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Report On

Storm Drainage Conditions Relative To

The Development of Academy Acres Subdivision

Bernalillo County, New Mexico

General

This report has been prepared in order to present the findings of a study of storm drainage conditions in an area proposed for development as Academy Acres Subdivision and to describe proposed methods for providing adequate storm drainage in the area.

Location

The area proposed for development is located in portions of Section 25, Range 3 East and Section 30, Range 4 East, Township 11 North, N.M.P.M. within the Elena Gallegos Grant in Bernalillo County, New Mexico. The area is bounded on the south by Academy Boulevard, on the west by U. S. Interstate Highway 25, on the north by the Arroyo del Pino and the proposed Harper Boulevard, and on the east by Wyoming Boulevard, as shown on the attached map labeled Exhibit A.

Existing Drainage Conditions

1. General

The area proposed for development lies almost entirely within a separate drainage area lying between the Arroyo del Pino watershed on the north and the Bear Canyon Arroyo on the south. Included within this separate drainage area, however, are three sub-areas, each of which drains independently to the west and discharges into existing structures under Interstate 25. A relatively small portion of the area drains to the north and discharges its storm runoff into the Arroyo del Pino. Another area, also relatively small, drains to the south and west and discharges its runoff into Academy Boulevard. which in turn discharges the runoff into culverts under San Mateo Boulevard or into drainage courses south of Academy boulevard.

Although the drainage areas described above are fairly well defined, the actual drainage courses within them are not so well defined. Also, since the area is subject to flash floods from rains in the Sandia Mountains to the east, the drainage courses are apt to change course, meander, or overflow their banks during periods of high runoff.

The area is presently undeveloped except for the paved Interstate 25 and its frontage roads on the west; the paved Academy Boulevard on the south; a graded portion of Wyoming Boulevard on the east; sanitary sewers installed in Academy Boulevard from San Mateo Boulevard to Wyoming Boulevard, along a portion of the Interstate 25 East Frontage Road to a point about 1600 feet west of Wyoming Boulevard; and a power line installed from north to south across the area apptoximately 1000 feet east of the East Frontage Road.

Previous planning for the area has established routes for several arterial roads, including Harper Road along the areas north side, an extension of Wyoming Boulevard along the east and northeast side of the property, Alvarado Drive running from Academy Boulevard to Harper Road and two unnamed streets crossing the area's center.

2. Topography

The area lies in the mesas and alluvial fans located west of the western slopes of the Sandia Mountains. It is crossed by numerous small arroyos running from east to west. To the north and

to the south of the area are two large arroyos, the Arroyo del Pino and the Bear Canyon Arroyo, which run from the Sandia Mountains on the east towards the Rio Grande on the west.

The ground surface slopes at a fairly uniform rate of 2½ percent from an elevation of about 5400 feet above sea level on the east to an elevation of about 5200 feet on the west. The contours run almost parallel from north to south except in the paths of the numerous small drainage courses.

3. Drainage Areas and Channels

At the present time the area in question is drained by five separate channels. These channels consist of the Arroyo del Pino on the north, Academy Boulevard on the south, and three minor arroyos located between the other two channels. The three minor arroyos, however, do not have well defined channels until they reach their points of discharge under the East Frontage Road.

The Arroyo del Pino drains an area of slightly more than 4000 acres extending from the crest of the Sandia Mountains to the East Frontage Road. Although its channel is fairly well defined in places, in other places it is not. In its lower reaches, for a distance of 2000 feet or so above the East Frontage Road, its channel has been largely obliterated by the construction of a sanitary fill within its channel. At a point approximately 2½ miles east of the East Frontage Road an earthen dam has been constructed across the arroyo to retain and slowly discharge flash flood water. Since the concrete outlet for this dam no longer exists and since the dam has no concrete spillway to prevent erosion if the dam should overflow, it is believed that its usefulness should be considered as doubtful.

Academy Boulevard drains a total area of about 316 acres extending from a point about one half mile east of Wyoming Boulevard to San Mateo Boulevard. The runoff draining through Academy Boulevard is discharged through an existing structure located at a point 2640 east of San Mateo Boulevard and through structures just east of the intersection of Academy and San Mateo Boulevards.

The three minor arroyos drain three separate areas extending from a point approximately one quarter mile east of Wyoming Boulevard to the East Frontage Road. Each of the arroyos drains into a separate structure under the East Frontage Road.

Proposed Drainage Plans

1. General

In order to provide an adequate system of storm drainage for the development it was necessary to:

(a) Determine the drainage areas which could contribute storm runoff affecting the development;
(b) Determine the amounts of runoff which could be expected from each area;
(c) Determine the points at which the various runoffs would converge and then determine the quantities of runoff to be expected at each of those points;
(d) Determine the ability of each of the existing drainage channels or structures to handle the quantities of runoff which might concentrate at them;
(e) Determine the means by which the expected runoff could be carried to channels or facilities adequate to handle the runoff;
(f) Design additional channels and structures adequate to handle the runoff in the area to be developed.

