STONE BROOKE SUBD.

SUBAREA		C
S -	75% @ 0.12, 25% @ 0.80 =	0.29
T -	75% @ 0.17, 25% @ 0.80 =	0.33
U -	90% @ 0.12, 10% @ 0.80 =	0.19
V -	20% @ 0.17, 80% @ 0.80 =	0.67
W -	90% @ 0.17, 10% @ 0.80 =	0.23
X -	95% @ 0.12, 05% @ 0.80 =	0.15
Y -	50% @ 0.17, 50% @ 0.80 =	0.48
AA -	50% @ 0.07, 50% @ 0.80 =	0.43
BB -	80% @ 0.17, 20% @ 0.80 =	0.30
CC -	50% @ 0.07, 50% @ 0.80 =	0.43
DD -	85% @ 0.17, 15% @ 0.80 =	0.26
EE -	90% @ 0.12, 10% @ 0.80 =	0.19
FF -	75% @ 0.12, 25% @ 0.80 =	0.29
GG -	25% @ 0.07, 75% @ 0.80 =	0.62

PRO-RATED "C" ON TABLE THREE FOR AREAS IN SUMP CONDITION

X -	60% @ 0.12, 40% @ 0.80 =	0.39
X_1 -	50% @ 0.12, 50% @ 0.80 =	0.40
Y -	50% @ 0.17, 50% @ 0.80 =	0.49
Y_1 -	50% @ 0.17, 50% @ 0.80 =	0.49
AA -	50% @ 0.07, 50% @ 0.80 =	0.44
AA_1 -	50% @ 0.07, 50% @ 0.80 =	0.44
BB -	50% @ 0.07, 50% @ 0.80 =	0.44
BB_1 -	25% @ 0.17, 75% @ 0.80 =	0.64

PROJECT ______________

TABLE I
IMPERVIOUS AND TOTAL AREA OF EACH SUBAREA

SHEET ____ OF ____
BY ____________
DATE. ____________

SUBAREA	IMPERVIOUS AREA			TOTAL AREA (ACRES)	IMPERVIOUSNESS (%)
	INTERCONNECTED (ACRES)	OTHER (ACRES)	TOTAL (ACRES)		
TOTAL					

PROJECT _____

TABLE 2
RAINFALL INTENSITY AVERAGING TIME AND RAINFALL INTENSITY
(SCS METHOD)

SHEET ____ OF ____
BY _____
DATE _____

SUBAREA	L feet	Y %	① IMP %	HLM %	② CN	③ S	④ LAG hours	⑤ F_{IMP}	F_{HLM}	⑥ T_C minutes	⑦ i in/hour

L = HYDRAULIC LENGTH OF WATERSHED
Y = AVERAGE WATERSHED LAND SLOPE.
HLM = HYDRAULIC LENGTH MODIFIED (PERCENTAGE OF MAIN CHANNEL THAT HAS BEEN HYDRAULICALLY IMPROVED.
CN = SCS CURVE NUMBER.
S = SOIL RETENTION FACTOR.
LAG = BASIN LAG IN HOURS.
F_{IMP} = LAG ADJUSTMENT FACTOR WHEN IMPERVIOUS AREAS OCCUR IN WATERSHED.
F_{HLM} = LAG ADJUSTMENT FACTOR WHEN MAIN CHANNEL HAS BEEN IMPROVED.

① FROM TABLE 1
② CN = 98 (IMP) + X (1 - IMP), WHERE 'X' IS A DIMENSIONLESS INTEGER THAT VARIES WITH THE SCS HYD. SOIL GROUP AS FOLLOWS: A-39 / B-61 / C-74 / D-80
③ $S = \left(\frac{1000}{CN}\right) - 10$
④ FROM CHART 1
⑤ FROM "ADJUSTMENTS TO CHART 1"
⑥ $T_C = \frac{60\,(LAG)}{0.6} \times F_{IMP} \times F_{HLM}$
⑦ FROM CHART 2.

PROJECT ____________
SHEET ______ OF ______
BY ____________
DATE ____________

TABLE 3
PEAK DISCHARGE RATE

SUBAREA	① C	② I (IN/HOUR)	③ A (ACRES)	PEAK Q (CFS)

① FROM CHART 3
② FROM TABLE 2
③ FROM TABLE 1

TABLE 4
DEPTH OF FLOW AND WIDTH OF SPREAD FOR PEAK INFLOW RATES

INTAKE NO.	SUBAREA	① (CFS)	② So (%)	$Q/\sqrt{So}$	CALCULATED ③ d (FT)	CALCULATED ④ W (FT)

① FROM TABLE 3
② FROM PROFILE
③ & ④ FROM CHART 4

d = DEPTH OF FLOW AT CURB
W = WIDTH OF STORM WATER SPREAD
So = LONGITUDINAL SLOPE IN FT. PER FT.

PROJECT_____

TABLE 5
INTAKE CAPACITY AND BYPASS FLOW

SHEET_____ OF_____
BY_____
DATE_____

INTAKE NO.	① PEAK Q (CFS)	Q_{BA} (CFS)	② Q_T (CFS)	③ S_o (%)	④ d (FT)	⑤ W (FT)	⑥ S_x	⑦ $\frac{Q_i}{Q}$	⑧ Q_i (CFS)	⑨ Q_B (CFS)

Q_{BA} = BYPASS FLOW FROM INTAKE HYDRAULICALLY ABOVE.
Q_T = TOTAL FLOW APPROACHING INTAKE IN STREET.
S_X = EQUIVALENT CROSS SLOPE
Q_i = FLOW INTERCEPTED BY THIS INTAKE

① FROM TABLE 3
② COL. 1 − Q_{BA}
③④&⑤ FROM TABLE 4

⑥ $S_x = \frac{0.56\, d^{2.67}\sqrt{S_o}}{Q n}$

⑦ FROM CHART 5
⑧ COL. 7 X COL. 2 X CLOGGING FACTOR X LENGTH ADJ FACTOR

⑨ COL. 2 − COL. 8

PROJECT ______________________

SHEET ____ OF ____

BY ______________

DATE ______________

TABLE 6
PIPE SIZING

① MANHOLE OR INTAKE NO. AND TOP OF CURB ELEV.						② Q_i (CFS) FROM TABLE 5		③ LENGTH OF PIPE	④ PIPE		⑤ SLOPE (%)	⑥ V FT/SEC.	⑦ CAP (CFS)
FROM	T.C.	TYPE	TO	T.C.	TYPE	INITIAL	ACC.		SIZE INCH	AREA SQ. FT.			

TABLE 7

FRICTION LOSSES IN EACH STORM SEWER SEGMENT

SHEET ____ OF ____

BY ____

DATE ____

PROJECT ____

STRUCTURE	TYPE	SIZE (IN.)	① ACC. Q (CFS)	② A (FT^2)	③ K	④ S_F (FT/FT)	⑤ L_1 (FT)	⑥ H_f (FT)

K = CONVEYANCE FACTOR
L_1 = LENGTH OF PIPE
H_f = LOSS OF HEAD DUE TO FRICTION.

① ACCUMULATED FLOW FROM COL. 2, TABLE 6.
② x-SEC. AREA OF PIPE FROM CHART 6.
③ K FROM CHART 6 FOR GIVEN n.
④ $S_F = \left(\frac{\text{COL. 1}}{\text{COL. 3}}\right)^2$

⑤ H_f = COL. 4 X COL 5

PROJECT _____

TABLE 8
MINOR LOSSES AND HYDRAULIC GRADE LINE

SHEET _____ OF _____
BY _____
DATE _____

① STRUCTURE NO.	② TYPE (MH OR C.B.)	③ MAX ELEVATION H.G.L.	④ D_2/D_1	⑤ K_j	⑥ V	⑦ H_f	⑧ H_j	⑨ H_{mh}	⑩ E.G.L.	⑪ H_v	⑫ H.G.L.	⑬ INVERT ELEVATION	⑭ DEPTH
											*	*	*

③ NOT LESS THAN 1 FT. BELOW BOTTOM OF SLAB.
④ RATIO OF LARGER TO SMALLER PIPE DIAMETER.
⑤ FROM CHART 7.
⑥ VELOCITY FROM TABLE 6
⑦ HEAD LOSS DUE TO FRICTION FROM TABLE 7

⑧ H_j = HEAD LOSS AT JUNCTION = COL. 5 X COL. 11
⑨ H_{mh} = HEAD LOSS AT MH = 0.02 ALWAYS.
⑩⑫ E&L = ENERGY GRADE LINE.
⑪ H_v = VELOCITY HEAD = $V^2 \div 64.4$
⑫ H&L = HYDRAULIC GRADE LINE = E.G.L. − H_v

* GIVEN

Northridge Parkway Subdivision
Storm Sewer Capacity Check

The existing storm sewer system in-place at Northridge Parkway Subdivision was checked using the Rational Method. This method estimates storm flow from the equation Q=CiA, where:

Q = Peak Runoff Rate, cubic feet per second (cfs)
C = Surface Runoff Coefficient
i = Rainfall Intensity, inches per hour (in./hr.)
A = Tributary Drainage Area, acres (ac.)

