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File 1992-0045 Name: Ptarmigan Ridge #3 - Ptarmigan Ridge Subdivision - RSF-4 - Final Plat

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		A few items are denoted with an asterisk (*), which means they are to be scanned for permanent record on the ISYS retrieval system. In some instances, items are found on the list but are not present in the scanned electronic development file because they are already scanned elsewhere on the system. These scanned documents are denoted with (**) and will be found on the ISYS query system in their designated categories. Documents specific to certain files, not found in the standard checklist materials, are listed at the bottom of the page. Remaining items, (not selected for scanning), will be listed and marked present. This index can serve as a quick guide for the contents of each file.
X	X	**Table of Contents**
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		***Submittal checklist**
X	X	***General project report**
		Reduced copy of final plans or drawings
		Reduction of assessor's map.
		Evidence of title, deeds, easements
X	X	***Mailing list to adjacent property owners**
		Public notice cards
		Record of certified mail
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DOCUMENT DESCRIPTION:

X	X	Action Sheet - 9/2/92	X		List of items needed before recording
X	X	Run Off and Drainage Plan 8/92	X		E-mails
X		Real Property Account History	X	X	Development Improvements Agreement and letter of credit - orig. to City Clerk for retention and scanning- **
X		Subdivision Summary Form	X	X	Pond Volume Study Ptarmigan
		Computer Files Indexing Information Sheet	X	X	Temporary Cul-De-Sac Easement - to City Clerk - **
X	X	Geologic Investigation - 4/16/90	X		Avigation Easement - to City Clerk - **
X	X	Subsurface Soils Exploration Report	X	X	Development Improvements Agmt - drainage facilities- to City Clerk
X		Owner's Title Policy from First American Title Company- 10/17/90	X	X	Grant of Easement - to City Clerk - **
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X		Legal Ad - 8/125/92	X	X	Site Plan
X	X	Planning Commission Mtg. Agenda, Minutes - ** 9/1/92	X	X	Ptarmigan Ridge Preliminary Plan
X		Public Notice Posting - 9/2/92	X	X	Plat - GIS Historical Map - **

X	X	Final Plat - GIS Historical Maps - **			
X	X	Grading and Drainage Plan			
X		Utility Plans			
X		Sewer Line “A” & “B” Plan & Profile			
X		Road Plans and Profiles			

DEVELOPMENT APPLICATION

Community Development Department
250 North 5th Street Grand Junction, CO 81501
(303) 244-1430

A

Receipt _____
Date _____
Rec'd By _____
File No. #45 92

We, the undersigned, being the owners of property situated in Mesa County, State of Colorado, as described herein do hereby petition this:

PETITION	PHASE	SIZE	LOCATION	ZONE	LAND USE
[ ] Subdivision Plat/Plan	[ ] Minor [ ] Major [ ] Resub				
[ ] Rezone				From: To:	
[X] Planned Development	[ ] ODP [ ] Prelim [X] Final	3.5 AC	NORTH ~~of~~ 15th Street & NORTH of Ridge Dr.	~~Proposed~~ RSF-4	Single Family Residential
[ ] Conditional Use					
[ ] Zone of Annex					
[ ] Text Amendment					
[ ] Special Use					
[ ] Vacation					[ ] Right-of-Way [ ] Easement

[X] PROPERTY OWNER	[X] DEVELOPER	[X] REPRESENTATIVE
John A. Siegfried	same	same
Name	Name	Name
P.O. Box 9088	same	same
Address	Address	Address
Grand Junction, CO 81501	same	same
City/State/Zip	City/State/Zip	City/State/Zip
241-7025	same	same
Business Phone No.	Business Phone No.	Business Phone No.

#45 92

Please Remove From Office

NOTE: Legal property owner is owner of record on date of submittal.

We hereby acknowledge that we have familiarized ourselves with the rules and regulations with respect to the preparation of this submittal, that the foregoing information is true and complete to the best of our knowledge, and that we assume the responsibility to monitor the status of the application and the review comments. We recognize that we or our representative(s) must be present at all hearings. In the event that the petitioner is not represented, the item will be dropped from the agenda, and an additional fee charged to cover rescheduling expenses before it can again be placed on the agenda.

X _____ July 29, 92
Signature of Person Completing Application Date

X _____
Signature of Property Owner(s) - Attach Additional Sheets if Necessary

JAJDK

GEOLOGIC INVESTIGATION
PTARMIGAN SUBDIVISION

Mesa County, Colorado
April 16, 1990

John H. Wright, C.P.G.
& Associates

(303) 241-6619
336 Main St., Suite 201

P.O. Box 2355
Grand Junction, CO 81502

GEOLOGIC INVESTIGATION
PTARMIGAN SUBDIVISION

Mesa County, Colorado
April 16, 1990

CONTENTS

GEOLOGIC INVESTIGATION

PTARMIGAN SUBDIVISION

Mesa County, Colorado
April 16, 1990

INTRODUCTION

The proposed Ptarmigan Subdivision is being developed by Ptarmigan Investments Inc., P.O. Box 9088, Grand Junction, CO 81501. The property consists of approximately 33 acres to be subdivided into an as yet undetermined number of residential lots. It is located in a portion of Section 1, T 1 S, R 1 W, Ute P.M. in Mesa County, Colorado southwest of the intersection of G Road and 27 1/2 Road. (See location map).

CONCLUSIONS AND RECOMMENDATIONS

1. Collapsible soils and potentially unstable slopes occur to a limited extent along the northwest margin of the property. These are described more fully below, and their location is indicated on the geologic hazards map which accompanies this report. The recommended means for mitigation of these hazards is avoidance.

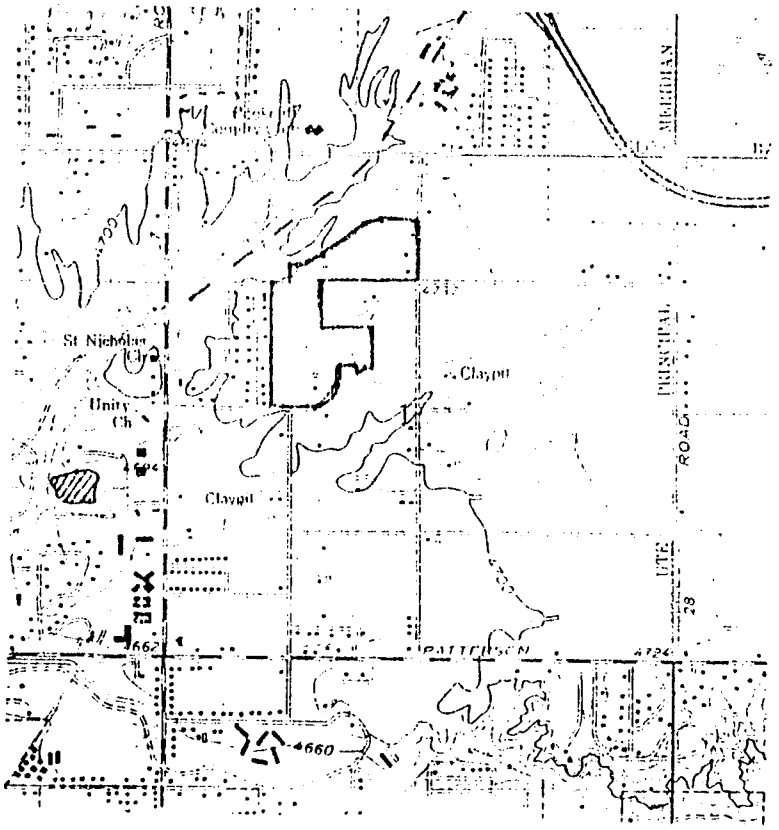
2. Several open irrigation ditches cross the property. At the time of this investigation, they contained flowing water. These ditches, along with poorly drained natural channels nearby but off site suggest a seasonally high water table. Basement structures are therefore not recommended with out a specific plan to prevent seepage into the structure.

3. Some of the irrigation ditches have been reinforced by a levee. If no plan is made to capture and bury the irrigation water in an underground pipe system, then construction should heed a setback from the artificial fill which composes the levee. The suggested set back is indicated on the hazards map which accompanies this report.

4. Subsurface soils testing is recommended to test for water table and other soil properties to guide foundation and other construction design. The tests should be conducted by a Registered Professional Soils Engineer who has been appraised of the findings given in this report.

SCOPE

This report represents the results of a geologic investigation of the proposed Ptarmigan Subdivision as required by Colorado S.B. 35 and local regulations. The investigation included a field examination as well as a review of available geologic literature.



PROPERTY LOCATION MAP (From USGS 7.5 min.quad: "Grand Junction, Colorado")
Scale: 1"= 2,000'
Section 1, T 1 S, R 1 W, Ute PM.

A copy of a preliminary property map (1"=200' with 2' contour topography) was provided by the developer. This map was used as the base for plotting geologic features and is reproduced to accompany this report. Monumentation from the survey was not precisely located in the field, and all the individual lot lines have not been shown.

The conclusions of this investigation are based solely on the site conditions at the time of investigation. They do not reflect hazards which might develop from improper design or construction methods.

GEOLOGY

The property lies entirely upon a soil horizon developed on top of Cretaceous Mancos shale (Km). The Mancos Shale is weathered sufficiently on the site so that no outcrops of formational material exist. Bedding is presumed to be nearly flat.

A geologic plan and hazards map (1"= 200') accompanies this report

Geologic Hazards

Collapsible soils (cs) have been identified along the northwest margin of the property. These occur near or with areas that have been artificially filled with soil and construction debris. The piles of fill and debris appear to have been bulldozed over the edge of a pre-existing slope with little effort made for thorough compaction. Near one of these areas of fill and debris accumulation, but apparently upon the original agricultural surface, concentric soil cracks and a depressed surface were observed. This is interpreted as subsidence due to soil collapse. In the absence of any other plan for mitigation or remedial action, new construction should avoid these areas.

Potentially unstable slopes (pus) also occur along the northwest margin of the property. Whereas most of the property is of fairly level grade, the areas of potential instability grade in excess of 30%. These fall off into an established natural drainage which lies to the north and west of the property. There is no present sign of active instability. However, it is felt that new construction in the areas designated as potentially unstable could initiate slumping or sliding soils conditions. In the absence of any other plan for mitigation or remedial action, new construction should avoid these areas.

A shallow water table, at least seasonally present, is suspected to underlie much of the property. This water is introduced to the substrata through open and unlined irrigation ditches which cross the property. Foundation design following soils testing should contemplate problems that might arise from a shallow water table.

No other geologic hazards, including radiation hazard (see attached Radiation Examination), are apparent.

Mineral Resources

No developable valuable mineral resources are known to occur on the property.

SITE CONDITIONS

Surface Features

Excepting the areas pointed out as potentially unstable, the remainder of the natural topography is gentle -- grading roughly 2% southwesterly.

The surface consists of level graded agricultural fields -- about 50% fallow and 50% freshly tilled, and level construction graded land. In the northeast and the southwest corners of the property are two small areas of plantings of trees and/ or lawn. Two irrigation ditches cross the property.

Drainage

The property contains an incipient stream channel which originates on the property and drains to the southwest. This channel empties into a pond which is well off site and which is adjacent to the Grand Valley Canal. The source and discharge of the Canal is the Colorado River.

The incipient stream channel, at the time of this investigation, contained a few inches of slowly running water. The probable source of this water is leakage from nearby irrigation systems. The water "daylights" in this channel and drains poorly towards the southwest where just before exiting the property, it creates marshy conditions. While the channel has been modified by artificial means with levees and ditch work, without further modifications, new construction should avoid the marshy areas and heed a set back from the levees. The marshy areas and suggested setbacks are indicated on the geologic plan and hazards map.

Construction Factors

No hard or resistant outcrops of rock occur on the property. Surficial materials are easily rippable with conventional means.

As described above, subsurface water may be a problem in construction.

WATER

Potable water will be obtained from Ute Water Conservancy.

Irrigation water will be derived from Grand Valley Water User's Association.

Sewage will be conveyed off property by the City of Grand Junction systems.

SOILS

Surface soils are comprised entirely of soil type: "Fruita clay loam". This is a light brown to reddish brown, somewhat calcareous soil. It typically exhibits the following properties: slow surface runoff, medium internal drainage, "slight" erosion hazard, easy rippability, and low to absent alkalinity. (These properties are confirmed by field observations at the site.) County wide, the soil type shows a low shrink-swell potential. However, the unweathered Mancos Shale lying immediately beneath it has a higher such potential.

It is recommended that a subsurface soils interpretation be conducted by a Professional Engineer prior to building construction. The soils characteristics thus determined should be considered in foundation and road design.

John H. Wright
Certified Professional Geologist
April 16, 1990

REFERENCES

1. Soil Conservation Service; Soil Survey of the Grand Junction Area, CO; Series 1940, No. 19; 1955.

2. Soil Conservation Service; Soil Survey of Mesa County; 1978.

3. Lohman, S.A.; Geology and Artesian Water Supply, Grand Junction Area, Colorado; U.S.Geological Survey P.P. 451; 1965.

RADIATION EXAMINATION

PTARMIGAN SUBDIVISION

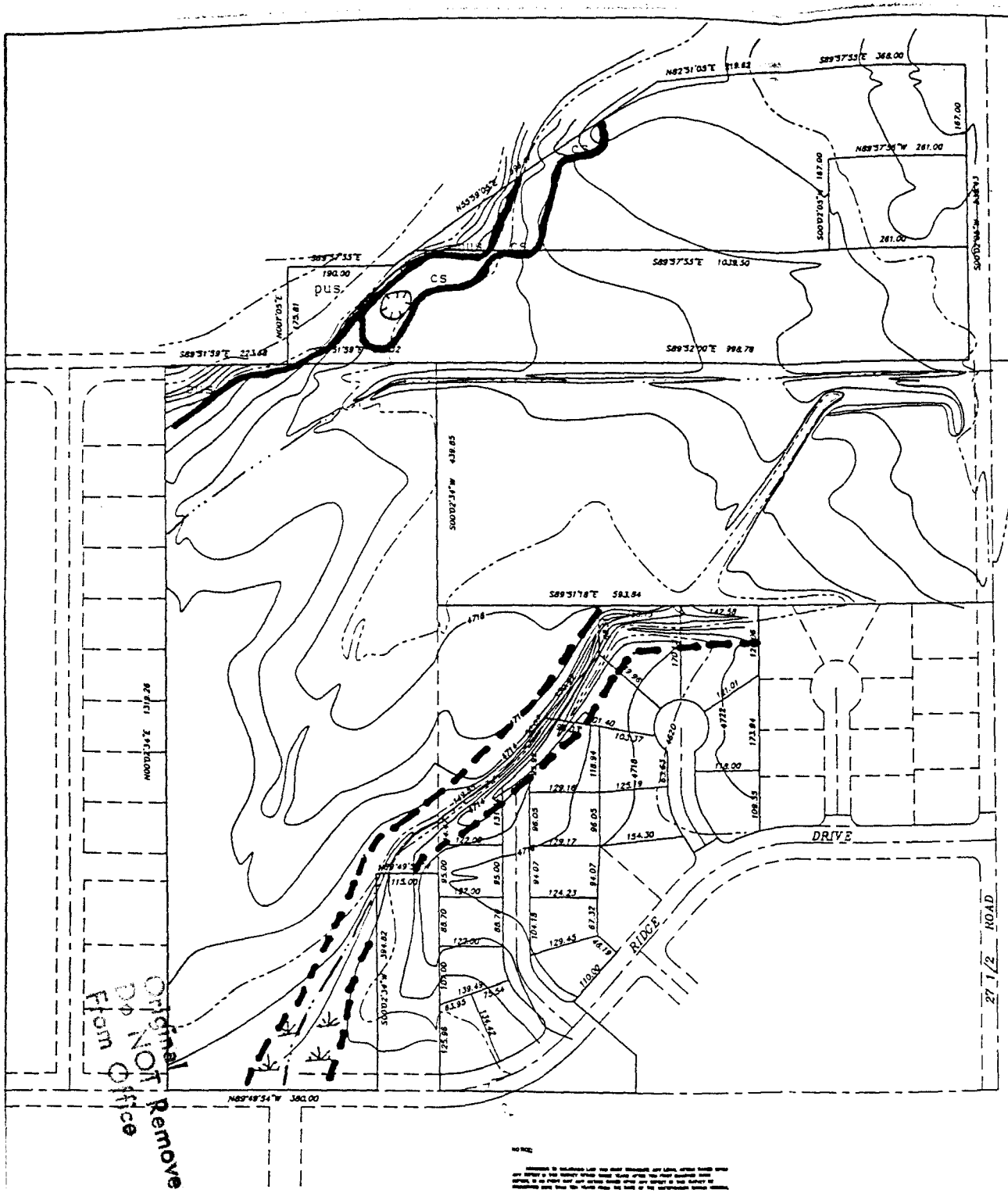
Mesa County, Colorado
April 16, 1990

The proposed Ptarmigan Subdivision, being developed by Ptarmigan Investments Inc., P.O. Box 9088, Grand Junction, CO 81501, was examined for potential radiation hazard. The property is located in a portion of Section 1, T 1 S, R 1 W, Ute P.M. in Mesa County, Colorado. Conditions at the site at the time of this investigation indicate the site is free of radiation hazard.

The examination of the site was carried out according to the requirements of Colorado SB 35, and of local regulations which require radiation examinations for proposed subdivisions. The field examination was carried out in conjunction with the foregoing geologic field investigation, using a Urinco Scintillation Counter Model #720N. The surface was thoroughly traversed on foot and the man-made structures and accumulations of debris were checked. Background radiation was 50 counts per second, +/- 10cps. No where on the property was found a reading higher than background.

As all readings were well below Colorado Health Department standards of 250 counts per second, there is no apparent reason for more detailed radiation survey work.

John H. Wright
Certified Professional Geologist



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LEGEND & NOTES

- FOUND SURVEY MONUMENTS SET BY
- SET NO. 5 RE-BAR W/CAP L.S. 18413

Contact or boundary between hazards

Suggested set back

Marshy ground

Collapsed ground

pus Potentially unstable slopes

cs Collapsible soil

PTARMIGAN SUBDIVISION

FOR:	Q.E.D. SURVEYING SYSTEMS Inc. 1018 COLO. AVE. GRAND JUNCTION COLORADO 81501 464-7568 241-2370
SCALE: 1" = 200'	ACAD ID:
DATE:	SHEET NO.
	FILE:

SURVEYED BY: GRAPH BY: HAMILTON WRIGHT

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SUBSURFACE SOILS EXPLORATION

BELL RIDGE SUBDIVISION AKA PTARMIGAN RIDGE

GRAND JUNCTION, COLORADO

Prepared For:

Mr. John Siegfried
P.O. Box 9088
Grand Junction, CO 81502

Prepared By:

LINCOLN-DeVORE, INC.
1441 Motor Street
Grand Junction, CO 81505

September 5, 1990

#45 92

Lincoln DeVore, Inc.
Geotechnical Consultants
1441 Motor St.
Grand Junction, CO 81505
(303) 242-8968

September 5, 1990

Mr. John Siegfried
P.O. Box 9088
Grand Junction, CO 81502

Re: SUBSURFACE SOILS EXPLORATION

BELL RIDGE SUBDIVISION

GRAND JUNCTION, COLORADO

Dear Mr. Siegfried:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed

If you have any questions after reviewing this report, please feel free to contact this office at any time. This opportunity to provide Geotechnical Engineering services is sincerely appreciated.

Respectfully submitted,

LINCOLN-DeVORE, INC.

By: _____
Edward M. Morris
Western Slope Branch Manager
Grand Junction, Office

Reviewed by: _____ 9/7/90
George D. Morris, P.E.
Colorado Springs Office

GEORGE D. MORRIS REGISTERED 2651 PROFESSIONAL ENGINEER STATE OF COLORADO

EMM/rl

LDTL Job No. 72865-J

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This report presents the results of our geotechnical evaluation performed to determine the general subsurface conditions of the site applicable to construction of single-family residential structures. We understand that the proposed structures will consist of one and two-story wood-framed buildings with the possibility of full basements with concrete floor slabs on grade or no basements and concrete slabs on grade or crawlspace-type structures. A vicinity map is included in the Appendix of this report.

The characteristics of the subsurface materials encountered were evaluated with regard to the type of construction described above. Recommendations are included herein to match the described construction to the soil characteristics found. The information contained herein may or may not be valid for other purposes. If the proposed site use is changed or types of construction proposed, other than noted herein, Lincoln DeVore should be contacted to determine if the information in this report can be used for the new construction without further field evaluations.

PROJECT SCOPE

The purpose of our exploration was to evaluate the surface and subsurface soil and geologic conditions of the site and, based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of the site development as previously described. The conclusions and recommendations included herein are based on an analysis of the data obtained from our field explorations, laboratory testing

program, and on our experience with similiar soil and geologic conditions in the area.

The scope of our geotechnical exploration consisted of a surface reconnaissance, a geophoto study, subsurface exploration, obtaining representative samples, laboratory testing, analysis of field and laboratory data, and a review of geologic literature.

Specifically, the intent of this study is to:

1. Explore the subsurface conditions to the depth expected to be influenced by the proposed construction.
2. Evaluate by laboratory and field tests the general engineering properties of the various strata which could influence the development.
3. Define the general geology of the site including likely geologic hazards which could have an effect on site development.
4. Develop geotechnical criteria for site grading and earthwork.
5. Identify potential construcion difficulties and provide recommendations concerning these problems.
6. Recommend an appropriate foundation system for the anticipated structure and develop criteria for foundation design.

FIELD EXPLORATION AND LABORATORY TESTING

A field evaluation was performed on August 18, 19, and 28 1990, and consisted of a site reconnaissance by our geotechnical personnel and the drilling of twelve exploration borings. These shallow exploration borings were drilled within the proposed building lots near the locations indicated on the Boring Location Plan. The twelve shallow exploration borings were located to obtain a reasonable coode

profile of the subsurface soil conditions. Six borings were utilized for the installation of piezometers. These piezometers were placed to monitor the water levels along the irrigation ditch, along the west property line. All exploration borings were drilled using a CME 45, truck mounted drill rig with continuous flight auger to depths of approximately 9 to 24 feet. Samples were taken with a standard split spoon sampler, a California spoon sampler with liners, thin-walled Shelby Tubes, and by bulk methods. Logs describing the subsurface conditions are presented in the attached figures.

Laboratory tests were performed on representative soil samples to determine their relative engineering properties. Tests were performed in accordance with test methods of the American Society for Testing and Materials or other accepted standards. The results of our laboratory tests are included in this report. The in-place moisture content and the standard penetration test values are presented on the attached drilling logs.

FINDINGS

SITE DESCRIPTION

The project site is located in the South East Quarter of Section I, Township I South, Range I West of the Ute Principal Meridan, Mesa County, Colorado. More specifically the site is located north of Ridge Drive and is between 27 1/2 Road and the extension of North 15th Street. The tract contains 60 single-family lots.

The topography of the site is relatively flat with a slight overall gradient to the South. The exact

direction of surface runoff on this site will be controlled by the proposed construction and therefore will be variable. In general, surface runoff is expected to travel along the proposed Ptarmigan Ridge Road and into the Ridge Drive drainage features, eventually entering a series of improved, naturally-occuring drainage ditches which discharge in the Colorado River. Surface and subsurface drainage on this site would be described as fair.

GENERAL GEOLOGY AND SUBSURFACE DESCRIPTION

The geologic materials encountered under the site consist of a series of silty clay and sandy clay soils which are underlain by the Mancos Shale Formation. Man-made fill, consisting of uncompacted soil, trash and construction debris is present in the north portion of the tract within Blocks 3 and 5. The geologic and engineering properties of the materials found in our twelve shallow exploration borings will be discussed in the following sections.

The soils on this site consist of a series of silty clay and sandy clay soils which are a product of mud flow/debris flow features which origininate on the south-facing slopes of the Bookcliffs. These mud flow/debris flow features are a small part of a very extensive mud flow/debris flow complex along the base of the Bookcliffs and extending to the Colorado River. Utilizing recent events and standard evaluation techniques, this tract is not with an active debris flow hazard area. The surface soils are an erosional product of the upper Mancos Shale and the Mount Garfield Formations which are exposed on the slopes of the Bookcliffs. The soils contained within these mud flow/debris flow features normally exhibit a

metastable condition which can range from very slight to severe. Metastable soil is subject to internal collapse and is very sensitive to changes in the soil moisture content. Based on the field and laboratory testing of the soils on this site, the severity of the metastable soils can be described as slight.

The geologic and engineering properties of the materials encountered, as indicated by the enclosed subsurface logs, will be discussed in the following paragraphs.

Soil Type No. I comprises the surface, alluvial soils which were encountered during this exploration.

This soil type was classified as a low plastic, silty clay (CL) under the Unified Classification System. The Standard Penetration Tests ranged from 9 blows per foot to 40 blows per foot. Penetration tests of this magnitude indicate that the soil is apparently stiff and of apparent medium to high density. Due to the moisture content of these soils the apparent stiffness and density appears to be higher than it is actually realized. The sample obtained from Exploration Boring No. 3 indicates that these have a dry density of only 92.6 pcf which indicates a low density soil. The moisture content varied from 4.3% to 14.3%, indicating a relatively dry soil. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon dessication. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil and expansive pressures on the order of 400 to 920 psf were found to be typical. This material will also consolidate upon saturation or excessive loading. If recommended bearing values

are not exceeded, such settlement will remain within tolerable limits. The allowable maximum bearing value was found to be on the order of 1200 psf. A minimum dead load of 300 psf will be required over the majority of the site.

At depths ranging from seven to twenty-two feet below the exisitng ground surface, the Mancos Shale was encountered. The Mancos Shale was found to be quite weathered and is designated as Soil Type No. IV. A minimum dead load of 300 psf will be required over a majority of the site.

Soil Type No.s II and III are very similar in engineering characteristics but have different appearances in the field. Soil Type No. II is a generally fine-grained sand which is alluvial in origin and is a product of the debris flow action from the Bookcliffs. Soil Type No. III is also alluvial and a product of the debris flow activity but contains large amounts of gravel and occasionally cobble-sized fragments of sandstone, siltstone, and claystone of the lower Mesa Verde Formation. These fragments are the deposits within the high-velocity areas of the original debris flow features. The fine-grained Soil Type II is derived from the sandstones, siltstones, and claystones of the Mesa Verde Formation and represent a more severely weathered and eroded version of Soil Type No. III. For the discussion of this report Soil Types II and III will be described together in the following paragraph.

This Soil Type was classified as a silty sand (SM) under the Unified Classification System. This material is of low plasticity, of low to moderate permeability, and was encountered in a moist to wet condition. It undergoes mild

expansion with the entry of small amounts of moisture, but will undergo long-term consolidation upon the addition of larger amounts of moisture. This soil will settle after being loaded. The maximum allowable bearing capacity for this soil was found to be 1200 psf, with 200 minimum dead load pressure required. The finer grained portion of Soil Type No. II and III contains sulfates in detrimental quantities.

The Mancos Shale is described as a thin-bedded, drab, light to dark gray marine shale, with thinly interbedded fine grain sandstone and limestone layers. Some portions of the Mancos Shale are bentonitic, and therefore, are highly expansive. The majority of the shale, however, has only a moderate expansion potential.

This soil type was classified as a silty clay (CL) under the Unified Classification System. The Standard Penetration Tests ranged from 39 blows per foot to over 80 blows per foot. Penetration tests of this magnitude indicate that the soil is variable and of medium to high density. The moisture content varied from 9.3% to 20.6%, indicating a relatively moist soil. This soil is plastic and is sensitive to changes in moisture content. With decreased moisture, it will tend to shrink, with some cracking upon dessication. Upon increasing moisture, it will tend to expand. Expansion tests were performed on typical samples of the soil and expansive pressures on the order of 900 psf were found to be typical. The allowable maximum bearing value was found to be on the order of 3500 psf for the top two feet of the weathered Mancos Shale and increased to 7000 psf below the top two feet of the Mancos Shale. A

minimum dead load of 1000 psf will be required for the top two feet of the Mancos Shale and 1800 psf will be required below the top two feet of the Mancos Shale.

The lines defining the change between soil types or rock materials on the attached boring logs and soil profiles are determined by interpolation and therefore are approximations. The transition between soil types may be abrupt or may be gradual.

GROUND WATER:

A free water table came to equilibrium during drilling and monitor wells were installed as indicated on the Exploration Boring Location Diagram. Measured depths to the water surface are indicated. This is probably very close to the true phreatic surface rather than a perched water table. In our opinion the subsurface water conditions shown are a permanent feature on this site. The depth to free water would be subject to fluctuation on this site depending upon external environmental effects.

Due to the proximity of the Mancos Shale formation, there exists a possibility of a perched water table developing in the alluvial soils which overlie the soil. This perched water would probably be the result of increased irrigation due to the presence of lawns and landscaping and roof runoff. The exploration holes indicate that the top of the Mancos Shale is relatively flat over much of the site and that subsurface drainage would probably be quite slow. While it is believed that under the existing conditions at the time of this exploration the construction process would not be effected by any

free-flow waters, it is very possible that several years after development is initiated, a troublesome perched water condition may develop which will provided construction difficulties. In addition, this potential perched water could create some problems for existing or future foundations on this tract. Therefore it is recommended that the future presence of a perched water table be considered in all deisgn and construction of both the proposed residential structures and any subdivision improvements.

Due to the existing water table in some portions of this tract and the possibility of free water in other portions of this tract, it is recommended that basement or half basement foundations be constructed with a subsurface peripheral drain system for each structure. All floor slabs should be constructed over a capillary break and vapor barrier.

Because of capillary rise, the soil zone within a few feet above any future free water level associated with perched water tables may be quite wet. Pumping and rutting may occur during the excavation process, particularly if the bottom of the foundations are near the capillary fringe. Pumping is a temporary, quick condition caused by vibration of excavating equipment on the site. If pumping occurs, it can often be stopped by removal of the equipment and greater care exercised in the excavation process. In other cases, geotextile fabric layers can be designed or cobble sized material can be introduced into the bottom of the excavation and worked into the soft soils. Such a geotextile or cobble raft is designed to stabilize the bottom of the excavation and to provide a firm base for equipment.

Careful analysis of the top elevations of the Mancos Shale Formation and the existing pattern of groundwater indicates that the majority of free water encountered in the exploration borings is associated with the irrigation ditch along the west property line and the normal lawn irrigation and water drainage characteristics of the residential Onan Subdivision, along East Cliff Drive. The surface drainage plan for Ptarmigan Ridge Subdivision should be designed in a manner which would improve the surface runoff characteristics in the west portion of this subdivision and encourage the rapid removal of surface waters into an established drainage system. Consideration should be given to properly lining or piping the existing irrigation ditch along the west property line, which is probably the major contributor to the ground water rise in this area.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL DISCUSSION

No geologic conditions were apparent during our reconnaissance which would preclude the site development as planned, provided the recommendations contained herein are fully complied with. Based on our investigation to date and the knowledge of the proposed construction, the site condition which would have the greatest effect on the planned development is the potential for perched water tables and the expansive clays of the Mancos Shale.

Since the exact magnitude and nature of the foundation loads are not precisely known at the present time, the following recommendations must be somewhat general in nature. Any special loads or unusual design conditions should be reported

to Lincoln DeVore so that changes in these recommendations may be made, if necessary. However, based upon our analysis of the soil conditions and project characteristics previously outlined, the following recommendations are made.

OPEN FOUNDATION OBSERVATION

Since the recommendations in this report are based on information obtained through random borings. it is possible that the subsurface materials between the boring points could vary. Therefore, prior to placing forms or pouring concrete, an open excavation observation should be performed by representatives of Lincoln DeVore. The purpose of this observation is to determine if the subsurface soils directly below the proposed foundations are similiar to those encountered in our exploration borings. If the materials below the proposed foundations differ from those encountered, or in our opinion, are not capable of supporting the applied loads, additional recommendations could be provided at that time.

DRAINAGE AND GRADIENT:

Adequate site drainage should be provided in the foundation area both during and after construction to prevent the ponding of water and the saturation of the subsurface soils. We recommend that the ground surface around the structure be graded so that surface water will be carried quickly away from the building. The minimum gradient within 10 feet of the building will depend on surface landscaping. We recommend that paved areas maintain a minimum gradient of 2%, and that landscaped areas maintain a minimum gradient of 8%. It is further recommended that roof drain downspouts be carried across all backfilled areas and

discharged at least 10 feet away from the structure. Planters, if any, should be so constructed that moisture is not allowed to seep into foundation areas or beneath slabs or pavements.

We recommend that a perimeter drain be placed around the exterior walls of the structure at foundation level or below. A drain of this type includes a perforated pipe and an adequate gravel collector, the whole being wrapped in a geotextile filter fabric. We recommend that the discharge pipe for this drain be given a free gravity outlet to exit at ground surface. If "daylight" cannot be obtained, we recommend that a sealed sump and pump be used to discharge the seepage. Under no circumstances shall a "dry well" be used on this site.

The existing drainage on the site must either be maintained carefully or improved. We recommend that water be drained away from structures as rapidly as possible and not be allowed to stand or pond near the building. We recommend that water removed from one building not be directed onto the backfill areas of adjacent buildings. We recommend that a hydrologist or drainage engineer experienced in this area be retained to complete a drainage plan for this site.

To give the building extra lateral stability and to aid in the rapidity of runoff, it is recommended that all backfill around the building and in utility trenches in the vicinity of the building be compacted to a minimum of 85% of its maximum Proctor dry density, ASTM D 698. The native soils on this site may be used for such backfill. We recommend that all backfill be compacted using mechanical methods. No water flooding techniques of any type may be used in placement of fill soon this

site.

Should an automatic lawn irrigation system be used on this site, we recommend that the sprinkler heads be installed a minimum of 5 feet from the building. In addition, these heads should be adjusted so that spray from the system does not fall onto the walls of the building and that such water does not excessively wet the backfill soils.

FOUNDATIONS

SHALLOW

We recommend the use of a conventional shallow foundation system consisting of continuous spread footings beneath all bearing walls and isolated spread footings beneath all columns and other points of concentrated load. Such a shallow foundation system, resting on the alluvial silty clays of Soil Type No. I, may be designed on the basis of an allowable bearing capacity of 1200 psf maximum. A minimum dead load of 300 psf must be maintained. Contact stresses beneath all continuous walls should be balanced to within + or - 150. psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf less than the average used to balance the continuous walls. The criterion for balancing will depend somewhat upon the nature of the structure. Single-story, slab on grade structures may be balanced on the basis of dead load only. Multi-story structures may be balanced on the basis of dead load plus 1/2 live load, for up to 3 stories.

It should be noted that the term "footings" as used above includes the wall on grade or "no footing" type of foundation system. On this particular site, the use of a more conventional footing, the use of a "no footing", or

the use of voids will depend entirely upon the foundation loads exerted by the structure. We would anticipate the use of conventional footings on this site.

If full basement type construction is anticipated for a given structure or if the loading conditions of a crawlspace or a half basement-type structure would require more bearing than the capacity than the silty clays of Soil Type No. I can offer then the clays of the Mancos Shale Formation may be utilized for foundation bearing. At this time Lincoln-DeVore has not been informed of the individual foundation/building plans and is therefore not informed as to the precise wall or column loading plan within any of the proposed buildings. Therefore, three foundation types which could be utilized for single-family residences are recommended based on our experience in this area. The choice between these foundation types depends on the internal loading of the foundation members and the amount of excavation planned to achieve the finished lower elevations.

The three foundation types preliminarily recommended are as follows:

1. The voided wall on grade foundation system with a stemwall resting directly on the shale formation.
2. The isolated pad and grade beam foundation system in which the grade beam is voided and loads are transfered to the isolated pads.
3. The drilled pier and fully voided grade beam system with the loads transfered to the piers.

Recommendations given in this report are given for the Shallow Foundation Types No. 1 and 2 and the Deep Foundation Type No. 3.

A conventional shallow foundation system consisting of either a voided wall on grade or an isolated pad and grade beam system, resting on the relatively unweathered expansive clays of the Mancos Shale Formation, may be designed on the basis of an allowable bearing capacity of 7000 psf maximum, and a minimum dead load of 1800 psf must be maintained. Contact stresses beneath all continuous walls should be balanced to within + or - 200 psf at all points. Isolated interior column footings should be designed for contact stresses of about 200 psf more than the average used to average used to balance continuous walls. The criteria use for balancing will depend somewhat upon the nature of the structure. Single-story, slab on grade structures and single-story crawlspace structures may be balance on the basis of dead load only. Multi-story structures may be balanced on the basis of dead load plus one half live load, for up to three stories.

Stem walls for a shallow foundation system should be designed as grade beams capable of spanning at least 13 feet. These "grade beams" should be horizontally reinforced both near the top and near the bottom. The horizontal reinforcement required should be placed continuously around the structure with no gaps or breaks. A foundation system designed in this manner should provide a rather rigid system and, therefore, be better able to tolerate differential movements associated with the expansive clays.

DEEP FOUNDATIONS:

If the building loads or final building elevations require a deep foundation system, consisting of either drilled piers or driven piles, the following recommendations should be followed. Deep foundations must extend through the low density, upper lean clay materials and into the underlying clays of the Mancos Shale. Both types of foundation have advantages and disadvantages with respect to this site. Therefore, the decision as to which system is used is largely economic and will be left to the owner or his representative. Drilled pier and driven pile foundation systems will be discussed in turn.

DRILLED PIERS:

We recommend that drilled piers have a minimum shaft length of 15 feet and be embedded at least 10 feet into the relatively unweathered bedrock. At this level, these piers may be designed for a maximum end bearing capacity of 25000 psf, plus 1800 psf side support considering only the side wall area embedded in the bedrock. Due to the expansive potential of the bedrock, a minimum dead load uplift is required, consisting of a point uplift of 1800 psf and 300 psf side uplift, based on the side wall embedded in the bedrock. The overburden is soft and no supporting or uplift values are assigned to this material. The weight of the concrete in the pier may be incorporated into the required dead load.

It is recommended that the bottoms of all piers be thoroughly cleaned prior to the placement of concrete. The amount of reinforcing in each pier will depend on the

magnitude and nature of loads involved. As a rule of thumb, reinforcing equal to approximately 1/2 of 1% of the gross cross-sectional concrete area should be used. Additional reinforcing should be used if structural conditions warrant. We recommend that reinforcing extend through the full length of pier.

To minimize the possibilty of voids developing in the drilled piers, concrete with a slump of 5 to 6 inches is recommended. We recommend that piers be dewatered and thoroughly cleaned of all loose material prior to placing the steel cage and concrete. The pier excavation should contain no more than 2 inches of free water unless the concrete is placed by means of a tremie extending to the bottom of the pier. A free fall in excess of 5 feet is not recommended when placing concrete in drilled piers. We recommend that casing be pulled as the concrete is being placed and that a 5 foot head of concrete be maintained while pulling the casing. It is recommended that drilled piers be plumb with 2% of their length and that the shaft maintain a constant diameter for the full length of the pier and not allowed to "mushroom" at the top.

DRILLED PIER OBSERVATION:

The foundation installation for drilled piers should be continuously observed by a representative of Lincoln DeVore to determine that the recommended bearing material has been adequately penetrated and that soil conditions are as anticipated by the exploration. This observation will aid in attaining an adequate foundation system. In addition, abnormalities in the subsurface conditions encountered during foundation installation can be identified and corrective measures taken as

required. Lincoln DeVore requires a minimum of one working day's notice, and a copy of the foundation plan, to schedule any field observation.

GRADE BEAMS:

A reinforced concrete grade beam is recommended to carry the exterior wall loads in conjunction with the deep foundation system. We recommend that this grade beam be designed to span from bearing point to bearing point and not be allowed to rest on the ground surface between these points. We recommend a void space be left between the bottom of the grade beam and the subgrade below due to the expansive nature of the subgrade soils.

DRIVEN PILES:

We recommend that driven piles bear in the competent materials of the underlying formation. We anticipate that pile driving refusal will be encountered within a few feet of penetration into the shale. Based on a static analysis, piles driven to refusal may be designed for an allowable tip bearing capacity of 70 to 100 tons psf. To determine the bearing area of the pile, the area including the space between the flanges may be included. For example, an HB-12 pile may be assumed to have an end area of approximately 1 square foot. A round, closed-end pipe pile bearing area would be the area of the pile end plate. Pile driving refusal should be determined by our representative in the field. Generally, pile driving refusal is taken as a maximum of 15 blows per inch. If pile groups are used, the overall capacity of the pile group should be reduced in

accordance with the appropriate efficiency formula (such as the Converse-Labarre method). If bearing capacities greater than those recommended above are necessary, we recommend that the pile bearing capacity be determined on the basis of static load tests.

It is anticipated that steel piling (either 'H' sections or concrete filled pipe) will be utilized in this construction. The following recommendations will assume the use of these materials. If wood or concrete piling are anticipated, recommendations can be readily provided.

Driving hammers should be of such size and type to consistently deliver effective dynamic energy suitable to the piles and materials into which they are to be driven. Hammers should operate at manufacturer's recommended speeds and pressures. We recommend that a pile driving hammer be used which is rated at at least 19,000 feet pounds. However, driving energy should not be so large that pile damage occurs.

Piles must be used in groups to provide for eccentricities in loading. The group capacity will be less than the summation of the individual pile capacities, depending upon the relative spacing of the piles. A conservative estimate of group capacity is two-thirds of the summation of the individual pile capacities.

