PARSONS BRINCKERHOFF

Design Analysis Report

Golf Course Road

Paradise Boulevard to Country Club Lane

Bernalillo County, New Mexico

HPP-4079(7)02, CN 7504

BCPWD Project No. TS02-14

Prepared For:

Bernalillo County Public Works Division
2400 Broadway SE
Albuquerque, New Mexico 87102

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B-12/D000

Table of Contents

List of Exhibits

List of Tables

Appendices

I. INTRODUCTION

The purpose of the Design Analysis Report is to describe the project, existing conditions and proposed improvements for Golf Course Road. It is also to document the engineering criteria and methodology used in the design, and to report the results of the engineering analysis performed. Engineering analyses were conducted on all aspects of the roadway design, including hydrology, hydraulics, traffic engineering, lighting and geotechnical. This report will describe the findings and conclusions so that the reasons for each design element can be understood.

II. PROJECT BACKGROUND AND DESCRIPTION

This project involves the final design of improvements to Golf Course Road from Paradise Boulevard to Country Club Lane in Albuquerque, NM. The project area is shown in the vicinity map in Exhibit 1. The final design is the last step in the project development process, beginning with the environmental phase that included an alignment study, conceptual design and preparation of an environmental document. Parsons Brinckerhoff Quade & Douglas (PB) completed this phase and assisted the County with preparing a Finding of No Significant Impact (FONSI). The FONSI was approved on August 19, 2003 by the Federal Highway Administration (FHWA).

The Golf Course Road reconstruction project is approximately 0.7 miles in length and involves widening the existing two-lane roadway to five lanes, adding pedestrian and bicycle facilities, and street lighting. New storm drains along Golf Course Road, Sutton Street and Academy Street are also included in the project. The majority of the project is located within Bernalillo County boundaries, with the exceptions of a short length just north of Paradise Boulevard and the segment north of Country Club Lane approaching Irving Boulevard, which are within City of Albuquerque (City, COA) limits. This project connects to the City of Albuquerque project (#5894.91) that improves the Golf Course Road and Irving Boulevard intersection.

III. EXISTING CONDITIONS

This chapter describes the existing conditions within the project area.

A. Typical Section

Golf Course Road is currently a two-lane roadway consisting of two 12' driving lanes, one lane in each direction. The centerline of the road varies within the right-of-way corridor, in other words, it is not necessarily coincident with the centerline of right-of-way. Pavement widths vary from 24' to 40' with intermittent paved shoulders and concrete curb and gutter as described below.

1. From Paradise Boulevard to Greene Avenue south, the typical section consists of:
   - Two 12' lanes
   - 8' shoulders, both sides
   - Estate type mountable curb and gutter, both sides
2. From Greene Avenue south to about 600' south of Sutton Street, the roadway consists of two 12' lanes. There are no paved shoulders or curb and gutter along this portion.
3. From 600' south of Sutton Street to Greene Avenue north, the typical section consists of:
   - Two 12' lanes
   - 20' to 30' paved shoulder, east side only
   - Barrier curb and gutter, east side only

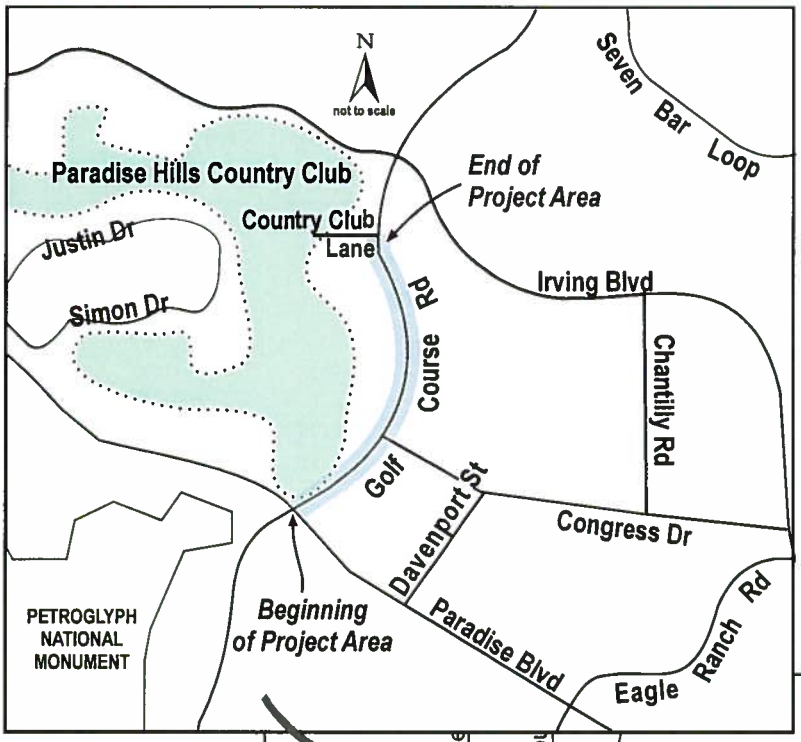
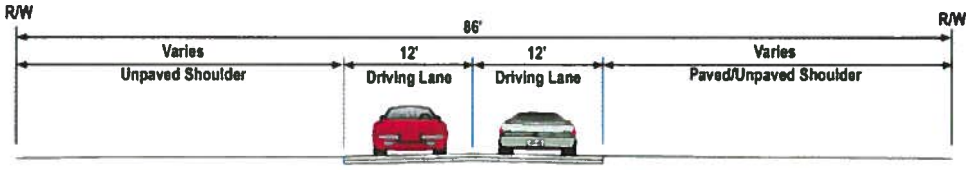