The drainage area for each segment of storm sewer pipe was analyzed separately and an appropriate runoff coefficient (C) was assigned to each area. A time of concentration, or storm duration, of ten (10) minutes was used because the individual areas are relatively small. This results in a five-year storm intensity (i) of 4.5 in./hr. Using the individual drainage areas and runoff coefficients along with the rainfall intensity, the flow in each segment of pipe was calculated.

The assumptions and limitations inherent to the Rational Method will yield a very conservative flow estimate, or "worst case scenario", for a number of reasons.

1. Using the smaller, individual drainage areas rather than the subdivision watershed as a whole, results in a lesser time of concentration which leads to a greater intensity of storm (see attached intensity-duration chart). This causes a higher rate of storm flow.

2. The Rational Method does not take characteristics of different soil types into account, as does the original design method. It also assumes the soil is in a saturated condition, which might not necessarily be the case, resulting in a greater runoff rate.

3 This method assumes the rainfall intensity is constant and uniform across the drainage area for the duration of storm, thus estimating a peak discharge for the entire design period.

4. All flow from the drainage area of each pipe segment, as well as all flow from upstream pipes, is assumed to be in the pipe being analyzed at the same instant. The Rational Method does not make allowances for incremental flow or flow already taken down-stream by the storm sewer system. This is probably the greatest reason why this method will produce the "worst case

scenario". An illustration of this would be the 48" pipe on Valley View Road at Sycamore Road is assumed to carry the flow coming to the street in that area along with the flow from Ridgetop Road in the 9th Addition, and Valley View Road in the 10th Addition.

By using the Rational Method, the five-year storm flow which is to be carried away from Northridge Parkway by the 54" storm sewer pipe is estimated to be 131 cfs. The existing capacity of the 54" pipe is calculated at 120 cfs. Considering the conservative nature of the method and limitations by which the required flow was estimated, the existing storm sewer system is capable of handling a five-year storm.

Additional improvements in the 10th Addition have lessened the burden on the 54" pipe at Northridge Parkway. The construction of a storm detention area, expected to hold up to 10 cfs during a five-year storm, will lower the flow rate reaching the 54" pipe to approximately 121 cfs compared with the calculated capacity of 120 cfs, assuming the runoff calculated by the Rational Method (131 cfs) is the most conservative.

Excerpt of minutes from the January 25, 1994, City Council meeting:

STORM SEWER IMPROVEMENT CONCEPTS, NORTHRIDGE SUBDIVISION: Moved by Parks, seconded by Brown, to approve the Alternative #3 concept for storm sewer improvements in Northridge Subdivision, whereby partial detention is developed and a piping system is installed along County Road R-50 to Moore Park Pond.

Tom Cackler, 2615 Hoover Avenue, appeared on behalf of the Northridge Homeowners Association. He also served on the subcommittee with the developers and City Staff to discuss the various alternatives for the storm sewer improvements. Mr. Cackler urged the Council to adopt Alternative #3 as the association feels it would be a compromise solution representing a consensus for all parties involved. Discussion was held regarding the differences between Alternatives #2 and #3. Alternative #2 would use full detention storage, whereas #3 would utilize partial detention. The area residents were concerned that #2 detention basin would be too deep, thereby causing a 3.9-foot retention prior to overflowing. Alternative #3's partial retention would have a depth of 2.6 feet before overflowing.

Carolyn Bolinger, 2718 Valley View Circle, appeared as representative from the Board of Directors of the Northridge Homeowners Association. Mrs. Bolinger indicated that all residents in the Northridge area feel victims of an inadequately designed storm sewer system. She stated that they would continue to have problems with the storm sewer system with rains of any significant amount. She further stated that homeowners are concerned about the safety issue of open drainage systems.

Noel Cresse, 2727 Valley View Road, stated that there has been a flooding problem since 1990 and that this has not been unique to 1993. He said City Staff had indicated the current system was designed for a five-year frequency storm. He recalculated that within a 12-minute period, the water flow would be 105 feet per second, and the current pipe system would handle only 95 feet per second flow. Mr. Cresse said the City was responsible for the problems Northridge was having. He, too, felt that Alternative #3 was the best solution, and without this option, the storm water run-off problem would only worsen.

Mieczysyaw Szopinski, 4123 Phoenix, stated he was not a resident of this neighborhood, but asked why the City allowed this to happen in a new subdivision development. Council explained that mistakes may have been made and that everyone has been fighting extreme conditions within the last two to three years. The City was in the process of reviewing the current storm sewer system criteria in order to correct and upgrade standards.

Public Works Director Paul Wiegand discussed the storm sewer piping in Northridge which is designed for a five-year storm, as are all other piping systems in the City's subdivisions. City Staff has proposed solutions to handle a 100-year storm in all the submitted alternatives. Mr. Wiegand explained that Northridge is having specific problems in low-lying areas. The situation began when the developers were in the final stages of development. The City now is asking developers to create and submit a grading plan to determine where water would accumulate in low areas. Mr. Wiegand reported that the Northridge storm sewer is adequate

to the five-year design standards. If Council was looking to change that standard to handle more, that direction would need to come from them.

The Council discussed the costs associated with the different alternatives. It was noted that Alternatives A, B, #1, #2, and #3 would have a cost of $20,000 in addition to the estimate due to grading expenses for retention basins.

Considerable discussion was held concerning the funding of the storm sewer improvements and who would be responsible for paying for the upgrades. Several questions were raised: Was the City obligated to correct the problems? Would the City be setting a precedent by funding the storm sewer system upgrades in Northridge without considering other neighborhoods with similar problems? Was it going to be an additional burden on the taxpayers, or should the upgrades be funded by only those affected by the improvements? In a cost-sharing program for the selected alternative, should the developers pay more than the agreed upon 25%?

Carolyn Bolinger stated that at a meeting last fall with City Staff, the developers, and homeowners, Ken Janssen with Engineering Plus and advisor to the developers stated that this system was not designed as a five-year plan.

Suresh Kothari, 3006 Northridge Parkway, did not understand how Staff could be so confident in their statement that it was designed according to five-year standards, as it has been three years in a row that the area has had problems.

William Jenks, 3101 Greenwood Road, stated that he was willing to believe that the City has made a good-faith effort to design standards according to the five-year plan, however, it has failed. He felt the City was obligated to provide service to properties elsewhere in the City, and should commit to providing that same service to Northridge residents.

Noel Cresse believed that the City is responsible for the storm sewer problems Northridge is experiencing, and that the developer's engineers had worked with the grade designs which were given to them by City engineers.

Shashi Gadia, 3129 Maplewood Road, felt that the system was not designed in accordance with a five-year plan. He stated that discussion was centered around five-year and 100-year standards, however, he had not heard any information about plans in between these figures.

Steve Finnegan, 2439 Ridgetop Circle, reported that he had served on the committee to discuss all of the submitted alternatives, and it was determined that Alternative #3 was the best option as it offered a compromise solution for most everyone involved.

Considerable discussion was held regarding the definitions of five-year and 100-year storm standards. Public Works Director Paul Wiegand explained the percentage indications of the two. Mr. Wiegand further explained that statistically once every five years, there is a 20% chance to have a five-year storm. He also discussed 25-year storm standards as well as 50-year standards.

Council Member Wirth questioned why the Council was trying to approve an improvement concept for Northridge at this meeting when they had not even determined which standard overall would be required to alleviate storm sewer problems throughout the City. Mr. Wiegand stated that the Northridge issue was brought back before Council in reaction to concerns expressed by homeowners in the neighborhood. Council Member Wirth stated that she would not feel comfortable making a decision until cost estimates are obtained for all problem areas within the city so that the Council would be more able to ascertain cost implications.

Council Member Brown felt that the Council needed to separate older, existing neighborhood improvements from new developments. She stated that the issues lie with the Subdivision Ordinance, which has created part of the problem regarding grading plans and piping systems in newer subdivisions. She further stated that with this ordinance in place, the City doesn't have the ability to require developers to create a grading plan. Council Member Brown questioned whether the enforcement of grading plans, in combination with piping systems, was going to be addressed in the update of the Subdivision Ordinance. City Manager Schainker stated that it would be up to Council to see that this policy was put into place. It was pointed out that the piping systems required by the City were for five-year storms, and the grading was being done for a 100-year frequency with the cooperation of the developers. Council Member Brown reiterated that the issue was enforcing a grading plan, and that ordinance requirement was not now in place.

Noel Cresse, reported that the Northridge residents did not want to be treated any differently than other citizens. However, they wanted a five-year plan in place, and that standard was not being met.

Steve Finnegan stated that had the needed planning been done five years ago, this problem would not exist today. He further stated that if a detention pond had been built in his back yard during the development stage, he could have made the choice as to whether or not to purchase the property.

Council Member Tedesco asked if the board of the homeowners association had considered Alternative #4. Option #4 was considered, but dismissed because the cost was greater. Council Member Tedesco pointed out that #4 would not have the $20,000 grading fee in addition to the estimated cost. The developer's engineers had advised the homeowners that this alternative would not solve the problems.

Mayor Curtis asked Staff what would be entailed in order to perform design standards for a five-year frequency storm. Paul Wiegand, Public Works Director, explained that recalculations would need to be performed. Mayor Curtis suggested that Council direct Staff to perform these measures.