We recommend that minimum spacing of the piles be twice the average pile diameter or 1.75 times the diagonal dimension of the pile cross-section, but no less than 24 inches. It is recommended that the tops of the piles extend a minimum of 4 inches into the pile cap. Based on the exploration borings no pile shorter than feet is recommended unless proper

pile capacity is verified by field inspection by the Geotechnical Engineer. Vertical piles should not vary more than 2% from the plumb position. We further recommend that eccentricity of reaction on a pile group with respect to the load resultant not exceed a dimension that would produce overloads of more than 10% in any one pile.

Since the underlying bedrock is moderately expansive, we recommend a minimum of permanent pressure be maintained on each pier. The minimum pressure should be designed based on a tip uplift pressure of 2500 psf. The area used to consider the uplift pressure should be width times the depth of the pile section used when considering H piles. Round pipe piles will require an end uplift pressure of 1800 psf and a side uplift of 300 psf for the portion of the side wall in contact with the expansive formation.

Based on our analyses, a standard 10-3/4 inch diameter, 1/4 inch wall, pipe pile driven to refusal may be designed for an allowable capacity of 70 to 100 tons. On this site the capacity of the pile will govern allowable load. Pile driving refusal required to obtain the recommended capacity was taken as 7 blows per inch with a 20 foot kip hammer. Driving hammers should be of such size and type to consistently deliver effective energy suitable to the piles and materials into which they are driven. Final pile driving refusal should be determined by representatives of Lincoln DeVore in the field.

DRIVEN PILE OBSERVATION:

Continuous observation of the pile driving operations and a pile load test, if required, should be

performed by Lincoln DeVore as a representative of the owner. A continuous log should be maintained on the number of blows per foot required to drive each pile. Driving should be completed without interruption (except for splicing) and without jetting or pre-drilling unless the gestechnical engineer has been contacted for further recommendations.

GRADE BEAMS:

A reinforced concrete grade beam is recommended to carry the exterior wall loads in conjunction with the deep foundation system. We recommend that this grade beam be designed to span from bearing point to bearing point and not be allowed to rest on the ground surface between these points. We recommend a void space be left between the bottom of the grade beam and the subgrade below due to the expansive nature of the subgrade soils.

CONCRETE SLABS ON GRADE

Slabs could be placed directly on the natural soils or on a structural fill. We recommend that all slabs on grade be constructed to act independently of the other structural portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab-structure interface.

Remove
Office

Any partitions which will be located on slabs on grade should be constructed with a minimum space of 2 inches at the bottom of the wall. This space should allow for any future potential upward movement of the floor slabs and minimize damage to the walls and roof sections above the slabs.

It is recommended that slabs on grade be

constructed over a capillary break of approximately 6 inches in thickness. We recommend that the material used to form the capillary break be free draining, granular material and not contain significant fines. A free draining outlet is also recommended for this break so that it will not trap water beneath the slab. A vapor barrier is recommended beneath the floor slab and above the capillary break. To prevent difficulty in finishing concrete, a 2 inch sand layer should be placed above the break.

The magnitude of expansion measured of the soils on this site is such that floor slab movement should be expected if slab on grade consstruction is used. In general, the closer the slab is to the Mancos Shale Formation, the more movement which should be expected. Where floor slabs are cast on expansive soils, no known method of construction will prevent all future slab movement. If the builder and future owner are willing to risk the possibility of some damage due to concrete floor slab movement, the recommendations contained herein should be carefully followed and can help minimize such damage. Any subsequent owner should be advised of the soil conditions and advised to maintain the surface and subsurface drainage, framing of partition above floor slabs, dry wall and finish work above floor slabs, etc.

The first alternative is to dispense with slab-on-grade construction and use a structural floor system. A structural floor system may be either a structural reinforced concrete slab or a structural wood floor system suspended with floor joists. Each system would utilize a crawl space. This alternative would substantially reduce a potential

for post construction slab difficulties due to the expansive properties of the Mnacos Shale Formation.

The second alternative is to install a three foot "buffer zone" of non-expansive, granular soil beneath the slab. This would mitigate the potential for slab movement; however, some potential for movment still exists. Should this alternative be selected, we would recommend that the following be performed:

1. Non-expansive granular soils should be selected for the "buffer zone". The granular soils should contain less than 20% of the material, by dry weight, passing the U.S. No. 200 Sieve. We recommend that the geotechnical engineer be contacted to examine the soils when they are selected, to substantiate that they comply with the recommendations.

2. The perimeter drain for the structures should be located at the elevation equal to or deeper than the "buffer zone". This is to reduce the potential for a "bathtub" effect" which may cause the slab to heave. The "bathtub effect" is created when water is allowed to seep into the "buffer zone" and then becomes trapped since the underlying clay soils have a much lower permeability rate than the "buffer zone" material. Therefore, water may accumulate in the "buffer zone" and subsequently wet the clay soils and cause them to expand.

3. All the non-bearing partitions which will be located on the slabs should be constructed with a minimum 2 inches of void space at the bottom of the wall. This space would allow for the future upward movement of the floor slabs and minimize damage to walls and roof sections above the slabs. The space may require rebuilding after a period of time, since heaving produced by the soils may exceed 2 inches.

4. We recommend that all slabs being placed on the "buffer zone" be constructed to act independently of the other structurall portions of the building. One method of allowing the slabs to float freely is to use expansion material at the slab-structure interface. Control joints should be placed 20 feet on center in each direction. These control joints should control the cracking of the slab should the under-lying soils come in contact with water.

If the slab is to be placed directly on the expansive soils or on a thin fill overlying these soils, the risk of slab movement is high and stringent mitigation techniques are recommended. No design method known at this time will prevent slab movement should moisture enter the expansive soils below. Therefore, to mitigate the effects of slab movement should they occur, we recommend the following:

1. Control joints should be placed in such a manner that no floor area exceeding 400 square feet remains without a joint. Additional joints should be placed at columns and at inside corners. These control joints should minimize cracking associated with expansive soils by controlling location and direction of cracks.

2. We recommend that all slabs on grade be isolated from structural members of the building. This is generally accomplished by an expansion joint at the floor slab/ foundation interface. In addition, positive separation should be maintained between the slab and all interior columns, pipes and mechanical systems extending through the slab.

3. The slab subgrade should be kept moist 3 to 4 days prior to placing the slab. This is done by periodically sprinkling the subgrade with water. However, under no circumstances should the subgrade be kept wet by the flooding or ponding water.

4. Any partitions which will rest on the slabs on grade should be constructed with a minimum void space of 2 inches at the bottom of the wall (see figure in the Appendix). This base should allow for future upward movement of the floor slabs and minimize movement and damage in walls and floors above the slabs. This void may require rebuilding after a period of time, should heave exceed 2 inches.

EARTH RETAINING STRUCTURES

The active soil pressure for the design of earth retaining structures may be based on an equivalent fluid pressure of 54 pounds per cubic foot. The active pressure should be used for retaining structures which are free to move at the top (unrestrained walls). For earth retaining structures

which are fixed at the top, such as basement walls, an equivalent fluid pressure of 77 pounds per cubic foot may be used. It should be noted that the above values should be modified to take into account any surcharge loads, sloping backfill or other externally applied forces. The above equivalent fluid pressures should also be modified for the effect of free water, if any.

The passive pressure for resistance to lateral movement may be considered to be 240 pcf per foot of depth. The coefficient of friction for concrete to soil may be assumed to be 0.24 for resistanse to lateral movement. When combining frictional and passive resistance, the latter must be reduced by approximately 1/3.

We recommend that the backfill behind any retaining wall be compacted to a minimum of 85% of its maximum modified Proctor dry density, ASTM D-1557. The backfill material should be approved by the Soils Engineer prior to placing and a sufficient amount of field observation and density tests should be performed during placement. Placing backfill behind retaining walls before the wall has gained sufficient strength to resist the applied lateral earth pressures is not recommended.

Drainage behind retaining walls is considered critical. If the backfill behind the wall is not well drained, hydrostatic pressures are allowed to build up and lateral earth pressures will be considerably increased. Therefore, we recommend a vertical drain be installed behind any impermeable retaining walls. Because of the difficulty in placement of a gravel drain, we recommend the use of a composite

drainage mat similar to Enkadrain or Miradrain. An outfall must be provided for this drain.

REACTIVE SOILS

Since groundwater in the Grand Junction area typically contains sulfates in quantities detrimental to a Type I cement, a Type II or Type I-II or Type II-V cement is recommended for all concrete which is in contact with the subsurface soils and bedrock. Calcuim chloride should not be added to a Type II, Type I-II or Type II-V cement under any circumstances.

PAVEMENTS

Samples of the surficial native soils at this property that may be required to support pavements have been evaluated using the Hveem-Carmany method to determine their support characteristics. The results of the laboratory testing are as follows:

R = 15 by expansion
Expansion @ 300 psi = 3.1
Displacement @ 300 psi = 3.68

All pavement should be protected from moisture migrating beneath the pavement structure. If surface drainage is allowed to pond behind curbs, islands or other areas of the site and allowed to seep beneath pavement, premature deterioration or possibly pavement failure could result.

The developer of the structure should be aware that the traffic volume and the loads on pavement will be considerably higher during the construction phase than during the design life of the pavement structure. Therefore, some repair may be required after construction of the pavement is complete.

An alternative would be to design a heavier pavement section at this time, utilizing the expected construction volume. It has been our experience that pavement failures during construction are minimal, and that it is more economical to repair localized failures due to contruction traffic rather than construct a heavier pavement section.

LIMITATIONS

This report is issued with the understanding that it is the responsibility of the owner, or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and are incorporated into the plans. In addition, it is his responsibility that the necessary steps are taken to see that the contractor and his subcontractors carry out these recommendations during construction.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in acceptable or appropriate standards may occur or may result from legislation or the broadening of engineering knowledge. Accordingly, the findings of this report may be invalid, wholly or partially, by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of 3 years.

The recommendations of this report pertain only to the site investigated and are based on the assumption that the soil conditions do not deviate from those

SOILS DESCRIPTIONS:

SYMBOL	USCS	DESCRIPTION
		Topsoil
		Man-made Fill
	GW	Well-graded Gravel
	GP	Poorly-graded Gravel
	GM	Silty Gravel
	GC	Clayey Gravel
	SW	Well-graded Sand
	SP	Poorly-graded Sand
	SM	Silty Sand
	SC	Clayey Sand
	ML	Low-plasticity Silt
	CL	Low-plasticity Clay
	OL	Low-plasticity Organic Silt and Clay
	MH	High-plasticity Silt
	CH	High-plasticity Clay
	OH	High-plasticity Organic Clay
	Pt	Peat
	GW/GM	Well-graded Gravel, Silty
	GW/GC	Well-graded Gravel, Clayey
	GP/GM	Poorly-graded Gravel, Silty
	GP/GC	Poorly-graded Gravel, Clayey
	GM/GC	Silty Gravel, Clayey
	GC/GM	Clayey Gravel, Silty
	SW/SM	Well-graded Sand, Silty
	SW/SC	Well-graded Sand, Clayey
	SP/SM	Poorly-graded Sand, Silty
	SP/SC	Poorly-graded Sand, Clayey
	SM/SC	Silty Sand, Clayey
	SC/SM	Clayey Sand, Silty
	CL/ML	Silty Clay

ROCK DESCRIPTIONS:

SYMBOL	DESCRIPTION
	SEDIMENTARY ROCKS
	CONGLOMERATE
	SANDSTONE
	SILTSTONE
	SHALE
X X X X X X	CLAYSTONE
	COAL
	LIMESTONE
	DOLOMITE
	MARLSTONE
	GYPSUM
	Other Sedimentary Rocks
	IGNEOUS ROCKS
	GRANITIC ROCKS
	DIORITIC ROCKS
	GABBRO
	RHYOLITE
	ANDESITE
	BASALT
	TUFF & ASH FLOWS
	BRECCIA & Other Volcanics
	Other Igneous Rocks
	METAMORPHIC ROCKS
	GNEISS
	SCHIST
	PHYLLITE
	SLATE
	METAQUARTZITE
	MARBLE
	HORNFELS
	SERPENTINE
	Other Metamorphic Rocks

SYMBOLS & NOTES:

SYMBOL	DESCRIPTION
	9/12 Standard penetration drive Numbers indicate 9 blows to drive the spoon 12" into ground.
	ST 2-1/2" Shelby thin wall sample
	W_o Natural Moisture Content
	W_x Weathered Material
Free water	Free water table
	γ^o Natural dry density
	T.B. – Disturbed Bulk Sample
②	Soil type related to samples in report
15' W_x Form.	Top of formation
	Test Boring Location
	Test Pit Location
	Seismic or Resistivity Station. Lineation indicates approx. length & orientation of spread (S = Seismic, R = Resistivity)

Standard Penetration Drives are made by driving a standard 1.4" split spoon sampler into the ground by dropping a 140 lb. weight 30". ASTM test des. D-1586.

Samples may be bulk, standard split spoon (both disturbed) or 2-1/2" I.D. thin wall ("undisturbed") Shelby tube samples. See log for type.

The boring logs show subsurface conditions at the dates and locations shown, and it is not warranted that they are representative of subsurface conditions at other locations and times.

LINCOLN DeVORE TESTING LABORATORY

COLORADO: Colorado Springs, Pueblo, Glenwood Springs, Montrose, Gunnison, Grand Junction. – WYO. – Rock Springs

EXPLANATION OF BOREHOLE LOGS AND LOCATION DIAGRAMS

BORING NO. 1

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		I				5.4%
5			GRAVELS – SANDSTONE FRAG.			
		III		5/6 15/12		10.2%
			Free Water @ 10'	25/18		
10			SANDSTONE FRAGMENTS – LARGE			
		IV		23/6 28/12 35/18		18.4%
15						
20		IV	MANCOS SHALE			11.9%
23						

FREE WATER AT 10'
24 HOURS AFTER DRILLING
8-17-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-17-90

JOB NO. 12865-J

DRAWN EHM

BORING NO. 3

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
5		I			92.6	4.3%
		I		6/6		14.2%
10				15/12		
			11'-6" FREE WATER	25/18		
		III		3/6		19.7%
15			Occ. SANDSTONE FRAGMENTS	7/12		
				12/18		
			MANCOS SHALE			
		IV		30/6		14.9%
20				76/12		

FREE WATER 11'-6"
24 HOURS AFTER DRILLING
8-20-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-20-90

JOB NO. 72865-J

DRAWN EHM

BORING NO. 7

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		I			105.9	5.2%
5						
		III		6/6 11/12 18/18		7.0%
10						
12			MANCOS SHALE			
		IV		13/6 39/12 78/18		13.5%
15						

No FREE WATER
8-20-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-20-90

JOB NO. 72865-J

DRAWN EMM

BORING NO. 8

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		II		6/6 18/12 33/18		5.5%
5						
		III		5/6 12/12 18/18		13.7%
10						
		I		5/6 13/12 26/18		14.3%
15						
16			KM MANCOS SHALE			
		IV		53/6 90/10		15.1%
20						

No FREE WATER
DURING DRILLING
8-24-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-24-90

JOB NO. 72865-J

DRAWN EHM

BORING NO. 9

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		I		15/6 40/12 70/18		4.9%
5						
		II				8.9%
10						
		III		3/6 7/12 12/18		12.6%
15						
17			MANCOS SHALE			
		IV		30/6 80/12		14.0%
20						

No Free Water
During Drilling
8-24-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-24-90

JOB NO. 72865-J

DRAWN EMM

BORING NO. 10

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			FILL			
5						
9		III	9' H_2O	7/6		14-9%
10				15/12		
				24/18		
		III	GRAVEL SIZED SANDSTONE FRAGMENTS	17/6		14-3%
15			MANCOS SHALE	32/12		
				46/18		
		IV		4½/6		17-5%
20				54/8		
			FREE WATER @ 9' DURING DRILLING 8-24-90			

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-24-90

JOB NO. 72865-J

DRAWN EMM

BORING NO. 11

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
			FILL	4/6 9/12 16/18		
5						
		II		4/6 11/12		6-3%
10				4/18		
12½		IV	MANCOS SHALE	18/6		20.6%
15				42/12 74/18		

No Free Water
8-28-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

DATE 8-28-90

JOB NO. 7285-J

DRAWN EHM

BORING NO. 12

ELEVATION:

DEPTH (FT)	SYMBOL	SAMPLE	DESCRIPTION	PENETRATION RESISTANCE	IN-SITU DENSITY (PCF)	MOISTURE CONTENT (%)
		II				
7			MANCOS SHALE			
		IV		15/6 46/12		9.3%

NO FREE WATER

8-28-90

LOG OF SUBSURFACE EXPLORATION

Lincoln DeVore, Inc.
Geotechnical Consultants

PTARMIGAN RIDGE

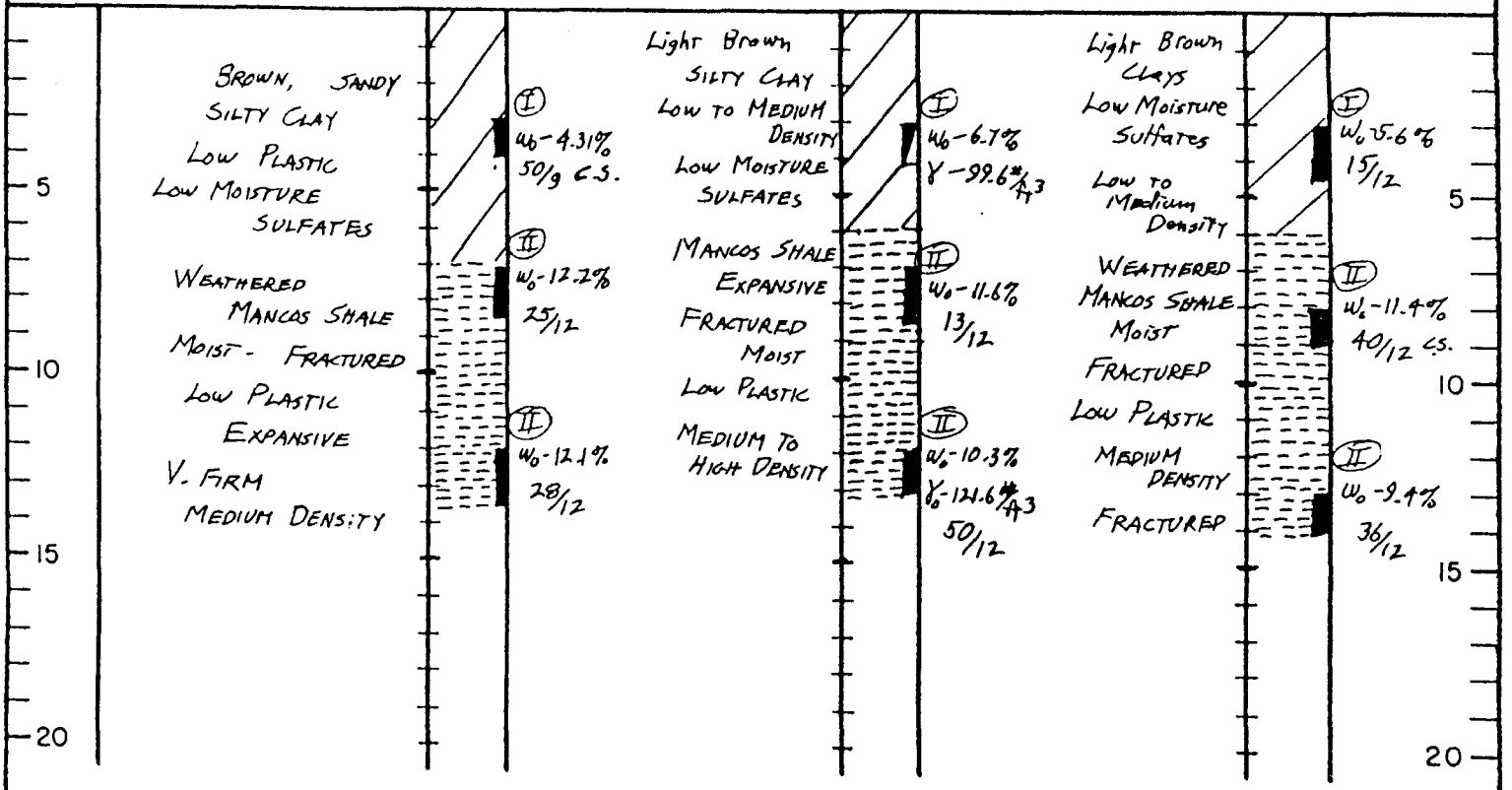
DATE 8-28-90

JOB NO. 72865-J

DRAWN EMM

Job No. LD 12821-J

TEST HOLE NO. P-H-#1 P-H-#2 P-H-#3
ELEVATION



No Free Water In The
Exploration Borings At
Time of Drilling 6-28-90

DRILLING LOGS

LINCOLN DeVORE ENGINEERS • GEOLOGISTS

COLORADO: COLORADO SPRINGS, GRAND JUNCTION, PUEBLO,

SUMMARY SHEET

Soil Sample CLAY - SILT (CL-ML) Test No. 72865-J

Location PTARMIGAN RIDGE - GRAND JUNCTION Date 8-28-90

Boring No. 9 Depth 3

Sample No. (I) Test by RM

Natural Water Content (w) 4.9 %

Specific Gravity (Gs) _____ In Place Density (γ_o) _____ pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	
4	
10	100.0
20	95.5
40	87.8
100	76.6
200	68.2

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	46.7
.005	44.4

Original
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Plastic Limit P.L. 15.1 %
Liquid Limit L. L. 20.6 %
Plasticity Index P.I. 5.5 %
Shrinkage Limit _____ %
Flow Index _____
Shrinkage Ratio _____ %
Volumetric Change _____ %
Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %
Maximum Dry Density - γ_d _____ pcf
California Bearing Ratio (av) _____ %
Swell: _____ Days _____ %
Swell against _____ psf Wo gain _____ %

BEARING:

Housel Penetrometer (av) _____ psf
Unconfined Compression (qu) _____ psf
Plate Bearing: _____ psf
Inches Settlement _____
Consolidation % under psf

PERMEABILITY:

K (at 20°C) _____
Void Ratio _____

Sulfates 1000 ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

Soil Sample Silty Sand (SM)

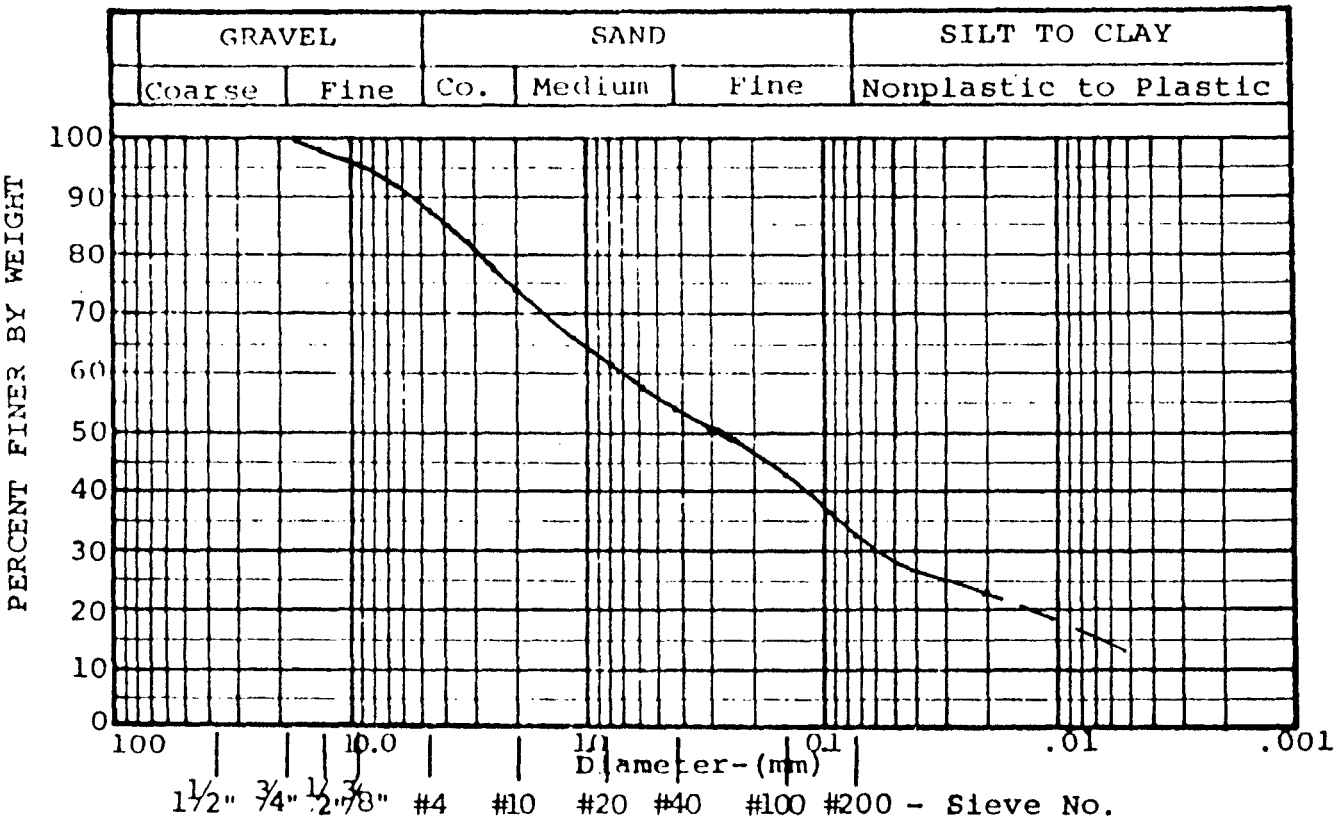
Test No. 72865-J

Project Ptarmigan Ridge

Date 8-31-90

Sample Location 11@8

Test by RM



Sample No. II

Specific Gravity

Moisture Content 13.7

Effective Size

Cu

Cc

Fineness Modulus

L.L. 18.6 % P.I. N.P. %

BEARING psf

Sieve Size	% Passing
1 1/2"	
1"	
3/4"	100.0
1/2"	98.2
3/8"	95.5
4	87.1
10	73.6
20	61.4
40	54.2
100	42.4
200	32.4
0200	23.2

Sulfates 2000 ppm

GRAIN SIZE ANALYSIS

LINCOLN DeVORE ENGINEERS GEOLOGISTS

COLORADO: COLORADO SPRINGS
GRAND JUNCTION, PUEBLO,
GLENWOOD SPRINGS

Soil Sample SILTY SAND (SM)

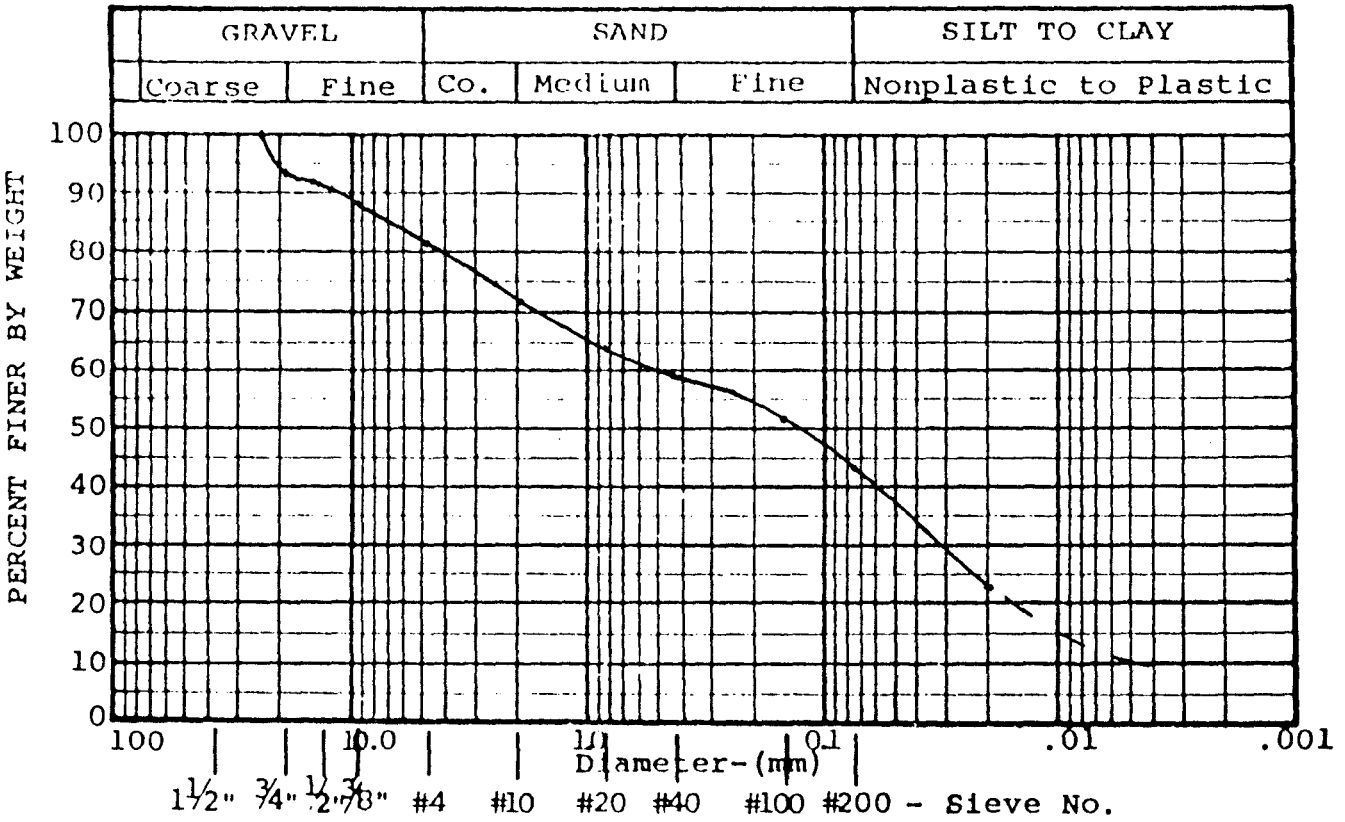
Test No. 72865-J

Project PTARMIGAN RIDGE

Date 8-31-90

Sample Location 3@13

Test by RM



Sample No. III

Specific Gravity

Moisture Content 19.7%

Effective Size

Cu

Cc

Fineness Modulus

L.L. 16.4 % P.I. N-P %

BEARING psf

Sieve Size	% Passing
1 1/2"	
1"	100.0
3/4"	97.9
1/2"	90.7
3/8"	87.8
4	81.3
10	71.2
20	63.7
40	59.4
100	50.7
200	43.0
0200	22.6

Sulfates 2000 ppm

GRAIN SIZE ANALYSIS

LINCOLN DeVORE ENGINEERS GEOLOGISTS

COLORADO: COLORADO SPRINGS GRAND JUNCTION, PUEBLO, GLENWOOD SPRINGS

SUMMARY SHEET

Soil Sample MANCOS SHALE (CL)

Test No. T2865-J

Location PTARMIGAN RIDGE

Date 8-28-90

Boring No. 7 Depth 13

Sample No. IV

Test by RM

Natural Water Content (w) 13.5 %

Specific Gravity (Gs) _____

In Place Density (γ_o) _____ pcf

SIEVE ANALYSIS:

Sieve No.	% Passing
1 1/2"	
1"	
3/4"	
1/2"	
4	
10	100.0
20	93.7
40	89.1
100	83.3
200	79.2

HYDROMETER ANALYSIS:

Grain size (mm)	%
.02	49.1
.005	41.8

Original
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Plastic Limit P.L. 17.2 %

Liquid Limit L. L. 27.1 %

Plasticity Index P.I. 9.9 %

Shrinkage Limit _____ %

Flow Index _____

Shrinkage Ratio _____ %

Volumetric Change _____ %

Lineal Shrinkage _____ %

MOISTURE DENSITY: ASTM METHOD

Optimum Moisture Content - w_o _____ %

Maximum Dry Density - γ_d _____ pcf

California Bearing Ratio (av) _____ %

Swell: _____ Days _____ %

Swell against _____ psf Wo gain _____ %

BEARING:

Housel Penetrometer (av) _____ psf

Unconfined Compression (qu) _____ psf

Plate Bearing: _____ psf

Inches Settlement _____

Consolidation % under psf

PERMEABILITY:

K (at 20°C) _____

Void Ratio _____

Sulfates 2000 ppm.

SOIL ANALYSIS

LINCOLN-DeVORE TESTING LABORATORY
COLORADO SPRINGS, COLORADO

TEST HOLE NO.	SAMPLE DEPTH (FT.)	NAT. MOIST. W_o = %	NAT. DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SEIVE	ATTERBERG LIMITS			UNCONFINED COMPRESSIVE STRENGTH (PSF)	SWELL TEST (PSF)	WATER SOLU. SULF. (PPM)	ASTM D-2487 SOIL CLASS.	SOIL TYPE NO.	DESCRIPTION AND NOTES
					LIQUID LIMIT LL-%	PLASTIC LIMIT PL-%	PLAST. INDEX PI-%						
9	3	4.9								2000		I	
	8	8.9							468 Remold			I	
	13	12.6								2000		III	
	18	14.0								2000		IV	
10	3									2000		FILL	
	8	18.9								2000		III	
	13	14.3								2000		III	
	18	17.5										IV	
11	3											FILL	
	8	6.3										II	
	13	20.6								2000		IV	
12	3											II	
	8	9.3								2000		IV	

Original
Do NOT Remove
From Office

LABORATORY TEST RESULTS
SUMMARY OF SAMPLES

LINCOLN DeVORE ENGINEERS · GEOLOGISTS

COLORADO: COLORADO SPRINGS, GRAND JUNCTION, PUEBLO, GLENWOOD SPRINGS
WYOMING: EVANSTON

Job No. LD
Rpt. Date

TEST HOLE NO.	SAMPLE DEPTH (FT.)	NAT. MOIST. Wo = %	NAT. DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SEIVE	ATTERBERG LIMITS LIQUID LIMIT LL-%	ATTERBERG LIMITS PLASTIC LIMIT PL-%	ATTERBERG LIMITS PLAST. INDEX PI-%	UNCONFINED COMPRESSIVE STRENGTH (PSF)	SWELL TEST (PSF)	WATER SOLU. SULF. (PPM)	ASTM D-2487 SOIL CLASS.	SOIL TYPE NO.	DESCRIPTION AND NOTES
1	3	5.4										I	
	8	10.2								2000		III	
	13	18.4										III	
	22	11.9								2000		IV	
3	3	4.3							204 remold			I	
	8	14.2								2000		I	
	13	19.7										III	
	18	14.9								2000		IV	
7	3	5.2	105.9						921			I	
	8	7.0										III	
	13	13.5								2000		IV	
8	3	5.5										II	
	8	13.7										III	
	13	14.3								2000		I	
	18	15.1								2000		IV	

Original
Do NOT Remove
Date Due Office

LABORATORY TEST RESULTS
SUMMARY OF SAMPLES

LINCOLN DeVORE ENGINEERS · GEOLOGISTS

COLORADO: COLORADO SPRINGS, GRAND JUNCTION, PUEBLO, GLENWOOD SPRINGS
WYOMING: EVANSTON

Job No. LD
Rpt. Date

H

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Grand Junction, CO 81506

Frank L. Webber
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Grand Junction, CO 81506

Kevin E. Tiedeman
663 Eastcliff Dr.
Grand Junction, CO 81506

Dennis A. Cotthaus
661 Eastcliff Dr.
Grand Junction, CO 81506

Michael D. McCoin
2716 Midway Ave.
Grand Junction, CO 81506

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Ltd. Partnership
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Grand Junction, CO 81502

J. D. Walters
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Grand Junction, CO 81506

Thomas Clink
3611 Ridge Ct.
Grand Junction, CO 81506

#45

B

IMPACT STATEMENT AND PROJECT NARRATIVE

PTARMIGAN RIDGE FILING 3

Ptarmigan Ridge is located on 26 acres bounded on the south by North 15th Street and Ridge Drive. It also touches 27 1/2 Road to the east. Both of these boundaries provide access to collector streets while other traffic flows will be internal.

From a design standpoint, Ptarmigan Ridge Filing # 3 is a continuation of Filing # 2, although the average lot size is approximately 1000 sq. ft. larger.

Ptarmigan Ridge is scheduled for development over a three year period that commenced in the fall 1990. It is anticipated that phases consisting of 25 to 30 lots per phase will be developed on an annual basis. First phases logically will be those areas closest to 27 1/2 Road and North 15th where it ends. Filing 3 will consist of 11 lots with development to commence in the fall of 1992. Street and sidewalk design has been reconfigured to conform to present City standards. The phases will use Ute water and City of Grand Junction services, as well as Grand Valley Water User's irrigation.

Ptarmigan Ridge Filing 3 is a development planned for a density of approximately 3 homes per acre, within an area zoned to permit four units per acre.

Ptarmigan can presently be served by Ute water from the northeast and southwest road frontage and city sewer is available at 15th Street. Irrigation water is available from Grand Valley Water User's Association, and should be adequate with a homeowner watering schedule to share this limited resource.

Part of Ptarmigan lies within the critical zone of Walker Field and an aviation easement will provided.

#45-2

I FLOODPLAIN ANALYSIS

This subdivision does not fall within any Federally established or published floodplain.

O DEVELOPMENT SCHEDULE

Construction will commence in the fall of 1992 and be completed in the fall of 1992 or by spring of 1993.

Q SITE PLAN

Standard Grand Junction setbacks will apply to these lots.

R

Adjacent land use and zoning is indicated on the site plan.

U LANDSCAPING

Individual landscaping of lots will be done by the lot-owners. There will be no common area landscaping in Filing 3.

Cemetery Investigation

Information regarding the old cemetery site at Ptarmigan Ridge is vague at best. The Fairview Cemetery was platted with the Jaynes Subdivision on February 12, 1896. The next plat we were able to find, at the County Surveyor's office, was when the cemetery site was replatted as Spomer Subdivision Lot 1 on December 5, 1978. The Surveyor's office had no other recorded plats between the two plats mentioned above. The only other help the surveyor's office was, was in providing us with the record owner in 1940 (which is as far back as their documents went.) Ken at the surveyor's office searched many other sources and found nothing. Mesa County library was no help at all. A Cemetery Registry published by the Colorado State Genealogical Society supposedly identified every known Colorado cemetery. The registry did list an old Fairview cemetery abandoned in the 1920-1930's with "no records available". The information did seem to fit, however, the location they gave was one half mile north of Main Street, we are two and one half miles north of Main Street.

The story, as we've heard it from a variety of sources, is that the cemetery was established in 1896, as we've verified. In the early 1930's, the cemetery was moved out to the present City cemetery. Years of public notices were made for relatives to come get their loved-ones. Those not moved were to be moved by the city. The two graves we found were apparently unmarked and missed through this whole process.

The Coroner's Office has established a procedure for us to follow in case any other graves, that were missed by the City, are encountered. We are intending to provide disclosure of the old cemetery in all title work in compliance with state statutes, now that we are aware of the cemetery (our title work when we purchased it said nothing about a cemetery.)

file:PRCEM

X,Y TRAFFIC ANALYSIS

Ten car trips per day per household, or 110 trips per day will be generated by Filing 3, rather than the maximum of 140 trips per day which present zoning allows.

Street signage and lighting will be installed to present city standards.

REVIEW COMMENTS

FILE NO. #45-92 **TITLE HEADING:** Final Plat

ACTIVITY: Ptarmigan Ridge #3

LOCATION: North 15th Street & Ridge Drive

PHASE: **ACRES:**

PETITIONER: John Siegfried

PETITIONER'S ADDRESS/TELEPHONE: P.O. Box 9088
Grand Junction, CO 81502
(303) 241-7025

ENGINEER/REPRESENTATIVE: John Siegfried

STAFF REPRESENTATIVE: Dave Thornton

NOTE: WRITTEN RESPONSE BY THE PETITIONER TO THE REVIEW COMMENTS IS REQUIRED ON OR BEFORE 5:00 P.M., AUGUST 27, 1992

U.S. WEST **08/10/92**
Leon Peach **244-4964**

New or additional telephone facilities necessitated by this project may result in a "contract" and up-front monies required from developer, prior to ordering or placing of said facilities.

UTE WATER **08/10/92**
Gary R. Mathews **242-7491**

Main line must run approximately 3' from the curb. C-900 PVC would be a good material for the main line. Policies and fees in effect at the time of application will apply.

WALKER FIELD **08/13/92**
M. Sutherland **244-9100**

Walker Field has no objections to this development phase. As noted, the project is located within the Airport Area of Influence, thus requiring an Avigation Easement. Please ensure that a copy of the recorded easement is forwarded to the airport authority.

CITY ATTORNEY **08/09/92**
Dan Wilson **244-1505**

1. See notes on plat (minor typo's etc.)
2. Proposed covenants are capable of refinement to remove ambiguities and to avoid difficulty of enforcement by homeowners. I suggest developer contact me directly (notes regarding covenants are attached).

CITY PARKS & RECREATION **08/06/92**
Don Hobbs **244-1542**

Open space fee based upon 11 units at $225.00 - $2,475 due for open space fee.

COMMUNITY DEVELOPMENT **08/17/92**
David Thornton **244-1447**

See attached comments.

CITY DEVELOPMENT ENGINEER **08/18/92**
Gerald Williams **244-1591**

City Development Engineer comments will need to be addressed in the future, after complete submittal has been made. Items missing are as follows:

1. off-site easements
2. drainage report

Also, the roadway plans are inadequate (need to show profiles for both flow lines).

CITY PROPERTY AGENT **08/17/92**
Tim Woodmansee **244-1565**

Please re-check all distance and bearings. Lot 1 of Block 1 does not close by 2 feet; Lot 2 of Block 1 misses by 1.8 feet. Other lots miss by more than 3 tenths.

Having 2 monuments on the north line of Lot 1, Block 1 is confusing. Perhaps the distance should be broken down as with the north line of Lot 4, Block 2.