Exhibit 1
Vicinity Map

4. From Greene Avenue north to Country Club Lane, the pavement widens from 24' to 40' and includes an estate type mountable curb and gutter on the west side only.

Other existing typical section features include a southbound left-turn lane onto Paradise Boulevard, and wheelchair ramps at the intersection of Golf Course Road and Paradise Boulevard. Sidewalk is sparse in the project area and consists of a 6' wide, 30' long section located in front of the Cottonwood Car Wash on the east side of Golf Course Road just north of Greene Street. There are no defined bicycle facilities within the project area. Exhibit 2 shows the general existing roadway section.

Exhibit 2 – Existing Golf Course Typical Section



B. Right-of-Way

The existing right-of-way width along the Golf Course Road project area is 86'. This is in concurrence with the Bernalillo County street standards and the City of Albuquerque's *Development Process Manual (DPM)* for minor arterial right-of-way requirements.

C. Design Speed

Based on the existing horizontal curvature, the existing roadway meets design criteria for a 30 mph design speed. The Bernalillo County street standards and the *DPM* suggest a design speed of 45 mph for a minor arterial, however the existing right-of-way constraints limit the design speed to 30 mph.

D. Posted Speed Limit

The current posted speed limit along Golf Course Road within the project limits is 30 mph.

E. Terrain

The terrain within the project limits is level.

F. Access Control

Access along Golf Course Road is currently unrestricted on the east side. Within the project limits there are 33 properties that abut Golf Course Road on the east side, including 26 homes and 4 undeveloped properties that have direct access onto Golf Course Road, and 2 homes and one car wash business that utilize side streets for their access. On the west side of Golf Course Road, there are 25 abutting properties, with 4 homes and an access road to Paradise Hills Golf Club having direct access onto Golf Course Road. The remaining 20 homes front and utilize access on Greene Avenue, however, several of these homes have backyard gates and occasionally use them for access to Golf Course Road.

G. Encroachments

Minor encroachments into the right-of-way have been noted along the project corridor including fences, block walls and landscaping consisting of gravel, railroad ties, and shrubs. One major encroachment consisting of 15' to 25' of fenced backyard within the right-of-way has been noted at the northwest corner of the south Greene Avenue and Golf Course Road intersection.

H. Drainage Channels & Floodplains

The nearest drainage channels are the Piedras Marcadas and the Calabacillas arroyos and are located outside of the project boundaries. Existing storm drains in the area drain into these channels. There are no floodplains on or adjacent to the proposed project site.

I. Existing Utilities

There are numerous utilities located within the existing right-of-way. Existing utilities were researched by contacting utility companies and consulting as-built plans or maps. Existing utilities were also designated, or underwent a level of subsurface utility engineering (SUE) that locates the horizontal positions of utilities by using electronic detection equipment to scan and locate utilities. Once designated, a utility location survey was performed. Utility maps are included in Appendix A. Utility companies that own facilities within the right-of-way include the following:

Utility Owner	Utility
New Mexico Utilities	Water and waste water systems
Public Service Company of New Mexico (PNM)	Power (gas and electric)
Comcast	Television and cable
Qwest	Telephone

1. Water

A 10" water line runs along the center of Golf Course Road from Paradise Boulevard north to Greene Street. This line transitions to the west side of the road and continues as a 12" water line north of Greene Street. Secondary lines (6" or 8") branch off at Greene Avenue (south), Greene Street and Country Club Lane. Numerous water services also branch off this mainline to many of the adjacent properties along Golf Course Road.