Tom Sally, 2930 Ridgetop Road, questioned Council about the issue of liability. He felt that the slope of an open trench would create a nuisance and safety concern for children.

Robert Brown, 3115 Sycamore, stated that he felt that the City's figures were not very exact on five-year storm water run-off. He indicated that when running his garden hose, 95% of the water run-off ended up in the street. Mr. Brown stated the soil was very high clay content and that there was plenty of water in the ground all the time.

William Jenks indicated his agreement with Mr. Brown. He stated that he felt residents would not object to Alternative #4 over #3 as this was not the major issue.

Tom Cackler stated that the reason the committee proposed Option #3 in lieu of #4 was that they did not have the incremental costs on the detention basins from the developers. Alternative #4 would have been recommended if they had received the total cost estimations.

Council Member Wirth reported that she felt Staff should check calculations on the five-year plan and come back to Council with a report as to whether those standards were met. If those design standards were not met, she felt the Council should establish one standard that would be used throughout the community.

Noel Cresse stated that everyone was in agreement with using the five-year standard, however, the City needed to review and collect more data as to what that five-year design was. He requested that once the calculations were completed, the information be given to the homeowners in order to have that data evaluated and verified.

Roll Call Vote: 2-4. Voting Aye: Brown, Parks. Voting Nay: Campbell, Hoffman, Tedesco, Wirth. (Motion failed.)

Moved by Wirth, seconded by Tedesco, to direct Staff to recalculate design standards for the storm sewer systems to see if they met the five-year storm frequency plan; to provide corrective design standards if the five-year plan was not being met; to delay discussion of meeting other standards until the City Council established a design standard policy for Ames; and to make the recalculation information available to the Northridge Neighborhood Association.

Noel Cresse asked that Council consider delaying any further subdivision development in Northridge as more control was being lost over the run-off issue.

Tom Randall, 1139 Johnson Street, stated that it was hard for him to believe that none of the developers were present at this meeting. He felt that now that the developers have been given permission to proceed with the next addition of the subdivision, their motivation in solving the water run-off problem had dwindled. Council Member Parks asked Mr. Randall what it was that the developers were not doing. Mr. Parks stated that they have been willing to participate in whatever solution the City arrived at, and the developers were relying upon the City to make a decision.

Vote on Motion: 6-0. (Motion declared carried unanimously.)

Council Action Form
from Jan. 25, 1994 48

STAFF REPORT
NORTHRIDGE PARKWAY SUBDIVISION
DRAINAGE CONCEPTS

Over the past two wet years, Northridge Parkway has experienced flooding events when the rainfall and subsequent runoff has exceeded the 5-year design flow capacity of the storm sewer system. The most significant problem is located on Northridge Parkway east of Valley View Drive. During rainfall/runoff events that exceed the 5-year design capacity of the underground storm sewers, the stormwater is channeled to the street areas and then flows to the low point in the street on Northridge Parkway. The stormwater builds up in the street because the flow arriving at the low point is coming faster than the pipe can carry the flow away. Complicating the situation is that area grading does not allow the stormwater to get away until it builds to a depth greater than three feet. At this depth, existing homes are exposed to damage and have actually experienced damage.

General management techniques available to address the situation relate to handling the major storm event and it's associated runoff by two methods. The first relates to slowing the runoff where possible through a series of basins called detention basins. A detention basin is an area that is designed to collect stormwater runoff and release it at a rate that any downstream system can handle. As the arrival rate exceeds the discharge rate, the stormwater is stored for short periods of time. The second method of control is to construct "conduits" to carry the water away and discharge it to a system large enough to carry it. Conduits can be either channels or underground pipes. The difference between channels and pipes is that a pipe system has a finite capacity, whereas a channel is usually capable of carrying differing storm runoff amounts.

In order to evaluate the problem of water accumulating at the low point in Northridge Parkway, different management techniques were reviewed. The usual design frequency that is used for major storm events is a 100-year frequency runoff. In the case of Northridge Parkway Subdivision, this calculates to a runoff amount of 114 cubic feet per second (cfs) reaching the low point if no controls were implemented.

Late in October, staff prepared a review of alternatives based on conceptual design only. These alternatives involved the following:

A) Develop detention basins in the 9th, 10th, and 11th Additions to reduce the speed at which the stormwater accumulated in the street low point. From that point the stormwater was carried through the area by pipe systems along the existing natural gas line easement to the Moore Park pond. The estimated cost of this project is the same as Alternative #1 ($105,000) which is explained in detail later in this study.

B) Develop detention basins in the 9th, 10th, and 11th Additions to reduce the speed and volume at which the stormwater accumulated in the low point. From the low point, a swale would be graded to the Lot A open space area in the 1st Addition where a detention basin would hold the accumulated runoff until the flow could be carried away by the existing pipe system. This alternative would also include grading of a channel along the open space area to Moore Park. The estimated cost of this project is $60,000.

Much local resident opposition was raised to the proposal dealing with the development of a detention basin in the Lot A open space of the 1st Addition. At the October 26, 1993 City Council meeting, staff was directed to further investigate the cost and feasibility of using pipe systems to carry the accumulated stormwater away from the low point in Northridge Parkway.

The attachments detail the six piping alternatives that were studied to handle the 100-year stormwater runoff. The alternatives vary in cost from $105,000 to $295,000. A map shows the general location of each alternative. The variables between the alternatives include the amount of detention developed in the 9th, 10th, and 11th Additions, the size and type of the intake opening, the size of the pipe needed to carry the accumulated runoff, and the route that is used for the pipe discharge.

Although Alternative #1 is the least costly pipe alternative, easement problems exist with the adjacent owners and the natural gas company. The gas main located in the easement is very high pressure (greater than 800 pounds per square inch) and they will resist construction parallel to their pipeline. This alternative can not be constructed outside of the gas pipe easement due to the presence of the existing homes.

Alternative #2 is the next lowest in cost of the pipe projects. This alternative assumes full development of the detention basins in the 9th, 10th, and 11th Additions with a 42" pipe carrying the stormwater to the east to R-50 then south. The only easement is one needed at the corner of Northridge Parkway and R-50. The subdivision Developers still own this lot and are willing to provide an easement.

The remaining four alternatives deal with changes in the amount of upstream detention and the size and location of the outlet pipe systems. These alternatives were looked at as a result of a request by representatives of the neighborhood association who were concerned about the effect that the detention basins would have on the value of their lots. It appears that the neighborhood association is not willing to grant an easement in the 9th Addition for a detention area on the south open space parcel. In addition, they requested that we evaluate the project cost if the proposed detention basin in the 11th Addition was only one-half as large as originally proposed, as well as to evaluate the cost if no detention areas were developed except the existing one in the 10th Addition. A copy of the proposed modification to the detention basin in the 11th Addition is also enclosed.

The affect of the detention is obvious in the cost figures. In Alternative #2 that includes the detention basins, the pipe cost is $145,000. The same route is used in Alternative #3 where only partial detention is developed and the cost increase is $20,000. Alternative #4 uses the same route also, but with no detention basins except the existing one in the 10th Addition, and the cost increases by $35,000.

At the present time, all the alternatives utilize "open throat" intakes similar to the other intakes in the area. The usual opening length is four feet. The opening length will vary in accordance with the amount of stormwater that is needed to be collected.

It should be noted that all of the proposed alternatives will solve the problem from an engineering perspective, however the grading project (Alternative B) is the most fail-safe since it does not rely on pipe systems to carry the stormwater away. Pipe systems can plug and fail whereas overland flow will always be in place and operating.

The above information was distributed to the Northridge Neighborhood Association. Their letter of comment is attached. A copy of this final report will also be distributed to the neighborhood association leaders.

The following table will summarize the alternatives:

Alternative	Description	Estimated Cost
B	Overland flow with detention	$ 60,000
A and #1	Full detention; pipe on gas easement	105,000
#2	Full detention; pipe on R-50	145,000
#3	Partial detention; pipe on R-50	165,000
#4	No detention; pipe on R-50	180,000
#5	No detention; pipe in 10th Addition to R-50 and Northridge Parkway	295,000
#6	No detention; pipe in 10th Addition to R-50 only	260,000

At the present time no budget money has been identified and the funding for any program will need to be further discussed at budget time. Based on our previous discussions with the Developers, it is expected that the selected alternative will be shared on a 75% City and 25% Developer cost sharing program. This cost sharing arrangement should include the $20,000 additional costs for detention pond work in Alternatives A, B, 1, 2, and 3.

Please again note that in an engineering sense all of the alternatives will address the upgrading of the drainage system to carry the 100-year storm. However, regardless of which alternative is selected, the City Council must understand that for a short duration of time (30 minutes) following an extremely heavy rainfall the street will be curb deep with storm water. Staff requests that Council select an alternative for project development.

Community-University-Opportunity

CITY OF AMES

P.O. BOX 811 AMES IOWA 50010
Public Works Department
515 Clark Avenue
P.O. Box 811
515-239-5160

Northridge Flood Alternatives
January 3, 1994

ALTERNATIVE ONE: Full north detention, south intakes, pipe along gas main easement to Moore Park pond.