Please provide distance along southerly line of Lot 4, Block 3, having a bearing of N83°47'22"W, and along the northerly line of Lot 3, Block 3, having a bearing of N76°50'53"W.

CITY ATTORNEY **08/09/92**
Dan Wilson **244-1505**

1. See notes on plat (minor typo's etc.)
2. Proposed covenants are capable of refinement to remove ambiguities and to avoid difficulty of enforcement by homeowners. I suggest developer contact me directly (notes regarding covenants are attached).

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2. drainage report

Also, the roadway plans are inadequate (need to show profiles for both flow lines).

F

Ptarmigan Ridge Filing 3

Mesa County, Colorado

These covenants are meant to help establish and continue a strong sense of neighborhood and quality within Ptarmigan Ridges.

1. All lots shall be used for one single family dwelling per lot and shall not be further subdivided.

2. No animals other than housepets shall be allowed and these will be confined by the owners to their lot. No animals shall be kept, bred, or maintained for commercial purposes. No horses, cattle, sheep, goats, or donkeys will be allowed to be kept on Ptarmigan Ridge lots.

3. Each single family dwelling shall be constructed so that the dwelling space on the first floor, excluding decks, patios, porches, carports,and garages, shall be not less than the following minimum square footages for both single story and two (2) story structures. If the structure is a tri-level, of the main living area is spread over two continuous and adjacent levels, the combination of such levels shall be construed to be the first floor. Lots will be designated as to type on final plat.

1 story: 1500 min.
2 story: 750 min. first floor

Except Lot 2, Block 3 which shall have a 1200 min. or 600 first floor for a 2 story min.

4. All building set back requirements are to be to city standards.

5. All foundation plans shall be engineered by a licensed Colorado engineer and bear the stamp of same.

6. Invalidation of any one of these covenants by judgement, statute, or court order shall in no way effect any other covenant. These covenants are binding upon all purchasers of a lot or lots in Ptarmigan now and in the future.

7. No trailer, basement, tent, barn, or other outbuilding or temporary structure shall be used as a residence, temporary or

permanent.

8. Only persons holding title to land in Ptarmigan Ridge shall have the right to seek remedy at law or in equity against any person or persons violating or attempting to violate any of these covenants.

9. There is hereby established Ptarmigan Ridge Homeowners Association, an association of which every lot owner will be a member. Membership passes automatically with the sale of the lot. The association shall have the duty to administer the water rights and irrigation practices for Ptarmigan Ridge. It shall have the right to assess members on any reasonable basis for their fair share of the costs of irrigation water, and such charges shall be a lien against each owner's lot. In the event that any such charges become more than thirty (30) days overdue, the association may assess a reasonable penalty, and may add to the assessment all costs of collection. The lien, if foreclosed, shall be foreclosed in the manner of a mechanic's lien under Colorado law. The members of the association, by majority vote, may elect officers. They may, but are not required to, adopt bylaws governing their organization. There shall be one vote per lot in any filed portion of the total Ptarmigan Ridge subdivision.

10. The above covenants may be modified and/or amended by a vote of members of the Homeowners Association with approval by no less than 80% of the members.

11. These covenants shall run with the land for the benefit of all future owners.

12. No vehicles shall be allowed on any lot, that ~~can't~~ be driven under their own power within twenty-four hours. RV storage is prohibited in the street. Storage of RV's is allowed on the lots behind a fenced area.

13. A three person architectural control committee shall be established to review and approve house plans and landscape plans in order to maintain the integrity of Ptarmigan Ridge.

atty fees?

define

define
- length of time before 4 "storage"

?

if don't approve, then what

how, who, done by Assoc?

maintained? by whom ?

14. Two large trees shall be planted at curb side in order to create a tree-lined street consistent with traditional Grand Junction street treatment.

16. If a lot is purchased and not built on within 18 months from date of purchase, the owner will submit an interim landscape plan which will maintain the integrity in accordance with other built-on lots.

1st ?

Dated:

Ptarmigan Investments Inc.

By: _____

FILE: PRF3F

COMMUNITY DEVELOPMENT DEPARTMENT STAFF REPORT

by Dave Thornton, 244-1447

File #45-92

REVIEW COMMENTS:

PLAT

1. Need Book & Page # in Plat dedication.
2. Lots 2 and 4 of Block 3 do meet the minimum lot size requirement of 8500 sq ft. Please adjust property lines accordingly.
3. Acres is misspelled in area summary table.
4. A temporary easement is required for the cul-de-sac.
5. Need to label type and dimensions of easement shown on west sides of lot 1, blk 2 and lot 1, blk 3.

GENERAL

1. The temporary cul-de-sac must be constructed with a dust free surface.
2. An avigation easement is required to be recorded and must be recorded with the plat.
3. The soils report notes a potential for perched water table conditions created by irrigation and roof runoff. The design and construction of all improvements should take that into account. Because of the possibility of varying soil conditions, open excavation observation should be performed by a soils engineer prior to placing forms or pouring concrete. The site drainage recommendations and foundation recommendations made in the Lincoln-DeVore, Inc. soils report (dated Sept. 5, 1990) should be followed for site specific construction.
4. **We have not yet received a drainage report and adequate roadway plans. Any submitted reports and plans must meet the minimum requirements of the code and be accepted by the City Development Engineer. They must be submitted by AUGUST 24, 1992. If any or all of the above does not happen, staff will recommend tabling this project until the following Planning Commission hearing.**
5. The covenants talk about an architectural review committee. Who will be the initial committee and do we need to have them stamp the plans prior to issuing any building permits.
6. Interim Landscaping Plans for vacant lots will be submitted to whom?
7. The improvements Agreement/Guarantee must be approved by City Engineering and will be recorded with the Final Plat.
8. All review agency comments must be addressed in writing to us by Friday, August 28th, 1992 by 5 p.m.

RUNOFF AND DRAINAGE PLAN

PTARMIGAN RIDGE
SUBDIVISION

FILING 3

Prepared By

WH ENGINEERING

Grand Junction, Colorado

August, 1992

"I hereby certify that this report (plan) for the drainage design of Ptarmigan Ridge Subdivision, Filing 3, was prepared by me."

William Heley, P.E.

Registered Professional Engineer,
State of Colorado, Number 12364

LOCATION AND DESCRIPTION OF PROPERTY

Ptarmigan Ridge Subdivision is located north of Ridge Drive, West of 27.5 Road, South of G Road, and East of E. Cliff Drive, in the City of Grand Junction, Mesa County, Colorado. More specifically, it is located in the NW 1/4 of Section 1, Township 1 South, Range 1 West of the Ute Meridian.

The total development includes an area of about 46 acres, including interior parcels not yet controlled by the developer, Ptarmigan Investments, Inc. The site has been developed so far in parcels, with filings on the southern corners of the property. Filings 1 and 2 of this subdivision have been platted and are currently being developed. Filing 3 is immediately north of Filing 2, and encompases 11 lots, totaling 3.35 acres including streets. Filing 4 will complete the northwest extension of the development.

Figure 1 shows the relative locations of the Development Parcels.

Surface soils are loamy and sandy clays, and the vegetal cover is thin, with grasses and shrubs typical of an abandoned pasture. The land may have been flood irrigated in the past, but no irrigation has occurred on Filing 3 for many years. An irrigation ditch does cross the northern edge of the property, which will provide water for a centralized irrigation system and water for the houses in O'Nan subdivision to the west. The ditch parallels Courtland Avenue and enters the Ptarmigan Development at the intersection of 27.5 Road and Courtland. The ditch is fed from the Highline Canal, and is unlined.

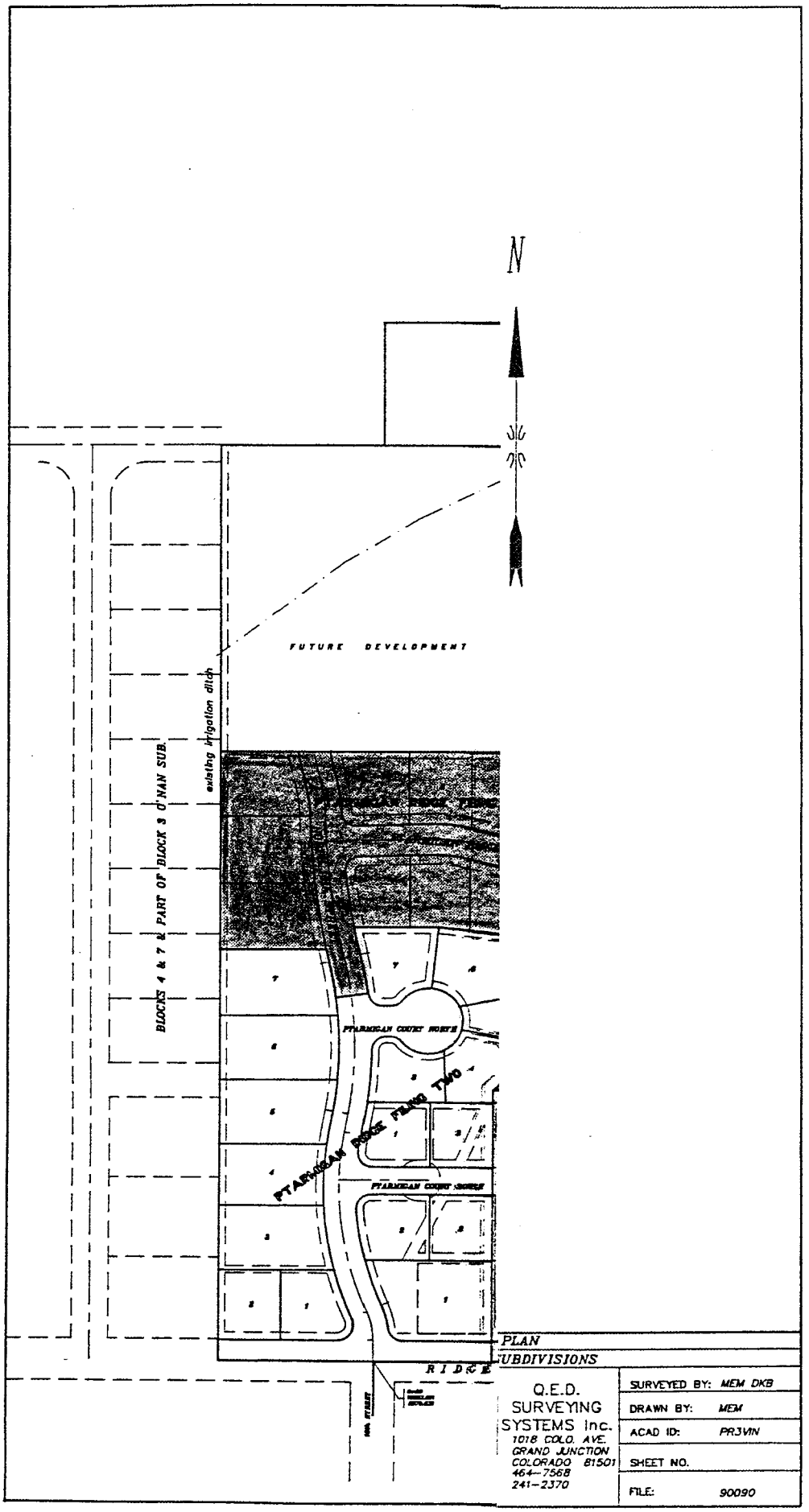
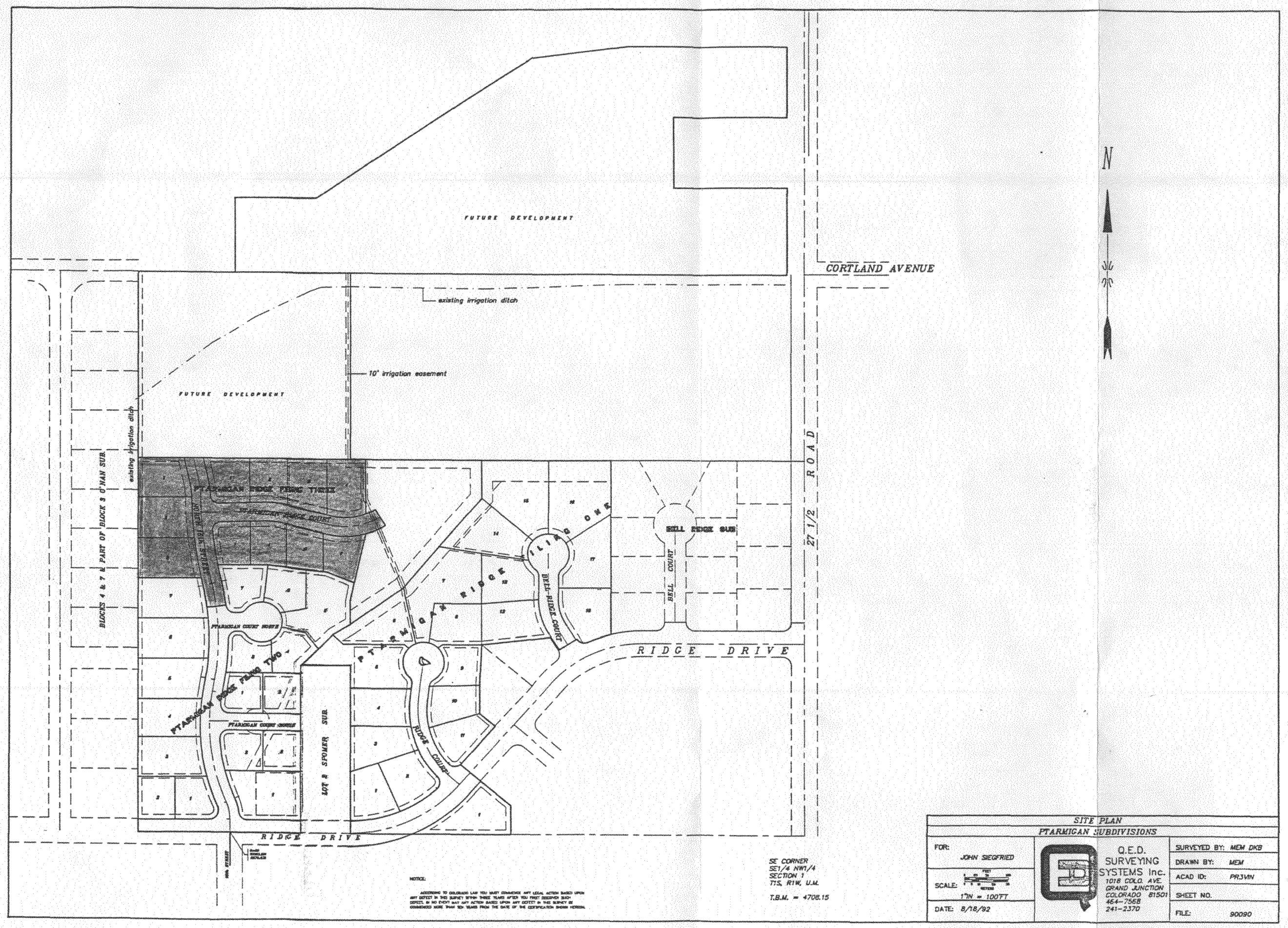


Figure 1 Site Development Plan



SITE PLAN
PTARMIGAN SUBDIVISIONS

FOR: JOHN SIEGFRIED	Q.E.D. SURVEYING SYSTEMS Inc. 1018 COLO. AVE. GRAND JUNCTION COLORADO 81501 464-7568 241-2370	SURVEYED BY: MEM DKB
SCALE: 1"IN = 100FT		DRAWN BY: MEM
DATE: 8/18/92		ACAD ID: PRJVIN
		SHEET NO.
		FILE: 90090

Figure 1 Site Development Plan

DRAINAGE BASINS AND SUB-BASINS LOCATION AND EVALUATION

The proposed development lies in the Colorado River watershed, located approximately 3 miles north of the River, and about 120 feet higher in elevation. It is well beyond any projected flood plain. The largest drainage close to the property is the creek which drains the Horizon Drive area, from Walker Field southward . Ptarmigan Ridge land drains southwestward toward the Lakeside reservoir.

Ptarmigan Ridge is essentially at the upper limit of its drainage basin, due to the divide effect of the irrigation ditch. Flows emanating from upgradient either travel along the ditch bank or cross it in a culvert pipe. Filing 2 has intercepted this culvert flow and retained it in a basin which isolates Filing 3 from runoff originating outside the Ptarmigan boundary.

The drainage within the development is divided into sub-basins as shown in Figures 2, 3, and 4 for the Pre-Development and Post-Development scenarios, respectively. The characteristics of each are discussed in the calculation appendices; areas were determined by planimeter.

Surface soils have been described by both geologic and geotechnical investigations as a clay loam and silty and sandy clays. Subsurface borings suggest depth in the range of 10-20 ft for these alluvial deposits overlying the Mancos shale, the low permeability aquitard limiting downward flows. Natural groundwater levels appear to be above the shale in the more granular materials, and are well below the surface e.g. 10 ft or greater depth. The groundwater does not effect surface runoff characteristics.

The surface is relatively flat, draining generally NE to SW. The natural drainage channel is a swale on the east side of Filing 3. The western edge of the property also drains to the south along the back lots of E. Cliff Drive. This sub-drainage will be a part of the back yard of N. 15th Street lots, and will not drain toward the street. The runoff from this area will become less with development and turf establishment.

The natural slopes vary slightly from 0.4% to about 1.3%, so the overall gradient is mild. Soil type and cover are consistent over most of the site, so less sub-areas are necessary in the composite calculation.

As in most sub-division development, the new drainage patterns do not always follow historic channels, so some judgement is required when comparing pre and post development flows past a given point of reference. We must consider the total system, and not simply a single flow line.

Watershed characteristics may be summarized as follows:

1) The watershed is isolated on the north, east, and west from any inflows, so it may truly be considered independently.

2) The groundwater table will not affect infiltration by causing saturation to develop during storm infiltration.

3) Soil cover is not such as to detain much water or retard overland flows.

4) Overland flow is significant since gradients are low and existing channels are not well developed.

DRAINAGE DESIGN CRITERIA

Regulations

The regulations applicable to this design submission are found in the City of Grand Junction Interim Outline of Grading and Drainage Criteria, dated July 1992. The essence of these criteria is that the on site runoff collection and conveyance facilities must accomodate the 2-year storm; and major structures and outfalls must accomodate the 100 year storm. Detention or retention capacity must also be provided to prevent an increase in runoff due to development for both the 2 year and 100 year storm.

The above referenced criteria also identify specific depths of flow permissible in gutters, traffic lanes, etc. for each class of event.

Development will be approximately 4 lots per acre in Filing 3 with slightly less density in Filing 4, although the lot size in the portion of 4 which flows to 3 will also be 4/acre. House size is 1800-2000 SF plus garage of 450 SF. (Use 2400 SF total average.)

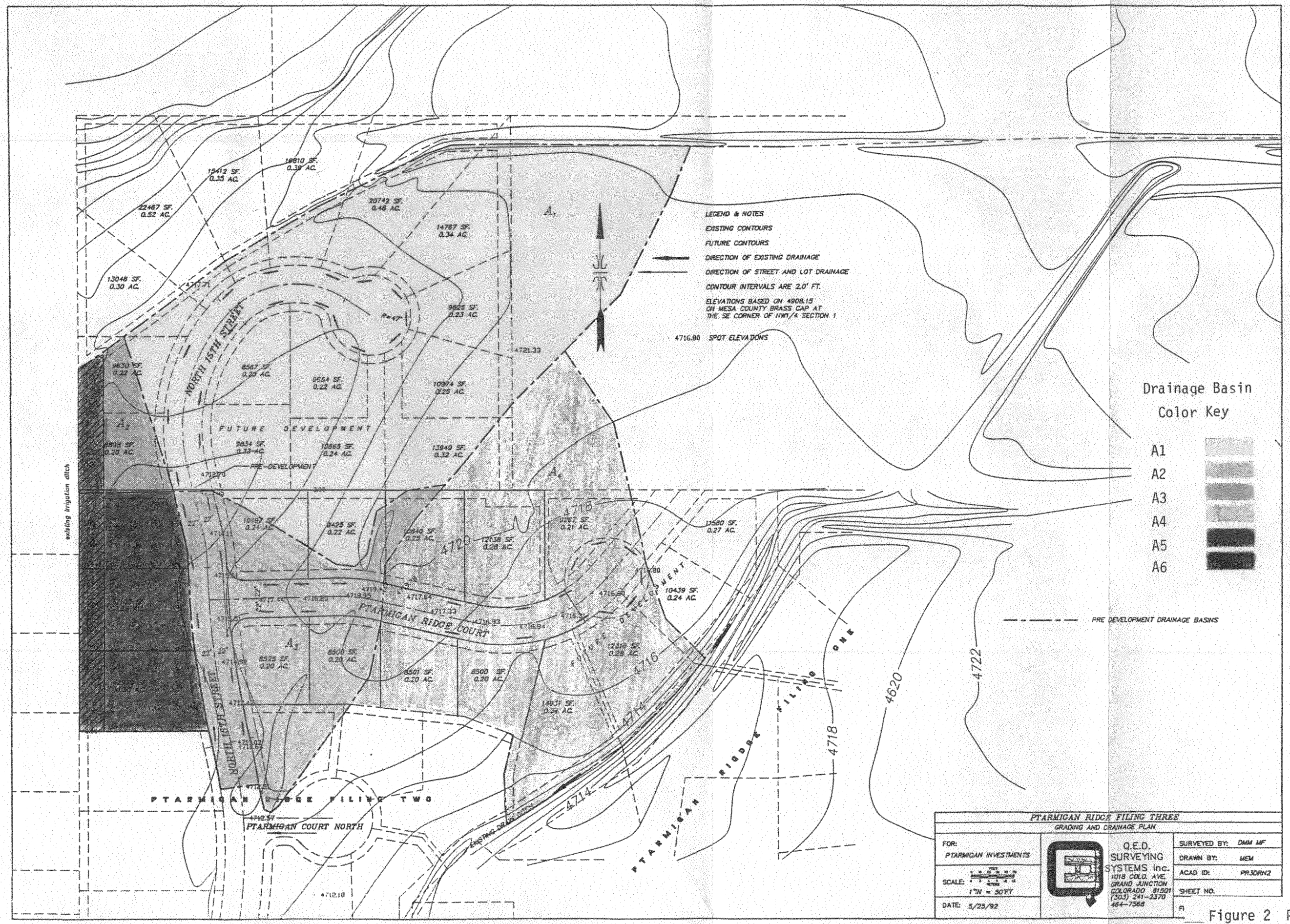


Figure 2 Pre Construction Drainage Sub-Basins

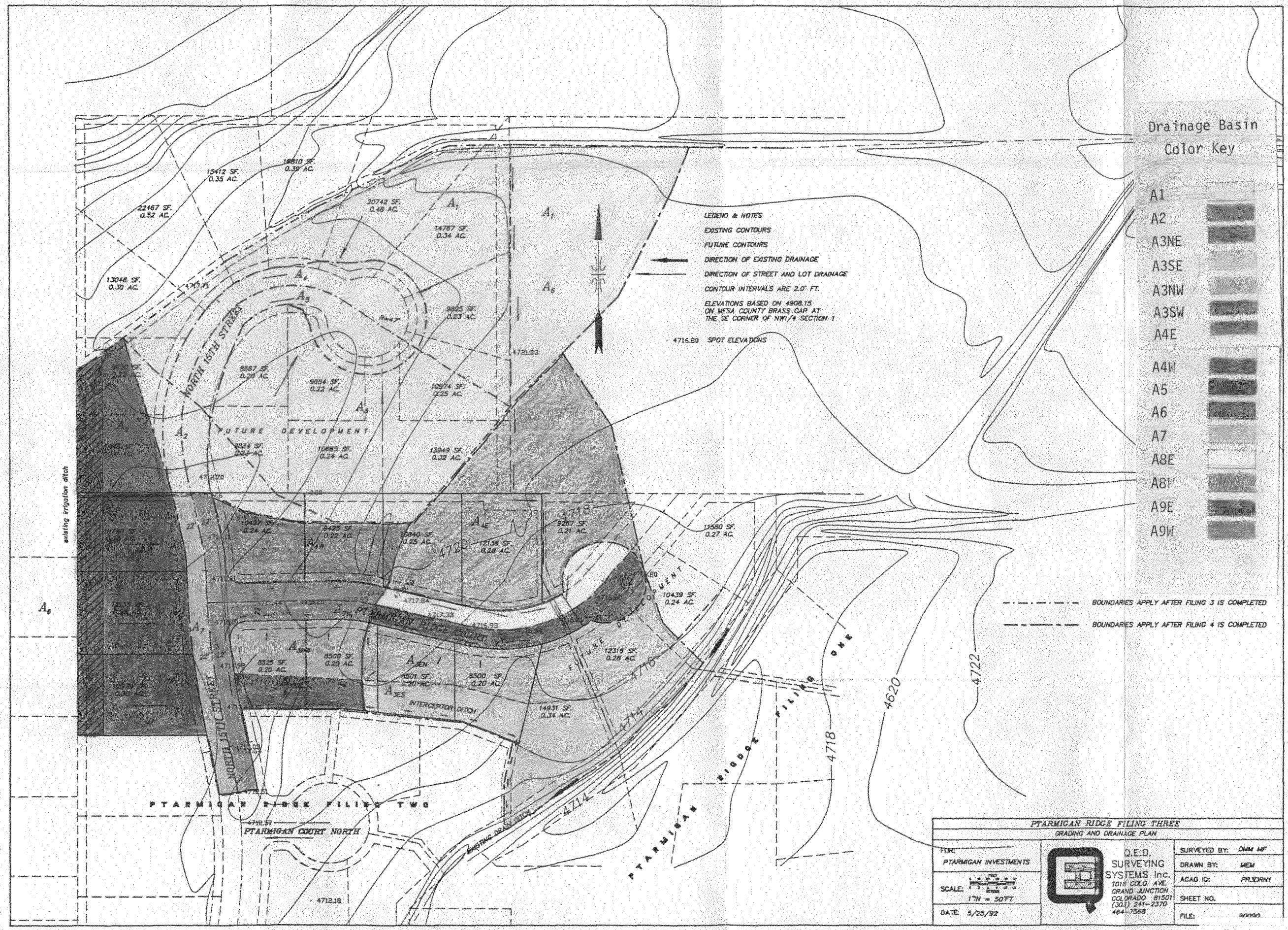


Figure 3 Post Development Filing 3 Drainage Sub-Basins

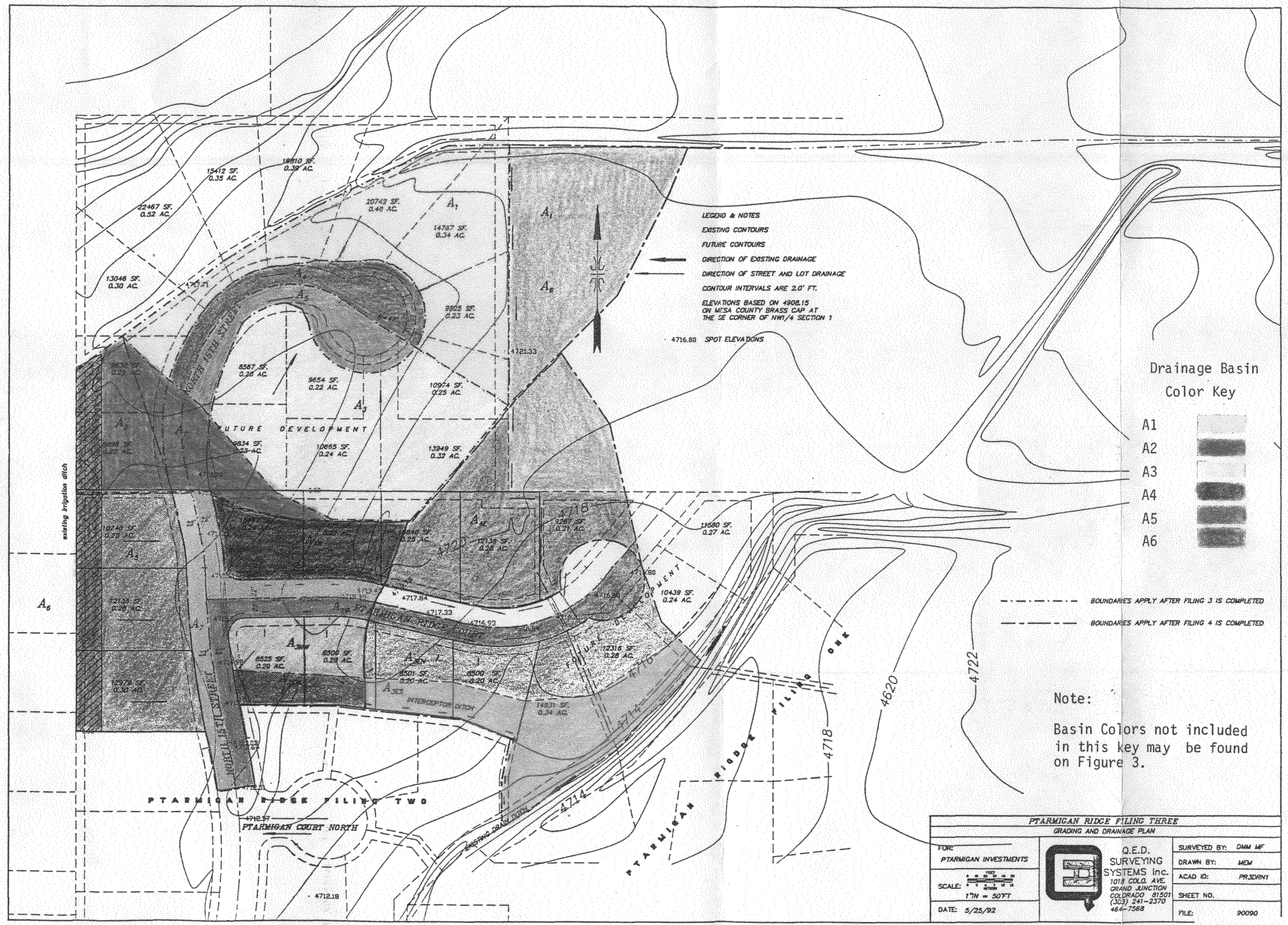


Figure 4 Post Development Filings 3,4 Drainage Sub-Basins

Development Criteria Reference and Constraints

Since the development is within a defined watershed, and essentially constitutes all of the watershed area, the effects of development can be separated from off-site variables and mitigated to meet the no-net-increase criteria. However, since the lowest portion of the property was developed first, including the installation of drop inlets, culverts, and streets, the upstream effects must be acommodated upstream of the lower installations. Essentially, since no overall drainage plan was developed for the entire development before construction began, each Filing must address drainage within its own boundaries.

Filing 2 did intercept and retain 9 cfs, and about 18,000 cubic feet of water from the runoff upstream of the subdivision. This water was removed from the drainage channel, allowing an equivalent increase in runoff from the developed site.

Of this permissable increase, the construction of Filing 2 will consume about 6.1 cfs, leaving about 2.9 cfs still available for Filing 3. However, the street flows of Filing 2 are already near to inlet capacity, and the main culverts are under the outlet control condition, carrying about their maximum rate of flow for the available heads. There is no easy way to convey much more water through the intersection of Ridge and North 15th street.

Hydrological Criteria

The most significant aspect of this drainage study involves a policy change in design procedures implemented by the City of Grand Junction since Filing 2 was made. The previous design basis was a 10 year recurrence interval storm, which created significantly more excess rainfall than the two year storm which is now the precipitation event. It will be possible to accept flow from a larger area if the individual components are smaller due to a smaller amount of rainfall, so the storm drains at Ridge Drive may possibly accomodate the increased flows from Filing 3 under the 2 year criteria.

The design rainfall is defined as the 2 year recurrence Type II storm, and the 100 year recurrence Type II storm,(as compared to Type IIA in Mesa County specifications.) This precipitation is further presented in Appendix A of the Grand Junction Drainage Criteria in an intensity-duration-frequency table (IDF) for use with the rational method of runoff prediction, and on page 3 for the 24 hour SCS 2 year storm as 1.00 inch and for the 24 hour SCS 100 year storm as 2.56 inches. These precipitations have been used in this drainage analysis.

Runoff Calculation

Several methods have been approved by the city of Grand Junction to predict historical and developed runoff flows from ungauged watersheds. Some of these involve computer simulation, while others use manual or nongraphic techniques with tabulated input parameters. Since the criteria for drainage plans have been recently updated in both the city of Grand Junction and Mesa County, the computerized techniques have not yet reached a level of implementation or familiarity in all circles. Rational and SCS methods are still acceptable, particularly on small watersheds, and are proabably equal in accuracy to more sophisticated tools.

Both the Rational Method and SCS-TR55 techniques have been used to determine runoff in this plan. References employed have been included at the end of this report.

Runoff is usually maximized as soon as all of the upstream watershed is contributing to the flow past the point of interest. Runoff lags precipitation, and peak runoff follows peak intensity by the time it take for the farthest component of runoff to reach a given point. This time is called the time of concentration, Tc.

Tc is a simple concept and is the summation of the time it takes droplets to aggregate when surfaces become wetted beyond initial absorbtion capacity (abstraction), then to travel as a sheet to some channel and to flow down that channel to the point where all drainage meets for the watershed in question. In reality, as variety in soils, cover, and slopes increase, the times for each stage of development become more difficult to predict with any confidence. Ptarmigan Ridge is relatively simple in comparision with some drainage basins.

Tables I, II , and III show the development of Tc for each sub-area for Pre-Development, Ptarmigan 3, and Ptarmigan 4 Developments completed.

Runoff is important both from rate of flow and total quantity perspectives. Rate of flow governs size of conveyances, and quantity is necessary to determine detained or retained storage volumes when one flow must be curtailed to permit another to run at new higher rates.

We may use the rational method to estimate peak flows in these small watersheds, knowing Area, C, and i @ Tc from the previous tables and Appendix A.

$$Q = CiA$$

Q = cfs
i = in / hr at Tc
A = drainage in acres
C = runoff coefficient

These peak flows have been tabulated in Tables IV,V,and VI for the stages of development, for both the 2 year and 100 year precipitation events.

TABLE I Time of Concentration

Pre-Construction Condition

Drainage Basin	Area (acres)	Long Path (ft) L_o	Flow (ft) L_{ch}	Slope (%)	Runoff Curve No.	"C" Gp c-good 2	"C" Gp c-good 100	N	T_o Minimum * (A) 2	(A) 100	(B) 2	(B) 100	(C) 2	(C) 100	V (fps)	T_{ch} L/60V	T_c (minutes) 2	T_c (minutes) 100
A_1	4.3	300	375	1.3	70	.25	.35	.10	36	22	27	17	28	24	2.3	2.7	31	27
A_2	0.2	100	80	1.1	70	.25	.35	.10	16	10	13	8	15	13	2.1	0.6	16	14
A_3	1.2	230	220	1.1	70	.25	.35	.10	32	20	23	15	26	24	2.1	1.7	28	26
A_4	2.5	300	220	1.2	70	.25	.35	.10	38	24	28	17	26	23	2.2	2.1	30	25
A_5	0.6	280	0	0.4	70	.25	.35	.10	55	34	40	25	33	30	1.4	0	33	30
A_6	0.3	300	150	0.6	70	.25	.35	.10	49	30	35	22	32	28	1.5	1.5	34	30

* Time of Overland Flow has been calculated using the three methods permitted in the Drainage Criteria Outline.:

(A) SCS TR-55 Method

$$T_{o_2} = \frac{0.42\ (NL)^{0.8}}{S^{.4}} \qquad T_{o_{100}} = \frac{0.26\ (NL)^{0.8}}{S^{.4}}$$

(B) HEC-12 Method

$$T_o = \frac{0.93\ L^{.6}\ N^{.6}}{i^{.4}\ S^{.3}}$$

(C) FAA Method

$$T_o = \frac{1.8\ (1.1 - C)\ L^{.5}}{S^{.33}}$$

TABLE II Time of Concentration

Post Development 3 Condition

Drainage Basin	Area (acres)	Long Flow Path (ft) L_o	L_{ch}	Slope (%) 0	CH	Runoff Curve No.	"C" c-good G_p 2	100	N	T_o Minimum * (A) 2	100	(B) 2	100	(C) 2	100	V (fps)	T_{ch} L/60V	T_c (minutes) 2	100
A_1	4.2	300	375	1.3		70	.25	.35	.10	36	22	27	17	28	24	2.3	2.7	31	27
A_2	2.1	100	80	1.1		70	.25	.35	.10	16	10	13	8	15	13	2.1	0.6	16	10
A_{3NE}	.52	60	225	.8	.4	75	.42	.57	.09	8	5	10	6	9	7	1.8	2.1	11	9
A_{3SE}	.59	30	95	.8	6.3	66	.20	.30	.30	11	7	13	8	8	7	1.2	1.3	11	8
A_{3NW}	.22	65	205	.8	2.0	85	.50	.60	.08	8	5	9	6	8	7	1.7	2.0	11	8
A_{3SW}	.13	35	140	1.4	.4	66	.20	.30	.30	10	6	12	8	7	6	2.4	1.0	11	7
A_{4E}	1.04	255	0	2.0	0	80	.45	.60	.09	13	8	19	12	16	13	0	0	15	12
A_{4W}	.38	80	185	1.9	2.3	75	.42	.57	.09	7	5	8	6	9	7	3.0	1.0	9	8
A_5	.70	90	380	.2	.5	80	.45	.60	.09	18	11	20	13	17	13	1.4	4.5	22	17
A_6	.30	300	150	.6	.6	66	.20	.30	.30	48	30	-	-	34	30	1.6	1.6	35	32
A_7	.18	14	355	-	.5	98	.90	.95	.05	5	5	5	5	5	5	1.4	4.2	9	9
A_{8E}	.19	14	195	-	2.6	98	.90	.95	.05	5	5	5	5	5	5	3.3	1.0	6	6
A_{8W}	.15	14	185	-	2.3	98	.90	.95	.05	5	5	5	5	5	5	3.0	1.0	6	6
A_{9E}	.21	14	220	-	2.3	98	.90	.95	.05	5	5	5	5	5	5	3.0	1.2	6	6
A_{9W}	.16	14	260	-	1.8	98	.90	.95	.05	5	5	5	5	5	5	2.9	1.5	7	7

TABLE III Time of Concentration

Post Development 4 Condition

Drainage Basin	Area (acres)	Long Path (ft) L_o	Flow (ft) L_{ch}	Slope (%) 0	Slope (%) CH	Runoff Curve No.	"C" G_p 2	"C" c-good 100	N	T_o Minimum * (A) 2	(A) 100	(B) 2	(B) 100	(C) 2	(C) 100	V (fps)	T_{ch} L/60V	T_c (minutes) 2	T_c (minutes) 100
A_1	1.26	195	0	3.6	-	80	.45	.60	.09	9	6	12	8	12	10	-	-	12	10
A_2	.52	195	0	0.6	-	70	.25	.35	.10	19	12	26	16	25	22	-	-	25	20
A_3	1.03	190	0	3.2	-	80	.45	.60	.09	9	6	13	8	12	10	-	-	12	10
A_4	.21	-	260	-	.5	98	.90	.95	.05	5	5	5	5	5	5	1.4	3.	8	8
A_5	.19	-	260	-	.5	98	.90	.95	.05	5	5	5	5	5	5	1.4	3	8	8
A_6	.92	160	430	1.3	1.9	70	.25	.35	.10	13	8	17	11	17	16	2.1	3.4	8	8

TABLE IV Peak Runoff Using the Rational Method (Q = c i A)
Pre-Construction Condition

Basin	Area (acres)	" c " 2 yr	T_{c_2} min	i_{T_c} in/hr	Q_p 2 yr cfs	" c " 100 yr	$T_{c_{100}}$ min	i_{T_c} in/hr	Q_p 100 yr
A_1	4.3	.25	31	.86	.92	.35	27	2.41	3.62
A_2	0.2	.25	16	1.24	.06	.35	14	3.33	0.23
A_3	1.2	.25	28	.92	.27	.35	26	2.46	1.03
A_4	2.5	.25	30	.88	.55	.35	25	2.51	2.19
A_5	0.6	.25	33	.83	.12	.35	30	2.27	0.48
A_6	0.3	.25	34	.82	.06	.35	30	2.27	0.24

TABLE V Peak Runoff Using the Rational Method (Q = c i A)
Post Development Filing 3 (Before Filing 4)

Basin	Area (acres)	" c " 2 yr	T_{c_2} min	i_{T_c} in/hr	Q_p 2 yr cfs	" c " 100 yr	$T_{c_{100}}$ min	i_{T_c} in/hr	Q_p 100 yr
A_1	4.2	.25	31	.86	.90	.35	27	2.41	3.54
A_2	0.21	.25	16	1.24	.07	.35	10	3.80	0.28
A_{3NE}	0.52	.42	11	1.46	.32	.57	9	3.99	1.18
A_{3SE}	0.59	.20	11	1.46	.17	.30	8	4.19	0.74
A_{3NW}	0.22	.50	11	1.46	.16	.60	8	4.19	0.55
A_{3SW}	0.13	.20	11	1.46	.04	.30	7	4.40	0.17
A_{4E}	1.04	.45	15	1.28	.60	.60	12	3.54	2.21
A_{4W}	0.38	.42	9	1.59	.25	.57	8	4.19	0.91
A_5	0.7	.45	22	1.05	.33	.60	17	3.07	1.29
A_6	0.3	.20	35	.81	.05	.30	32	2.19	0.20
A_7	0.18	.90	9	1.59	.26	.95	9	3.99	0.68
A_{8E}	0.19	.90	6	1.83	.31	.95	6	4.65	0.84
A_{8W}	0.15	.90	6	1.83	.25	.95	6	4.65	0.66
A_{9E}	0.21	.90	6	1.83	.35	.95	6	4.65	0.93
A_{9W}	0.16	.90	7	1.83	.26	.95	7	4.40	0.67

TABLE VI Peak Runoff Using the Rational Method (Q = c i A)
Post Development 4

Basin	Area (acres)	" c " 2 yr	T_{c_2} min	i_{T_c} in/hr	Q_p 2 yr cfs	" c " 100 yr	$T_{c_{100}}$ min	i_{T_c} in/hr	Q_p 100 yr cfs
A_1	1.26	.45	12	1.41	0.80	.60	10	3.80	2.87
A_2	0.52	.25	25	.98	0.13	.35	20	2.84	0.52
A_3	1.03	.48	12	1.41	0.70	.60	10	3.80	2.35
A_4	0.21	.90	8	1.66	0.31	.95	8	4.19	0.84
A_5	0.19	.90	8	1.66	0.28	.95	8	4.19	0.76
A_6	0.92	.25	8	1.66	0.38	.35	8	4.19	1.35

The SCS-TR55 method of runoff prediction yields a runoff Q determined by the equation:

$$Q = \frac{(P - 0.2\,S)^2}{P + 0.8\,S}$$

This equation is solved in tabular form for the Type II storm, 24hr duration, with antecedent moisture condition II. Q is represented in inches of runoff for applied inches of rain. The tables are differentiated by runoff curve number CN.