2. Drainage Areas

A study was made of contour maps of the entire area which could conceivable contribute storm runoff water which might affect the development. The contour maps used for this purpose were prepared by Limbaugh Aerial Surveys, Inc. and the United States Geological Survey.

From this study it was determined that five separate

drainage areas would have to be considered. These five areas are shown on the attached Exhibit A, although for the purposes of this study, several of the areas have been divided into sub-areas. The five separate drainage areas include the following:

(a) The drainage area comprising most of the area proposed for development and composed of areas A,B,C,D,E,F, G,H,I and K as shown on Exhibit A; Drainage area A was further sub-divided as shown on Exhibit B into 17 sub-areas in order to analyze runoff quantities at each point of accumulation within the boundaries of the first unit of the proposed subdivision.

(b) The drainage area in the north-central portion of the proposed development and designated as area L on Exhibit A;

(c) The drainage area in the northern portion of the proposed development and including areas M and N;

(d) The area draining into the Arroyo del Pino and designated as area R on Exhibit A;

(e) The area draining into Academy Boulevard and including areas O. P and Q.

3. Runoff Quantities

The quantity of runoff to be expected from each drainage area was determined using the Rational Formula, Q=AIR, where: Q=quantity of runoff in cubic feet per second, A=area of contributing watershed in acres, I=intensity of rainfall in inches per hour for a duration equal to the time of accumulation in minutes, and R= coefficient of runoff dependent upon the type of surface drained.

The area (A) of each separate contributing area was determined by outlining the watersheds on the contour maps and measuring the areas in acres.

The intensity of rainfall (I) was determined by assuming a 100 year frequency rainfall and then utilizing Chart I, Intensity Duration Frequency Curves (Albuquerque Area - 1961) as prepared by Gordon Herkenhoff and Associates, together with the expected times of accumulation of runoff from each of the areas. The times of accumulation were determined by using probable future street and drainage channel alignments and grades, as shown on Exhibits A and B; assuming the overland flows to be across either poor grass, asphalt pavement, or bare soil surfaces, depending upon the probable type of development in each area and estimating the probable type of grading to be done in each area; assuming future streets to be asphalt paved with concrete curbs and either crowned or flat survaces; assuming drainage channels to be trapezoidal in shape and concrete or gunite lines; and determining the times of flow by utilizing the tables on Pages 5.00, 5.04 and 5.05 of Design by E. E. Seelye.

The coefficient of runoff (R) was determined by assuming the maximum possible development in the areas in consideration. A coefficient of 0.65 was used for areas where dense residential development was most probable. A coefficient of 0.70 was used for areas of probable commercial development, and a coefficient of 0.50 was used for rural areas with light vegetation in the Sandia Mountains where future development is unlikely.

The quantities of runoff expected from each area, the points of concentration with the runoff quantities at each of those points are indicated on Exhibits A and B. Copies of the calculations used to determine the runoff quantities are indicated in the attached Exhibit C.

4. Drainage Channels and Facilities

In order to determine the capacity of the existing drainage channels and structures to carry the expected quantities of runoff, the types, dimensions and slopes of each of the structures were

obtained from field measurements or from construction plans, and they were then analyzed using the following formulas:

Manning Formula, $Q=A\frac{1.486}{n}R2/3\ S1/2$, where: Q=quantity of flow in cubic feet per second, A=cross-sectional area of channel in square feet, n=coefficient of roughness dependent upon the type of channel lining, R=hydraulic dadius of the channel, and S=slope of the channel in feet per foot. For this study the values of n were taken as 0.022 for gunite lining, 0.013 for concrete pipe, 0.014 for concrete box culverts, 0.015 for asphalt paved streets, and 0.030 for dirt lines channels.

Inlet Formula, Q=CA 2gh x F, where Q=quantity of flow in cubic feet per second, A=open area of inlet in square feet, g=32.2 feet per second per second, h=allowable head in feet, and F=clogging factor (taken as 0.67 for square edges).

The proposed drainage facilities were designed using the expected quantities of runoff which each would have to handle, together with the formulas given above and the probable grades and alignments of the drainage channels so as to assure that they would adequatily handle the expected quantities.

The capacities of the existing facilities, together with the quantities of runoff to be carried by the existing and proposed facilities are indicated on Exhibits A and B. Copies of the calculations used to determine those capicities and to design the proposed facilities are indicated in Exhibit C.

Inasmuch as Drainage Area A, which comprises the area proposed for development as the first unit of Academy Acres, includes several streets which would carry runoff water on relatively straight runs of from 2 to 3 percent for distances of from 300 to 1000 feet, special precautions will be taken to avoid problems at the ends of those streets. In particular, no curb cuts will be permitted in line with the gutters of the dead-ending streets. Curbs and gutters on the intersecting street will be constructed so as to divert the runoff water without permitting it to enter onto the adjacent property.