This alternative involves making use of full detention storage possibilities in the 9th Addition (5cfs), 10th Addition (15 cfs), and the 11th Addition (48 cfs). The remainder of the 100 year overland flood flow would be picked up by a pair of 15' open throat intakes on Northridge Parkway and carried south along the gas main easement by a 42" RCP to Moore Park pond.

The cost estimate for this alternative is $105,000.

ALTERNATIVE TWO: Full north detention, south intakes, pipe along County Road R-50 (R-50) to Moore Park pond.

This alternative involves full detention storage in the 9th, 10th, and 11th Additions. The remainder of the 100 year overland flood flow would be picked up by a pair of 15' open throat intakes on Northridge Parkway and carried east to County Road R-50, then south along the west side of R-50 by a 42" RCP to Moore Park pond.

The cost estimate for this alternative is $145,000.

ALTERNATIVE THREE: Partial north detention, south intakes, pipe along R-50 to Moore Park pond.

This alternative involves using full possible detention storage in the 10th Addition (15 cfs), partial detention storage capability in the 11th Addition (17 cfs), and no storage in the 9th Addition. The remainder of the 100 year overland flood flow would be picked up by a pair of 25' open throat intakes on Northridge Parkway and carried east to R-50, then south along the west side of R-50 by a 48" RCP to Moore Park pond.

The cost estimate for this alternative is $165,000.

ALTERNATIVE FOUR: No north detention, south intakes, pipe along R-50 to Moore Park pond.

This alternative would not make use of detention storage in the 9th, 10th, or 11th Additions. All of the 100 year overland flood flow from the north would be picked up by a pair of 35' open throat intakes on Northridge Parkway and carried east to R-50, then south along the west side of R-50 by a 54" RCP to Moore Park pond.

The cost estimate for this alternative is $180,000.

ALTERNATIVE FIVE: No north detention, north and south intakes, pipes along R-50 to Moore Park pond.

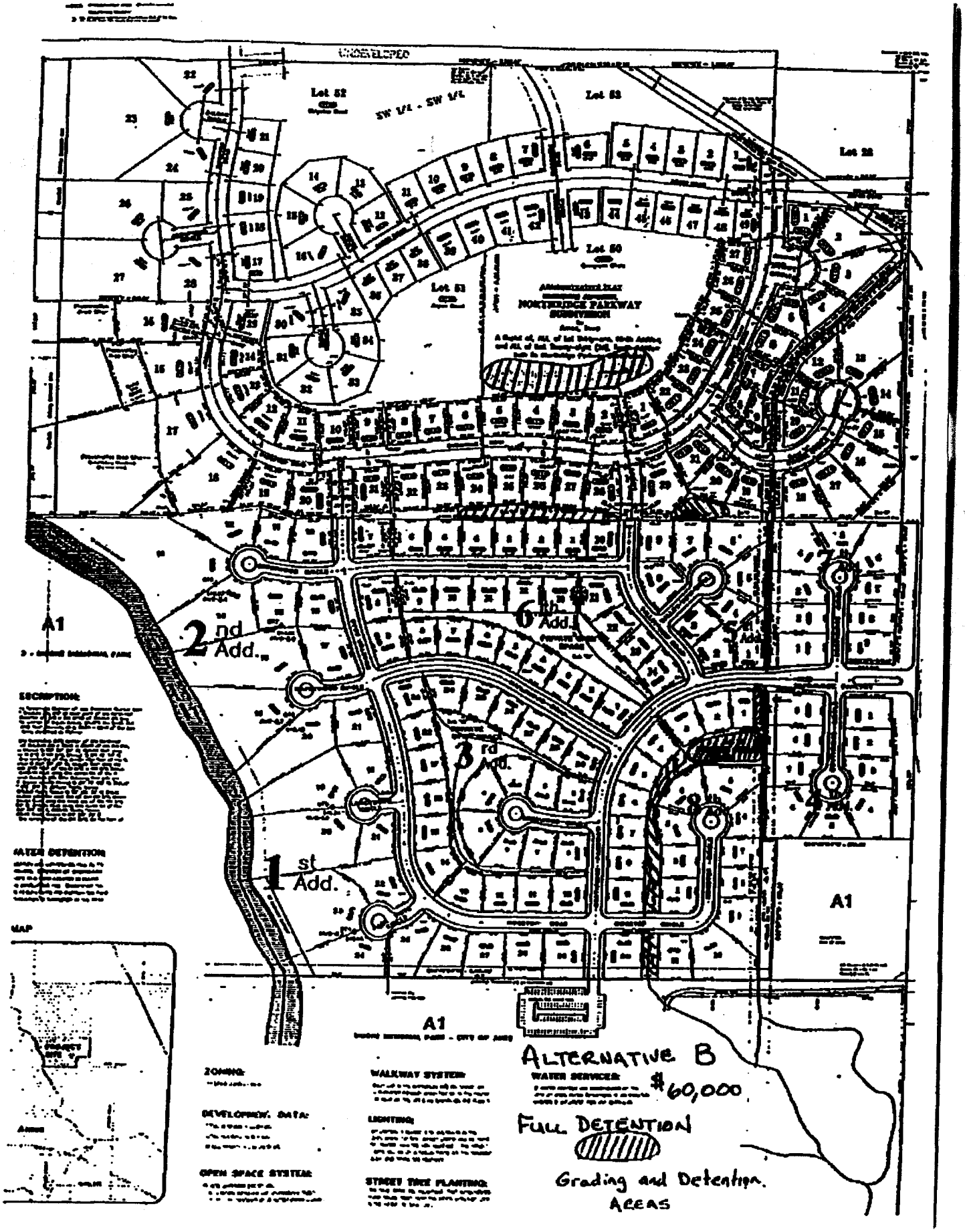
This alternative would not make use of detention storage in the 9th, 10th, or 11th Additions. One half of the 100 year overland flood flow from the north would be picked up by a pair of 26' open throat intakes on Valley View Road at the north end of the 5th Addition. This flood flow and all flows in the existing storm sewer system at this point would be carried east to R-50, then south along R-50 by a 48" RCP. The remainder of the overland flood flow would be picked up by two 13' intakes on Northridge Parkway and carried east to R-50 by a 36" RCP to a manhole joining the 48" RCP from the north. The combined flow is carried south from the manhole by a 54" RCP to Moore Park pond.

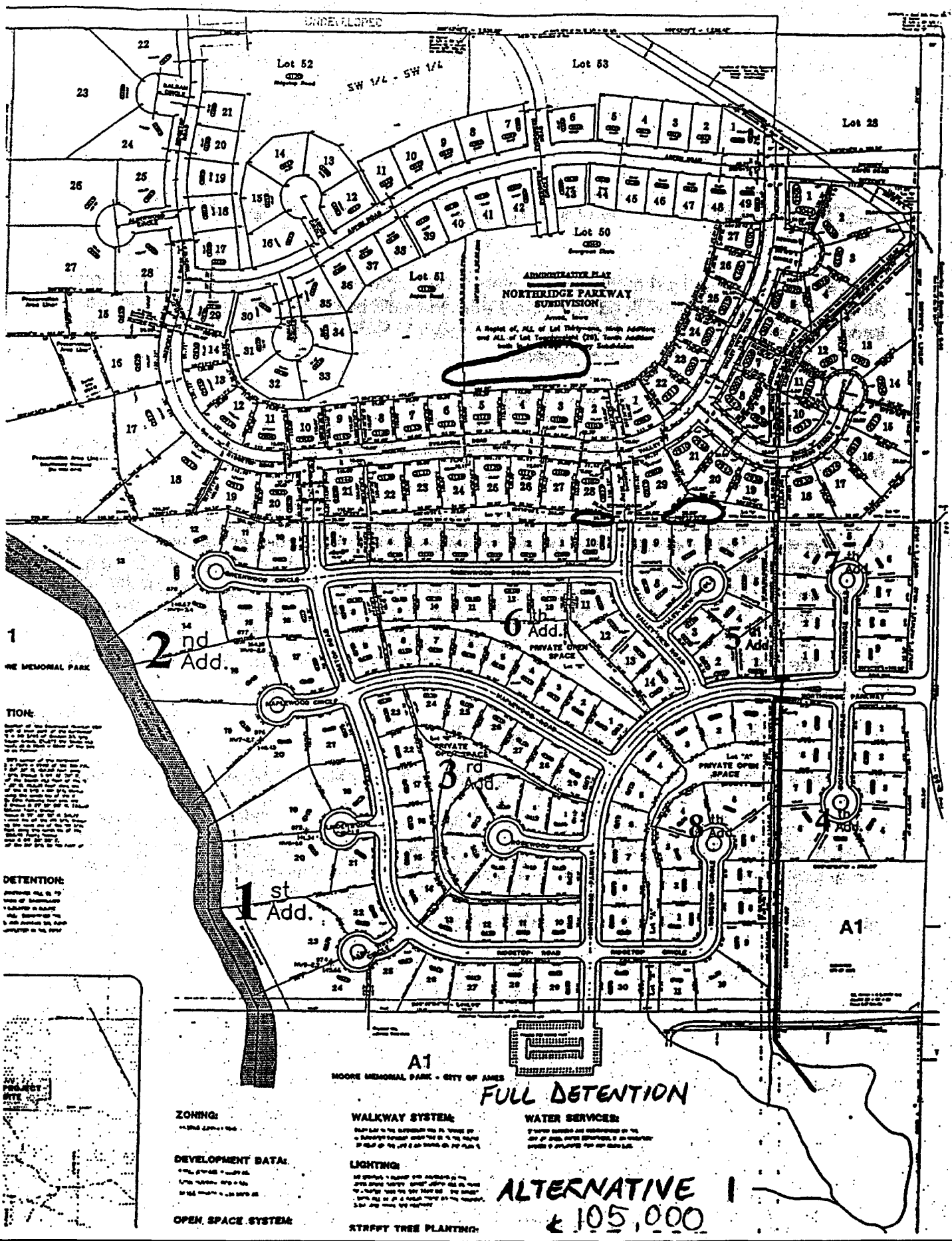
The cost estimate for this alternative is $295,000.