Next, a runoff table for each of three development cases has been prepared for the 2 year and 100 year storms. These tables show the runoff for each sub-basin, (Tables VII,VIII,IX).

Hydraulic Criteria

Hydraulic design criteria have been presented in the July, 1992 Interim Criteria Manual. This manual presents equations and coefficients for flow on pavements and gutters, through inlets, culverts, and open channels. The methods which have been presented are normal, and references for the sources of this information have been given.

Essentially, the acceptable methodology has been developed and implemented by the Federal Highway Administration. HDS-5 and HEC-12 are the two primary publications which address culvert design and highway drainage. These utilize nomographs and standardized analysis forms to provide quick solutions, and reflect extensive testing by the developing agency. Other hydraulic handbooks, manufacturers' publications, and textbooks support the criteria manual.

References to the specific methods are included in the calculation appendices.

TABLE VII Runoff Volume for Ptarmigan Ridge Filing 3

Pre-Construction Condition

1" = 3630 cf/acre

Basin	Area (acres)	CN	$T_{c_{2\ yr}}$ min	Precip 2 yr-24 hr in	Total Runoff in	Total Runoff cf	$T_{c_{100}}$ min	Precip 100yr-24 hr	Total Runoff in	Total Runoff cf
A_1	4.3	70	31	1.00	0.01	156	27	2.56	0.48	7492
A_2	0.2	70	16	1.00	0.01	10	14	2.56	0.48	348
A_3	1.2	70	28	1.00	0.01	44	26	2.56	0.48	2090
A_4	2.5	70	30	1.00	0.01	90	25	2.56	0.48	4356
A_5	0.6	70	33	1.00	0.01	22	30	2.56	0.48	1045
A_6	0.3	70	34	1.00	0.01	10	30	2.56	0.48	523

TABLE VIII Runoff Volume for Ptarmigan Ridge Filing 3

Post Development 3 Condition

1" = 3630 cf/acre

Basin	Area (acres)	CN	$T_{c_{2\ yr}}$ min	Precip 2yr-24 hr in	Total Runoff in	Total Runoff cf	$T_{c_{100}}$ min	Precip 100 yr-24hr in	Total Runoff in	Total Runoff cf
A_1	4.2	70	31	1.00	0.01	152	27	2.56	0.48	7320
A_2	0.21	70	16	1.00	0.01	8	10	2.56	0.48	366
A_{3NE}	0.52	75	11	1.00	0.03	57	9	2.56	0.69	1300
A_{3SE}	0.59	66	11	1.00	0.00	0	8	2.56	0.35	750
A_{3NW}	0.22	85	11	1.00	0.17	135	8	2.56	1.22	975
A_{3SW}	0.13	66	11	1.00	0.00	0	7	2.56	0.35	165
A_{4E}	1.04	80	15	1.00	0.08	302	12	2.56	0.93	3510
A_{4W}	0.38	75	9	1.00	0.03	42	8	2.56	0.69	952
A_5	0.70	80	22	1.00	0.08	203	17	2.56	0.93	2360
A_6	0.30	66	35	1.00	0.00	0	32	2.56	0.35	380
A_7	0.18	98	9	1.00	0.79	516	9	2.56	2.33	1520
A_{8E}	0.19	98	6	1.00	0.79	545	6	2.56	2.33	1600
A_{8W}	0.15	98	6	1.00	0.79	430	6	2.56	2.33	1270
A_{9E}	0.21	98	6	1.00	0.79	602	6	2.56	2.33	1780
A_{9W}	0.16	98	7	1.00	0.79	459	7	2.56	2.33	1350

TABLE IX Runoff Volume for Ptarmigan Ridge Filing 3

Post Development 4 Condition

1" = 3630 cf/acre

Basin	Area (acres)	CN	$T_{c_{2yr}}$ min	Precip 2yr-24hr in	Total Runoff in	Total Runoff cf	$T_{c_{100}}$ min	Precip 100yr-24hr in	Total Runoff in	Total Runoff cf
A_1	1.26	80	12	1.00	0.08	366	10	2.56	0.93	4250
A_2	0.52	80	25	1.00	0.08	151	20	2.56	0.93	1760
A_3	1.03	80	12	1.00	0.08	300	10	2.56	0.93	3480
A_4	0.21	98	8	1.00	0.79	602	8	2.56	2.33	1780
A_5	0.19	98	8	1.00	0.79	545	8	2.56	2.33	1600
A_6	0.92	70	8	1.00	0.01	33	8	2.56	0.48	1600

DRAINAGE FACILITY PLAN

Concept and Typical Drainage Patterns

Ptarmigan Ridge is a single family residential community being built on gently sloping terrain. Access is limited to one route initially, but may eventually include one through street. Drainage generally follows the streets, except for the historic drainage channel which will remain essentially in its natural state.

Filings 1 and 2 have drained to Ridge Drive, and then into the existing undeveloped drainage to the west. With the completion of Filing 2, storm drains will convey the runoff beneath the intersection of Ridge Drive and N15th Street, both from the pavements and the natural drainage channel.

Filing 3 simply extends the streets farther uphill, and adds another lateral street to the drainage system. Flow from these streets will enter both the inlet/drain system at the bottom of the hill, and the natural channel. Basically, all water on the west side of N 15th will flow to the bottom, and part of the east side water will enter the channel at some point, crossing under the street in the twin 18 inch culverts, or through the drop inlet and culvert on the NE corner of the intersection.

No additional culverts are included in Filing 3. Valley pans and curbing will form the flow boundaries, either directing flow along the streets or off the street to the channel. North 15th Street drains to the south, and approximatley 230 feet of Ptarmigan Ridge Court drains westward back to N 15th Street; about 180 feet drains to the east and then into the natural channel.

All flows from Filing 3 enter Filing 2.

Filing 4 will include the termination of N 15th in a cul de sac. No additional laterals will be developed from N. 15th. The development of Filing 4 will require some additional retention capacity, and by retaining some waters from the northern portion of the drainage, the inflow to Filing 3 will be diminished.

Compliance With Off-Site Runoff Considerations

Applicable Runoff Design Criteria concern depth of flow in streets. For the 2 year storm, flow must be contained within the curb, with a maximum depth of flow in gutters and valley pans of 6 inches. One lane in each direction must be free of inundation. The 100 year storm must not produce a depth of flow in the street of over 1 foot, and there must be a 12 ft lane width at the center of the street which does not exceed 6 inches of depth.

Design peak discharges from the developed area can not exceed historic levels where they leave the site or discharge onto private property. It is impractical to suggest that total runoff can be controlled by any means except retention, so this design will only be concerned with peak flow.

The historic flows generated for earlier studies on Filing 1 and 2 were based upon the 10 year runoff event. Drainage basins were defined differently, and all flow was originally in the drainage channel. The flow quantities were developed by others, and included inflow from up drainage runoff. This runoff was estimated as 9 cfs, entering the Ptarmigan site for both the 10 year and 100 year event.

In order to compare developed to historic runoff rates, comparable methods and coefficients should be used in developing these rates. The Rational Method has been used for Filing 3, with a 2 yr runoff coefficient of 0.25 for undeveloped land. Employing this method for an undevelped basin of 25.3 acres (see appendices), yields a peak runoff of 4.6 cfs for historic flows generated on the property.

However, in order to generate and deliver the off site flows to the Ptarmigan outlet point requires a significantly greater time of concentration for the storm. Moreover, it is unreasonable to say that the 2 year runoff from offsite is still 9 cfs. Without doing a complete analysis of these inflows,(which will be retained anyway in Filing 2,) some factors may be applied to adjust the rates of flow.

The time of concentration for upstream flow development is estimated to be 20 minutes, which added to the Tc of Ptarmigan of 43 minutes, yields an effective Tc of 63 minutes. This thereby reduces the flow from Ptarmigan from 4.6 to 3.5 cfs.

Factoring the storm intensity from a 10 year to a 2 year storm reduces the runoff potential from off-site from 9 cfs to 5.4 cfs (60%). This ratio was selected based upon the rainfall isohyets for the 2 year and 10 year-2 hr storms for Grand Junction (0.7,1.2 inches) as found in Technical Paper 40, US Weather Bureau, US Dept. of Commerce. Although this type of factor would not be applicable to total runoff, the rational formula is dependent only on intensity.

Combining the two values for on-site and off-site runoff yields a historic runoff of 8.9 cfs for the 2 year storm. Following the same procedure for the 100 year storm, (off-site stays @ 9 cfs), the historic runoff becomes 24.1 cfs.

Existing and Proposed Drainage Patterns

The drainage pattern proposed for Filing 3 is merely an extension upgradient of the streets from Filing 2. Flows depart Filing 3 and enter Filing 2 at three specific points; (1) West gutter of N15th Street, (2) East gutter of N15th Street, and (3) in the Drainage channel. Note that there is flow in the drainage channel from the 'forgotten area' upstream of Filings 3 and 4, which is supplemented by Filings 2,3, and 4. (Filing 1 is not included in the historic or developed flows.)

The contributing basins from proposed development are shown on Figures 2,3, and 4. Combining the flows which ultimately leave the Filing boundary at points 1,2, and 3 is accomplished by summing the contributions from each basin as follows:

	Outlet	Pre Construction (Fig 2-Table IV)	Filing 3 (Fig 3-Table V)	Filings 3 & 4 (Fig 4-Table V,VI)
1	W. N15	0	A1,A5,A7	A5, (1/2)A2
2	E. N15	A1, A3	A1,A3NW,A3SW A4W,A8W,A9W	(1/2)A2,A3NW,A3SW A4W, A8W, A9W
3	Channel	A4	A3NE,A3SE,A4E A8E,A9E	A3NE,A3SE,A4E A8E,A9E,A10

Utilizing the contributions from each basin as shown, Tables X and XI summarize the effects of development on peak flows and total runoff from proposed Filings 3 and 4.

Next, it is necessary to add the contributions at 1, 2, and 3 to the contributions from Filing 2 in order to compare with the historic peak flows. Filing 2 has three outlet points as well. They are (I) the sag inlet on the NW corner of N15 and Ridge Drive, (II) the sag inlet on the NE Corner of Ridge Drive, and (III) the twin 18 inch culverts in the drainage channel.

From calculations in the Appendices, Filing 2 contributions are as follows:

@ I : 1.2 cfs

@ II : .3 cfs

@ III : 2.0 cfs (plus FA flow 2.2 cfs) 4.2 cfs

These flows may be added to the flows in Table X, although there is an additional lag time due to gutter flow down N 15th street. Lags generally reduce the peak flow because of a decrease in intensity in the Rational Formula, and because of channel storage. In this case, however, the gutter travel time from 1 to I is about 3.5 minutes, so the peaks will not change significantly.

The total flow rates (cfs) at the Ridge Drive exit points are:

TABLE XII Total Peak Flows at Ridge Drive

2 year:	Case A	Case B	Case C	
				A: Pre Construction
I	1.2	2.7	1.6	B: Post Devel. 3
				C: Post Devel. 4
II	1.5	2.2	1.3	
III	4.8	6.0	6.3	
Total Flow:	7.5	10.9	9.2	(HISTORIC : 8.9)

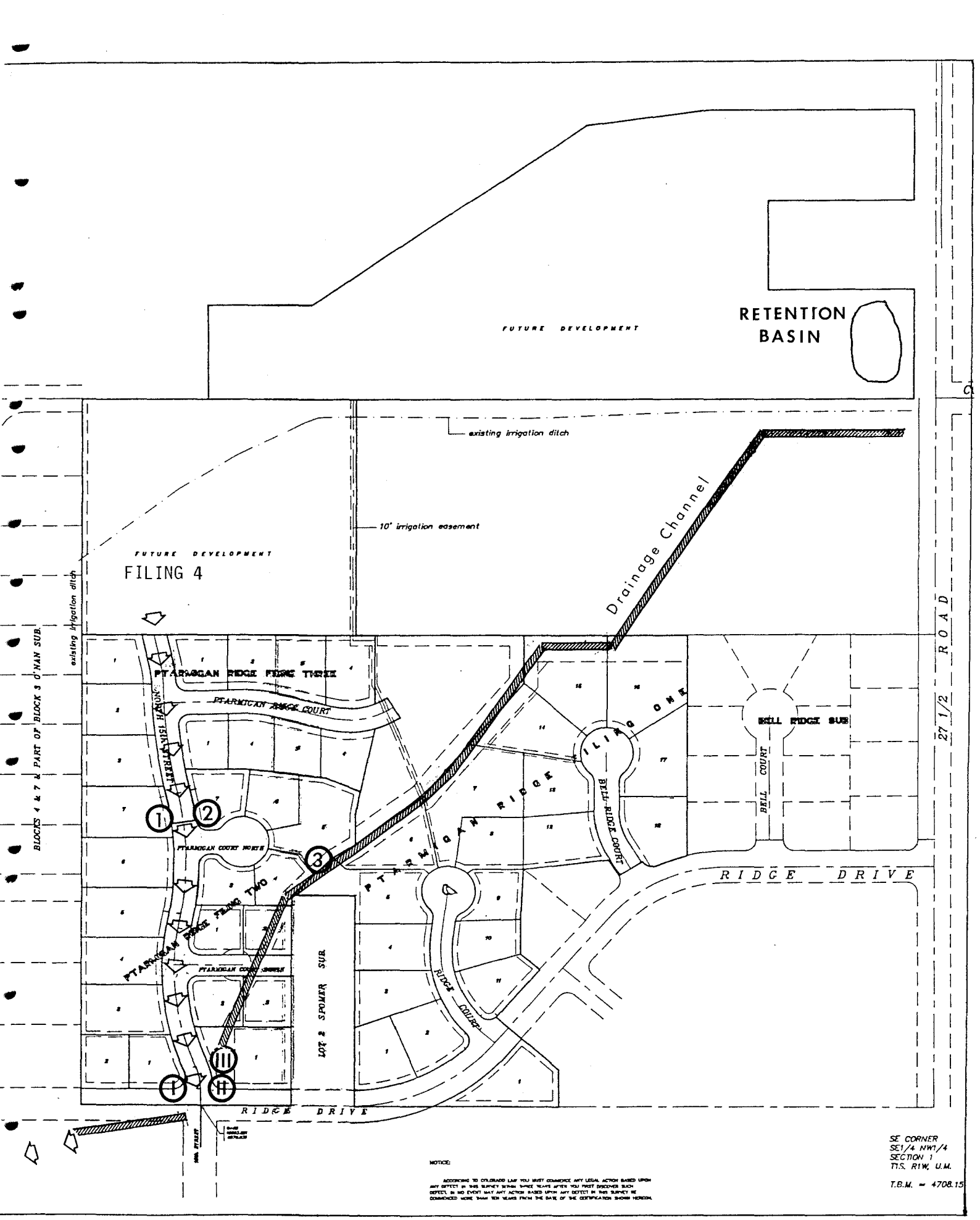


Figure 5 Drainage Plan Reference Points

TABLE XII continued

100 year:	Case A	Case B	Case C	
I	4.2	9.7	5.2	
II	5.5	7.2	4.1	
III	18.5	22.2	22.9	
Total Flow	28.2	39.1	32.2	(HISTORIC : 24)

As anticipated, the flow totals exceed historic values, even with some retention in Filing 2, primarily because of the pavement areas contributing to runoff.

TABLE X Effect of Development on Drainage System

Case A Pre Construction Condition
Case B Post Development Filing 3
Case C Post Development Filing 4

	Outlet Point	Peak Flow Q_p 2 year-cfs			Peak Flow Q_p 100 yr-cfs		
		(A)	(B)	(C)	(A)	(B)	(C)
1	N15 Street West gutter	0	1.49	0.40	0	5.51	1.02
2	N15 Street East gutter	1.19	1.86	1.03	4.65	6.35	3.22
3	Existing Channel	0.55	1.75	2.13	2.19	5.90	6.57
	Total	1.74	5.10	3.56	6.84	17.76	10.81

PEAK FLOWS leaving Filing 3

TABLE XI Effect of Development on Drainage System

Case A Pre Construction Condition
Case B Post Development Filing 3
Case C Post Development Filing 4

	Outlet Point	Total Runoff 2 yr - cf			Total Runoff 100 yr - cf		
		(A)	(B)	(C)	(A)	(B)	(C)
1	N15 Street West Gutter	0	1485	523	0	12,812	2,596
2	N15 Street East Gutter	598	1872	1557	10,381	21,812	5,818
3	Existing Channel	272	2156	2206	4,719	12,045	13,744
		870	5513	4286	15,100	46,669	22,158

TOTAL RUNOFF from Filing 3

CONCLUSIONS

Compliance With Standards

The proposed drainage of Ptarmingan Ridge Subdivision Filing 3 generally meets the criteria, particularly when combined with Filing 4. However, it does slightly exceed historic flows in the 2 year event, and significantly does in the 100 year event.

For the 2 year event, the amount of excess is 1 cfs or less, and this could as easily be due to errors in estimating flow from off site as in inadequate design. A significant portion of the property to be developed in the future contains the probable location for detention or retention, e.g. the existing channel, which is very defined.

The future development will require some retention or detention, and at that time, the additional fraction of a cfs from Filing 3 can be handled as well, if necessary.

The 100 year event is a greater distortion of historic. Development simply adds flow to the runoff peak which has not been taken out. The drainage system will handle these flows within the criteria of water depths in gutter and street.

Effectiveness of Drainage System To Control Damage From Runoff

It is uncertain exactly what is meant by this judgement of effectiveness, (required per Mesa County Report Format). The flows remain in the street, the streets and gutters do not flood beyond specified depths, and waters are directed to historic channels.

It cannot be stated that 100 year flows will not cause damage, either within the development boundary or beyond, if clogging of pipe occurs, inlets plug, or future landowners modify the lots and drainage channel significantly. The water in the streets will be acceptable, and the pipes will carry the projected runoff.

When more retention or detention is added in the future, the peaks will be lessened, but the total flows will increase. Since the downstream conveyance system is probably inadequate now, it will probably sustain some damage in a 100 year flood event, due in part to this development, and to others as well, since Ptarmigan Ridge is only one of several developments in the area.

Impact Mitigation Plans

There is no short term mitigation required. However, since the 100 year, or even maximum probable, event could occur at any time, there is the possibility that runoff could exceed historic before the subdivision is built out, and future retention capacity is realized.

It is not practical, at this time, to add retention or detention in the current configuration of the Filing. It will be necessary to add retention next year as part of the additional development, so the risk will be present until then. However, Filing 3 will not be built by next storm season, and major precipitation does not happen during the winter or early spring months as a statistical norm, but rather in summer and early autumn. Design will have progressed by that time to define where and how much water will be detained. No changes will be made to the existing system.

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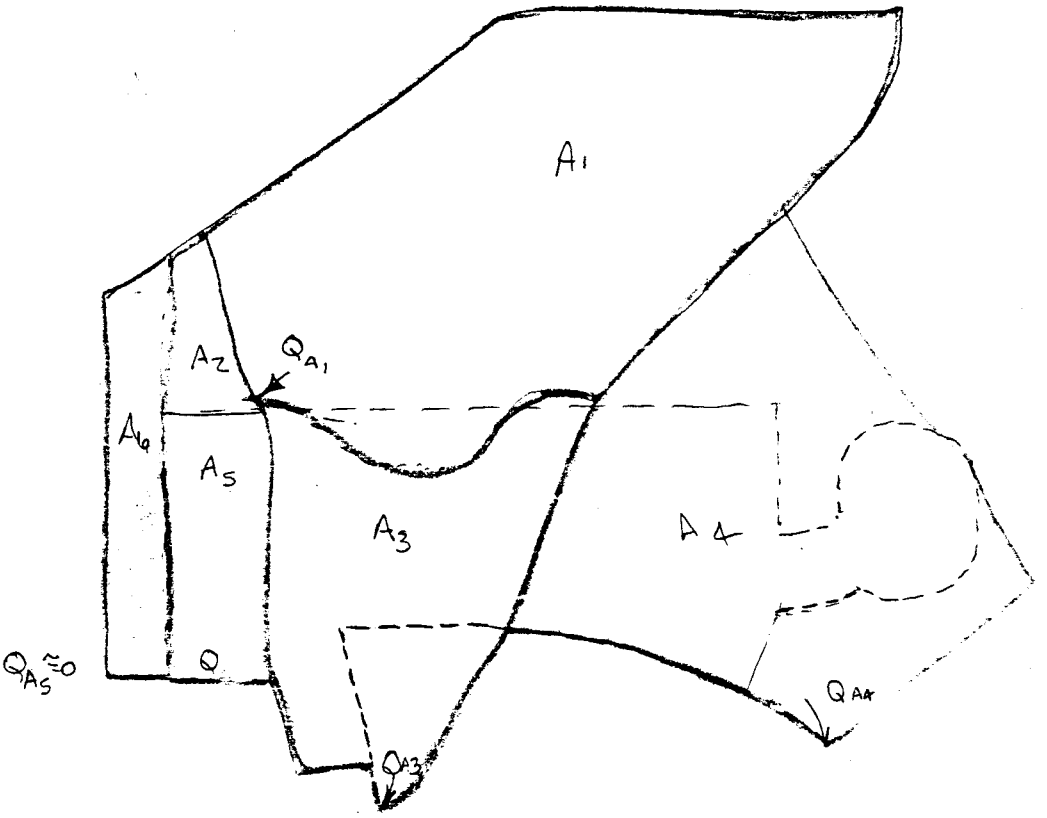
Appendices

Appendix A

Drainage Basins

I HAVE REDRAWN THE DRAINAGE BASIN BOUNDARIES FROM THE EARLIER SCHEME BECAUSE THE BORDERS DID NOT REPRESENT FLOW LINE DIVIDES. THEN, THE BASINS ALSO CHANGE WITH DEVELOPMENT IN THAT THE FLOW CHANNELS (GUTTER LINES) FURTHER DIVIDE THE FLOW, AS WELL AS CHANGING THE RUNOFF COEFFICIENTS.

FOR <u>PREDEVELOPMENT</u>, PR3 INCLUDES 4 SUBBASINS, $A_1, A_2, A_3 A_4, A_5$ and A_5., SHOWN IN THE FOLLOWING SKETCH. REF PR3 - Site & Drainage



EACH DRAINAGE SUBBASIN IS DESCRIBED AS FOLLOWS

A_1: THE PRIMARY UPLAND CONTRIBUTOR, BOUNDED ON THE NORTH AND NORTHWEST BY THE IRRIGATION DITCH. A_1 CONTRIBUTES TO THE NORTH END OF N. 15 COURT, AT THE BOUNDARY OF PR3.

THIS MAY NOT BE ENTIRELY ACCURATE BECAUSE OF THE IRRIGATION PIPE LINE N-S WHICH COULD LIMIT WESTERLY FLOW FROM THE NE PORTION OF A_1, BUT THE BOUNDARY SHOWN IS CONSERVATIVE.

CHARACTERISTICS: AREA = 4.3 ACRES
Δ ELEV. = 22 − 13 = 9 feet slope = 1.3 %
LONGEST FLOW DIST = 675 FEET
SOIL TYPE = HYDROLOGIC GROUP D (FRUITA CLAY LOAM)
CN 86

A_2: This small triangular area includes the N.W. portion of the drainage above PR-3 which would contribute to the West Gutter flow on N.15 Ct. at the boundary. [A small strip (~20' wide) bordering the west property line is included in A_6 and will not drain back to N.15 under any development scenario and does not contribute to gutter or culvert flow.]

Area ≅ .2 acres
Δ elev = 2 feet
Long flow path = 180 ft
Hydrologic Soil Gp: C
CN ≅ 70

$\text{Slope} = \frac{2}{180} \approx 1.1\%$

A_3 A_3 is the extension of A_1 southward to include the portion of PR3 which contributes to the east gutter flow into PR2 (pre-development).

Area ≅ 1.2 acres
Δ elev ≅ 5 feet
Long flow path = 440 feet
Hydrologic Soil Group C
CN = 70

$\text{Slope} = \frac{5}{440} \approx 1.1\%$

A_4 This is the southeast portion of the drainage in PR-3 which enters the main drainage channel (pre-development) over a reach length of ~ 300 feet.

Area ≅ 2.5 acres
Δ elev ≅ 8 feet
Long flow path ≈ 10.5 to 13" 525 → 650 feet
Hydrologic Soil Group C
CN ≈ 70

$\text{Slope } \frac{8}{600} \approx 1.2\%$

A_5 A_5 is the extension of A_2 south through PR3 bordering on the west edge of N15 and A_6 on the west. It is a meaningless area in predevelopment, but will contribute to West Side Gutter flow in PR3 after development. Initially, $A_5 + A_2 \approx$ inflow to PR2 Gutter flow. Actually, it probably runs south along the west property boundary.

Area = .6 Acres
Δ elev = 1 Ft
Long flow path = 280 ft
Hydrologic Soil Group
CN = 70

$\text{Slope} = \frac{1}{280} \cong .4\%$

PRE DEVELOPMENT

A_6 — West Side Strip ≈ Fairly Flat. Will be Back yards of Block 1 which will NOT Drain to the Street.

Area = .3 Acres
Δ Elev = 2.5 feet
Longest Flow Path = 450 ft
Soil Group B
CN ≈ 60

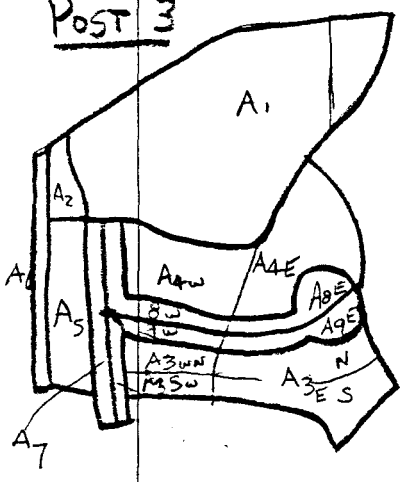
$Slope \approx \frac{2.5}{450} = .6\%$

FOR POST DEVELOPMENT PR3 (PRE-PR4) THERE ARE 10 SUB-BASINS WHICH CONTRIBUTE TO SURFACE FLOWS. $A_1 \ldots A_{10}$. THESE ARE SHOWN IN VIOLET ON THE P.D. DRAWING. SOME ARE THE SAME AS PRE-DEVELOPMENT, BUT OTHERS CHANGE IN BOTH BOUNDARY AND RUNOFF NUMBER.

THESE ARE SUMMARIZED AS:

A_1: NEARLY IDENTICAL TO PRE.D. A_1, THIS AREA INCLUDES MOST OF THE FILING 4 CONTRIBUTION. IT CHANGES SLIGHTLY ALONG THE SOUTHERN BOUNDARY DUE TO LOT GRADING IN BLOCK 2 WHICH WILL DIRECT SOME FLOW TO THE STREET.

POST 3



Area = 4.2 Acres
Δ Elev = 9 feet
Longest Flow Path = 675 ft
Soil Type = Hydrologic Group C
CN = 70

$Slope = 1.3\%$

A_2: As in Predevelopment

Area = .21 Acres
ΔElev = 2 feet
Long Flow Path = 180 ft
Hydrologic Soil Gp. C
CN = 70

$Slope = 1.1\%$

POST DEVELOPMENT

A_3 = AREA$_3$ IS THE SOUTHERN LOT BLOCK 3 PLUS THE AREA BELOW THE CUL DE SAC AND THE DRAINAGE SWALE WHICH IS OUTSIDE PR3 BUT INCLUDES 2 LOTS ON. THIS AREA IS DIFFICULT TO DRAIN TO THE NORTH BECAUSE OF EXISTING CONTOURS AND AN INTERCEPTOR DITCH MAY BE NECESSARY TO DRAIN LOTS 2, 3, & 4 TO THE EAST AND INTO THE DRAINAGE SWALE. THIS AREA SHOULD PROBABLY BE SUBDIVIDED BETWEEN THE FLOWS TO THE STREET AND THE LOT FLOW TO THE INTERCEPTOR. e.g. A_{3_N} A_{3S}, BUT THIS MAY ONLY BE ESTIMATED BECAUSE HOUSE LOCATIONS ARE NOT PRECISELY KNOWN. WE CAN ESTIMATE THAT FOR THE 100' LOT DEPTH, 30' IS BACK OF HOUSE AND $\frac{1}{2}$ ROOF AREA WILL DRAIN TO THE SOUTH, OR ABOUT 1/2 OF THE LOT. (A_{3s})

THESE SUB-AREAS HAVE THE FOLLOWING CHARACTERISTICS

A_{3_N} : AREA = .75 ACRES

(DON'T KNOW GRADES') ΔEL

A_{3SE} : AREA = .42 ACRES

A_{3s} : AREA = .23 ACRES

A_{3Sw} : AREA = .10 ACRES

SUPERCEDED

NET 1.50 ACRES

POST DEVELOPMENT — REVISED

A_3 IS THE SOUTHERN BLOCK 3 INCLUDING THE AREA BELOW THE CUL DE SAC (TURNAROUND)

IT IS DIVIDED INTO 4 SUBSECTIONS DEPENDING UPON FLOW LINE DIRECTIONS BECAUSE THE STREET BREAKS SLOPE AT STATION ≈ 2+12 DRAINING EAST & WEST FROM THERE. BLOCK 3 DRAINS TOWARD THE STREET TO THE HOUSE LINE AND TO THE BACK PROPERTY LINE BEHIND THE HOUSE. CONSEQUENTLY THERE ARE 4 DISTINCT RUNOFF WATERSHEDS HERE.

$A_{3_{NE}}$ AREA .52 ACRES
LENGTH OF FLOW: $60'_0$ $\Delta = .5$ .8%
$225'_G$ $\Delta = .8'$ .4%

$A_{3_{SE}}$ AREA = .59 ACRES
LENGTH OF FLOW: $30'_0$ $\Delta = 1'$ .8%
$95'_G$ $\Delta = 6'$ 6.3%

$A_{3_{NW}}$ AREA = .22 ACRES
LENGTH OF FLOW: $65'_0$ $\Delta = .5'$ .8%
$205'_G$ $\Delta = 4.2$

$A_{3_{SW}}$ AREA = . .13 ACRES
LENGTH OF FLOW: $35'_0$ $\Delta = .5$ EST. 1.4%
$140'_G$ $\Delta = .5$ EST. .4%

DEPENDING ON OVERLOT GRADING

POST DEVELOPMENT

DRAINAGE AREA A_4:

THIS AREA is the steepest portion of the filing, INCLUDING BLOCK 2. THE MODIFICATIONS TO THIS AREA WILL INCLUDE GRADING TO THE STREET AND ADDING DRIVEWAYS AND ROOFED AREAS TO INCREASE RUNOFF. LAWN AREAS MAY REDUCE RUNOFF FROM THE PERVIOUS ~~ZONES~~.

STREET GRADES?

A_4 AREA = 1.4 ACRES

ΔELEV =

LONGEST FLOW PATH 215 ft Slope =

AVERAGE closer to 75 ft overland, 370' Gutter channel

SOIL TYPE B or C (depends on cut depth)

CN =

DRAINAGE AREA A_5

AREA IS NOW GRADED TOWARD N15 AND HAS AN INCREASE IN IMPERVIOUS AREA.

A_5 AREA = 0.7 ACRES

ΔELEV = 1 Ft ±

FLOW PATH:
90' overland.
380' gutter.

SOIL TYPE B

DRAINAGE AREA A_6

AREA MAY BE LAWNS — INCREASED INFILTRATION
DOES NOT CONTRIBUTE TO STREET FLOWS

DRAINAGE AREA A_7

STREET & GUTTER @ ½ N. 15th

AREA = .18 ACRES

LONG. SLOPE = D = 1.6'
SIDE SLOPE =
LONG. FLOW PATH = 355'

(PLUS INFLOW from A_1) ~ 10% ? ± most GOES into A_8

A-6

POST DEVELOPMENT REVISED CONT'D

A_4 AREA 4 IS THE PORTION OF THE FLING INCLUDING BLOCK 2 AND UPSTREAM OF THE CUL DE SAC (TEMP).

IT IS DIVIDED ACCORDING TO EAST OR WEST FLOW ALONG THE STREET

4_E : AREA = 1.04 ACRES
FLOW LENGTH 255' (LONGEST) NO GUTTER
Δ EL = 5'
SLOPE = 2%

4_W : AREA = .38 ACRES
FLOW LENGTH 80' ΔEL = 1.5 1.9%
185' ΔEL = 4.2' 2.3%

A_5 UN REVISED
A_6 UN REVISED
A_7 UN REVISED

STREET
A_{8_E} : AREA = .19 A
FLOW LENGTH 195' (gutter only)
ΔEL = 5'
SLOPE = 2.6

A_{8_W} AREA = .15 A
FLOW LENGTH 185 Gutter only
MAX ΔEL. 4.2
SLOPE: 2.3%

A_{9_E} AREA = .21 ACRES
FLOW LENGTH 220' GUTTER ONLY
MAX Δ EL 5'
SLOPE: 2.3%

A_{9_W} AREA = .16 ACRES
FLOW LENGTH 260' (GUTTER ONLY)
MAX ΔL 4.8'
SLOPE: 1.8%

POST DEVELOPMENT

DRAINAGE AREA A_8

THIS AREA INCLUDES CURB, GUTTER & STREET FOR THE EAST SIDE OF N15 ABOVE THE INTERSECTION WITH PTARMIGAN COURT AND THE N. HALF OF PTARMIGAN COURT.

AREA = .34 ACRES (- .09 if just to cross over.)
= .26 ACRES

Slope =
Longest Drain Path.
~ 480 LF Gutter

FLOW ALSO INCLUDES 90% of A_1 Pre Devel. IF it will carry it. — will Probably Sheet flow across to A_9.

DRAINAGE AREA A_9

South Side of Ptarmigan Court

AREA = .26 - .09 = .17 ACRES
Slope =
Longest Drain Path 380 ft.

REVISED

Flow includes possible Sheet flow from A_8

DRAINAGE AREA A_{10}

South east Side of N. 15th.

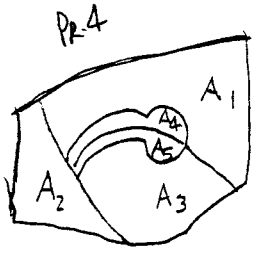
Area = .11 Acres
Slope
Longest Drain = 225 ft

FOR THIS STAGE - WHICH WILL INCLUDE THE INTERIM BETWEEN CONSTRUCTION OF 3 AND 4, WE WILL NOT INCLUDE ANY RETENTION FROM 4.

POST 4 DEVELOPMENT

NEXT, CONSIDER 4 IN THE DEVELOPED STATE, WHERE THE ORANGE AREAS APPLY. BASICALLY A_1, A_2, A_3, A_4, A_5 COMPRISE THE TOTAL CONTRIBUTING AREA. HOWEVER, A_6 GOES DIRECTLY TO THE DRAINAGE CROSSING OF PTARMIGAN RIDGE COURT AND INTO THE MAIN DRAINAGE CHANNEL. ALL OF THE REST IS RETAINED, OR AT LEAST EVERYTHING FROM ABOVE EL. 4716.00. (A_1, A_4, A_5)
A_2 DRAINS DOWN N.I.S.

ORANGE ON DRAWING



A_1 1.26 A
L = 195' Δ = 7'
Slope = 3.6%

A_2 .52 A
L = 195' Δ = 1.4'
Slope 0.6%

A_3 1.03 A
L = 190' Δ = 6
Slope 3.2%

A_4 .21
L = 260' Δ = 1.2'
Slope .5%

A_5 .19 L = 260' Δ = 1.2
Slope .5%

Appendix B

Runoff Calculations

RUNOFF CALCULATIONS

TIME OF CONCENTRATION

(3 METHODS) — REF. CITY CRITERIA

FOR T_o — OVERLAND MIN 5 MINUTES

2 year Storm

RATIO $\frac{42}{.26} = 1.6$

$\frac{2}{100} = .26$ i_2

Because i_{100}

A) SCS - TR55

$$T_{o_{2yr}} = \frac{0.42\,(NL)^{.8}}{S^{0.4}}$$

$$T_{o_{100}} = \frac{0.26\,(NL)^{.8}}{S^{0.4}}$$

T_o MIN = 5 minutes

B) HEC 12

$$T_o = \frac{0.93\,L^{.6}\,N^{.6}}{i^{.4}\,S^{.3}}$$

NOMOGRAPH SOLUTION

C) RATIONAL (FAA)

$$T_o = \frac{1.8\,(1.1-C)\,L^{.5}}{S^{1/3}}$$

NOMOGRAPH SOLUTION

SHALLOW CONCENTRATED FLOW T_{SH} 1975 TR-55 FIGURE 3.1

T_{SH} = LENGTH ÷ VELOC

CHANNEL FLOW — N/A TO THIS SUBDIVISION SINCE ALL CONSIDERED FLOW IS IN GUTTERS.

Runoff Calculations – Ptarmigan Ridge

In order to compare developed to 'historic' runoff rates, we must utilize comparable methods and coefficients. Earlier studies performed by others employed the Rational Method, but the drainage basin boundaries were not the same as this study has considered.

Consequently, it is necessary to recalculate runoff based upon undeveloped land and the two year precipitation event.

The area of the contributing basin is developed as follows:

Planimetered area 25.3 acres + 9 cfs from off-site courtland church Property

$C \cong 0.25$

$T_c = T_o + T_{CH}$

Overland flow
$S = 2\%$
$L = 300'$

Channel Flow
$S = .9\%$
$L = 1500$ ft ±
$n = .07$

City Criteria
Ref App. D, 1 of 5

Using SCS Method

$$T_{o_2} = \frac{0.42 (NL)^{.8}}{S^{.4}}$$

$N = .10$
$S = .02$
$L = 300$

$$\therefore T_{o_2} = \frac{(0.42)((.10)(300))^{.8}}{.02^{.4}}$$

$$= \left(\frac{.42}{.21}\right)(30)^{.8}$$

$$= (2)(15.19)$$

$T_{o_2} = 30.4$ minutes

$$T_{CH} = \frac{L}{60V}$$

$$V = \frac{1.49 R^{2/3} S^{1/2}}{n}$$

we don't know Q, A, or R yet

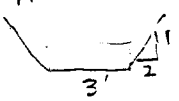
So... we must estimate R

$$R = \frac{A}{P}$$

if $Q = 20$ cfs at $V \cong 2$ fps

$$A = \frac{20}{2} \quad \text{where } \frac{Q}{A} = V$$

$A = 10$



est.

$A = 3D + (2)(2)D$

$A = 7D$

$\frac{10}{7} = D = 1.4'$

$\therefore P = 3 + 2(\sqrt{2.86^2 + 1.4^2})$

$3 + 2(3.2)$

$= 9.4$

$R = \frac{10}{9.4} = 1.06$

B-2

$$\therefore \quad V = \frac{(1.49)\ 1.06^{2/3}\ (.009)^{\frac{1}{2}}}{.07}$$

$$= \frac{(1.49)}{.07}(1.04)(.09) = 1.99$$ So guess of 2. was OK. for assumed channel shape, & Q

$$\therefore \quad T_{ch} = \frac{L}{60V} = \frac{1500}{2} = \frac{1500}{120} = 12.5 \text{ minutes}$$

$$T_c = T_o + T_{ch}$$

$$= 30.1 + 12.5 = 43 \text{ minutes}$$

From Appendix A

$$i_2 = 0.73 \text{ in/hr}$$

So for $Q = CiA + q$ offsite inflow

$= (.25)(.83)(25.3)$ historic

$Q = 4.62$ cfs plus inflow at top of channel of 9 cfs.

$= 13.6$

This is obviously an incorrect analysis because to be correct, the 9 cfs needs to develop and get to the property, so $T_c >> 33$ minutes

Given another ΔT of say 20 minutes

$T_c \Rightarrow 63 \pm$ minutes and $i \Rightarrow .55$

then $Q = (.25)(.55)(25.3) +$ offsite

$= 3.5 + 9$ or 12.5 cfs.

This is probably reasonable, except inflow < 9 cfs

So, we will use a historic 2 year Q of ___ cfs, coming to Ridge Drive from the northeast. (not including flow westward along Ridge Drive.