5. Conclusions

On the basis of this study and its calculations it is concluded that the area proposed for development can be provided with adequate storm drainage in accordance with the following plan:

(a) The area made up of Drainage Areas A-K will require the construction of a concrete lined channel extending from Wyoming Boulevard to the East Frontage Road. The runoff from this area can feasibly be carried to the channel by proposed streets and drainage channels and can then be discharged into existing culverts under the frontage road which have a flow capacity sufficient to handle the expected flow.

(b) The area included in Drainage Area L can be adequately drained by means of proposed streets which carry the runoff to existing culverts under the East Frontage Road which have a flow capacity sufficient to handle the expected flow.

(c) The area included in Drainage Area M can be adequately drained by means of proposed streets which carry the runoff to an existing culvert under the East Frontage Road which has a flow capacity sufficient to handle the expected flow.

(d) The areas included in Drainage Areas P and Q can be adequately drained to Academy Boulevard and then discharged through existing facilities at San Mateo and 2640 feet east of San Mateo which have flow capacities sufficient to handle the expected flows from these areas.

(e) The runoff from Drainage Area O which comprises very little of the proposed development will discharge through existing or proposed streets to a point approximately 2400 feet west of Wyoming Boulevard. At that point, according to the plans for Academy Boulevard, the runoff would dis-

charge directly onto Academy Boulevard. From the quantities of runoff expected to concentrate at that point, and considering the fact that Academy Boulevard does not have a sufficient capacity to carry the runoff away, it appears certain that the runoff would run across the street to discharge into the golf course on the south side of the street.

In consideration of the above, it is recommended that a culvert be constructed at the point of discharge of Drainage Area O to carry the runoff across the road to the golf course retention area. If this culvert is not constructed, it appears almost certain that at some time in the future Academy Boulevard will be severely damaged at this point and the runoff will cross to the golf course anyway.

A possible alternate solution to the problem of drainage in this area would be to construct a drainage channel along the eastern side of Wyoming Boulevard to intercept runoff from the area east of Wyoming and then carry the runoff to the Arroyo del Pino. Even if this intercepter channel were installed, however, the runoff from that portion of Drainage Area O lying west of Wyoming Boulevard would still require that some facilities be constructed on Acdemy Boulevard between Wyoming Boulevard and approximately 3000 feet west of Wyoming to allow that runoff to cross Academy Boulevard.

It is recommended that the development of that portion of Drainage Area O lying west of Wyoming Boulevard be deferred until one of the solutions described above be put into effect.

(f) The area included in Drainage Areas R and N can only be drained through the Arroyo del Pino.

Although Drainage Area N presently drains through Drainage Area M to an existing structure under the East Frontage Road, that structure has a flow capacity which is sufficient to handle only the runoff from Drainage Area M. It is therefore proposed that all runoff from Drainage Area N be diverted northwards through future streets so as to discharge into the Arroyo del Pino.

Since Drainage Area N presently drains into the Arroyo del Pino, it is believed that nothing included in the proposed development will affect the existing conditions of that drainage channel.

Since this study indicates that a possible runoff discharge of over 4100 cubic feet per second can be expected in the Arroyo del Pino, a quantity of runoff confirmed by the United States Army Corps of Engineers estimates of runoff which this channel might have to carry of from 4900 to 7100 cubic feet per second as shown in their report of 1970, it is highly recommended that this arroyo be improved so as to be capable of carrying at least a minimum runoff of 4900 cubic feet per second. If the Arroyo del Pino channel is not so improved, a possible overflowing of its banks or change in its channel could affect the proposed Harper Road and the lower portions of Drainage Areas M, N and K.

It is believed that the improvement and channelization of the Arroyo del Pino is important not only to the proposed development of Academy Acres but also to the other properties immediately adjacent to it, and that it should be considered as a regional problem which requires a regional

solution. It does not seem reasonable that the improvement and channelization of the Arroyo del Pino should be the sole responsibility of this development which does not contain the arroyo within its boundaries, and in large part does not even border on it.

It is also recommended that any improvement of the Arroyo del Pino should include improvements to the previously mentioned retention dam. It is believed that these improvements should include the construction of outlet facilities to permit the gradual release of water and the construction of a concrete spillway for use in case the dam should ever overflow.

If these facilities are not constructed, the dam will always present a certain danger to lower areas bordering the Arroyo del Pino since it is conceivable that a series of rains could fill the dam and cause it to overflow. Without a concrete lined spillway the overflowing water could erode the existing earthen spillway with a resulting sudden discharge of its retained water. It is believed that any improvements to this dam should fall into the same category as those on the Arroyo del Pino channel and require a regional solution rather than fall to the responsibility of any single developer.

In conclusion, it is believed that adequate storm drainage can be provided for the proposed development, following the lines set forth in this report.

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