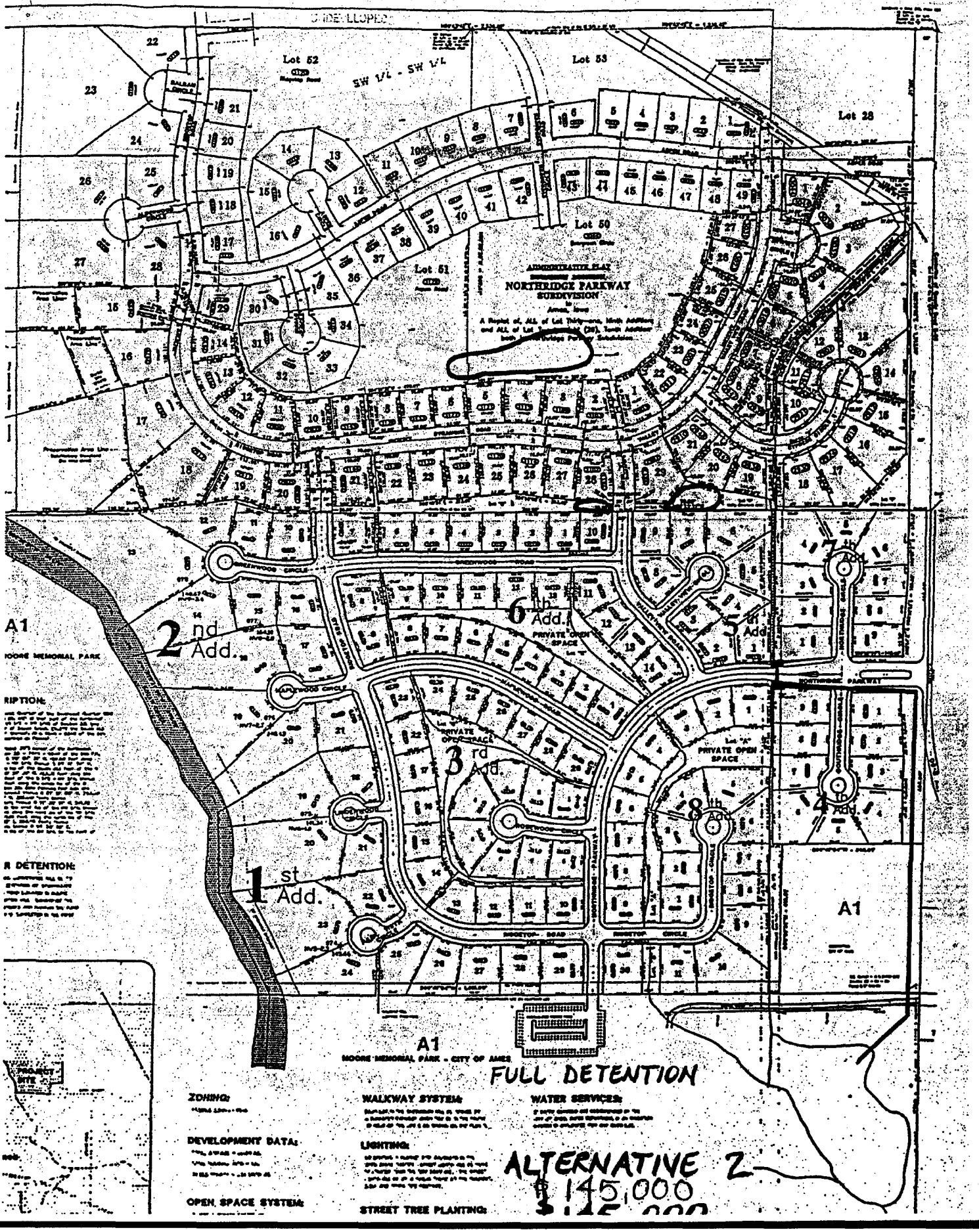
ALTERNATIVE SIX: No north detention, north intakes, pipe along R-50 to Moore Park pond.

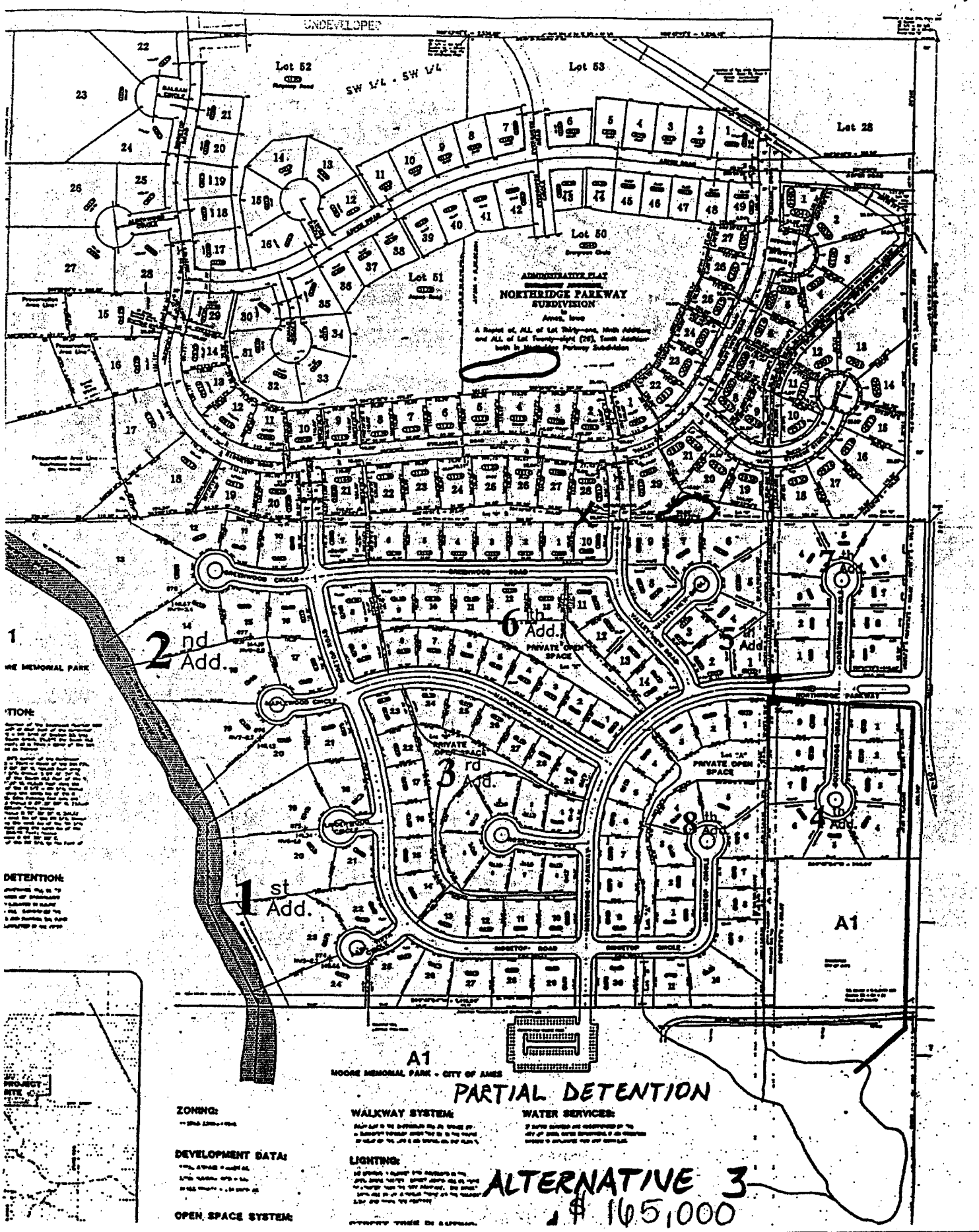
This alternative would not make use of detention storage in the 9th, 10th, or 11th Additions. All of the 100 year overland flood flow from the north would be picked up by a pair of 35' open throat intakes on Valley View Road at the north end of the 5th Addition. This flood flow and all flow in the existing storm sewer system at this point would be carried east to R-50, then south along the west side of R-50 by a 54" RCP to Moore Park pond.