Factor 9 cfs by 2yr/10yr Storm —

$= 60\%$

So $9 \times .61 = 5.4$ cfs

$Q_{2\ \text{historic}} = 8.9$ cfs say 9

B-3

HISTORIC 100 year flows are also necessary to know for COMPARISON SINCE FLING 3 OUTFLOWS HAVE BEEN DONE.

$$T_{o_{100}} = \frac{0.26\,(nL)^{.8}}{S^{.4}}$$

same coefficients as 2 yr.

300 max overland flow

$$\frac{(.26)}{(.21)}(15.19)$$

$$= 18.8$$

say 19 min.

T_{ch} stays same ~ 12 minutes

So $T_{c_{100}} \Rightarrow$ 31 minutes

add 17 minutes for offsite

48 minutes

$$\therefore Q_{p_{100}} = (.35)(1.70)(25.3) + \text{offsite}$$

$C_{100} = (.35)$

$i_{100\ @\ 48} = 1.70$

$A = 25.3$

$Q_{p,100}$ 15.05 + 9 = 24.05 cfs

HISTORIC FLOWS CONT'D.

THERE IS AN AREA OF 9.5 ACRES INCLUDED IN THE HISTORIC FLOW AREA WHICH DOES NOT CHANGE WITH DEVELOPMENTS 1→4. THIS IS AFFECTIONATELY CALLED THE "FORGOTTEN AREA", SINCE I FORGOT ABOUT IT WHEN I FIRST RAN THE QUANTITY CALC'S.

UNFORTUNATELY, THIS AREA DOES CONTRIBUTE ~ 2.2 cfs to channel flow FROM THE 2 year Storm, and 9.3 cfs FROM THE 100 yr Storm. IN THE SHORT TERM, IT WILL NOT BE MITIGATED. IN THE LONGER TERM, IF/WHEN PTARMIGAN RIDGE COURT EXTENDS TO 27.5 ROAD, IT WILL REQUIRE SOME DETENTION.

THE CALCS FOR THE FORGOTTEN AREA (FA) ARE AS FOLLOWS

AREA: 9.5 ACRES (PLANIMETER)

$T_{c_{2yr}}$ $\quad \dfrac{.42\,[(.10)(300)]^{.8}}{.013} = 20.6$ min

T_{ch} $\quad$ est. V = 1.5 fps

$\dfrac{L}{60V} = \dfrac{700}{90} = 7.8$ min

$\therefore T_c = 28.4$

$C_2 = .92$

$Q_{p_2} = (.25)(.92)(9.5) = 2.2$ cfs

$T_{c_{100yr}}$ $\quad \dfrac{26}{42} \times 20.6 \Rightarrow 12.8$

T_{ch} $\quad$ SAME $\Rightarrow \dfrac{7.8}{20.6}$

$T_c =$

$C_{100} = 2.80$

$C = .35$

$Q_{p_{100}} = (.35)(2.8)(9.5) = 9.3$ cfs

NEXT, IT IS NECESSARY TO RECALCULATE THE FLOWS FROM FILING 2 FOR THE 2 year Storm. ALTHOUGH THE DRAINAGE BASINS USED IN FILING 2 ARE NOT THE SAME AS USED IN FILING 3, SOME PORTIONS MAY OVERLAP SUFFICIENTLY TO BE USED.

IT IS ONLY ESSENTIAL TO CALCULATE RUNOFF FROM WITHIN THE FILING BOUNDARIES. FROM A ROUGH OUTLINE ON FILING 2 GRADING & DRAINAGE PLAN

WEST SIDE OF N. 15th STREET [INLET (SAG)]

CONTRIBUTING BASINS

T_c is est. Based on Similar Parcels on 3.

A 1.64 ACRES
C = .45 HOUSE/DRIVEWAY $T_c \approx 20$ min

C .40 ACRES
C = .90 PAVEMENT $T_c \approx 9$ min

EAST SIDE OF N. 15th STREET [INLET (SAG)]
(PART OF RIDGE DRIVE

BASIN E .23 ACRES $T_c = 9$ min
C = .90 PAVEMENT

DRAINAGE CHANNEL (TWIN 18" CMP)

BASIN B 1.34 ACRES DEVELOPED C = .45
BASIN F .83 ACRES DEVELOPED C = .45
BASIN D .47 ACRES PAVEMENT (PTARMIGAN COURT N, S.)
C = .90

$T_c \sim 12$ min

THE EAST SIDE OF N-15 $T_c \approx$ 12 minutes

West SIDE of STREET $\approx$ T_c : 20 minutes.

Flow estimates.

INTENSITIES FROM APPENDIX A

$Q_{\text{West Gutter}} = C\ i\ A$

$= (.45)(1.11)\ 1.64 = .82$ cfs

$+ (.90)(1.11)(.40) = .40$

1.22 cfs

$Q_{\text{EAST Gutter}} = C\ i\ A$

$= (.90)(1.41)(.23) = .29$ cfs

Q DRAINAGE CHANNEL

	C	i	A	
Q =	(.45)	(1.41)	(2.17)	= 1.37
+	(.90)	(1.41)	(.47)	.60
				2.0 cfs

THESE NUMBERS CAN BE ADDED TO FLING 3 NUMBERS FOR COMPARISON TO PRE-DEVELOPMENT HISTORIC FLOWS.

FILING 2

PEAK TOTAL FLOWS FOR THE 100 STORM

Flow estimates

West Gutter: C i A

C ≈ .60
T_c ≈ 17 min ∴ i_{100} = 3.07
A 1.64

Q_1 = 3.02 cfs

C ≈ .95
i = 3.07
A = .40

Q_2 = 1.17 cfs

Q_T = 4.2 cfs

EAST GUTTER

T_c ≈ 9 min i ≈ 3.99
c ≈ .95
A = .23

Q_T = .87 cfs

CHANNEL

Q_1 (.60)(3.99)(2.17) = 5.19
Q_2 (.95)(3.99)(.47) = 1.78

Q_T 6.97

\+ 9.3 FA

16.3 cfs

PEAK

TOTAL FLOWS THEN BECOME (FOR THE 2 year Storm)

NOTE THE FLOWS ARE NOT ADDITIVE DIRECTLY BECAUSE OF ADDITIONAL CHANNEL FLOW TIME IN THE GUTTERS, BUT i does not vary much FOR 5 MINUTES, SO IT IS CONSERVATIVE TO ADD FLOWS FROM 3 to 2.

FILING 3 only

West Side N. 15th AT DROP INLET :

1.49 cfs	Top of FILING 2 *
1.22	FILING 2
2.7 cfs	TOTAL

EAST SIDE N. 15th : .29 SAME AS BEFORE 3 (BUT SOME OF 3 will PASS P. Ct South) (1.86)*

2.15 TOTAL need to estimate LATER (%)

MAIN CHANNEL

1.75	ABOVE FILING 2 *
2.0 cfs	FILING 2
3.75 cfs	

TOTAL FLOW : = 8.6 cfs

8.6 < 10.4 So we are below HISTORIC WITH RETENTION AT COURTLAND AVE.?

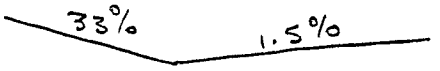
* NOTE THESE FIGURES ARE SHOWN ON TABLE X

GUTTER FLOW TIME

TO ESTIMATE THE TRAVEL TIME IN THE GUTTERS FROM FILING 3 to the RIDGE DRIVE OUTLETS, USE HEC-12 NOMOGRAPHS.

$Q_{WEST} \sim 2$ cfs
$Q_{EAST} \sim 2.75$ cfs

for a COMPOSITE SLOPE GUTTER



$$S_x = \frac{(.33)(.015)}{(.33)+(.015)} = .014$$

$$S = \frac{\Delta H}{L} = \frac{7.5\ Ft}{550\ Ft} = .014$$

FROM CHART 3.

TOP Width West = 12' = T
TOP Width East = 13' = T

THEN FROM CHART 2

$V \approx 2.6$ fps

$60\ V = 156$ fpm

So Channel travel time $\approx$ 550 Ft $\div$ 156 OR 3.5 minutes.

Appendix C

Hydraulic Calculations

SINCE PEAK FLOWS HAVE BEEN DEVELOPED FOR FLINGS 3 AND 4, IT IS NECESSARY TO CHECK THE HYDRAULIC CAPACITY OF THE STORM DRAINAGE SYSTEM.

THE FOLLOWING CONDITIONS MUST BE CHECKED [FILING 3 2yr & 100yr]

1. GUTTER CAPACITY ON E & W N. 15TH STREET
2. DEPTH IN VALLEY PANS ON PTARMIGAN RIDGE COURT, N. 15th
3. FLOW THROUGH SIDEWALK / VALLEY PAN DRAIN
4. FLOW OF WATER THROUGH INLET & CULVERT @ I
5. FLOW OF WATER THROUGH INLET & CULVERT @ II
6. FLOW of WATER THROUGH 18" CMP AT III
7. 100 YEAR OVERTOPPING AT RIDGE DRIVE INTERSECTION

FINALLY, AN ESTIMATE OF RETENTION CAPACITY ON FILING 4 AND "FORGOTTEN ACRES" SHOULD BE MADE. ALSO, SOME CONSIDERATION FOR FUTURE DETENTION MAIN CHANNEL SHOULD BE MADE, AT LEAST TO DEVELOP EASEMENT, RIGHTS OF WAY, MAINT. ACCESS ETC.

A FLOOD HYDROGRAPH ALSO NEEDS TO BE PREPARED FOR THE STORM DRAINS AT RIDGE DRIVE TO PERMIT SIZING THE HYDRAULIC STRUCTURE AT THE OUTLET OF THE CULVERTS, AND THE CHANNEL EXTENSION TO THE WEST.

GUTTER CAPACITY

ALL CALCULATIONS AND ANALYSES ON GUTTER AND INLET CAPACITY ARE BASED UPON METHODOLOGY FROM FHWA-TS-84-202 "DRAINAGE OF HIGHWAY PAVEMENTS", HEC-12, USDOT-FHA MARCH, 1984.

FROM TABLE XII OF THE MAIN REPORT, THERE ARE TWO FLOWS WHICH REPRESENT THE MAXIMUM CASE OF GUTTER FLOW FOR EACH GUTTER. BOTH OCCUR AT THE FILING 3 ONLY CASE. THESE FLOWS ARE:

N. 15th STREET (BOTTOM)	WEST SIDE	2.7 cfs	2 year event
	EAST SIDE	2.2 cfs	
	WEST SIDE	9.7 cfs	100 year event.
	EAST SIDE	7.2 cfs	

		(2yr)	(100)
PTARMIGAN RIDGE COURT	NW GUTTER	0.4 cfs	1.3 cfs
	SW GUTTER	0.3	0.9
	NE GUTTER	0.6	1.9
	SE GUTTER	0.7	2.1
	E. Valley Pan	0.9	3.0
	W. Valley Pan	1.40	5.1

SEE FOLLOWING PAGE FOR DEVELOPMENT OF THESE FLOWS.

OF NOTE IS THE CHANGE IN GUTTER SHAPE FROM FILING 2 to FILING 3. FILING 3 (UPPER N. 15th & P.R. COURT) HAS A 1½" LIP AT THE GUTTER EDGE, BEFORE RISING AT A 3:1 SLOPE FOR 3 MORE INCHES. TOTAL RISE TO THE BACK OF WALK = 4.5 + .5 + 1" = 6".

THIS IS OBVIOUSLY NOT TO SIMPLIFY CALCULATION, BUT PERHAPS CLEANS BETTER THAN THE OLDER STYLE.

ANALYSIS IS BASED ON A MODIFIED VERSION OF MANNINGS EQUATION

$$Q = \frac{K}{n} S_x^{5/3} S^{\frac{1}{2}} T^{8/3}$$

K = 0.56 for concrete n = 0.016

So $$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

PTARMIGAN RIDGE COURT — GUTTER FLOWS from Table V

		2 year	100 year
N.E. GUTTER:	A8E	0.31	0.84
	~½ A4E	0.30	1.10
		0.61	1.94
SE GUTTER	A9E	0.35	0.93
	A3NE	0.32	1.18
		0.67	2.11
NW. GUTTER:	(.6) A8W	0.15	0.39
	A4W	0.25	0.91
		0.40	1.30
SW GUTTER	A3NW	0.16	0.55
	~½ A9W	0.13	0.33
		0.29	.88
EAST VALLEY PAN:	A8E	0.31	0.84
	A4E	0.60	2.21
		0.91	3.05
WEST VALLEY PAN:	A_1	0.90	3.54
	A_{4W}	0.25	0.91
	A8W	0.25	0.66
		1.40	5.11

DOES NOT CONSIDER KINEMATIC WAVE

SIDEWALK DRAIN

NE GUTTER + SE GUTTER	1.28 cfs	4.05 cfs

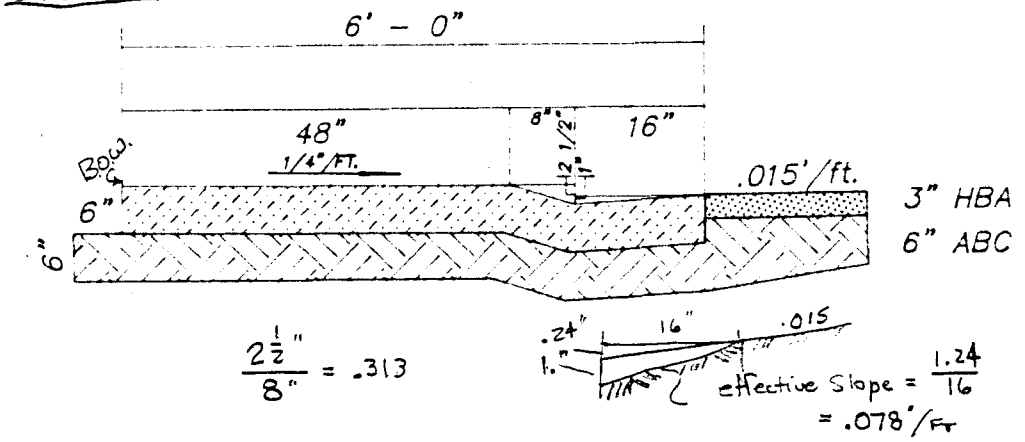
THE MOST SEVERE CONDITION FOR THE SIDEWALK DRAIN IS AFTER COMPLETION OF FLING 4 WHEN SUB-AREA A-6 ALSO KICKS IN

0.38 cfs for the 2 year and 1.35 cfs for the 100 yr storms ABOVE THE AMOUNTS FOR FILING 3 ONLY. ALSO, Development IN FA WILL PUT MORE GUTTER FLOW INTO THE DRAIN. WE DO NOT HAVE THIS DESIGNED YET.

Chart 3 SOLVES THIS EQUATION IN NOMOGRAPHIC FORM AND ALLOWS FOR A COMPOSITE SLOPE GUTTER.

CALCULATE THE EFFECTIVE CROSS SLOPE FOR THE FOLLOWING:

CASE A

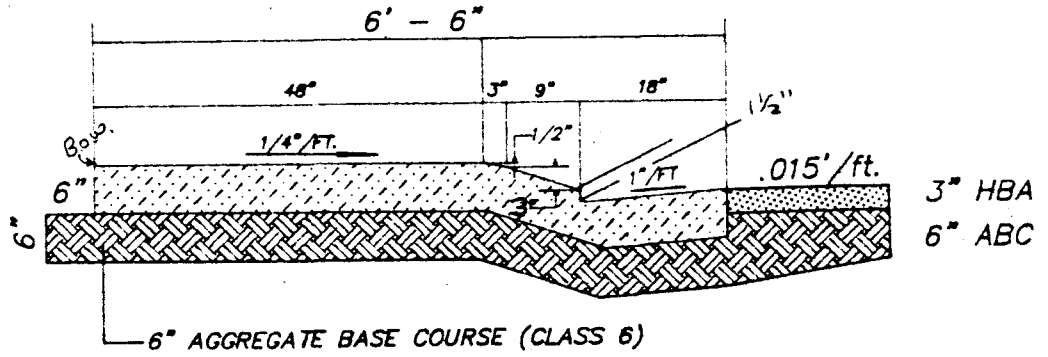


DRIVE OVER CURB, GUTTER & SIDEWALK
PER CITY OF GRAND JUNCTION SPECS.

OLD STYLE (TYPICAL)

SCALE: 1"IN = 2.0'FT

$$V_{Shape}\ S_X = \frac{S_{x_1} \cdot S_{x_2}}{S_{x_1} + S_{x_2}} = \frac{(.313)(.015)}{.328} = .0143$$



NEW STYLE

DRIVE OVER CURB, GUTTER & SIDEWALK

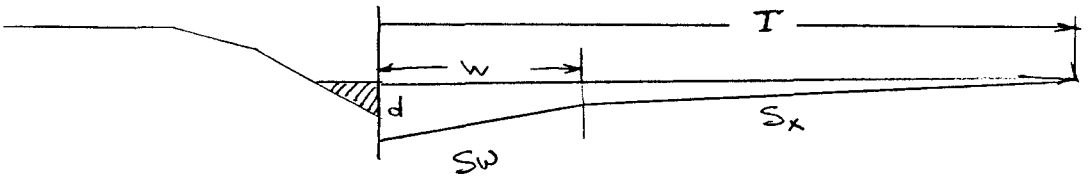
PER CITY OF GRAND JUNCTION SPECS.

$\frac{3"}{9"} = .33$ (TYPICAL) $\frac{1}{18"} = .056$

SCALE: 1"IN = 2.0'FT

V_{SHAPE} w/LIP S_x : DOES NOT FIT THIS ANALYTICAL TECHNIQUE.

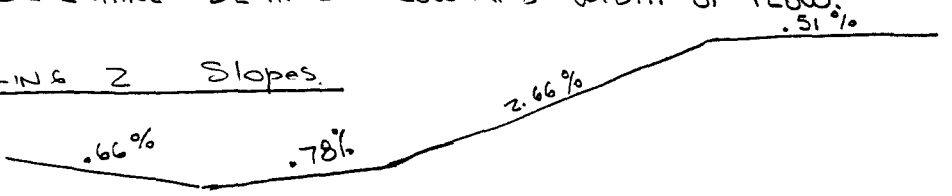
SUGGESTED SOLUTION IS TO DO A SIMPLE COMPOSITE SECTION IGNORING WATER ON CURB.



IF IT IS SIGNIFICANT TO FLOW CAPACITY, WHEN d IS DETERMINED ANOTHER FLOW WITH $d - 1.5"$, $S_x = .33$ AND T CALC. CAN BE DETERMINED AND ADDED TO THE COMPOSITE SECTION FLOW.

USING THE OLD STYLE CURBS FIRST, TRY THE FLOWS AT I and II TO DETERMINE DEPTH OF FLOW AND WIDTH OF FLOW.

FLING 2 Slopes.



USING S_x = 0.014

Check T with Long. Slopes = .51, .78, 2.66 %

Q_w = 2.7 cfs

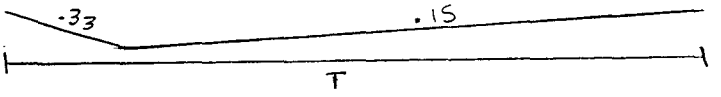
Q_E = 2.2 cfs

FROM CHART 3

	Long. Slope .78%	2.66%	.51°
Q_w = 2.7	13'	11'	15'
Q_E = 2.2	12'	10'	14'

FLOW WIDTH "T" FEET (2 year)

depth for A Vshape channel ≅ $T_{Sx\ effect}$



FLOW DEPTH FOR WIDEST T = 15'

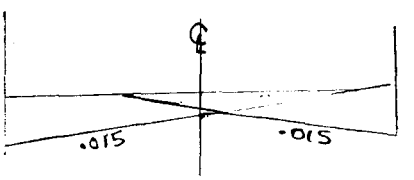
d = (.014)(15) = 0.21' = 2.5"

∴ does not overtop curb in WORSE CASE, SO IT DOES NOT OVERTOP CURB IN ANY CASE FOR 2 yr FLOW. IT DOES COVER 14' LANE SO WHOLE STREET IS WET.

100 year Case .51 %

Q_w = 9.7 cfs T = 25'

Q_E = 7.2 cfs T = 22'



STREET IS FULL

d_w = (25)(.014) = .35' water crosses to east side

d_E = (22)(.014) = .31' depth = 4.2" ∠ curb. OK

WE MAY THEREFORE CONCLUDE THAT N 15 STREET WILL CARRY THE 2yr and 100yr FLOODS WITHIN CURB LEVELS, SO IT MEETS CRITERIA FOR CONVEYANCE OF WATER.

(THE PORTION IN FLING 3 HAS A 1½" LIP WITH A GREATER FLOW LINE DEPRESSION, SO IT WILL CARRY MORE THAN THE LOWER SEGMENT IN FLING 2.

PTARMIGAN RIDGE COURT HAS THE LIP CURB AND SLOPES 2% TO THE WEST AND 5.2% TO THE EAST.

MAX FLOWS: IN GUTTERS	TO EAST	TO WEST
	Q_{100yr} 2.1 (T=8.6')	Q_{100yr} 1.9 T=8.5
	Q_{2yr} 0.6 (T=5.5')	Q_{2yr} 0.7 T=7.

USE ~ SAME S_x = .014 FOR APPROXIMATE SOLUTION

E Slope .052

W slope .020

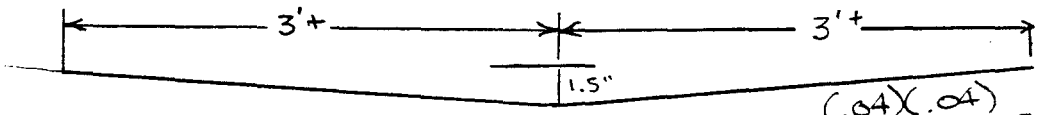
So FOR T = 8.6 $d = T S_x = (8.6)(.014) = 0.12' = 1.4"$

NOTE: THAT d is FOR A STRAIGHT GUTTER SLOPE. d ACTUALLY WILL BE < 1.4" + 1.5" OR ABOUT 2.5" IN THE DEPRESSED GUTTER FLOW LINE.

IN ANY CASE - THE FLOWS WILL BE WELL WITHIN THE CURBS ON PTARMIGAN RIDGE COURT FOR 2yr & 100 yr STORMS. (THE SLOPES ARE QUITE STEEP AND CARRY A LOT OF WATER - HIGHER VELOCITIES)

VALLEY PANS
P.R. COURT

REF. DEPT. OF PUBLIC WORKS AND UTILITIES
CITY OF GRAND JUNCTION, CO
STANDARD CONCRETE DETAILS 7-1-92



$S_x = \frac{(.04)(.04)}{.08} = .02$

So.
WE HAVE A TRIANGULAR CHANNEL WITH SIDE SLOPES = $\frac{1.5}{36} = .04$

FLOW LINE SLOPES

WEST END 4713.73 — 4713.57 = 0.16 FT ÷ 28' = .006%

EAST END 4716.05 — 4715.85 = 0.20 FT ÷ 28' = .007%

WEST END FLOWS: 1.4 cfs 2yr
5.1 cfs 100yr

FROM CHART 3

S_x = .02	T_2 = 8.8'	d = .17' = 2.1"
S_L = .006	T_{100} = 14.5'	d = .29' = 3.5"

THE WIDE FLOWS WOULD CREATE A COMPOSITE CROSS SLOPE SINCE THE CROWN SLOPE ON THE PAVEMENTS ARE FLATTER THAN 4% AS IN THE VALLEY PANS, SO THE FLOWS WOULD BE OF GREATER WIDTH, BUT LESSER DEPTH. THE CRITERIA STATES FLOW SHALL BE LESS THAN 6" IN 2yr; THIS CASE IS LESS THAN 6" FOR 100 YEAR, SO IT IS ACCEPTABLE.

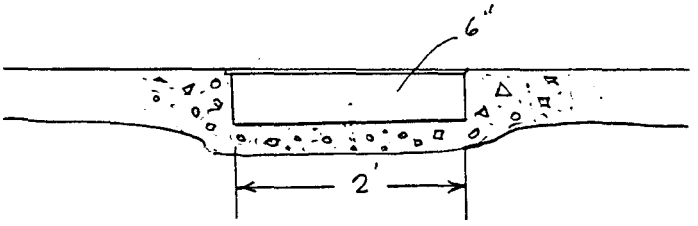
EAST END FLOWS 0.9 cfs 2yr
3.0 cfs 100yr

AGAIN FROM CHART 3

S_x = .02	T_2 = 7.3'	d = .146' = 1 3/4"	
S_L = .007	T_{100} = 12'	d = .24' = 2.9"	< 6

AS EXPECTED THESE FLOWS ARE ALSO ACCEPTABLE.

SIDEWALK DRAIN THROUGH



THIS IS AN OPEN CHANNEL OF RECT. X-SECT
Slope = SAME AS CROSS PAN = .007
n = .015

USING MANNING EQUATION

$$Q = \frac{(1.486)\ A^{1.67}\ S^{0.5}}{n\ \ P^{2/3}} \quad \text{cfs}$$

Where $A = .5' \times 2' = 1$
$S = .007$
$n = .015$
$P = 3'$

$$= \frac{(1.486)(1)(.007)^{\frac{1}{2}}}{.015 \quad 3^{2/3}} = \frac{1.486}{.015} \cdot \frac{(.0837)}{2.08}$$

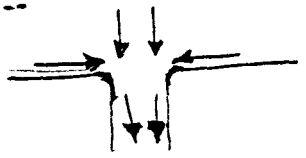
$Q = 3.98$ say 4 cfs

THE CHANNEL WILL CARRY 4 cfs. $Q_{100} = 3$ cfs.

IF THE FLOW WILL GO INTO THE HOLE, IT WILL CARRY IT.

HDS-5 HAS A NOMOGRAPH, BUT IT DOES NOT GO DOWN TO 6" DEPTH - RECTANGULAR CULVERTS. ROUND THE ENTRANCES WITH A 6" RADIUS TO DIRECT THE WATER INTO THE OPENING.

FLOWS ARE APPROXIMATELY EQUAL IN CROSS PAN AND GUTTER. I DON'T KNOW IF IT WILL ACCEPT 3 cfs. HDS-5 HAS AN ENTRANCE LOSS COEFFICIENT OF ~.2, BUT SINCE FLOWS LOOK LIKE...



...AND depth in pan & gutters are < 4", IT SHOULD WORK.

IT WILL DEFINITELY WORK FOR 2yr flows, PROBABLY FOR 100yr.

IF IT DOESN'T TAKE 100% of THE FLOW, THE REST WILL FLOW OVER THE WALK.

SIDEWALK DRAIN THROUGH - CONT'D

ANOTHER POSSIBILITY FOR CONSIDERATION IS ORIFICE FLOW, BUT HEAD IS NOT GREAT ENOUGH TO SUBMERGE THE OPENING, AND CERTAINLY NOT TO A SUM OF Velocity head AND entrance Head Loss.

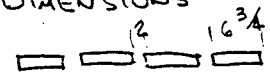
WEIR HYDRAULICS DO NOT APPLY EITHER, SINCE THE DOWN STREAM SLOPE IS LESS THAN CRITICAL.

WATER FLOW THROUGH OUTLET I.

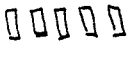
DEPRESSED COMBINATION INLET FEEDING 18" RCP
LENGTH 35'
SLOPE .017

INLET IS IN SAG CONDITION.

GRATE DIMENSIONS



TOTAL: 4 @ 6.75 + 6 = 33" = L



TOTAL: 5 @ 1.875 + 4 @ 1.125 = 13.9" = W

HEC-12 Grate OPERATING AS WEIR

$P = 2W + L$

$Q_i = C_w P d^{1.5}$ Where $C_w = 3$

$P = \frac{(2)(13.9) + 33}{12} = 5$

Sag depth = 4" = .33' $Q_i = (3)(5)(.33)^{1.5} = 2.88$ cfs

5" = .41 $Q_i = (3)(5)(.41)^{1.5} = 3.93$ cfs

6" = .50 $Q_i = (3)(5)(.5)^{1.5} = 5.30$ cfs

for a 2" depressed inlet — 4" of water on curb
INlet will carry 5.3 cfs
(NOT COUNTING ANY FLOW INTO CURB OPENING.

WILL THE CULVERT CARRY THE INFLOW

e.g. Q_{2yr} = 2.7 cfs

Q_{100yr} = 9.2 cfs

NOTE MAXIMUM HEADWATER IS RIDGE DRIVE CROWN ELEVATION = 4705.70

RIM OF GRATE 4705.13

MAX. HEAD .57' = 6.84" (.57')

[MAYBE UP TO 2" of FLOW? 100yr RUNOFF] = 8.8"

PLUGGING BOTH INTO PREVIOUS EQUATION (.73')

$Q_{.57'}$ = 6.45 cfs

$Q_{.73}$ = 9.35 cfs ≤ 100 yr flow

WILL THE PIPE CARRY IT?

INLET CONTROL NOMOGRAPH — Requires

Q_{2yr} $\frac{Hw}{D}$ = .61 DEPTH = .91'

Q_{100yr} $\frac{Hw}{D}$ = 1.35 DEPTH = 2.02'

∴ PIPE & INLET WILL ACCEPT 100yr flood

WILL IT CARRY IT?

TAILWATER: EL = 4704 ± ∴ H = 4705.7 − 4704 = 1.7

NOT A PROBLEM. INLET CONTROL SITUATION.

PIPE IS ACCEPTABLE.

PROJECT: PTARMIGAN RIDGE FILING 3
STORM DRAIN UNDER RIDGE DRIVE

STATION: I

SHEET _____ OF _____

CULVERT DESIGN FORM

DESIGNER / DATE: WH / 8/23/92

REVIEWER / DATE: _____ / _____

HYDROLOGICAL DATA

SEE ADD'L SHTS.

☐ METHOD: RATIONAL

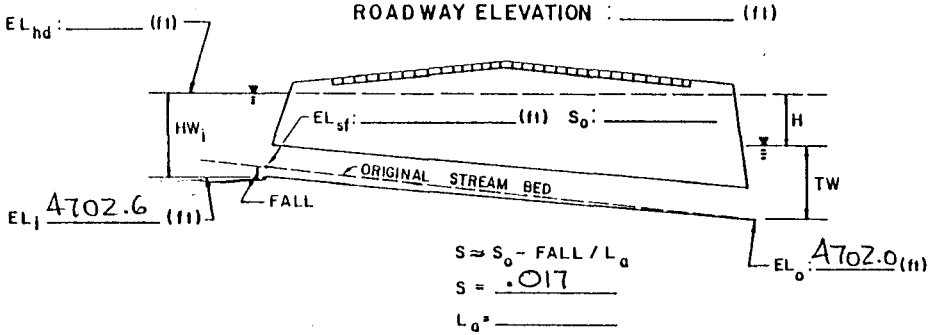
☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____

☐ CHANNEL SHAPE: _____

☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
2	2.7	
100	9.2	



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	INLET CONTROL HW_i	INLET CONTROL FALL (3)	INLET CONTROL EL_hi (4)	OUTLET CONTROL TW (5)	OUTLET CONTROL d_c	OUTLET CONTROL (d_c+D)/2	OUTLET CONTROL h_o (6)	OUTLET CONTROL k_e	OUTLET CONTROL H (7)	OUTLET CONTROL EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
18" RCP 35' LONG DROP INLET	2.7	2.7	.61	.91'	-		2'				.2	1.7			5.2 fps	

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw TAILWATER

COMMENTS / DISCUSSION:

PIPE IS UNDER INLET CONTROL AND WILL CARRY 100 year flow of 9cfs.

CULVERT BARREL SELECTED:

SIZE: 18"

SHAPE: _____

MATERIAL: n=.012

ENTRANCE: _____

OUTLET I - 18" RCP

240

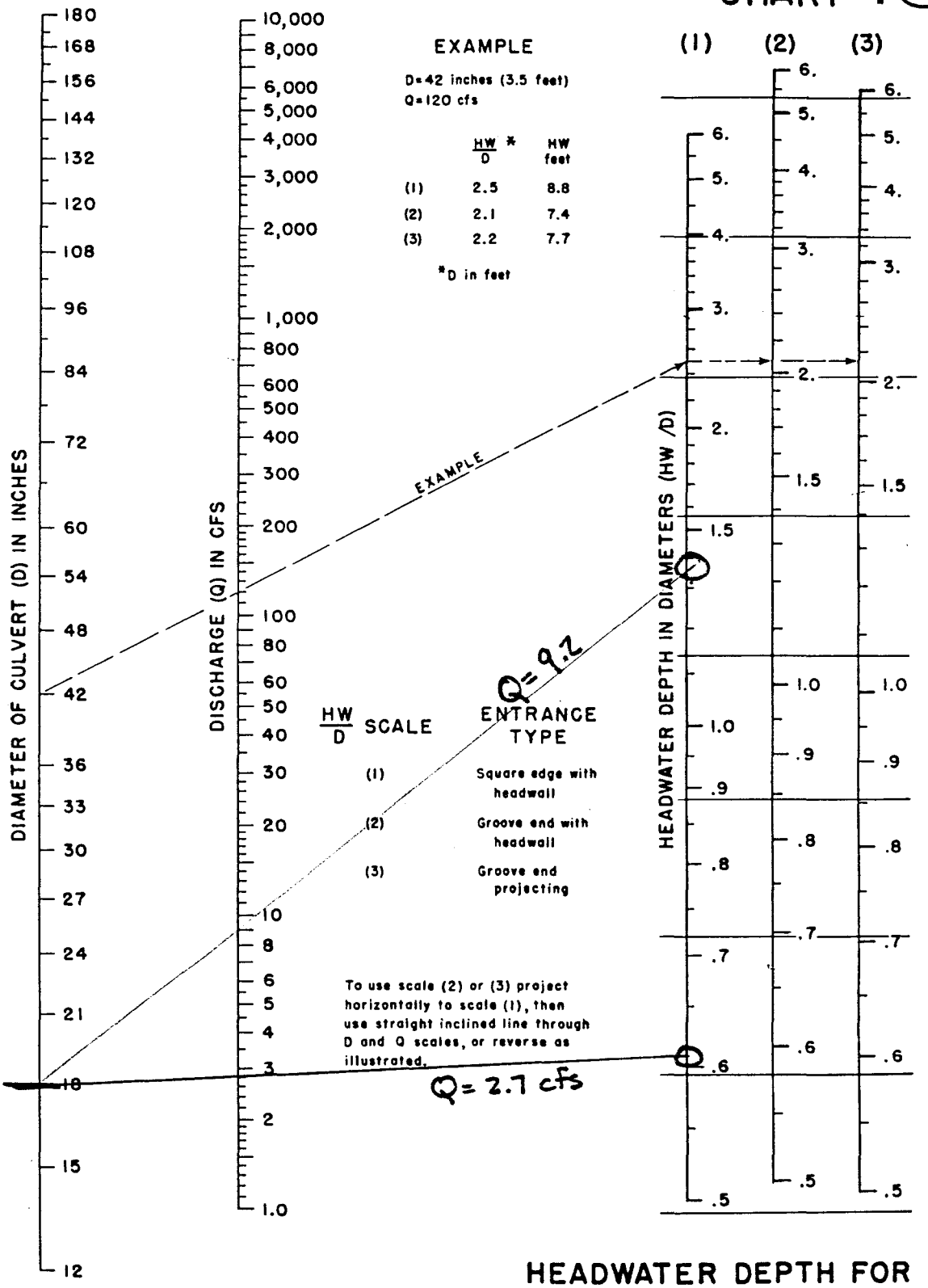
C-17

12

PTARMIGAN RIDGE - F3
OUTLET I

WH 8/23/92

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

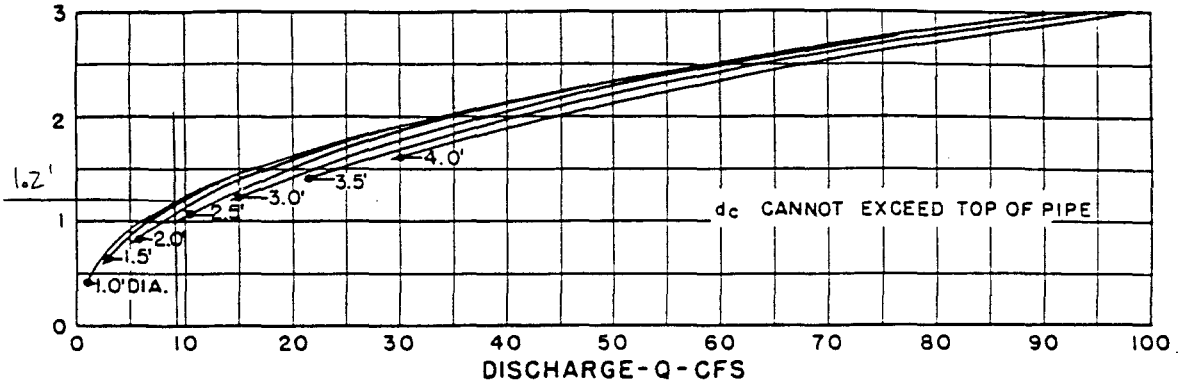
BUREAU OF PUBLIC ROADS JAN. 1963

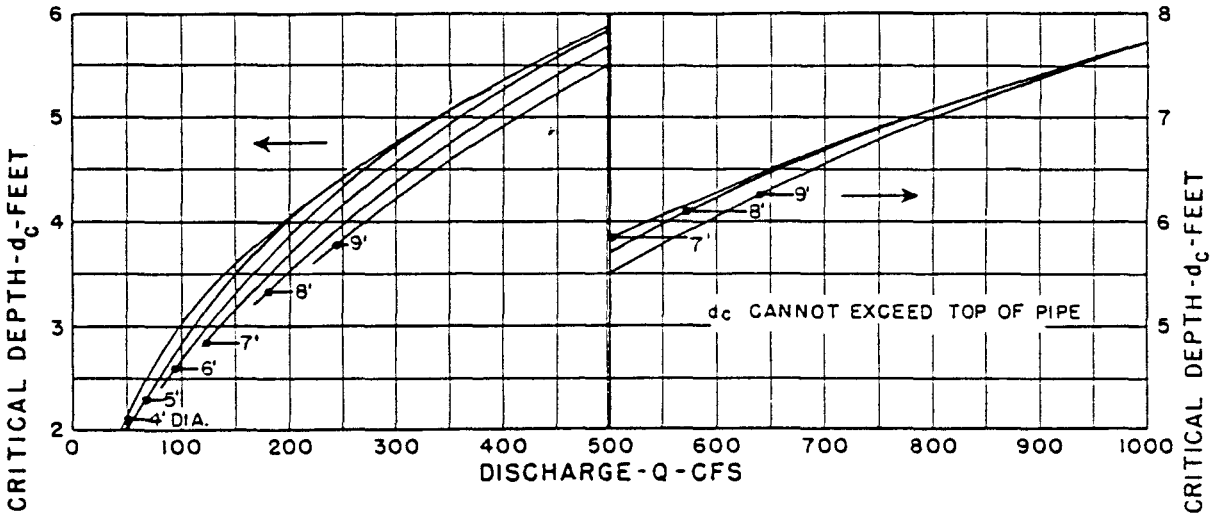
C-13

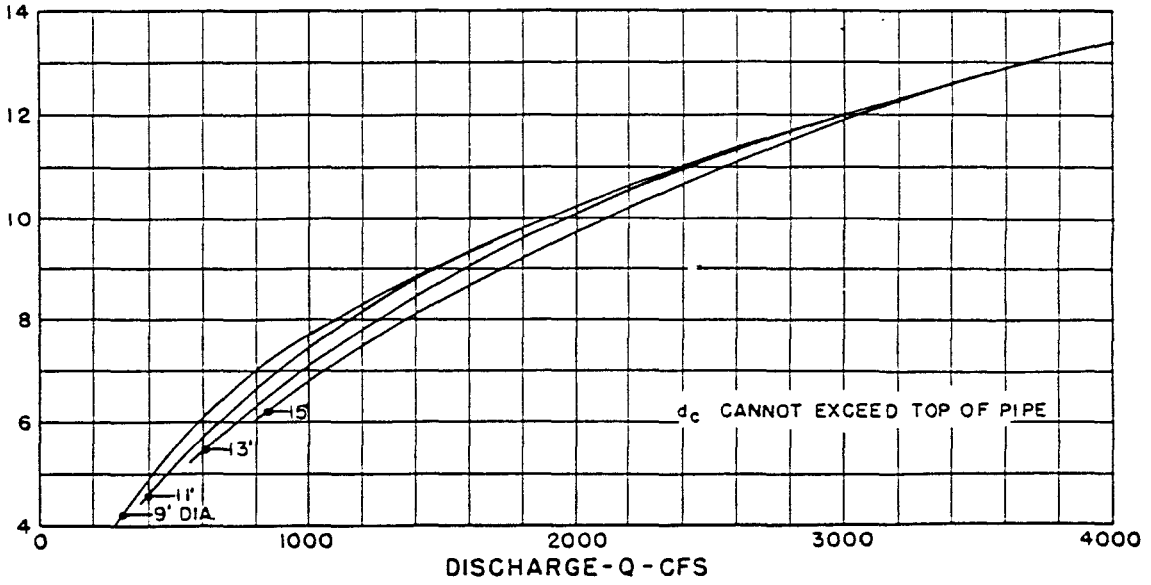
FILING 3 – OUTLET I

$d_c = 1.2'$

CHART 4







BUREAU OF PUBLIC ROADS

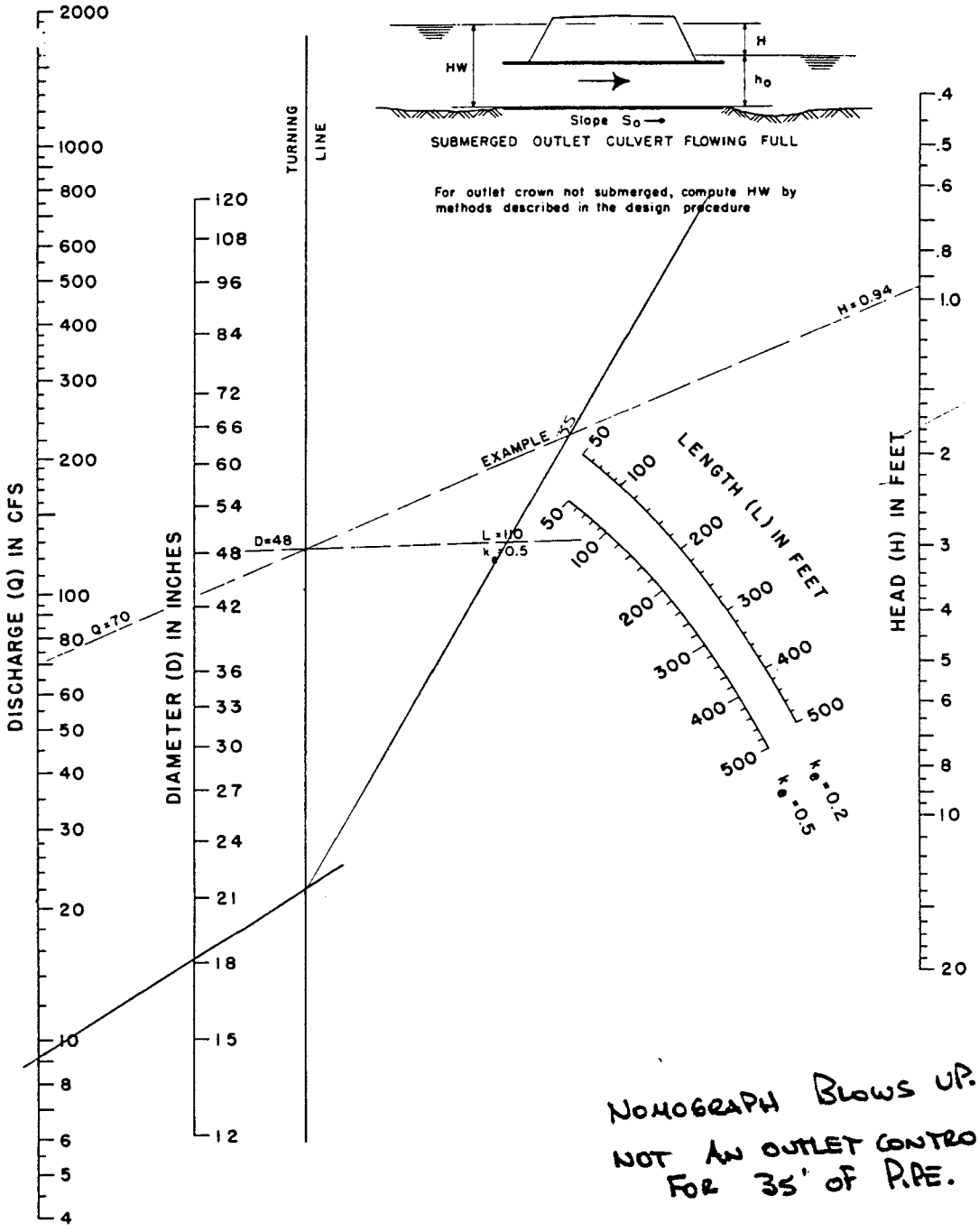
JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

C-14

PTARMIGAN RIDGE F-3
OUTLET I

CHART 5



NOMOGRAPH BLOWS UP.
NOT AN OUTLET CONTROL FOR 35' of P.P.E.

HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

C-15

WATER FLOW THROUGH OUTLET II

SAME CIRCUMSTANCE AS OUTLET I

RIM EL. ON GRATE 4705.03

MAX DEPTH ON RIDGE DRIVE 4705.7

Head on INLET CAN BE .67' => 8"

∴ GRATE (AS IN CASE I IN SAG OR SUMP CONDITION

$$Q_i = (3)(5)(.67)^{1.5} = 8.2 \text{ cfs} > Q_{100} = 7.2$$

ACTUALLY A HEAD of .61' WOULD DELIVER THE WATER INTO THE PIPE.

NOTE: Q_{100} ASSUMES ALL FLOW FROM FLING 3 COMES TO OUTLET II. IN FACT, PART OF IT WILL GO INTO CHANNEL AT PTARMIGAN COURT SOUTH, SO EVEN IN THE WORST CASE, THE INLET WILL HANDLE THE WATER.

WILL THE PIPE TAKE IT?

INVERT IN = 702.4
INVERT OUT = 702.0

$Q = Q_2 = 2.2$
$Q_{100} = 7.2$
GRATE ELEV. 4705.3

∴ AEL = 5.3 − 2.4 = 2.9'
MAX HW/D = $\frac{2.9}{1.5} = 1.9$

IF WE LEAVE 1' AS Required Below Grate
MAX $\frac{HW}{D} = \frac{1.9}{1.5} = 1.26$

CHECK NOMOGRAPH FOR INLET CONTROL

ACTUALLY — THIS PIPE ALSO HAS FLOW FROM RIDGE DRIVE WHICH IS COMING FROM FLING 1. IN THE FLING 2 CALC'S WE WERE USING A MUCH SMALLER $Q \approx 3.5$ cfs, SO THIS WILL STILL WORK.

$\frac{d_c}{D} = \frac{1.1}{1.5} = .73$

$S_o = \frac{S_o}{S_{c\,op}}$

$$S_{c\,op} = \frac{111\,n^2}{D^{\frac{1}{3}}} = \frac{(111)(.012)(.012)}{1.5^{\frac{1}{3}}} = \frac{.0160}{1.145} = .014$$

$$S_o = \frac{S_o}{S_{c_{op}}} = \frac{.0055}{.0140} = .39$$

So we have outlet control (FG 41 PCA HANDBOOK)

$$Q_{tc} = 2.7 = \frac{Q}{D^{5/2}} = \frac{Q}{2.75}$$

$$\therefore Q = (2.7)(2.75) = 7.44$$

THE FLOW IS MAX'D OUT AT Q_{100}... BUT IT WORKS.

PROJECT: PTARMIGAN RIDGE FLING 3
NE STORM DRAIN UNDER RIDGE DRIVE

STATION: OUTLET II

SHEET ____ OF ____

CULVERT DESIGN FORM

DESIGNER / DATE: ____ / ____

REVIEWER / DATE: ____ / ____

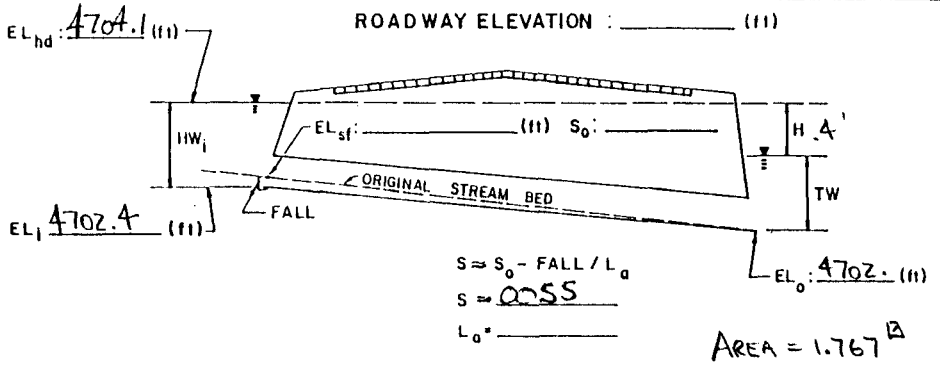
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: RATIONAL
- ☐ DRAINAGE AREA: ____ ☐ STREAM SLOPE: ____
- ☐ CHANNEL SHAPE: ____
- ☐ ROUTING: ____ ☐ OTHER: ____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
100	7.2	2'



$S \approx S_o - FALL / L_a$

$S = .0055$

$L_a =$ ____

AREA = 1.767 ac

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	INLET CONTROL HW_i	INLET CONTROL FALL (3)	INLET CONTROL EL_hi (4)	OUTLET CONTROL TW (5)	OUTLET CONTROL d_c	OUTLET CONTROL (d_c+D)/2	OUTLET CONTROL h_o (6)	OUTLET CONTROL k_e	OUTLET CONTROL H (7)	OUTLET CONTROL EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
18" RCP CL III 78' LONG	7.2	—	1.14	1.7'	0		2	1.1			.2	.4			4 fps	
DROP INLET																

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

$\frac{L}{100 S_o} = \frac{78}{55} = 1.41$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

PIPE WILL CARRY 7.4 cfs ≥ Q_{100}.

CULVERT BARREL SELECTED:

SIZE: 18"

SHAPE: Ø

MATERIAL: RCP n=.012

ENTRANCE: ____

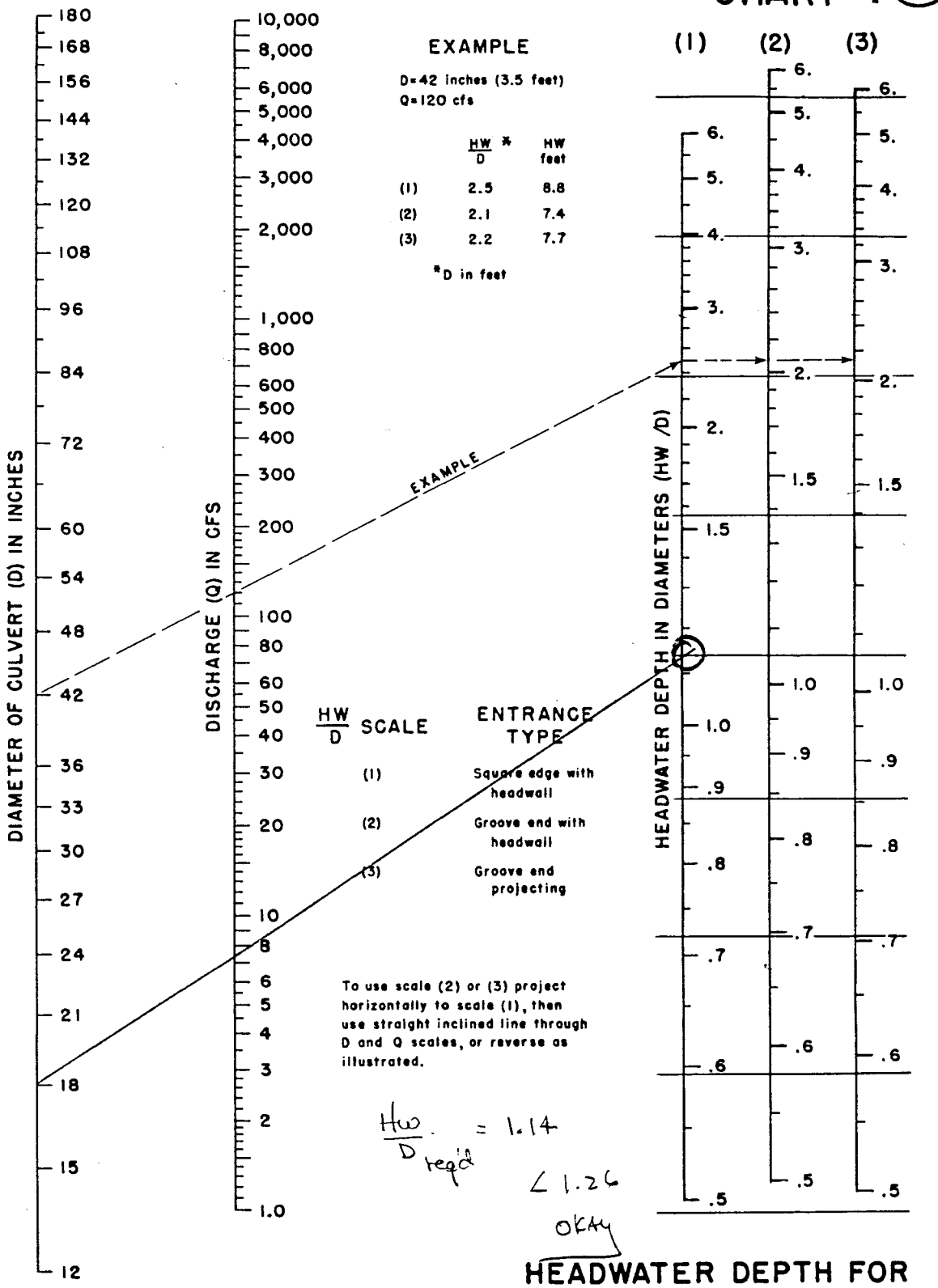
240

C-1

08

OUTLET II

CHART 1



$\frac{HW}{D}_{req'd} = 1.14$

< 1.26

OKAY

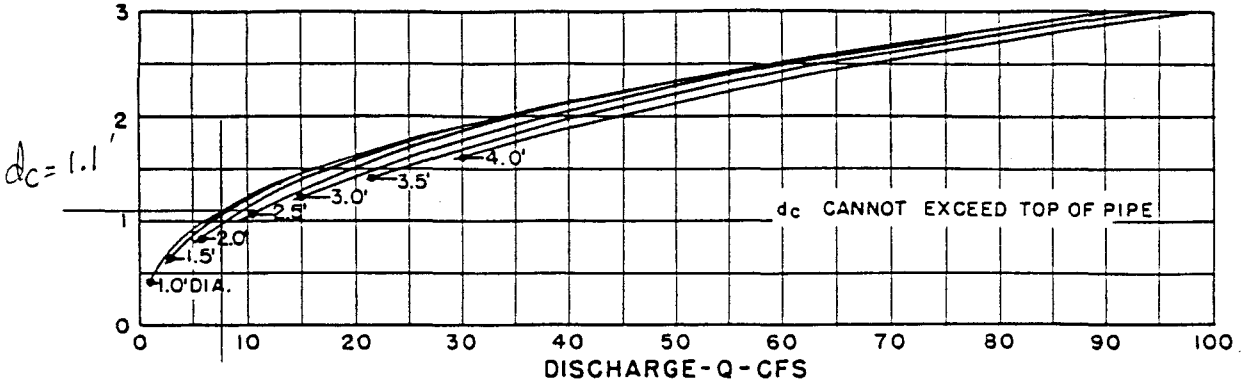
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

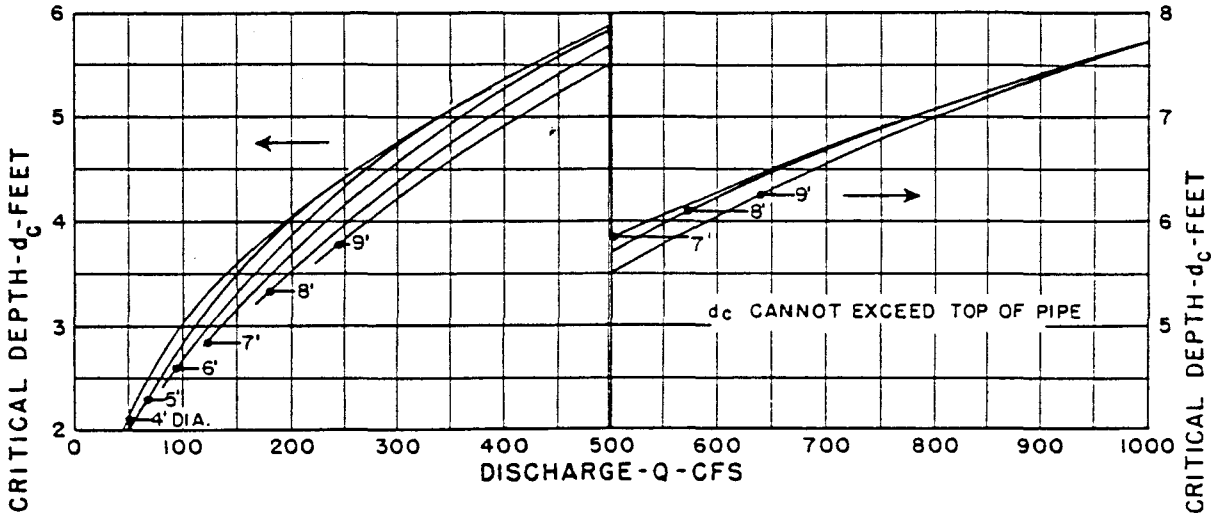
HEADWATER SCALES 2&3
REVISED MAY 1964

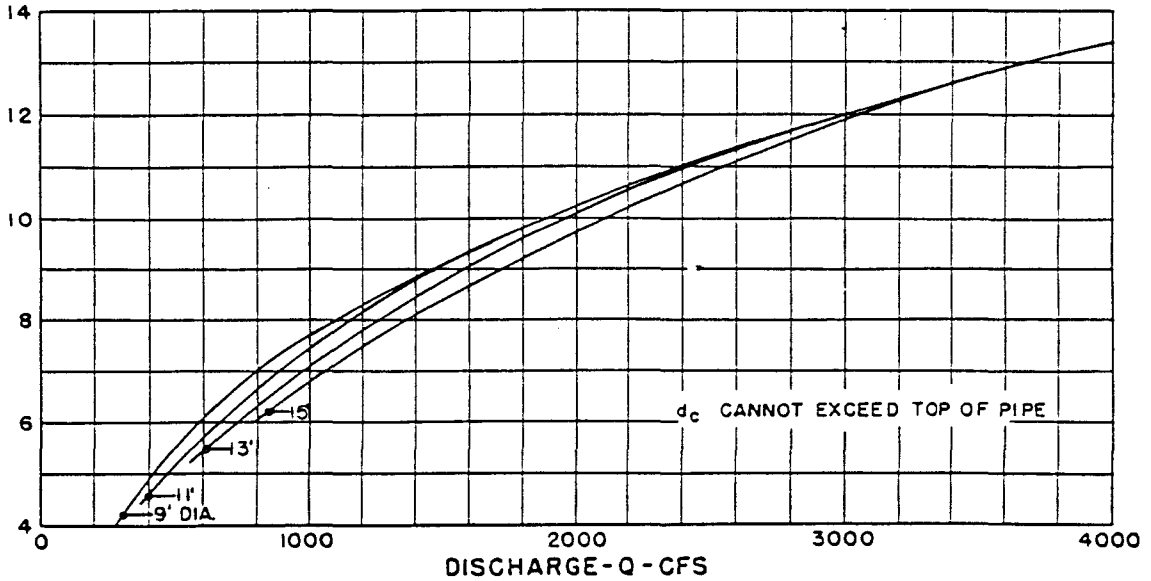
BUREAU OF PUBLIC ROADS JAN. 1963

OUTLET II

CHART 4



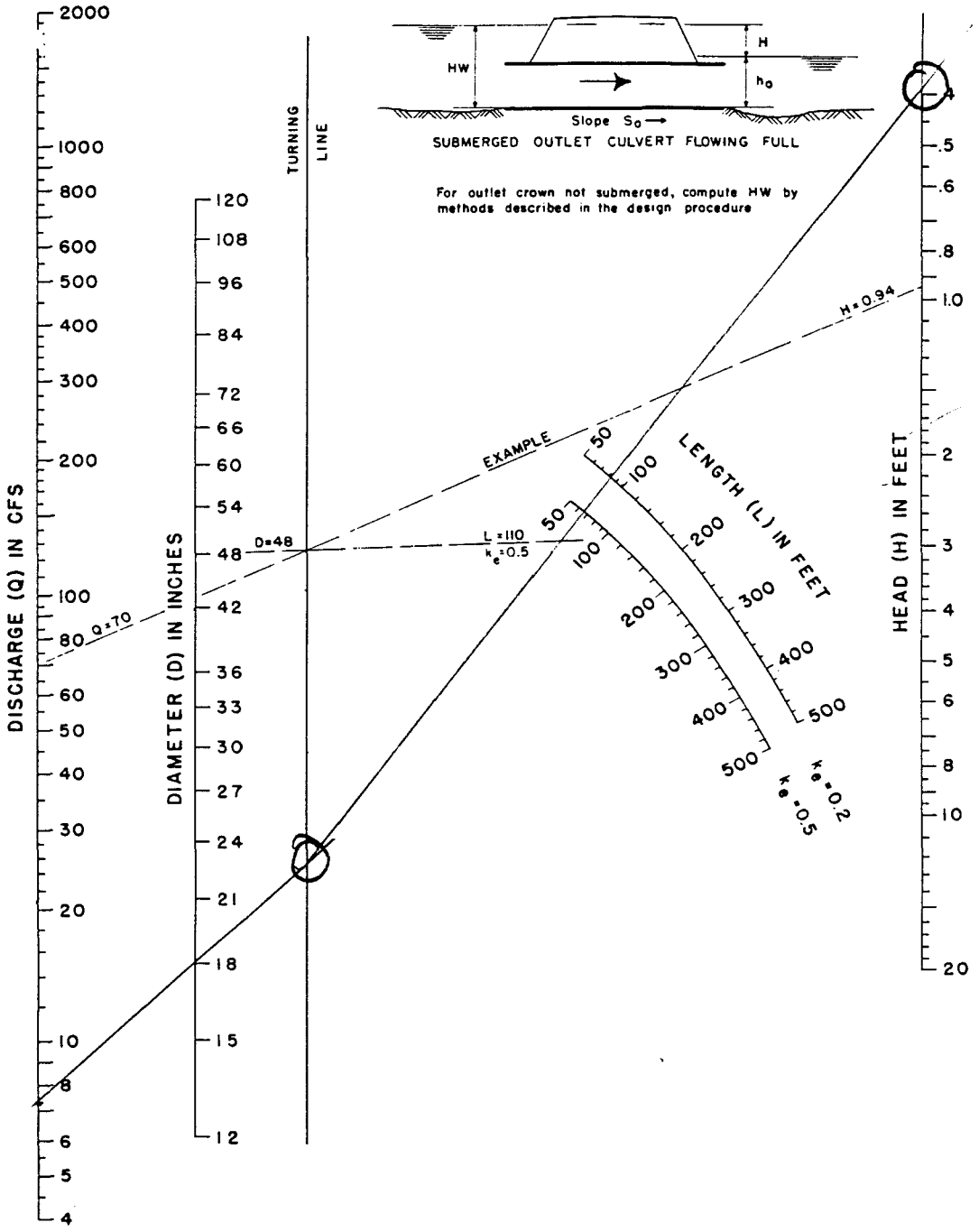




BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

CHART 5



H ≈ .4'

HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

C-2

WATER FLOW THROUGH OUTLET III — TWIN 18" DIA RCP CLASS III

$Q_2 = 6.3$

$Q_{100} = 22.9$

WE HAVE DONE THIS BEFORE... — THERE IS NO PROBLEM WITH Q_{P2} @ 6.3 cfs. HOWEVER 11.5 cfs PER PIPE MAY BE A PROBLEM.

$S_c = 1.08$

$\frac{Q}{D^{5/2}} = \frac{11.5}{2.756} = 4.17$

$d_{cr} = 1.3$

CHART 4

$\frac{d_{cr}}{D} = .85$ FIG 35 $\quad (.85)(1.5) = 1.27$ close check

THE PIPE WILL CARRY 11.5 cfs (if it can get in), ALTHOUGH IT IS STILL UNDER OUTLET CONTROL.

INLET CONTROL NEEDS 2.7' HW OR $\begin{array}{r} 4702.8 \\ 2.7 \\ \hline 4705.5 \end{array}$ WATER SURFACE

IF THE WHOLE STREET FILLS TO CROWN OF RIDGE DRIVE

4705.7 . . .

THE PIPES WILL CARRY ALL OF THE WATER WITHOUT OVERTOPPING RIDGE DRIVE.

TH...TH...TH...THATS ALL FOLKS!

PROJECT: PTARMIGAN RIDGE - FILING 3

STATION: OUTLET 3

SHEET _____ OF _____

CULVERT DESIGN FORM

DESIGNER / DATE: WH / 8/23/96

REVIEWER / DATE: _____ / _____

HYDROLOGICAL DATA

SEE ADD'L SHTS.

☐ METHOD: _____

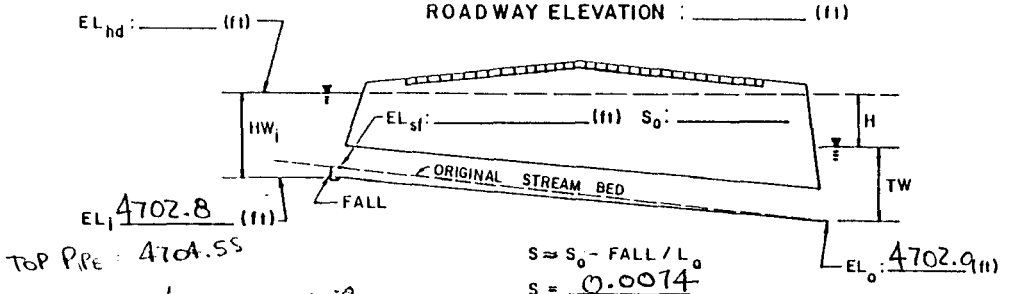
☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____

☐ CHANNEL SHAPE: _____

☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
100	23 cfs	



TOP PIPE: 4704.55

LENGTH = 108.

$S \approx S_o$ - FALL / L_o

S = 0.0074

L_o = _____

CULVERT DESCRIPTION:

MATERIAL - SHAPE - SIZE - ENTRANCE

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW i/D (2)	INLET CONTROL HW i	INLET CONTROL FALL (3)	INLET CONTROL EL hi (4)	OUTLET CONTROL TW (5)	OUTLET CONTROL d_c	OUTLET CONTROL $\frac{d_c + D}{2}$	OUTLET CONTROL h_o (6)	OUTLET CONTROL k_e	OUTLET CONTROL H (7)	OUTLET CONTROL EL ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
DUAL 18" RCP	23	11.5	1.8	2.7'	0											

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW /D OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

o. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

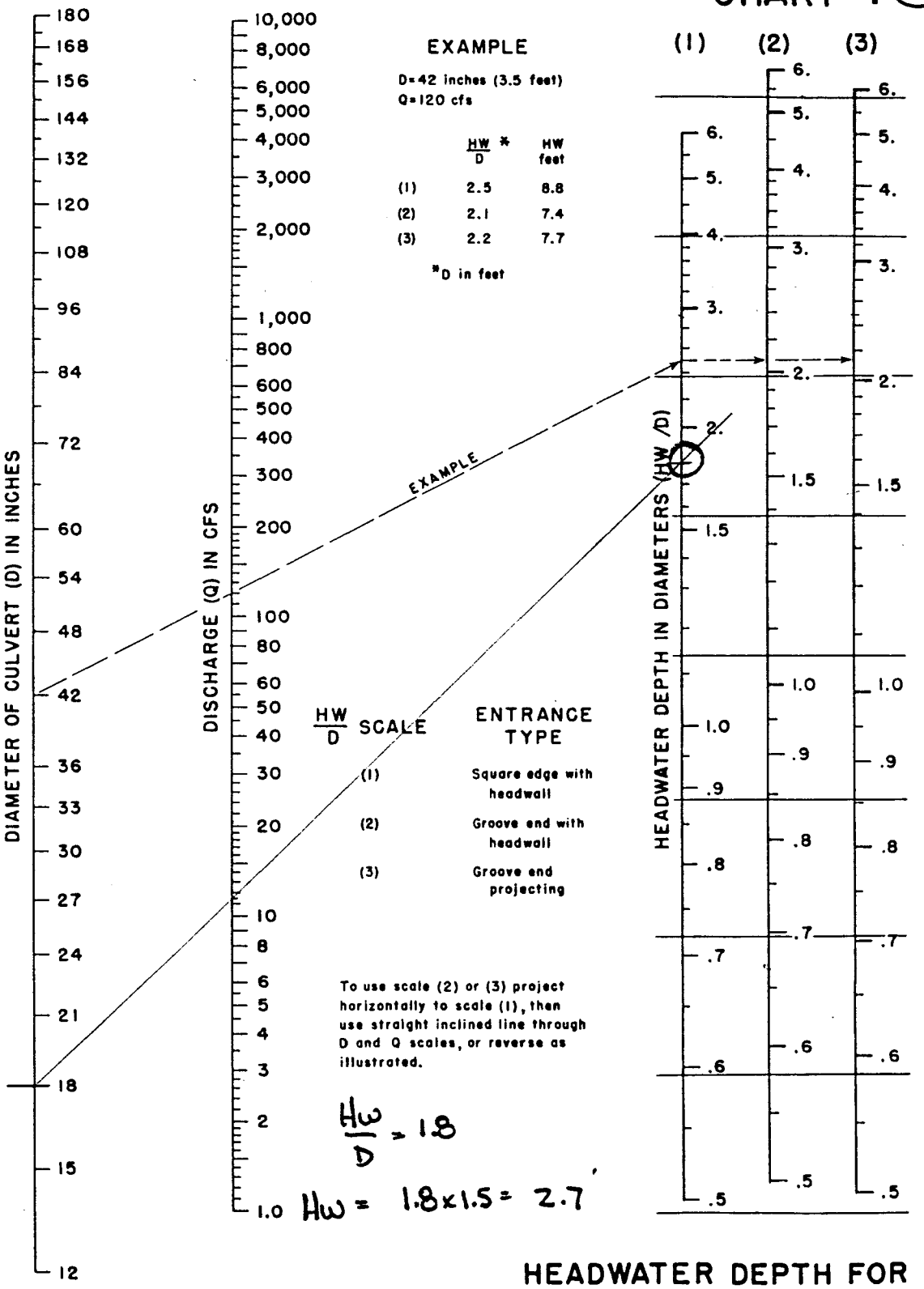
SIZE: TWIN 18"

SHAPE: ROUND

MATERIAL: RCP n: .012

ENTRANCE: BELL UP.

CHART 1



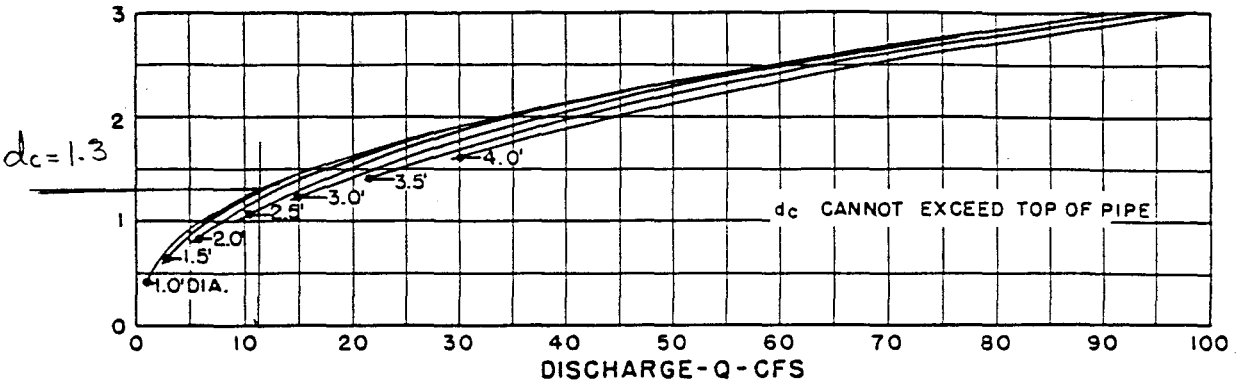
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

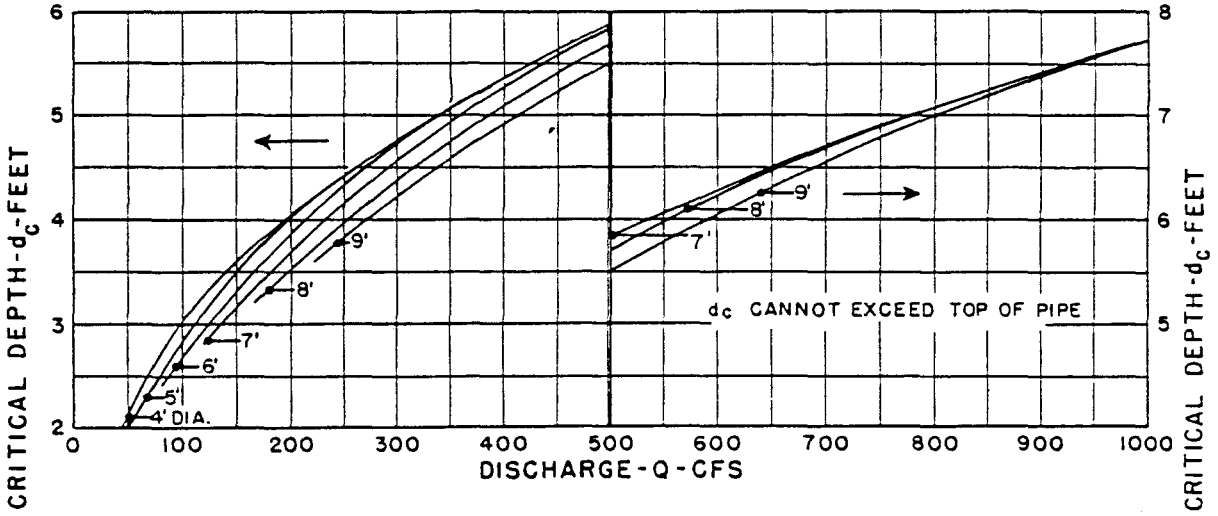
HEADWATER SCALES 283
REVISED MAY 1964

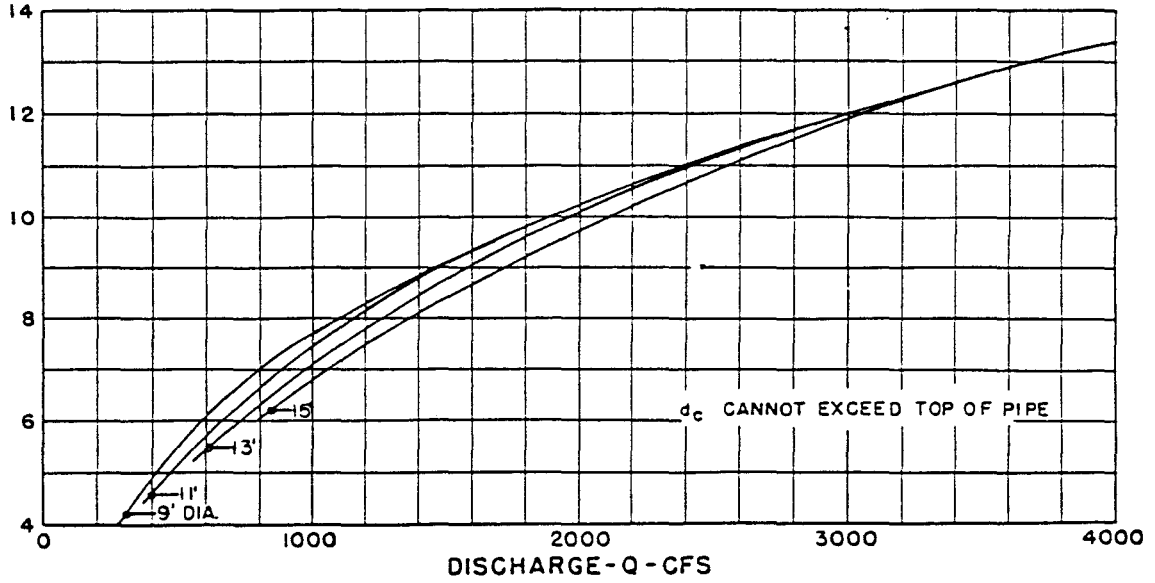
BUREAU OF PUBLIC ROADS JAN. 1963

C-2

CHART 4







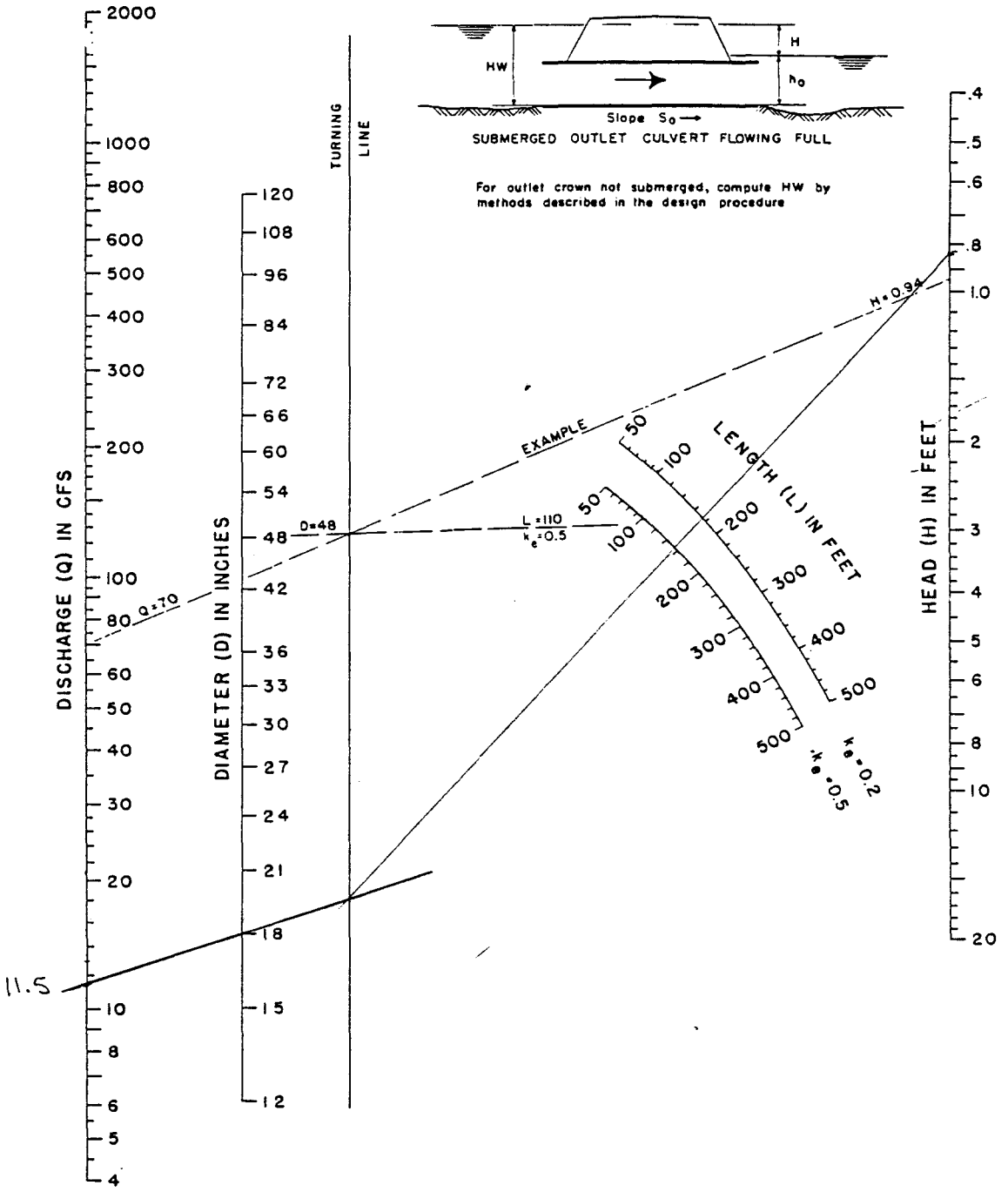
BUREAU OF PUBLIC ROADS

JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

C-25

CHART 5



HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

C-26

August 12, 1992

John Siegfried
P.O. Box 9088
Grand Junction, CO 81502

Grand Junction Community Development Department
Planning • Zoning • Code Enforcement
250 North Fifth Street
Grand Junction, Colorado 81501-2668
(303) 244-1430 FAX (303) 244-1599

RE: Ptarmigan Ridge Subdivision Deficiencies

Dear John:

This letter is to apprise you of City Staff's concerns regarding Ptarmigan Ridge Subdivision as per the current deficiencies in Filings One, Two and Three. In our last Development Review meeting we concluded that if the deficiencies are not corrected staff will recommend that the Planning Commission table Filing 3 until such time that all concerns are addressed.

The following are major concerns which need attention prior to recommending that Planning Commission take action on Filing Three on September 1st:

1. The Irrigation system for Filing One still has not been resolved. We are receiving numerous complaints from residents on that system and expect a resolution from you. Your release from Improvements Agreement/Guarantee for the irrigation system must be signed off by a professional engineer as to its design, installation and operation. Although the latter may not be completed by September 1st we expect a solution and a plan to accomplish it be decided and executed.

2. As of today, all construction drawings have not yet been approved for Filing Two. These must be completed per City Standards and accepted by City Engineering. Please note also that Filing Three is not serviceable nor accessible without acceptable completion of Filing Two.

3. We have not yet received the Drainage Plan/Report for Filing Three. Gerald Williams has already informed you that he will not review Filing Three until he receives the Drainage Plan/Report. Upon submittal of this report staff will review it and must approved it prior to Planning Commission action. In addition to this, all plans and reports already submitted for Filing Three must be approved by Staff.

APPROVED 8/18/92 see letter attached

Received

We request that you promptly respond to these deficiencies. It is <u>not</u> our desire to hold up Filing Three, but it will be of necessity if the above concerns are not satisfactorily resolved. If you have any questions, please contact us at you earliest convenience.

Respectfully,

Dave Thornton
Planner

cc: Don Newton
Gerald Williams
Claudia Hazelhurst
John Shaver
File #45-92

(pt3.let)

City of Grand Junction, Colorado
250 North Fifth Street
81501-2668
FAX: (303) 244-1599

August 18, 1992

William Heley, P.E.
WH Engineering
2257 Fawn Court
Grand Junction, CO 81503

Re: Ptarmigan Ridge Filing 2

Dear Bill:

We have received and reviewed the plans sealed August 13, 1992, for Ptarmigan Ridge Filing 2, sheets 1 through 10, and approve the plans for construction. The remaining outstanding issue is a sketch detail of the future outlet manhole at the southwest corner of Ridge Drive and North 15th Street.

A detention/retention facility maintenance agreement will not be required. Although the agreement addresses developer/owner responsibility, particularly items 1 through 4 therein, it was determined that the existing development code and obligations implied therein adequately covers these issues, and that additional paperwork is unmerited.

If you have any questions concerning the above, please call.

Sincerely,

Gerald R Williams

Gerald R. Williams, P.E.
Development Engineer

mg

xc: Don Newton, City Engineer
Dave Thornton, City Planner
John Seigfried, Developer

filegw\\ptarm_#2

August 28, 1992

Responses to Review Comments to Ptarmigan Ridge Filing #3
City file # 45-92

The plat and plans have been corrected per comments by Dan Wilson, Tim Woodmansee, Gerald Williams, Bill Cheney, Ute Water, and Dave Thornton.

We have amended covenants per Dan Wilson and added a fence restriction per Grand Valley Water User's Assoc.

All temporary easements and Cul-de-sacs will be by separate recorded document.

CITY OF GRAND JUNCTION DEVELOPMENT FILE 45-92, PTARMIGAN RIDGE FILING 3, LOCATED AT NORTH 15th STREET AND RIDGE DRIVE IN THE CITY OF GRAND JUNCTION HAS BEEN REVIEWED AND APPROVED BY THE UTILITY COORDINATING COMMITTEE.

John L. Ballagh
CHAIRMAN

Sept. 9 1992
DATE

COMMUNITY DEVELOPMENT DEPARTMENT STAFF REPORT

by Dave Thornton, 244-1447

File #45-92

REVIEW COMMENTS:

PLAT

1. Need Book & Page # in Plat dedication.
2. Lots 2 and 4 of Block 3 do meet the minimum lot size requirement of 8500 sq ft. Please adjust property lines accordingly.
3. Acres is misspelled in area summary table.
4. A temporary easement is required for the cul-de-sac.
5. Need to label type and dimensions of easement shown on west sides of lot 1, blk 2 and lot 1, blk 3.

GENERAL

1. The temporary cul-de-sac must be constructed with a dust free surface.
2. An avigation easement is required to be recorded and must be recorded with the plat.
3. The soils report notes a potential for perched water table conditions created by irrigation and roof runoff. The design and construction of all improvements should take that into account. Because of the possibility of varying soil conditions, open excavation observation should be performed by a soils engineer prior to placing forms or pouring concrete. The site drainage recommendations and foundation recommendations made in the Lincoln-DeVore, Inc. soils report (dated Sept. 5, 1990) should be followed for site specific construction.
4. **We have not yet received a drainage report and adequate roadway plans. Any submitted reports and plans must meet the minimum requirements of the code and be accepted by the City Development Engineer. They must be submitted by AUGUST 24, 1992. If any or all of the above does not happen, staff will recommend tabling this project until the following Planning Commission hearing.**
5. The covenants talk about an architectural review committee. Who will be the initial committee and do we need to have them stamp the plans prior to issuing any building permits.
6. Interim Landscaping Plans for vacant lots will be submitted to whom?
7. The improvements Agreement/Guarantee must be approved by City Engineering and will be recorded with the Final Plat.
8. All review agency comments must be addressed in writing to us by Friday, August 28th, 1992 by 5 p.m.

PROPOSAL

The proposal is for a final plat of Ptarmigan Ridge 3 located north of Ridge Drive and west of 27 1/2 Road. The current zoning for the property is RSF-4. Filing 3 consists of 11 single family lots on 3.353 acres for an overall density of 3.2 units per acre.

SURROUNDING LAND USE AND ZONING

The proposal is consistent with the surrounding land use and zoning.

CORRIDOR GUIDELINES -

N/A

CRITERIA - (rezone, special use, conditional use, vacation, etc.)

N/A

RECOMMENDATIONS

Staff recommends approval subject to review agency summary sheet comments.

Summary Sheet Comments

Gerald Williams

Revised Drainage Plan / Report is needed
OFF SITE ~~Easements~~ on separate Document
Recommend Conditional Approval

Grand Valley Water Users has request a fence restriction in the irrigation easement along the West Property lines for Lots 1, 2, 3 Blk 1
The petitioner has Amended the covenants to include this.

John-

Lita Higginston (was at Tues. P.C. hearing) would like to talk to you about Ptarmigan Ridge ~~Estates~~ and some of your comments about what can, and can't, be done to get Sigfreid to fix the irrigation system, specifically having someone not in the Sub. hooked onto the Subs. system.

Karl

P.S. #'s 242-1453 (work)
241-9003 (home)

Ptarmigan Ridge Filing #3 October 5, 1992

Items needed before recording:

	STATUS
~~1.~~ Avigation Easement	In File
~~2.~~ Covenants	In File
~~3.~~ Improvements Agreement	Being updated by Lewis. He will deliver to Gerald for his review this week. After Gerald's okay, need to send upstairs with cover-memo for Marks signature. ATTACHED Received MARK to SIGN obtained
~~4.~~ The following Easements:	Tim W. will provide Lewis w/ the proper format. we now have the signed easements
~~a)~~ Temporary for cul-de-sac	
~~b)~~ Temporary Utility	
~~c)~~ Irrigation	
5. Improvements Guarantee	Lewis will give us the Letter of Credit midweek.
6. Approval of Construction Drawings	Gerald still needs to review these. Waiting for his approval.
7. Final Plat	Need 3 more signatures, but waiting for all other requirements to be satisfied.
~~8.~~ Open Space Fees	$2,475.00 due to Parks & Rec. Need Receipt
9. County Surveyor Certificate	

Items to be recorded:

Avigation Easement
Covenants
Improvements Agreement
Temporary easement for cul-de-sac
Temporary Utility easement
Irrigation easement
Final plat

Recorded 11-13-92 AT 2:08 p.m.
Book 14
Page 77
Reception # 1620500
Drawer # Z68

(ptridge.not)

FF

ACTION SHEET

Full TCP Required - $500/unit
KP 8/18/94

#45 92

ACRES ~~3.5~~ (3.3)

UNITS 11

DENSITY ~~3.14~~ (3.34)

FINAL

FILE NUMBER

ZONE RSF 4

TAX SCHEDULE # 2945-012-26-003
2945-012-00-107

ACTIVITY Filing # 3 of Ptarmigan Ridge

PHASE FINAL

COMMON LOCATION North 15th Street & North of Ridge Dr.

DATE SUBMITTED _____ DATE MAILED OUT _____ DATE POSTED _____

_____ DAY REVIEW PERIOD RETURN BY _____

OPEN SPACE DEDICATION (acreage) _____ OPEN SPACE FEE REQUIRED $_____ PAID RECEIPT #_____

RECORDING FEE REQUIRED $_____ PAID (Date) _____ DATE RECORDED _____

REVIEW AGENCIES

REVIEW AGENCIES	A	B	C	~~D~~	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	~~U~~	V	W	X	Y	~~Z~~	~~AA~~	BB	CC	DD	EE	FF	GG
Planning Department	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●	●	●	●		●	●	●	●	●	●	●
City Engineer (2 SETS)	●	●	●						●		●	●	●	●	●	●	●	●	●	●		●	●	●	●			●					
Transportation Engineer	●	●	●										●	●	●	●	●	●	●	●		●	●	●	●			●					
City Parks/Recreation	●	●	●	●									●	●	●	●	●	●	●			●	●					●					
City Fire Department	●	●	●										●	●	●	●	●	●	●	●		●	●	●	●			●					
City Police Department	●	●	●												●	●	●	●				●	●					●					
County Planning	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
County Engineer	●	●	●										●	●	●	●	●	●	●	●		●	●	●	●			●					
County Health	●	●	●							●	●		●	●	●	●	●	●	●			●	●					●					
Floodplain Administration	●	●	●						●				●	●	●	●	●	●	●			●	●					●					
G.J. Dept. of Energy	●	●	●										●	●	●	●	●	●	●			●	●					●					
Walker Field	●	●	●										●	●	●	●	●	●	●			●	●					●					
School District	●	●	●										●	●	●	●	●	●	●			●	●					●					
Irrigation (GRAND VALLEY)	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
Drainage (GRAND VALLEY)	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
Water (Ute, Clifton)	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
Sewer Dist. (FV, CGV, OM)	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
U.S. West	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
Public Service (2 sets)	●	●	●										●	●	●	●	●	●	●	●		●	●					●					
State Highway Department	●	●	●										●	●	●	●	●	●				●	●					●					
State Geological	●	●	●							●	●		●	●	●	●	●	●	●			●	●					●					
State Health Department	●	●	●										●	●	●	●	●	●	●			●	●					●					
City Property Agent	●	●	●										●	●	●	●	●	●	●			●	●					●					
City Utilities Engineer	●	●	●										●	●	●	●	●	●	●			●	●					●					
City Attorney	●	●	●		●	●							●	●	●	●	●	●										●					
Building Department	●	●	●									●			●		●	●				●						●					
DDA	●	●	●												●													●					
GJPC (7 packets)	●	●	●												●			●				●	●					●					
CIC (~~11 packets~~) ONE PACKET	●	●	●												●			●				●	●					●					
Other County Surveyor	●	●	●												●	●	●	●				@						●					
Grand Valley Rural Electric	@	@	@												@	@	@	@				@				@		@		@	@		

TOTALS

BOARDS	DATE	
P.C.	9-2-92	Approved 7-0 and subject to Review Agency Comments

STAFF

APPLICATION FEE REQUIREMENTS

$50 SIGN DEPOSIT
$780.00 DUE AT SUBMITTAL ($225.00 BASE + $5.00 PER LOT)

GRAND JUNCTION Planning

REVIEW COMMENTS
DEVELOPMENT ENGINEER - GERALD WILLIAMS
FOR FILE #45-92
PTARMIGAN RIDGE FILING #3
OCTOBER 14, 1992

1. We have yet to receive a copy of the executed documents which provide off-site utility, drainage, and ingress/egress easements.

2. The grading plan shows catch basin inlets on Ptarmigan Ridge Court having different grade elevations. Inasmuch as these are at the same station, the grades should be the same.

3. More detail is required on the outlet end of the proposed 12" PVC drain pipe. What is the invert and the channel invert at the outlet, where is the irrigation pump house, and how is conflict avoided? Please show with adequate detail.

4. Please provide leader lines from the water line note shown on the Utility Plans (see Lot 1, Block 2).

5. The roadway grades on Ptarmigan Ridge Court have not been revised since the valley pan was removed and catch basins were added. Catch basins should be at the same grade, and the 1.5% street cross-grade maintained. This affects both the sewer line plan and profile and also the road plan and profile drawings.

6. There are two ways to station the road profiles which should be consistent:

   (i) Have separate stationing for each of three profiles, that is, for the left and right flow lines and also the centerline; and

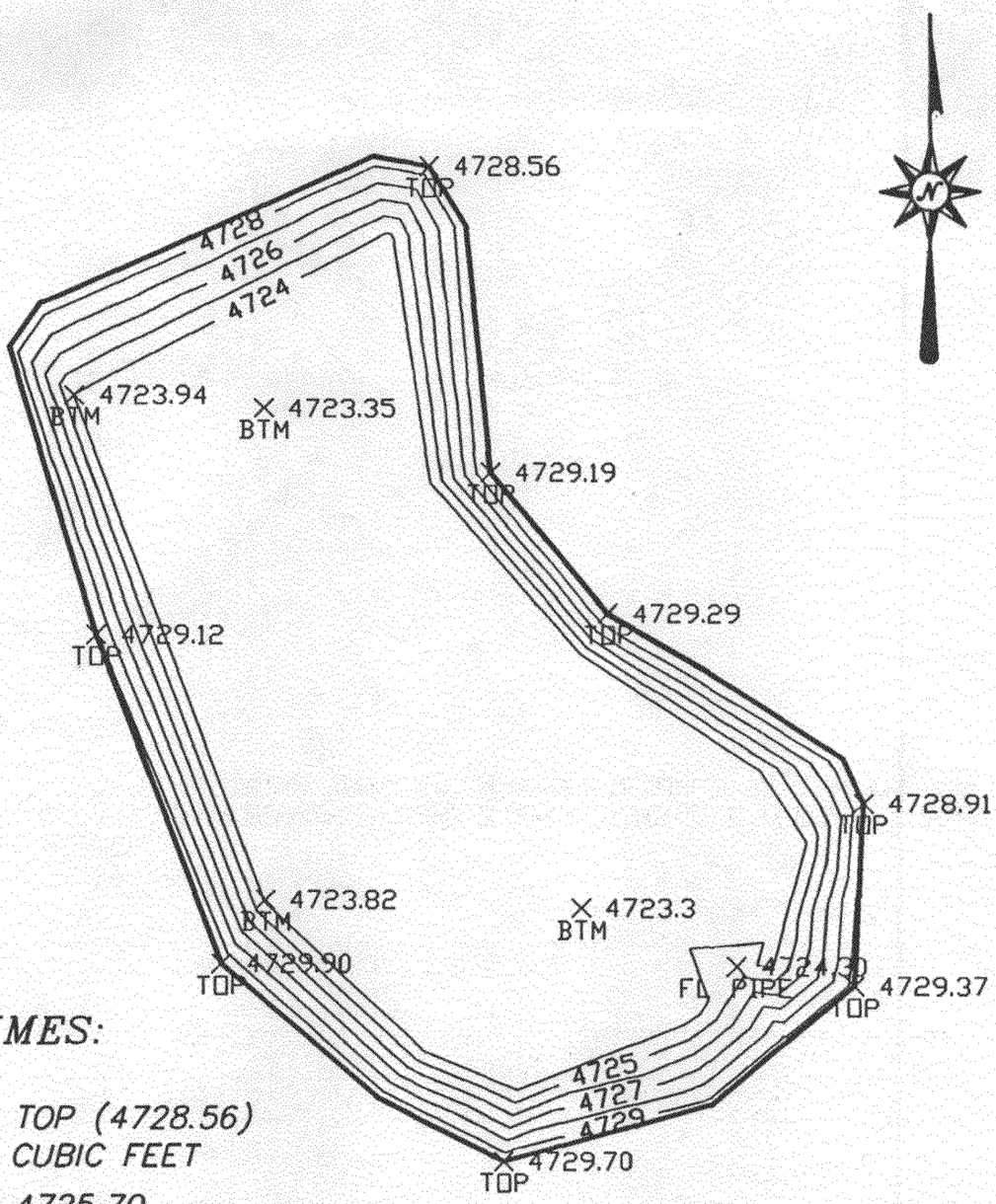
   (ii) Have all points based upon centerline stationing, with true length slopes provided along flow lines. This method is preferred by the City Engineer, since it is less confusing and reduces chance for error.

7. An Addendum to the Filing 3 and 4 Drainage Report has been received. The cover letter to the report acknowledges that "some aspects of Filing 4 are not yet completely designed, so there will probably be a second addendum to the drainage report when the plans are completed, e.g., a revised retention basin detail . . .". The Addendum does refer to an 11,500 cubic feet retention basin, but new hydrologic calculations and an overall runoff summary for pre-, post-Filing 3, and post-Filings 3 and 4 conditions have not been provided. The values provided should include all factors, including reductions due to diversion upstream to the proposed retention basin along 27.5 Road, and reduction elsewhere due to retention and/or detention facilities. These values are necessary to determine whether or not compliance has been obtained.

8. As a matter of note, hydraulic gradients would be of concern not only up to the first catch basin inlet, but to the second inlet as well. Calculations on page 3 of the Addendum appendix appears to show adequacy only to the first inlet.

9. Filing 3 and 4 design and drainage scheme is dependent upon a facility which is not a part of these filings; that is, a large retention basin along 27.5 Road. This basin must be completed and approved prior to acceptance of new filings (3 and 4) which depend upon the basin being in place.

Reviewed by: Gerald Williams, Development Engineer
Copied to: Don Newton, City Engineer



VOLUMES:

BELOW TOP (4728.56)
24859 CUBIC FEET

BELOW 4725.70
9146 CUBIC FEET

COLORADO REGISTERED
DANIEL KERMIT BROWN
23877
PROFESSIONAL LAND SURVEYOR

CERTIFICATION

I, DANIEL K. BROWN, CERTIFY THAT THE VOLUMES DEPICTED HEREON ARE AN ACCURATE REPRESENTATION OF A FIELD SURVEY CONDUCTED UNDER MY SUPERVISION ON NOV. 5, 1992.

Daniel K. Brown 11/5/92

COLO. REG. PROF. LAND SURVEYOR L.S. 23877

POND VOLUME STUDY PTARMIGAN

27 1/2 & CORTLAND AVE. RETENTION POND

FOR: PTARMIGAN

SCALE: FEET 0 5 10 20 / METERS 0 1 3 6 — 1" = 20'

DATE: 11/5/92

Q.E.D. SURVEYING SYSTEMS Inc.
1018 COLO. AVE.
GRAND JUNCTION
COLORADO 81501
464-7568
241-2370

SURVEYED BY: MF VP

DRAWN BY: VAP

ACAD ID: PRPOND

SHEET NO.

FILE: 90090

1620506 02:08 PM 11/13/92
MONIKA TODD CLK&REC MESA COUNTY CO

F

Ptarmigan Ridge Filing 3

Mesa County, Colorado

These covenants are meant to help establish and continue a strong sense of neighborhood and quality within Ptarmigan Ridge. These covenants shall be enforced by the association.

1. All lots shall be used for one single family dwelling per lot and shall not be further subdivided.

2. No animals other than housepets (as defined by section 5-10-4 of the City of Grand Junction Zoning and Development Code) shall be allowed and these will be confined by the owners to their lot. No animals shall be kept, bred, or maintained for commercial purposes. No horses, cattle, sheep, goats, or donkeys will be allowed to be kept on Ptarmigan Ridge lots.

3. Each single family dwelling shall be constructed so that the dwelling space on the first floor, excluding decks, patios, porches, carports,and garages, shall be not less than the following minimum square footages for both single story and two (2) story structures. If the structure is a tri-level, if the main living area is spread over two continuous and adjacent levels, the combination of such levels shall be construed to be the first floor.

1 story: 1500 min.
2 story: 750 min. first floor

4. All building set back requirements are to be to city standards.

5. All foundation plans shall be engineered by a licensed Colorado engineer and bear the stamp of same.

6. Invalidation of any one of these covenants by judgement, statute, or court order shall in no way effect any other covenant. These covenants are binding upon all purchasers of a lot or lots in Ptarmigan now and in the future.

7. No trailer, basement, tent, barn, or other outbuilding or temporary structure shall be used as a residence, temporary or permanent.

8. Only persons holding title to land in Ptarmigan Ridge shall have the right to seek remedy at law or in equity against any person or persons violating or attempting to violate any of these covenants.

9. There is hereby established Ptarmigan Ridge Homeowners Association, an association of which every lot owner will be a member. Membership passes automatically with the sale of the lot. The association shall have the duty to administer the water rights and irrigation practices for Ptarmigan Ridge. It shall have the right to assess members on any reasonable basis for their fair share of the costs of irrigation water, and such charges shall be a lien against each owner's lot. In the event that any such charges become more than thirty (30) days overdue, the association may assess a reasonable penalty, and may add to the assessment all costs of collection, including attorney's fees. The lien, if foreclosed, shall be foreclosed in the manner of a mechanic's lien under Colorado law. The members of the association, by majority vote, may elect officers. They may, but are not required to, adopt bylaws governing their organization. There shall be one vote per lot in any filed portion of the total Ptarmigan Ridge subdivision.

10. The above covenants may be modified and/or amended by a vote of members of the Homeowners Association with approval by no less than 80% of the members.

11. These covenants shall run with the land for the benefit of all future owners.

12. No vehicles shall be allowed on any lot, that can't be driven under their own power within twenty-four hours. Storage of Recreational Vehicles (as defined in Chapter Thirteen-Definitions of the City of Grand Junction Zoning and Development Code) is prohibited in the street. Storage of RV's is allowed on the lots behind a fenced area.

13. Fences shall not be built within the rear lot easements in Block 1 in order to provide access by the Grand Valley Water User's Association.

Date:

5-28-92

Ptarmigan Investments Inc.

By: _____

FILE: PRF3F2

December 4, 1992

Mr. Don Newton, P.E.
City Engineer
City of Grand Junction
250 North Fifth Street
Grand Junction, CO 81501

Re: Ptarmigan Ridge--Drainage Improvements Agreement and Guarantee

Dear Don:

I have reviewed, with the appropriate subcontractors, the costs that you had questions as to the amount. I would like to submit the following revised cost estimate to complete the required drainage improvements. This estimate should be the basis for the improvements agreement and guarantee, rather than the $20,000 which was an unsubstantiated estimate.

Drainage Improvements:		
Catch Basin and Pipe at N. 15th St. and Ridge Dr.		
Catch Basin	$ 890.00	
67 LF of 12" RCP	1390.25	
Manhole	770.00	
Street Patch	400.00	
Compaction Testing	47.00	
Surveying	120.00	
Traffic Control	100.00	
SUBTOTAL	$3717.25	
LESS City Share 50%	1858.62	
TOTAL	$1858.63	$1858.63
Pond at 27 1/2 Road and Cortland		
Reshape Slopes-4 hrs. w/loader	$ 260.00	
Bleed-off Pipe		
90 LF of 2" PVC	440.00	
Orifice w/1" opening	10.00	
TOTAL	$ 710.00	710.00
Pond in Future Filing East of Filing 3		
Earthwork-4 hrs. w/loader	$ 260.00	
Engineering/Design	180.00	
Surveying	180.00	
TOTAL	$ 620.00	620.00
GRAND TOTAL		$3188.63

We feel that the $3188.63 is a more realistic value of the cost of the drainage improvements rather than the $20,000. Please review the cost estimate, and if it is acceptable we will be glad to provide you a new agreement and guarantee.

If you have any further questions regarding the estimate, please contact me at 241-7025 and I will be happy to provide any additional information.

Sincerely,

Lewis E. Hoffman III

Lewis E. Hoffman III
Land Development Manager

C:\WP51\PRDRN2

March 15, 1994

Larry Timm
Director of Community Development
City of Grand Junction
250 N. Fifth St.
Grand Junction, CO 81501

Re: Ptarmigan Ridge Improvements Agreements and Guarantees
Filings 2,3,4,5, and Drainage

Dear Mr. Timm:

Please refer to attached copies of letters previously sent to the city...I reiterate the requests!

Sincerely,

Lewis E. Hoffman III

Lewis E. Hoffman III
Ptarmigan Investments, Inc.
P.O. Box 9088
Grand Junction, CO 81501

January 20, 1994

Jody Kliska, P.E.
Development Engineer
City of Grand Junction
250 N. 5th Street
Grand Junction, CO 81501

Re: Ptarmigan Ridge--Drainage Improvements Agreement and Guarantee

Dear Jody:

Please find attached volume certifications for retention/detention ponds in Filings 4 & 5. These are the last outstanding items under our Development Improvements Agreement (recorded 12-16-93, BK 1945, PGS 178-188). I would like to request at this time that our cash deposit of $3188.63 be released.

If you have any questions, please call me at 241-1105.

Sincerely,

Lewis E. Hoffman, III
Ptarmigan Investments, Inc.
P.O. Box 9088
Grand Junction, CO 81501

June 29, 1993

J. Don Newton, P.E.
City Engineer
City of Grand Junction
250 N. Fifth St.
Grand Junction, CO 81501

Re: Ptarmigan Ridge Subdivisions

Dear Don:

This letter shall serve to tie-up a variety of loose ends at Ptarmigan Ridge. First of all, I would like to request that the Letters of Credit for Filings 3, 4, and 5 be released. The warranty period is in progress and the Letters of Credit should no longer be necessary. I also would like to request that the Cash Bond ($3188.63) for the improvements agreement recorded in Book 1945 Page 178-188 be released. The three drainage facilities have been completed, with the exception of the catch basin and pipe at N. 15th St. and Ridge Dr. which you said would not be required back on March 22, 1993 after you and I discussed the merits of that improvement. If you are lacking anything from us which will not allow you to release any of these, please let me know.

Another matter we need to resolve, is the billing of the City's share of street improvements in front of Margaret D. Eachus' lot at 652 27 1/2 Rd. aka Ridge Drive; parcel #2945-012-26-002; Lot 2 Spomer Subdivision.

RECEIVED 7/15/93

COST DETAIL (copies of invoices attached):

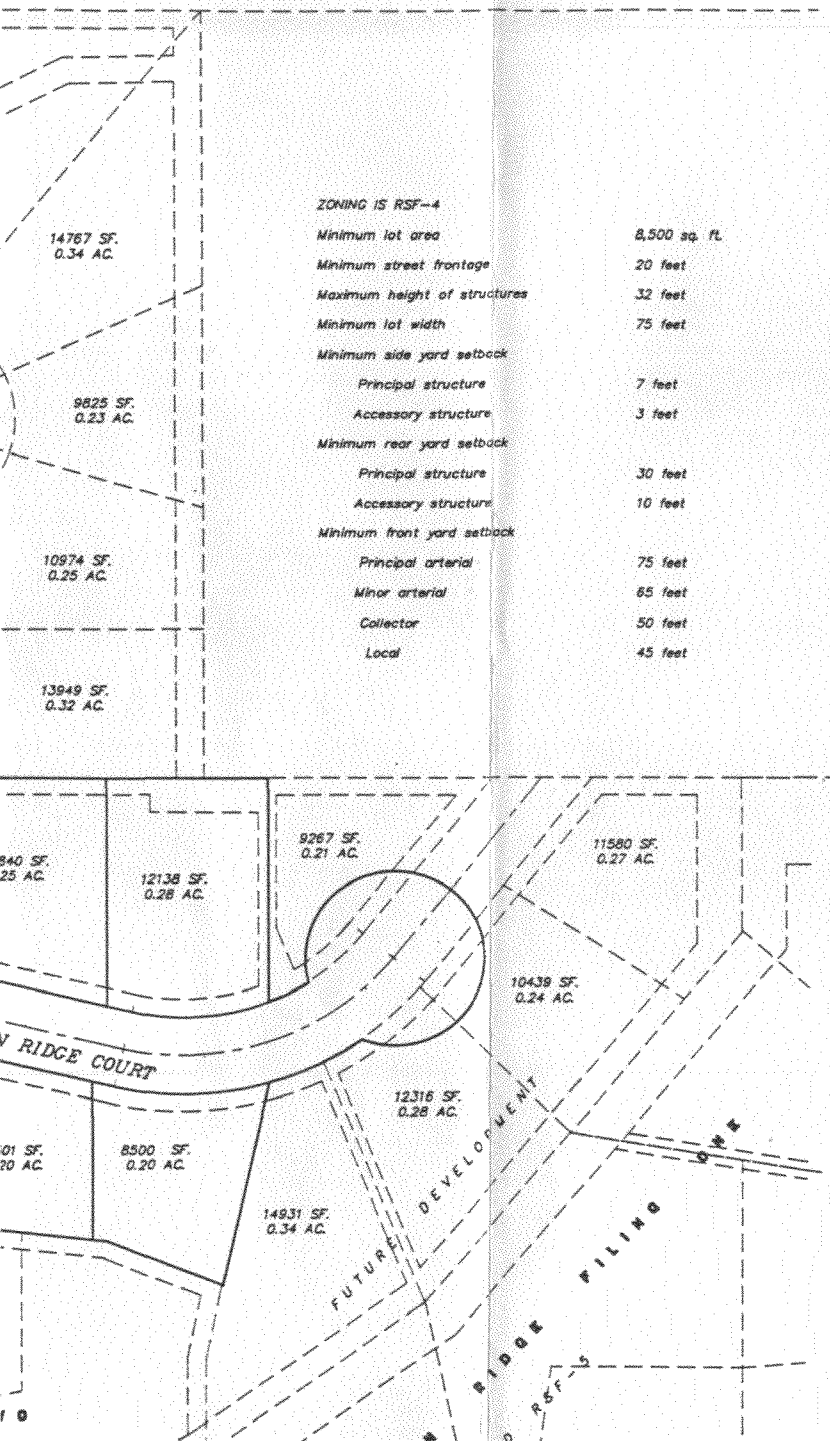
Engineering and surveying(10%)	$ 190.00
Dirtwork 115'x 7'x 1'= 805 CU. FT. = 30 CU. YDS. @ $1.25/cu. yd.	37.50
Roadbase 115'x 7.5'x 0.5'= 431.25 CU. FT. = 16 CU. YDS. = 8 Tons @ $13.80/ton	110.40
Concrete 94.5 LF of 7' C,G,& S @ $14.75/LF	1398.88
143.5 SF of Driveway Apron @ $2.50/SF	358.75
TOTAL	$2095.53

Your help in clearing up these matters will be greatly appreciated. If you have any questions regarding any of these matters, please contact me at 241-7025.

Sincerely,

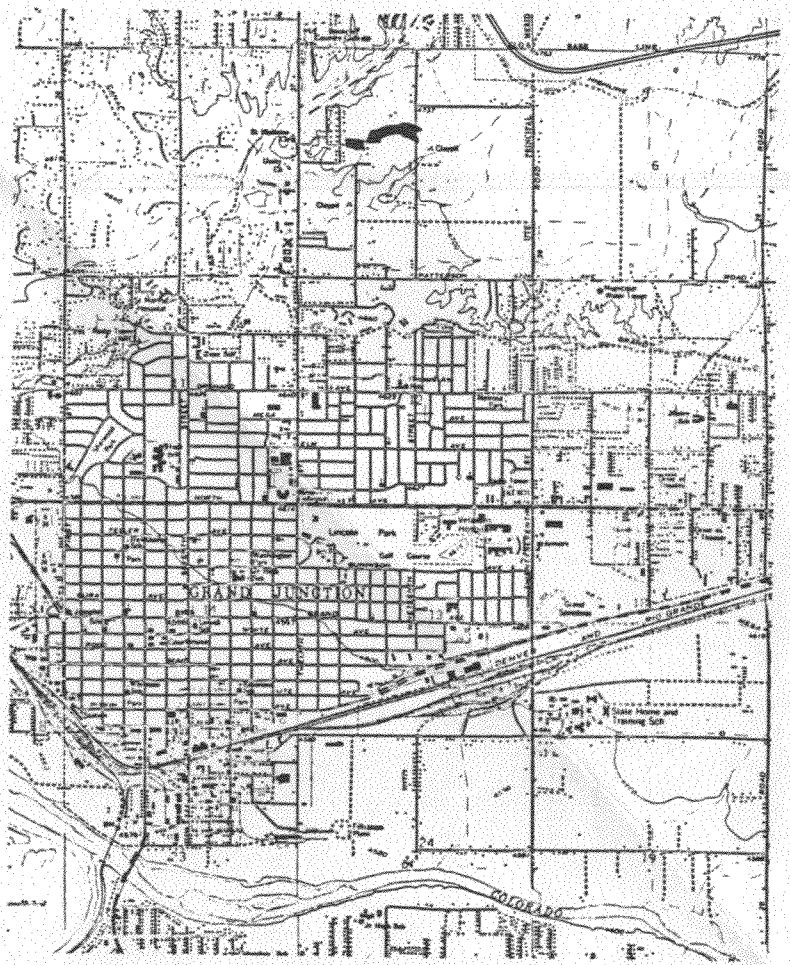
Lewis E. Hoffman III

for Ptarmigan Investments Inc.
PO Box 9088
Grand Junction, CO 81501



ZONING IS RSF-4

Minimum lot area	8,500 sq. ft.
Minimum street frontage	20 feet
Maximum height of structures	32 feet
Minimum lot width	75 feet
Minimum side yard setback	
Principal structure	7 feet
Accessory structure	3 feet
Minimum rear yard setback	
Principal structure	30 feet
Accessory structure	10 feet
Minimum front yard setback	
Principal arterial	75 feet
Minor arterial	65 feet
Collector	50 feet
Local	45 feet



INSERT: SCALE 1"IN = 2000'FT

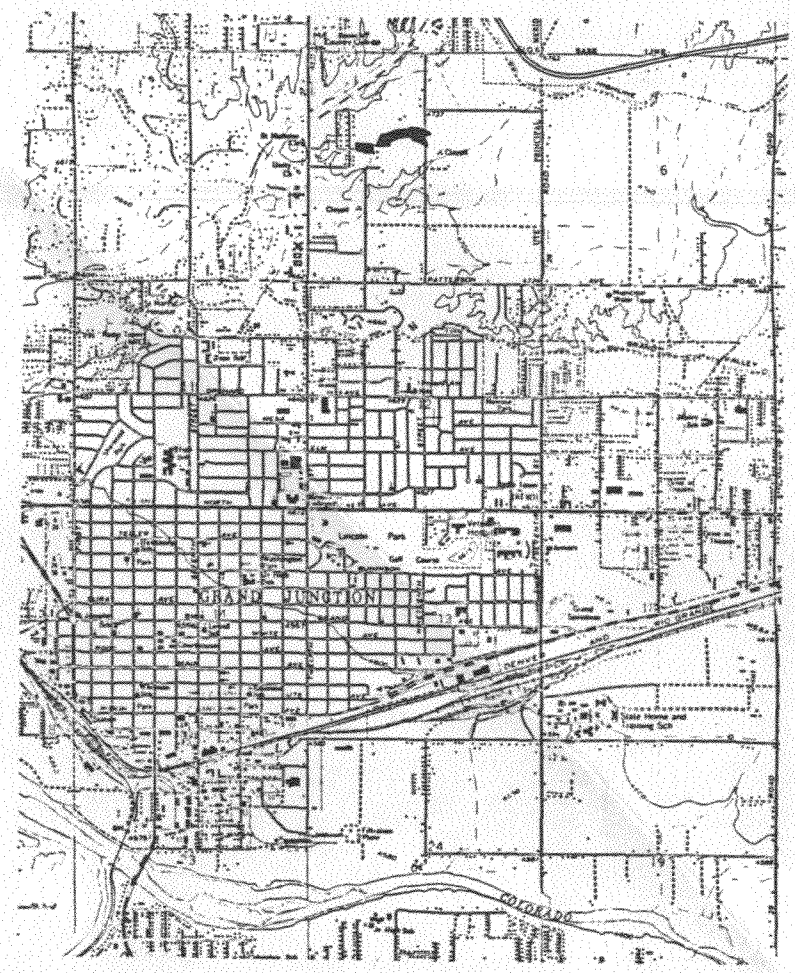
PART OF BLOCK 3 O'NAN SUB.
ZONED RSF-4
existing irrigation ditch

BLOCKS 4 & 7
ZONED RSF-4

15412 SF. 0.35 AC.
16810 SF. 0.39 AC.
22487 SF. 0.52 AC.
20742 SF. 0.48 AC.
14767 SF. 0.34 AC.
13046 SF. 0.30 AC.
9825 SF. 0.23 AC.
R=47'
NORTH 15TH STREET
9630 SF. 0.22 AC.
8567 SF. 0.20 AC.
9654 SF. 0.22 AC.
10974 SF. 0.25 AC.
FUTURE DEVELOPMENT
8898 SF. 0.20 AC.
9834 SF. 0.23 AC.
10665 SF. 0.24 AC.
13949 SF. 0.32 AC.

10740 SF. 0.25 AC.
22' 22'
10497 SF. 0.24 AC.
9425 SF. 0.22 AC.
10840 SF. 0.25 AC.
12138 SF. 0.28 AC.
9267 SF. 0.21 AC.
11580 SF. 0.27 AC.
12135 SF. 0.28 AC.
22' 22'
PTARMIGAN RIDGE COURT
10439 SF. 0.24 AC.
22' 22'
8525 SF. 0.20 AC.
8500 SF. 0.20 AC.
8501 SF. 0.20 AC.
8500 SF. 0.20 AC.
12316 SF. 0.28 AC.
12979 SF. 0.30 AC.
NORTH 15TH STREET
14931 SF. 0.34 AC.
FUTURE DEVELOPMENT
PTARMIGAN RIDGE FILING TWO
ZONED RSF-4
PTARMIGAN COURT NORTH
PTARMIGAN RIDGE FILING THREE
ZONED RSF-4

ZONING IS RSF-4	
Minimum lot area	8,500 sq. ft.
Minimum street frontage	20 feet
Maximum height of structures	32 feet
Minimum lot width	75 feet
Minimum side yard setback	
Principal structure	7 feet
Accessory structure	3 feet
Minimum rear yard setback	
Principal structure	30 feet
Accessory structure	10 feet
Minimum front yard setback	
Principal arterial	75 feet
Minor arterial	65 feet
Collector	50 feet
Local	45 feet



INSERT: SCALE 1"IN = 2000'FT

PTARMIGAN RIDGE FILING THREE
SITE PLAN

FOR: PTARMIGAN INVESTMENTS

SCALE: 1"IN = 50'FT

DATE: 8/3/92

Q.E.D. SURVEYING SYSTEMS Inc.
1018 COLO. AVE.
GRAND JUNCTION
COLORADO 81501
(303) 241-2370
464-7568

SURVEYED BY: DMM MF
DRAWN BY: MEM
ACAD ID: PR3SITE
SHEET NO.
FILE: 90090

DD

PTARMIGAN Ridge Preliminary Plan

S89°51'59"E 223.68

N00°02'34"E 175.85

irrigation, drainage and utility easement

30

pump house

existing ir

30

AND IRRIGATION PONDS

S00°02'34"W 439.85

this area to be used for retention ponds

S89°51'18"E

existing irrigation ditch

N00°02'34"E 1319.26

4718

4716

4714

4714

25

25

4716

existing irrigation ditch

50' Ingress, egress drainage, irrigation and utility easement

drainage, irrigation & utility esmt.

N89°49'54"W 115.00

S00°02'34"W 394.82

N00°02'34"E 394.82

8"

N89°49'54"W 380.00

8" WATER LINE

N89°49'58"W 365.25

3" SEWER LINE

NOTICE:

1 INCH = 100'

ACCORDING TO COLORADO LAW
ANY DEFECT IN THIS SURVEY WITHIN
DEFECT. IN NO EVENT MAY ANY ACTIO
COMMENCED MORE THAN TEN YEARS

RSF-4

PTARMIGAN RIDGE FILING THREE

NW CORNER
LOT ONE
SPOMER SUBDIVISION

S 89°51'59" E 223.68

S 89°51'59" E 271.32'

S 89°52'00" E 1038.78

NE CORNER
SE1/4 NW1/4
SECTION 1
T1S, R1W, U.M.

N 00°02'34" E 439.75

BLOCKS 4 & 7 & PART OF BLOCK 3 O'NAN SUBDIVISION

CURVE#	RADIUS	LENGTH	CHORD	CHORD BEARING	DELTA ANGLE	TANGENT
C1	554.30'	53.64'	53.62'	S10°33'22"E	05°32'41"	26.84'
C2	979.78'	169.46'	169.24'	N08°22'25"W	09°54'34"	84.94'
C3	979.78'	37.55'	37.54'	N02°19'15"W	02°11'44"	18.78'
C4	900.30'	39.81'	39.74'	S06°55'31"E	11°24'15"	19.97'
C5	826.30'	52.35'	52.21'	S84°07'41"E	14°33'37"	26.32'
C6	150.30'	119.02'	115.98'	N80°25'19"E	45°22'38"	62.84'
C7	532.30'	51.51'	51.49'	S10°33'22"E	05°32'41"	25.78'
C8	1001.78'	19.17'	19.17'	N12°46'48"W	01°05'47"	9.59'
C9	1001.78'	95.88'	95.84'	N09°29'24"W	05°29'01"	47.98'
C10	1001.78'	96.68'	96.56'	N03°59'08"W	05°31'30"	48.36'
C11	178.00'	35.43'	35.37'	S06°55'31"E	11°24'15"	17.77'
C12	222.00'	39.97'	39.92'	S07°28'09"E	10°18'57"	20.04'
C13	20.00'	31.10'	28.06'	N46°51'35"W	89°05'49"	19.69'
C14	298.00'	57.94'	57.78'	S84°07'41"E	14°33'37"	29.13'
C15	128.00'	76.67'	75.53'	N85°59'29"E	34°19'17"	39.53'
C16	128.00'	24.89'	24.85'	N63°15'40"E	11°08'21"	12.48'
C17	150.00'	48.82'	48.61'	S48°22'03"W	18°38'53"	24.63'
C18	72.00'	17.17'	17.13'	N60°39'02"W	05°43'05"	8.59'
C19	172.00'	32.70'	32.65'	N68°51'19"E	10°53'29"	16.40'
C20	172.00'	86.61'	85.70'	N88°43'36"E	28°51'03"	44.24'
C21	184.00'	46.76'	46.63'	S84°07'41"E	14°33'37"	23.51'
C22	22.00'	33.05'	29.91'	N41°15'22"E	94°48'17"	21.70'
C23	957.78'	79.96'	79.94'	N08°28'17"W	04°47'00"	40.00'
C24	957.78'	41.21'	41.21'	N12°05'44"W	02°27'28"	20.61'
C25	576.30'	55.77'	55.75'	S10°33'22"E	05°32'41"	27.91'

LEGEND & NOTES

- ● SET NO. 5 RE-BAR WITH CAP L.S. 18413 IN CONCRETE
- ⊥ SET NO. 5 RE-BAR W/CAP L.S. 18413
- ϟ MESA COUNTY BRASS CAP

N

AREA SUMMARY
LOTS = 2.584 ACRES = 77%
ROAD = 0.369 ACRES = 23%
TOTAL = 3.353 ACRES = 100%

Temporary utility easement

FUTURE DEVELOPMENT

S 89°51'18" E 495.00

S 89°51'18" E 35.00

BLOCK ONE

BLOCK TWO

BLOCK THREE

NORTH 15TH STREET

PTARMIGAN RIDGE COURT

PTARMIGAN COURT NORTH

PTARMIGAN RIDGE FILING TWO

PTARMIGAN RIDGE FILING ONE

FUTURE DEVELOPMENT

TEMPORARY CUL-DE-SAC FOR INGRESS AND EGRESS AND UTILITY EASEMENT, BOOK 1926 PAGE 996

LOT	SQ. FT.	ACRES	ADDRESS
1	10740	0.25	3701
1	10279	0.24	3702
2	9439	0.22	1514
3	10840	0.25	1524
4	12138	0.28	1538
1	12135	0.28	3663
2	8519	0.20	3660
3	12979	0.30	3659
1	8500	0.20	1515
2	8500	0.20	1525
3	8500	0.20	1539
1	1501		
1	1502		
7	3655		

P.O.B.
NW CORNER
LOT 7
BLOCK 1
PTARMIGAN
RIDGE
FILING 2

SW CORNER
PTARMIGAN RIDGE FILING NO TWO

SW CORNER
SE1/4 NW1/4
SECTION 1
T1S, R1W, U.M.