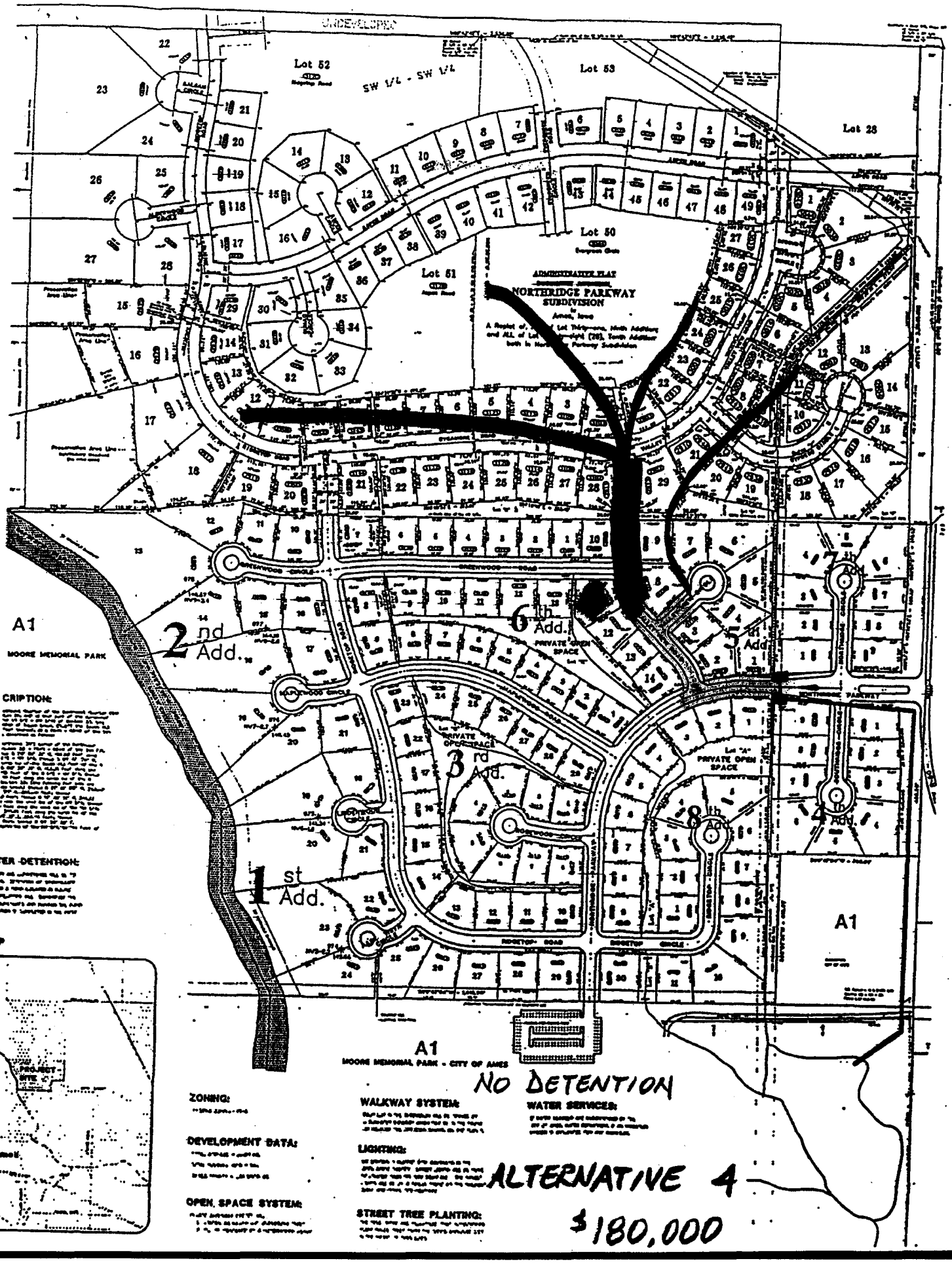
The cost estimate for this alternative is $260,000.

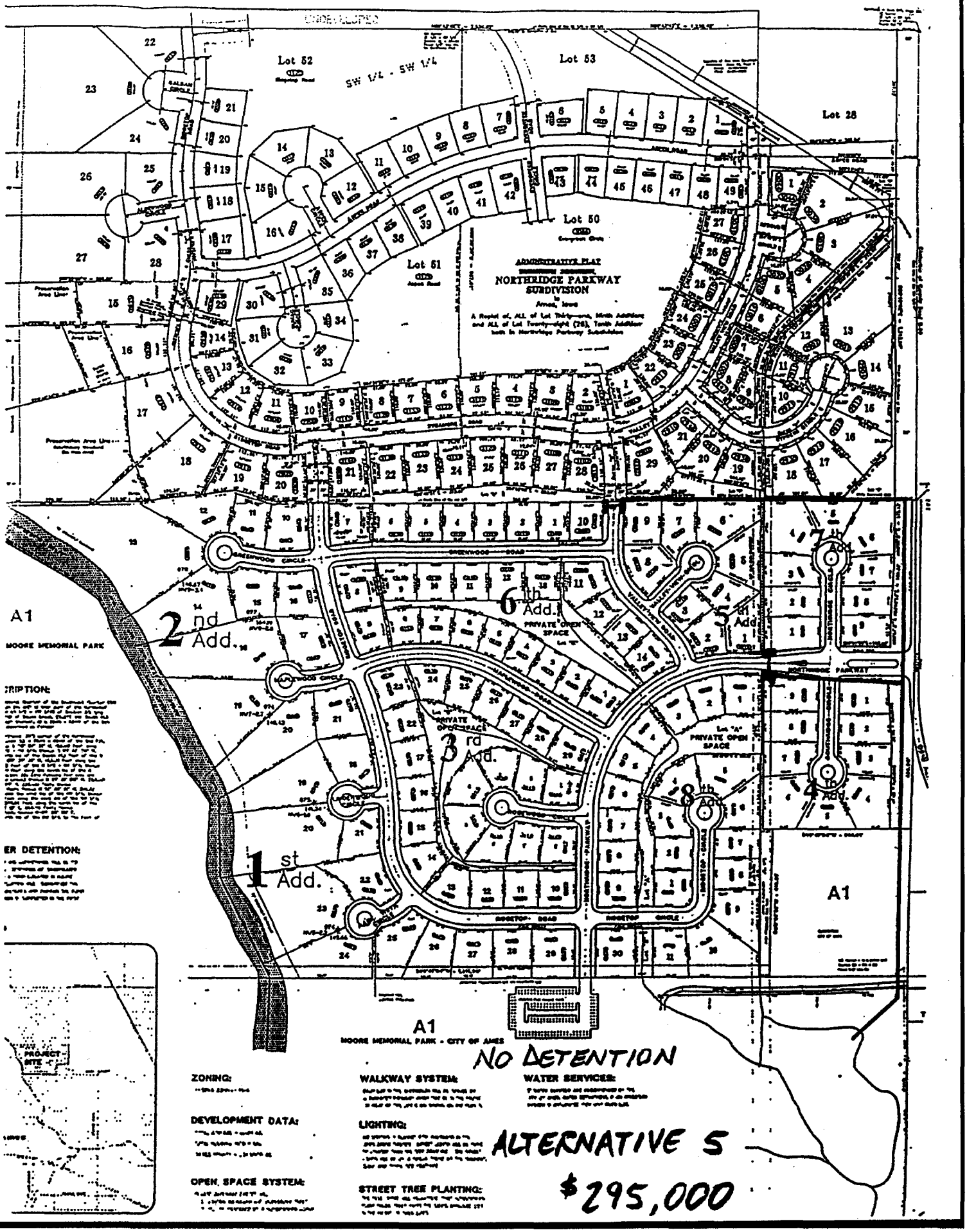

UNDEVELOPED
Lot 52
SW 1/4 - SW 1/4
Lot 53
Lot 50
Lot 51
NORTHRIDGE PARKWAY SUBDIVISION
A1
2nd Add.
6th Add.
3rd Add.
1st Add.
A1
A1
ALTERNATIVE B
WATER SERVICES: $60,000
FULL DETENTION
Grading and Detention Areas
ZONING:
DEVELOPMENT DATA:
OPEN SPACE SYSTEM:
WALKWAY SYSTEM:
LIGHTING:
STREET TREE PLANTING:

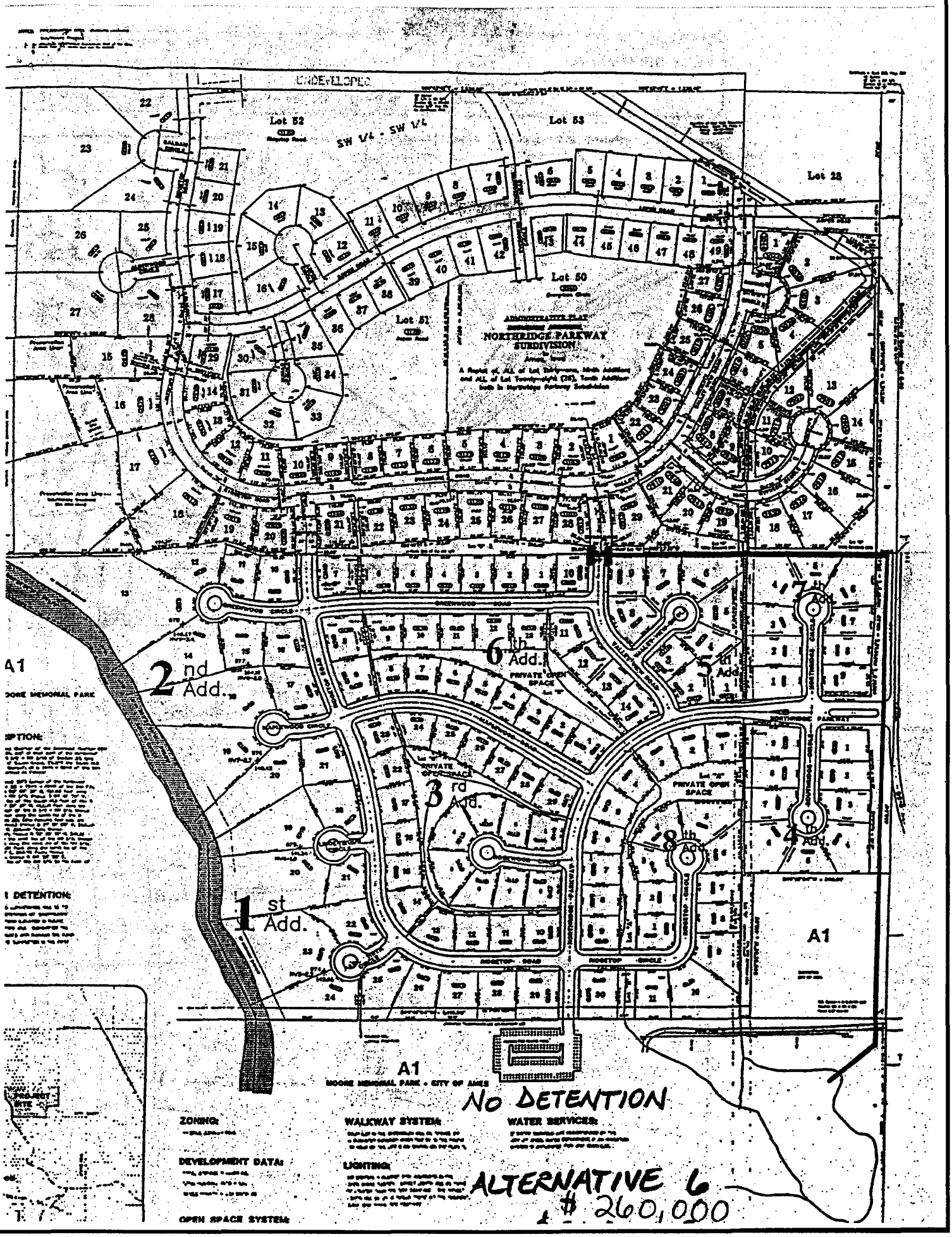

UNDEVELOPED
Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
ADMINISTRATIVE PLAT
NORTERIDGE PARKWAY
SUBDIVISION
2nd Add.
6th Add.
5th Add
7th Add
3rd Add.
8th Add
4th Add
1st Add.
PRIVATE OPEN SPACE
A1
MOORE MEMORIAL PARK - CITY OF AMES
ZONING:
DEVELOPMENT DATA:
OPEN SPACE SYSTEM:
WALKWAY SYSTEM:
LIGHTING:
STREET TREE PLANTING:
WATER SERVICES:
FULL DETENTION
ALTERNATIVE 1
$105,000


Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
ADMINISTRATIVE PLAT
NORTHRIDGE PARKWAY SUBDIVISION
Ames, Iowa
1st Add.
2nd Add.
3rd Add.
4th Add.
5th Add.
6th Add.
7th Add.
8th Add.
PRIVATE OPEN SPACE
A1
MOORE MEMORIAL PARK - CITY OF AMES
FULL DETENTION
ALTERNATIVE 2
$145,000
ZONING:
WALKWAY SYSTEM:
WATER SERVICES:
DEVELOPMENT DATA:
LIGHTING:
OPEN SPACE SYSTEM:
STREET TREE PLANTING:


UNDEVELOPED
Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
ADMINISTRATIVE PLAT
NORTHRIDGE PARKWAY
SUBDIVISION
2nd Add.
6th Add.
5th Add.
7th Add.
3rd Add.
4th Add.
8th Add.
1st Add.
PRIVATE OPEN SPACE
A1
MOORE MEMORIAL PARK - CITY OF AMES
DETENTION:
ZONING:
DEVELOPMENT DATA:
OPEN SPACE SYSTEM:
WALKWAY SYSTEM:
WATER SERVICES:
LIGHTING:
PARTIAL DETENTION
ALTERNATIVE 3
$ 165,000


Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
NORTHRIDGE PARKWAY SUBDIVISION
1st Add.
2nd Add.
3rd Add.
4th Add.
5th Add.
6th Add.
8th Add.
A1
MOORE MEMORIAL PARK
A1
MOORE MEMORIAL PARK - CITY OF AMES
A1
PRIVATE OPEN SPACE
PRIVATE OPEN SPACE
PRIVATE OPEN SPACE
GREENWOOD CIRCLE
GREENWOOD ROAD
RIDGETOP ROAD
RIDGETOP CIRCLE
NORTHRIDGE PARKWAY
ZONING:
DEVELOPMENT DATA:
OPEN SPACE SYSTEM:
WALKWAY SYSTEM:
LIGHTING:
STREET TREE PLANTING:
WATER SERVICES:
NO DETENTION
ALTERNATIVE 4
$180,000


Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
ADMINISTRATIVE PLAT
NORTHRIDGE PARKWAY SUBDIVISION
Ames, Iowa
A Replat of, ALL of Lot Thirty-one, Ninth Addition and ALL of Lot Twenty-eight (28), Tenth Addition both in Northridge Parkway Subdivision
2nd Add.
6th Add.
5th Add.
7th Add.
3rd Add.
8th Add.
4th Add.
1st Add.
A1
MOORE MEMORIAL PARK
A1
MOORE MEMORIAL PARK - CITY OF AMES
PRIVATE OPEN SPACE
NORTHRIDGE PARKWAY
GREENWOOD CIRCLE
GREENWOOD ROAD
VALLEYVIEW ROAD
RIDGETOP ROAD
RIDGETOP CIRCLE
PROJECT SITE
ZONING:
DEVELOPMENT DATA:
OPEN SPACE SYSTEM:
WALKWAY SYSTEM:
LIGHTING:
STREET TREE PLANTING:
WATER SERVICES:
NO DETENTION
ALTERNATIVE 5
$295,000


UNDEVELOPED
Lot 52
Lot 53
Lot 28
Lot 50
Lot 51
SW 1/4 - SW 1/4
NORTHRIDGE PARKWAY SUBDIVISION
2nd Add.
6th Add.
5th Add.
7th Add.
3rd Add.
4th Add.
8th Add.
1st Add.
PRIVATE OPEN SPACE
A1
MOORE MEMORIAL PARK - CITY OF AMES
No DETENTION
ZONING:
WALKWAY SYSTEM:
WATER SERVICES:
DEVELOPMENT DATA:
LIGHTING:
OPEN SPACE SYSTEM:
ALTERNATIVE 6
1" = 260,000

Grading Plan for Ponding Area
Part of Lot 50, 11th Addition
Northridge Parkway Subdivision

ENGINEERING PLUS
Ames, Iowa
515-232-8553

January 18, 1994

Mr. Paul D. Wiegand, Director
Public Works Department
City of Ames
515 Clark Avenue
P.O. Box 811
Ames, IA 50010

Dear Mr. Wiegand:

The Board of Directors of the Northridge Homeowners Association and the Subcommittee of the Board for Flood Control met January 15 to consider the options outlined in your letter to Glenn Bastiaans dated January 5.

Glenn distributed your Staff Report on drainage to the homeowners in the development and asked for response to the subcommittee before the 15th. A summary of the conclusions from the residents, the Subcommittee and the Board are presented briefly below. We assume that all alternatives will do the job.

Alternative one was not seriously considered because of your staff's comments about easement concerns from the pipeline company.

Alternative two appears to be the lowest cost of the remaining alternatives but the homeowners have raised serious objections. The homeowners whose property backs up to the 9th Addition basin are concerned about the possible depth of the basin, potential drainage problems in back yards adjoining the basin and the relatively small retention capacity of this basin. The full-capacity retention basin in the 11th Addition also has homeowners concerned. They believe that the basin is too deep, that the outlet is too large and poses a safety concern for small children, and that the cleanout of the basin will require action by the homeowners who are not equipped to perform this service.

Alternative three appears to remove both the concerns regarding #2 and avoids the concerns in #1. It is also the least expensive of the remaining Alternatives. Alternatives 4, 5 and 6 seem to offer little improvement for the additional cost.

The Board of Directors of the Northridge Homeowners Association has therefore directed me to convey our preference for Alternative 3.

We also wish to express our appreciation for your efforts in developing these alternatives. Your office has been very responsive to the resident's concerns. Thanks.