SE CORNER
SE1/4 NW1/4
SECTION 1
T1S, R1W, U.M.

T.B.M. = 4708.15

N89°49'54"W 213.00

S89°49'58"E 1320.97

N 00°02'05" E 1320.17 (BASIS OF BEARINGS)

KNOW ALL MEN BY THESE PRESENTS:

That the undersigned, Ptarmigan Investments Inc., a Colorado Corporation, is the owner of that real property situated in the City of Grand Junction, County of Mesa, State of Colorado, and is described in Book 1934, at Page 478, of the Mesa County Clerk and Recorders Office, and being situated in the NW1/4 Section 1, Township 1 South, Range 1 West of the Ute Meridian, Mesa County, Colorado as shown on the accompanying plat, said property being additionally described as follows:

A parcel of land situated in the NW 1/4 Section 1, Township 1 South, Range 1 West of the Ute Meridian, Grand Junction, Colorado being described as follows: Considering the East line of the NW 1/4 Section 1, T1S, R1W, U.M. to bear S00°02'34"W and all bearings contained herein to be relative thereto: Beginning at the NW corner of Lot 7, Block One, Ptarmigan Ridge Filing Two being 213.00 feet N89°49'54"W and 596.01 feet N00°02'34"E of the SW corner of the SE1/4 NW1/4 Section 1, T1S, R1W, U.M.; thence N00°02'34"E 283.50 feet; thence S89°51'18"E 495.00 feet; thence S89°51'18"E 35.00 feet; thence S00°02'34"W 128.75 feet; thence 24.89 feet along the arc of a curve to the left with a radius of 128.00 feet and whose chord bears N63°54'40"E 24.85 feet; thence S12°18'31"E 44.00 feet; thence 17.17 feet along the arc of a curve to the right with a radius of 172.00 feet and whose chord bears S80°33'02"W 17.16 feet; thence 32.70 feet along the arc of a curve to the right with a radius of 172.00 feet and whose chord bears S68°51'19"W 32.65 feet; thence S12°57'20"W 119.12 feet to the NE corner of Lot 5, Block 3, Ptarmigan Ridge Filing Two; thence N68°12'49"W 68.57 feet; thence N83°47'22"W 139.61 feet; thence N89°57'26"W 116.82 feet; thence 41.21 feet along the arc of a curve to the left with a radius of 857.78 feet and whose chord bears S12°05'44"E 41.21 feet; thence 55.77 feet along the arc of a curve to the right with a radius of 576.30 feet and whose chord bears S10°33'22"E 55.75 feet; thence S82°12'58"W 44.00 feet; thence 51.51 feet along the arc of a curve to the left with a radius of 532.30 feet and whose chord bears N10°33'22"W 51.49 feet; thence 19.17 feet along the arc of a curve to the right with a radius of 1001.78 feet and whose chord bears N12°46'48"W 19.17 feet; thence N90°00'00"W 146.01 feet to the point of beginning, containing 3.353 Acres as described.

That said owner has caused the said real property to be laid out and surveyed as PTARMIGAN RIDGE FILING NO. THREE, a subdivision of a part of City of Grand Junction, County of Mesa, State of Colorado.

That said owner does hereby dedicate and set apart all of the streets and rights-of-way as shown on the accompanying plat to the City of Grand Junction, for the use of the public forever and dedicate to the CITY OF GRAND JUNCTION, for the use of the public those portions of said real property which are labeled as utility easements on the accompanying plat as perpetual easements for the installation and maintenance of utilities, irrigation, and drainage facilities, including but not limited to electric lines, gas lines, sewer lines, telephone lines, and appurtenances, together with the right to trim interfering trees and brush with perpetual right of ingress and egress for installation and maintenance of such lines, and said owners hereby dedicate, as common areas to the use and benefit of the owners of the lots hereby platted, Such easements and rights shall be utilized in a reasonable and prudent manner. The areas shown as ingress and egress and utility easements are dedicated to the owners of the property within said PTARMIGAN RIDGE FILING NO. THREE, for perpetual ingress and egress for themselves and the general public, including the postal service, trash, fire, police, emergency vehicles, and the City of Grand Junction.

That all expenses for street paving or improvements shall be furnished by the seller or purchaser, not the City of Grand Junction.

IN WITNESS WHEREOF said owner has caused its name to be hereunto subscribed this 10TH day of SEPTEMBER.

Ptarmigan Investments Inc., a Colorado corp.
John A. Siegfried, President

STATE OF COLORADO } ss.
COUNTY OF MESA }

The foregoing instrument was acknowledged before me this 10TH day of SEPT., A.D., 1992 by John A. Siegfried as president of Ptarmigan Investments Inc., a Colorado Corporation.

My commission expires: 11/11/1995

Notary Public Box 1866, Telluride, Co 81435
Address

CLERK AND RECORDERS CERTIFICATE

STATE OF COLORADO } ss.
COUNTY OF MESA }

I hereby certify that this instrument was filed in my office at 2:08 o'clock P.M. this 13 day of NOVEMBER A.D., 1992 and is duly recorded in Plat Book No. 14 Page 77

APPROVAL

This plat of PTARMIGAN RIDGE, FILING NO. THREE, a subdivision of the City of Grand Junction, County of Mesa, State of Colorado was approved and accepted this 28th day of October A.D., 1992

City Manager

Director of Development

Grand Junction City Engineer

President of Council

(Ron Halsey)
Chairman, Grand Junction Planning Commission

SURVEYOR'S CERTIFICATE

I, Max E. Morris, certify that the accompanying plat of PTARMIGAN RIDGE, FILING NO. THREE, a subdivision of a part of the City of Grand Junction, County of Mesa, State of Colorado has been prepared under my direct supervision and accurately represents a field survey of same. I further certify that this plat conforms to all applicable requirements of the Zoning and Development Code of the City of Grand Junction and all applicable state laws and regulations.

Max E. Morris, Q.E.D. Surveying Systems Inc.
Colorado Registered Professional Land Surveyor L.S. 18413

9/16/92
Date

Reception # 1620500
DRAWER # Z 68

PTARMIGAN RIDGE FILING THREE

Revised 9/11/92
Revised 8/27/92

FINAL PLAT

SITUATED IN THE NW 1/4 SECTION 1, TOWNSHIP 1 SOUTH, RANGE 1 WEST, UTE MERIDIAN

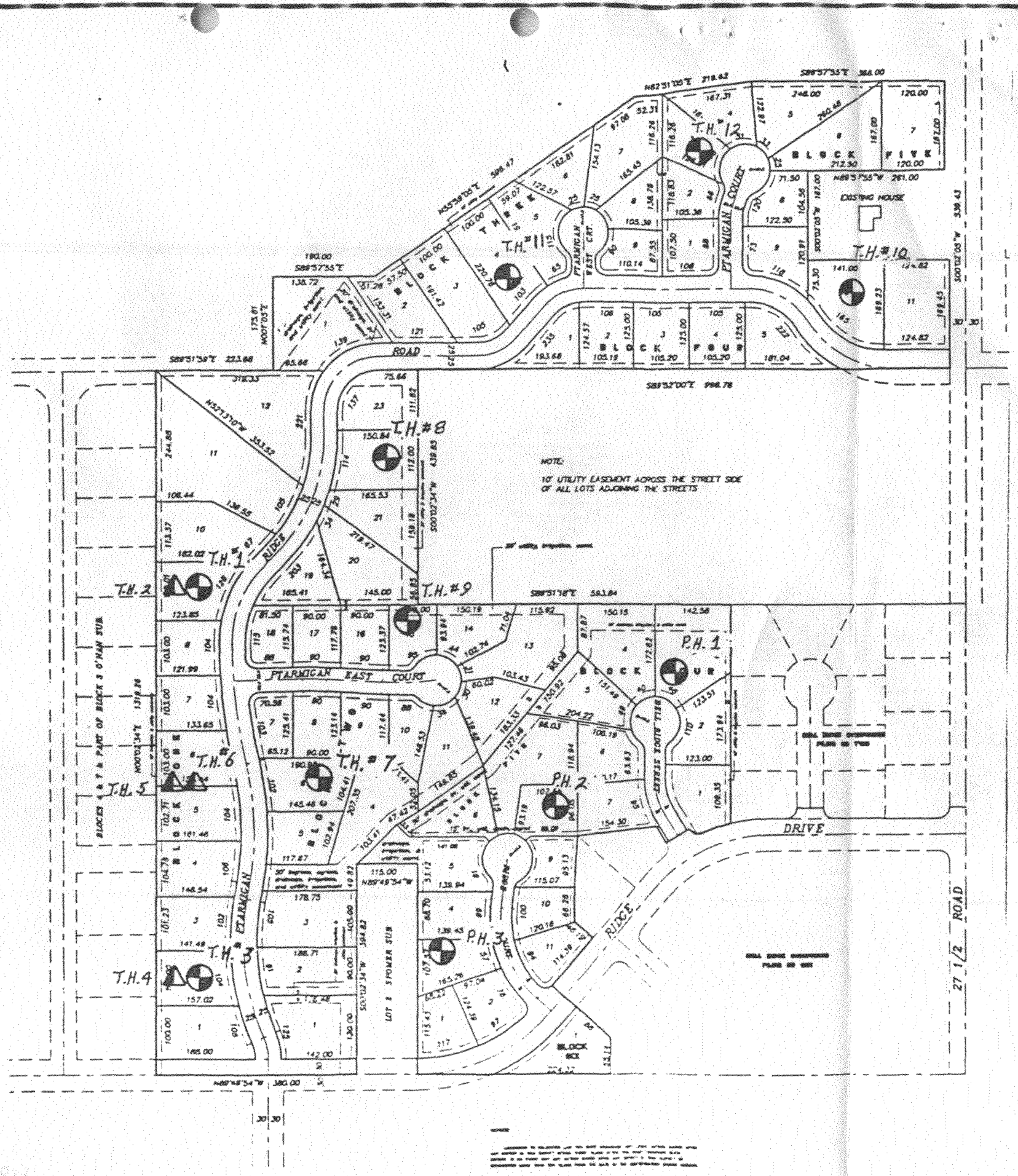
FOR: JOHN SIEGFRIED

SCALE: 1" = 50FT

DATE: 6/28/92

Q.E.D. SURVEYING SYSTEMS Inc.
1018 COLO. AVE.
GRAND JUNCTION
COLORADO 81501
(303) 241-2370
464-7568

SURVEYED BY:	DMM MF
DRAWN BY:	MEM
ACAD ID:	PR3FIN
SHEET NO.	
FILE:	90090



HOLE NUMBER	DATE DRILLED	DEPTH TO SHALE	WATER @ DRILLING	WATER @ 8-28-90	WATER @ 9-4-90	WATER @ 12-7-90	WATER @ 3-19-91	WATER @ 6-26-91
T.H. 1	8/17/90	22'	10'-6"	10'	10'	10'-1"	11'-6"	8'-2"
T.H. 2	8/17/90	22'	10'-0"	9'-2"	9'-7"	9'-7"	10'-4"	8'-2"
T.H. 3	8/20/90	17'	12'	11'-6"	11'-4"	12'-10"	15'-0"	10'-5"
T.H. 4	8/20/90	17'	12'-6"	12'	10'-10"	13'-7"	15'-7"	10'-11"
T.H. 5	8/20/90	19'	10'	9'-8"	9'-0"	11'-1"	13'-4"	8'-0"
T.H. 6	8/20/90	19'	10'	10'	9'-7"	11'-4"	12'-0"	8'-5"
T.H. 7	8/20/90	12'	—	—				
T.H. 8	8/20/90	16'	—	—				
T.H. 9	8/24/90	17'	—	—				
T.H. 10	8/24/90	15'	9'					
T.H. 11	8/28/90	12'	—	—				
T.H. 12	8/28/90	7'	—	—				
P.H. 1	6/28/90	7'	—					
P.H. 2	6/28/90	6'	—					
P.H. 3	6/28/90	6'	—					

EXPLORATION BORING

PIEZOMETER

EXPLORATION BORING LOCATION

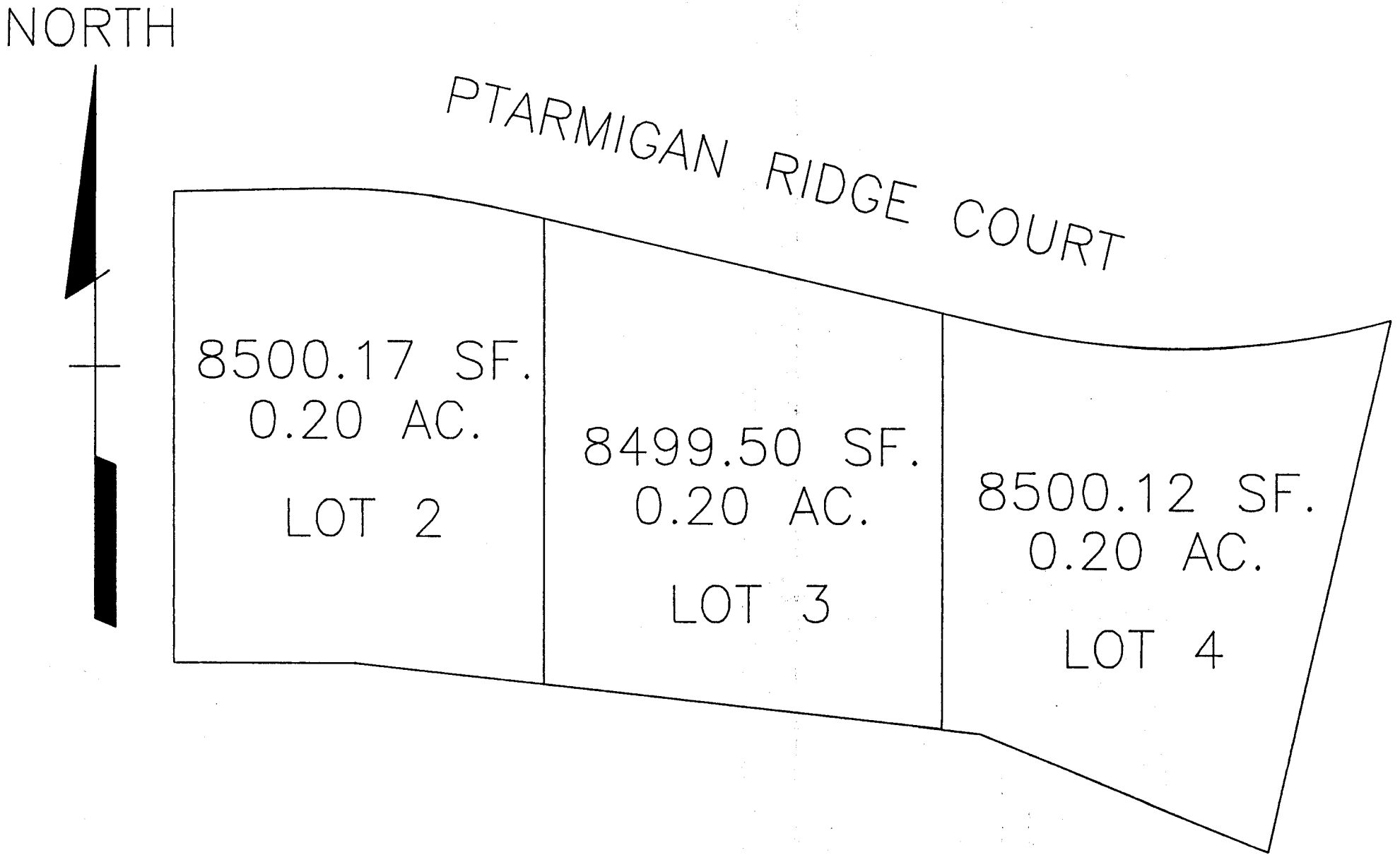
PTARMIGAN RIDGE SUB. GRAND JUNCTION, COLO.

LINCOLN DeVORE ENGINEERS · GEOLOGISTS

COLORADO: COLORADO SPRINGS, GRAND JUNCTION, PUEBLO,

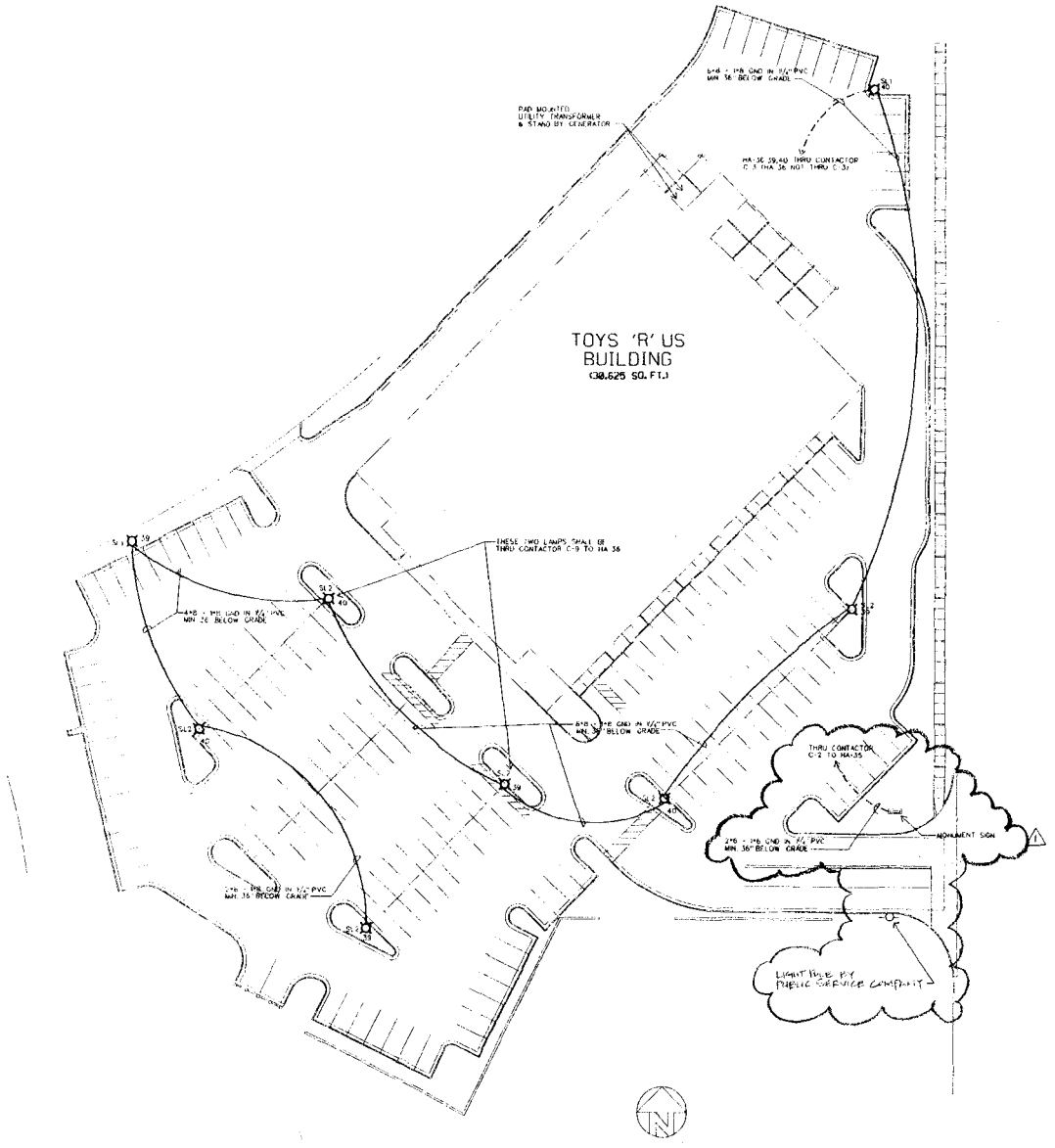
LD # 72865-J

DRAWN BY: EMM	SCALE:	DATE: 8-28-90
CHECKED BY:	CONT. INTERVAL:	REV.


NORTH
PTARMIGAN RIDGE COURT
8500.17 SF.
0.20 AC.
LOT 2
8499.50 SF.
0.20 AC.
LOT 3
8500.12 SF.
0.20 AC.
LOT 4

NOTES:

1. SEE SHALL REFER TO CIVIL DRAWINGS FOR REMAINDER OF SITE INFORMATION
2. APPROXIMATE LOCATION OF PARKING LOT LIGHT FIXTURES IS SHOWN ON THIS DRAWING. COORDINATE EXACT LOCATION OF PARKING LOT LIGHT FIXTURES WITH SITE PLAN TO ENSURE THAT POLES ARE NOT IN AISLEWAYS OR PARKING SPACES
3. SEE PARKING LOT LIGHT POLE BASE DETAIL ON DRAWING E3
4. E.C. SHALL COORDINATE EXACT LOCATION OF ALL SITE UTILITIES BOTH BELOW AND ABOVE GRADE TO ASSURE THAT THERE IS NO INTERFERENCE WITH ANY EASEMENTS, PROPERTY LINES OR OVERHEAD/UNDERGROUND TRAFFIC LINES. ANY RELOCATION OF EXISTING UTILITIES SHALL BE APPROVED PRIOR TO RELOCATION BY THE OWNER'S REPRESENTATIVE



Revisions

No	Date	Description
1	08/19/92	ISSUED FOR BULLETIN NO. 2.

Drawing References

No	Drawings

ISSUED FOR PERMITS	06-16-92
ISSUED FOR PERMITS	06-16-92

CADD NAME: T92CDUE1 PROJECT NO.: 26192
DRAWN BY: CHECKED BY:
PROTOTYPE DESIGNATION:

THE WBDC GROUP
ARCHITECTURE PLANNING ENGINEERING INTERIORS
50 MONROE PLACE
GRAND RAPIDS MI 49503
TELEPHONE (616) 235-6000
FAX (616) 235-6132

TOYS "R" US®

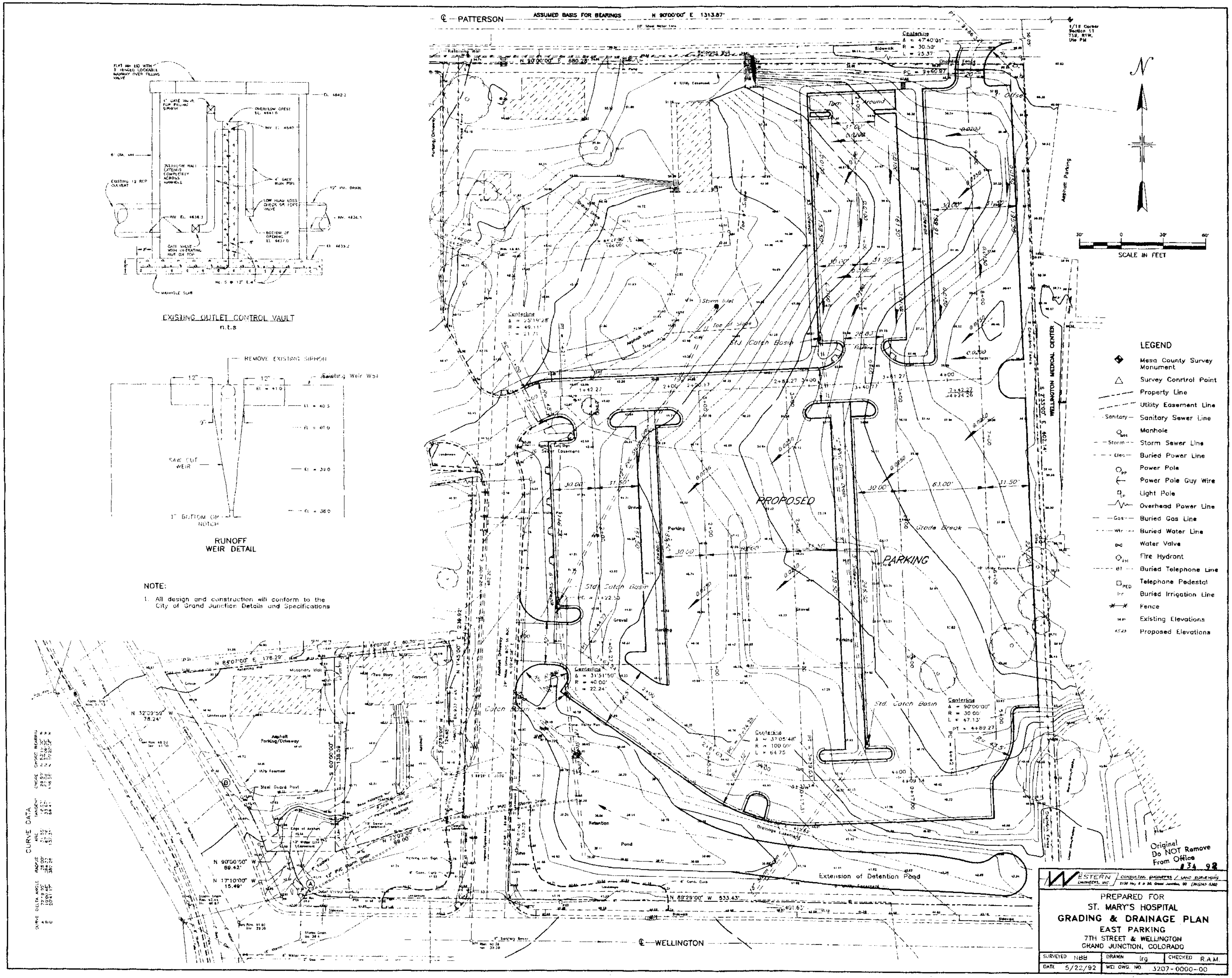
National Office
461 From Road
Paramus, NJ 07652
(201) 599 7800

Location
GRAND JUNCTION, COLORADO

Drawing Title
SITE LIGHTING PLAN

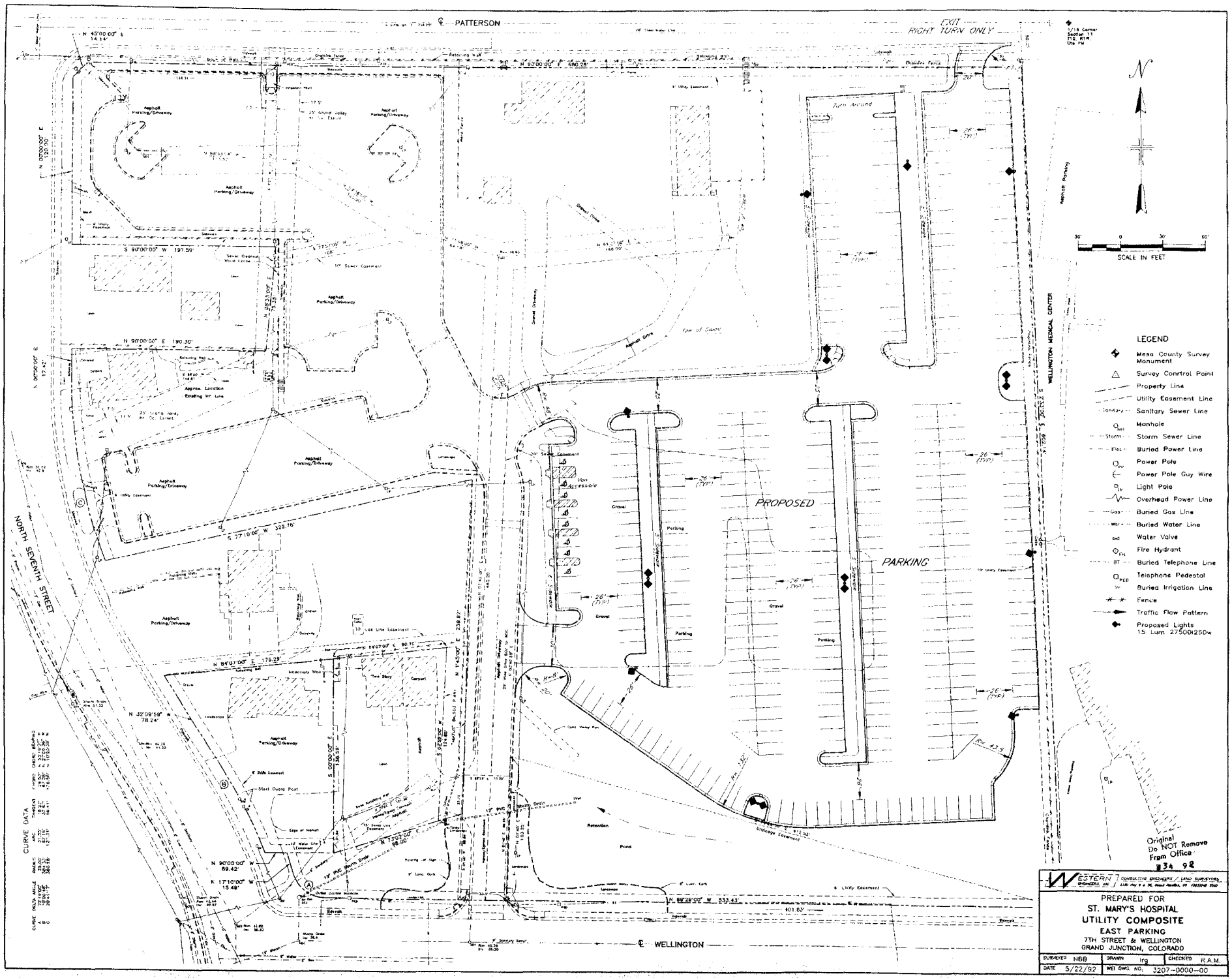
Scale 1"=30'-0" Date 06-16-92

Sheet no.
UE1



EXISTING OUTLET CONTROL VAULT
n.t.s
REMOVE EXISTING SIPHON
Existing Weir Wall
SAW CUT WEIR
1" BOTTOM OF NOTCH
RUNOFF
WEIR DETAIL
NOTE:
1. All design and construction will conform to the City of Grand Junction Details and Specifications
℄ PATTERSON
ASSUMED BASIS FOR BEARINGS N 90°00'00" E 1313.87'
N 90°00'00" E 580.28'
Centerline
Δ = 47°40'01"
R = 30.50'
L = 25.37'
PC = 9+60.87
1/16 Corner Section 11 T1S, R1W, Ute PM
N
SCALE IN FEET
Asphalt Parking
WELLINGTON MEDICAL CENTER
Turn Around
Storm Inlet
Toe of Slope
Std. Catch Basin
PROPOSED
PARKING
Grade Break
Std. Catch Basin
Centerline
Δ = 31°51'50"
R = 40.00'
L = 22.24'
Centerline
Δ = 37°05'48"
R = 100.00'
L = 64.75'
Centerline
Δ = 90°00'00"
R = 30.00'
L = 47.13'
PT = 4+89.27
Retention Pond
Drainage Easement
Extension of Detention Pond
N 89°29'00" W 533.43'
℄ WELLINGTON
N 32°09'59" W 78.24'
N 89°07'00" E 176.29'
Asphalt Parking/Driveway
Steel Guard Post
Edge of Asphalt
N 90°00'00" W 89.42'
N 17°10'00" W 15.49'
N 73°02'00" E 98.00'
12" PVC Storm Drain
CURVE DATA
LEGEND
Mesa County Survey Monument
Survey Conrtrol Point
Property Line
Utility Easement Line
Sanitary Sewer Line
Manhole
Storm Sewer Line
Buried Power Line
Power Pole
Power Pole Guy Wire
Light Pole
Overhead Power Line
Buried Gas Line
Buried Water Line
Water Valve
Fire Hydrant
Buried Telephone Line
Telephone Pedestal
Buried Irrigation Line
Fence
Existing Elevations
Proposed Elevations
Original
Do NOT Remove
From Office
#34 92
WESTERN ENGINEERS, INC.
CONSULTING ENGINEERS / LAND SURVEYORS
PREPARED FOR
ST. MARY'S HOSPITAL
GRADING & DRAINAGE PLAN
EAST PARKING
7TH STREET & WELLINGTON
GRAND JUNCTION, COLORADO
SURVEYED NBB
DRAWN lrg
CHECKED R.A.M.
DATE 5/22/92
WEI DWG. NO. 3207-0000-00

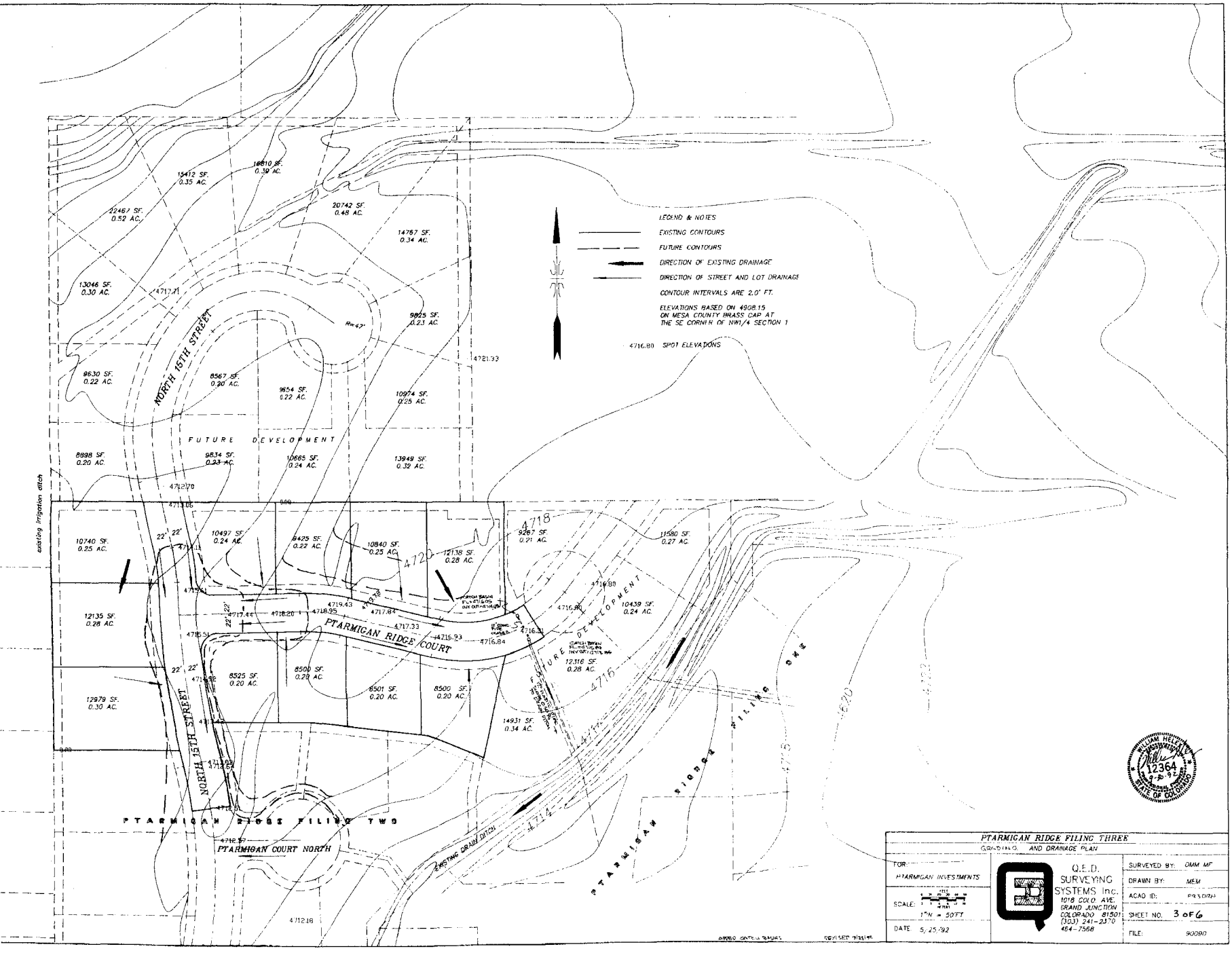
34-92



WESTERN CONSULTING ENGINEERS / LAND SURVEYORS
GRAND JCT. CO. 1120 Hwy 6 & 50, Grand Junction, CO 81505 970

PREPARED FOR
ST. MARY'S HOSPITAL
UTILITY COMPOSITE
EAST PARKING
7TH STREET & WELLINGTON
GRAND JUNCTION, COLORADO

SURVEYED	NBB	DRAWN	lrg
DATE	5/22/92	CHECKED	R.A.M.
		WST DWG. NO.	3207-0000-00



PTARMIGAN RIDGE FILING THREE

GRADING AND DRAINAGE PLAN

FOR: PTARMIGAN INVESTMENTS

SCALE: 1"=50FT

DATE: 5/25/92

Q.E.D. SURVEYING SYSTEMS, Inc.
1018 COLO. AVE.
GRAND JUNCTION
COLORADO 81501
(303) 241-2370
434-7568

SURVEYED BY: DMM MF

DRAWN BY: MEM

ACAD ID: P3-3.DWG

SHEET NO. 3 OF 6

FILE: 90090

WILLIAM HELLER 12364 9-20-92 REGISTERED STATE OF COLORADO

RECEIVED GRAND JUNCTION PLANNING DEPARTMENT

OCT 0 2 1992

AVIGATION EASEMENT

1620505 02:08 PM 11/13/92
MONIKA TODD CLK&REC MESA COUNTY CO
DOC EXEMPT

THIS EASEMENT is made and entered into by and between the WALKER FIELD, COLORADO, PUBLIC AIRPORT AUTHORITY, a body corporate and politic and constituting a political subdivision of the State of Colorado, hereinafter called GRANTEE, and PTARMIGAN INVESTMENTS INC. hereinafter, GRANTOR;

WHEREAS, Grantee is the owner and operator of Walker Field Airport situated in the County of Mesa, State of Colorado, and in close proximity to the land of Grantor, and Grantee desires to obtain and preserve for the use and benefit of the public a right of free and unobstructed flight for aircraft landing upon, taking off from, or maneuvering about said airport; and

WHEREAS, Grantor is the owner in fee simple of that certain parcel of land situated in the County of Mesa, State of Colorado, to wit:

PTARMIGAN RIDGE FILING THREE

NOW, THEREFORE, in consideration of the sum of One Dollar ($1.00) and other good and valuable consideration, the receipt of which is hereby acknowledged, the Grantor, for himself, his heirs, administrators, executors, successors and assigns, does hereby grant, bargain, sell and convey unto the Grantee, its successors and assigns, for the use and benefit of the public, an easement and right of way appurtenant to Walker Field Airport, for the passage of all aircraft ("aircraft" being defined for the purposes of this instrument as any device known or hereafter invented, used or designed for navigation or flight in the air) by whomsoever owned and operated, in the navigable airspace above the surface of Grantor's Property to an infinite height above said Grantor's property, together with the right to cause in said airspace such noise and vibrations, smoke, fumes, glare, dust, fuel particles and all other effects that may be caused by the normal operation of aircraft landing at or taking off from or operating at or on said Walker Field Airport, and Grantor hereby waives, remises and releases any right or cause of action which Grantor now has or which Grantor may have in the future against Grantee, its successors and assigns, due to such noise, vibrations, smoke, fumes, glare, dust, fuel particles and all other effects caused by the normal operation of such aircraft.

FURTHER, Grantor hereby covenants, for and during the life of this easement, that Grantor:

(a) shall not hereafter construct, permit or suffer to maintain upon said land any obstruction that extends into navigable airspace required for use of said airport runway surfaces; (Navigable airspace is defined for the purpose of this instrument

as airspace at and above the minimum flight altitudes, including take off and landing, as prescribed in Federal Aviation Administration Federal Air Regulations Part 91, and as such regulations are amended.)

(b) shall not hereafter use or permit or suffer use of said land in such a manner as to create electrical or electronic interference with radio communication or radar operation between the installation upon Walker Field Airport and aircraft, or to make it difficult for flyers to distinguish between airport lights and others or to result in glare in the eyes of flyers using the said airport, or to impair visibility in the vicinity of the airport, or otherwise to endanger the landing, taking off or maneuvering of aircraft.

Grantor agrees the aforesaid covenants and agreements shall run with the land for the benefit of Grantee, its successors and assigns, until said airport shall be abandoned and shall cease to be used for public airport purposes.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal on this 23 day of Sept, A.D. 19 92.

PRESIDENT
(Title)

STATE OF COLORADO)
) ss.
COUNTY OF MESA)

The foregoing instrument was acknowledged before me this 23RD day of SEPTEMBER, A.D. 1992, by JOHNNIE A. SIEGFRIED.

My Commission expires: Nov 1, 1995.

Notary Public

STATE OF COLORADO
NOTARY PUBLIC