Sincerely,

Dean L. Ulrichson, Secretary
Northridge Homeowners Board of Directors

Jan. 1994: Sent by Northridge Homeowners Assn. to resident

Northridge Homeowners Association

REMINDER

DEAR HOMEOWNERS:

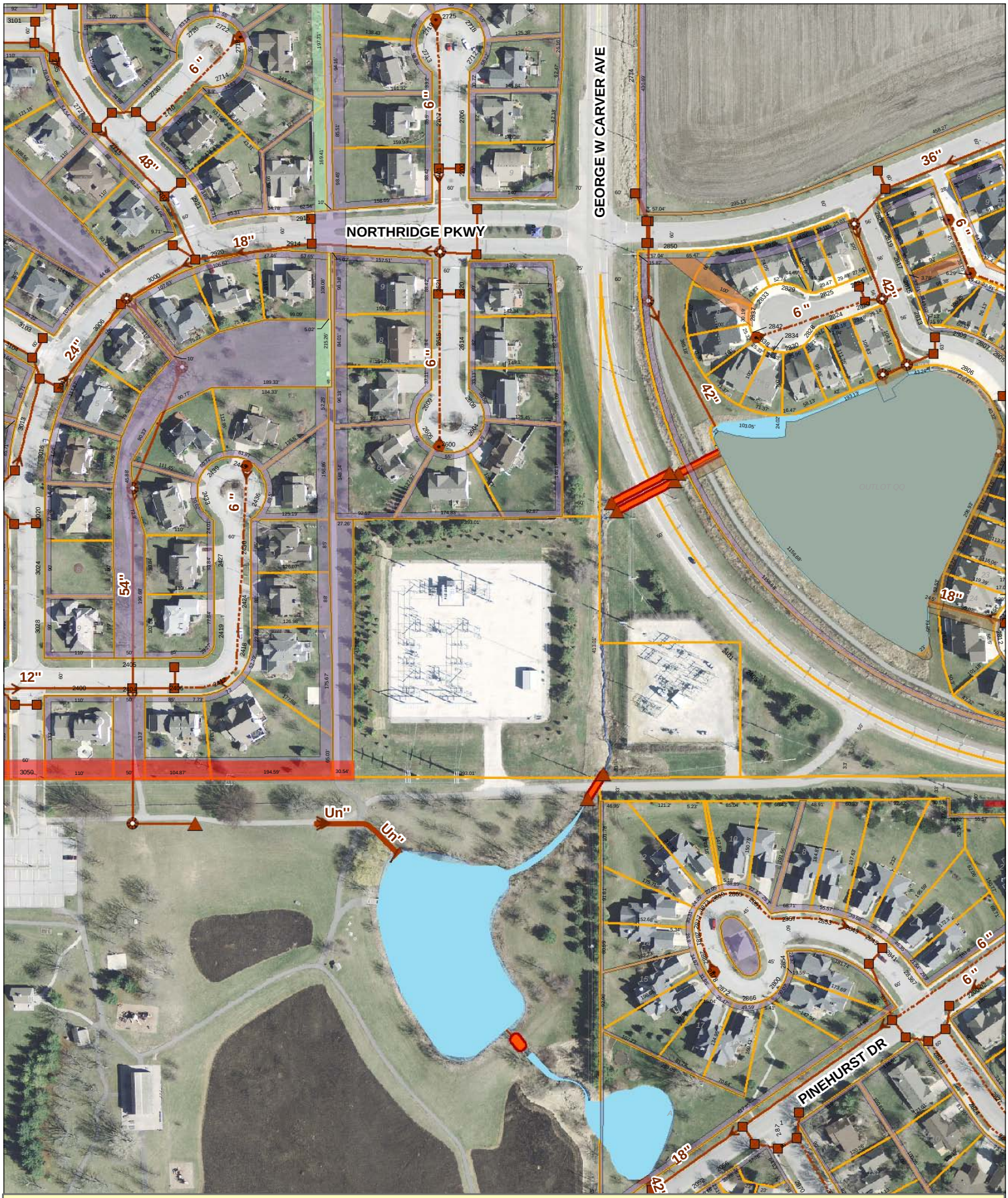
On this coming Tuesday, Jan. 25, the Ames City Council will meet to decide on what, if any, flood control measures for the Northridge subdivision will be funded.

Please plan to attend this meeting in order to show your support for city action to correct the flooding problems encountered last summer.

The Northridge Homeowners Association has recommended that the city of Ames choose Alternative 3 (see last week's notice) for flood control. However, the Public Works Department is not recommending a specific alternative to the City Council.

Thus, the City Council must decide if the City will fund any control measures and then decide which alternative to choose if funding is possible.

Your attendance at the Jan. 25 City Council meeting may well influence their decision with respect to Northridge flood control measures. The meeting will be held in the City Hall council chambers and starts at 5:00 PM (although flood control may not be discussed until 6:00 PM or later). Hope to see you there.



CITY OF AMES IOWA
Caring People Quality Programs Exceptional Service

Water Sanitary Storm

Legend

Ames Easements <all other values>

ETYPE Access Electric Environmental Misc Pedestrian Sanitary Storm Streets Traffic Unknown Utility Water

Information in this map is a representation only. All information should be field verified.

NORTH

Title:	24th and G W Carver Area
Scale:	1 in = 200 ft
Date:	12-10-2010

Excerpt of minutes from the August 22, 1995, City Council meeting:

REVIEW OF ALTERNATIVES FOR LOW POINT DRAINAGE PROJECT IN NORTHRIDGE SUBDIVISION: Public Works Director Paul Wiegand said Staff has explored options to eliminate ponding that occurs in Northridge Parkway at the entrance to the subdivision and at Rooftop Circle.

Tom Harrington, 3016 Northridge Parkway, said the back of his property would abut the proposed surface water channelization program, and he was strongly opposed to that alternative. He expressed concerns about the aesthetics of that program, and said it would also present a safety concern for children. He said he felt the estimated cost for the program was optimistic and it would cost more to re-vegetate the area. He said the neighbors feel the proposals offered by Staff as solutions to the problem are too extreme, one being too expensive and the other being cost-efficient at the sacrifice of aesthetics. He said the homeowners feel they have been given a "take it or leave it" alternative. He said perhaps they don't have to plan for a 100-year storm, and some compromise should be explored. He suggested a way might be found to more directly divert the run-off from the Moore Park parking lot to the pond without disturbing the homeowners' properties. He said another idea would be to construct a less dramatic detention basin in Lot A. He said he would like to see alternatives such as these pursued.

Jane Cunningham, 2521 Park Vista Circle, President of the Northridge Homeowners Association, submitted and read a prepared statement stating that the Association Board does not want the City to take a "do-nothing" approach. She said contrary to the Staff report, the general consensus of the residents is not that the City is harassing them, or that they want to be left alone. She said they know the City is aware of the problem, and is making an effort to solve it. She said they do not believe the surface water channelization program should be implemented, but that Staff should continue to study the problem and develop a solution based on the future development of Northridge and of the Taylor Farm. She said they wish the Staff to do more, not less.

Wendele Maysent, 2433 Ridgetop Circle, said he concurred with the statement read by Ms. Cunningham. He said the surface water channelization program would require the homeowners to give up an integral part of their backyards. He said the residents had bought their properties with the understanding that the developer and the City had done their jobs and that the storm water problem in Northridge had been taken care of. He said they do not want their backyards disrupted.

Steve Finnegan, 2439 Ridgetop Circle, said his main concern is that the flooding at Ridgetop Circle is not being addressed. He said the proposed surface water channelization alternative would merely move the problem from the Northridge entranceway to Ridgetop Circle. He said he felt the 48" sewer pipe, if installed properly and tied in to the current system, would be a feasible solution which would relieve some of the pressure being put on the existing 54" pipe. He said as a taxpayer, he was concerned that the estimated cost of the 48" sewer pipe alternative had increased $57,000 since 1994. He said while the developers had paid for the cost of the

detention ponds, they had also made a commitment to help subsidize a program to correct the problem, yet he saw no evidence of that in the proposed alternatives.

Carroll Marty, 2802 Ridgetop, said he was a member of the Northridge Homeowners Association Board, and had been studying this problem for several weeks. He said what made the Northridge situation unique from other areas in the community was the dam at the end of the storm sewer outlet. He displayed a sketch showing how water goes out the pipe at the dam, and said nearly half of that water is run-off from the Taylor Farm. He described how in a large rainfall, the water in the dam will quickly fill up and flow more slowly through the 54" storm sewer pipe. He said he felt the 48" sewer pipe would result in the same problems as at present. He said they must tie development in the Taylor Farm to whatever solution is selected for the Northridge drainage problem, because ultimately the systems are going to work together. He said a solution to consider would be putting in a smaller 12" pipe from R-50, and pushing it through the Northridge area by hydraulic methods so it wouldn't tear up residents' lawns. He said another alternative would be to dig a trench through Moore Park and divert the water to the southwest of the park to Squaw Creek.

Motion by Parks, Second by Tedesco, to direct Staff to explore other alternatives to solve the low-point drainage problem in Northridge Subdivision, such as the diversion of water from the parking lot in Moore Park, increasing capacity of the Moore Park pond, and a detention area in the Taylor Farm area.
Vote on Motion: 6-0. Motion declared carried unanimously.