Mid-block between Congress Avenue and Sutton Street a 6" water line begins approximately 700' south of Sutton Street and continues north on the east side of Golf Course Road, then turns east onto Sutton Street. This 6" water line provides service to the adjacent properties and to properties along Sutton Street.

2. Sanitary Sewer

An 8" sewer line runs along the west side of Golf Course Road from the Paradise Boulevard intersection to approximately 260' north of Green Avenue (south). A secondary 8" sewer line provides service to Greene Avenue.

Another 8" sewer line begins at the intersection of Congress Avenue and continues north on the east side of Golf Course Road for approximately 930'. A secondary 8" sewer line provides service to Congress Avenue.

A 6" sewer line on the east side of Golf Course Road begins approximately 510' south of Sutton Street and ends at a manhole at the intersection of Golf Course Road and Sutton Street. This line continues north out of the manhole as a 10" sewer line for approximately 825'. Service is provided at Sutton Street and Greene Street by 10" and 6" branches, respectively.

3. Storm Sewer

Currently there is no storm sewer along Golf Course Road within the project limits. The only existing storm sewer facilities in the area are in the Paradise Boulevard intersection going south; and along Academy Street, north of Congress Avenue.

4. Natural Gas

A 6" HP PNM gas line is located between the edge of existing pavement and the east right-of-way line and runs from Paradise Boulevard to Greene Street. North of Greene Street, it continues as a 2" HP line past the project limits. A 2" HP gas line branches off at Greene Avenue (south) and runs the length of this street, connecting to the mainline at the north end of the Greene Avenue loop. A 4" HP gas line branches off at Congress Avenue, and 2" HP gas lines branch off at Sutton Street and Green Street.

5. Power

Buried power lines are located between the edge of existing pavement and the west right-of-way line and run from Congress Avenue to the northern city/county boundary.

6. Telephone

Underground telephone lines are located along the west side of Golf Course Road from Paradise Boulevard north to Congress Avenue. At this point, one telephone line jogs to the east side of the road and continues north to Greene Street. Additional underground telephone lines begin at Country Club Lane and continue north beyond the project limits.

Underground fiber optic telephone lines (UGFOT) are located along the west side of Golf Course Road beginning at Paradise Boulevard, continuing to Country Club Lane. UGFOT lines branch off to the east at Congress Avenue and Greene Street.

7. Cable TV

Two cable television (CATV) lines are located underground along both sides of Golf Course Road from Paradise Boulevard north to Congress Avenue; and again from Sutton Street to Greene Street. In between, the CATV lines run along the west side. The eastern CATV line crosses over to the west side at Congress Avenue, and crosses over the to east side again at Sutton Street. Another CATV line runs from Greene Avenue (south) along the west side of Golf Course Road to Sutton Street.

An underground fiber optic television line runs along the west side of Golf Course Road from Sutton Street and continues north beyond the project limits. This line also branches off east along the north side of Sutton Street.

J. Street Lighting

Street lighting is located along the west side of Golf Course Road and consists of nine poles spaced approximately 450' apart. Power is provided underground. There is no street lighting located along the east side of Golf Course Road.

IV. Engineering Criteria and Methodology

This chapter identifies and describes the engineering criteria and methodologies that will be used in the design of the project. Criteria and/or methodologies for all aspects of the design will be discussed, including roadway design, hydrology, hydraulics, traffic and roadway lighting design.

A. Roadway Design Criteria

The design for Golf Course Road is based on the 2001 edition of the American Association of State Highway and Transportation Officials' (AASHTO's) *A Policy on Geometric Design of Highways and Streets.* The City of Albuquerque's *Development Process Manual (DPM)* will also be consulted. The project design criteria are consistent with the provisions of the Americans with Disabilities Act.

The primary factor that determines the engineering design criteria to be used is the functional classification of the roadway. Golf Course Road between Montano Road and Southern Boulevard, which encompasses this project, is classified as a **minor arterial** according to the Albuquerque Metropolitan Planning Area Long Range Roadway System map. Therefore, Chapter 7 "Rural and Urban Arterials" from *A Policy on Geometric Design of Highways and Streets,* was primarily used to compile most of the criteria listed in the following sections, along with criteria from Chapter 3 "Elements of Design" and Chapter 9 "Intersections". The following sections list the design criteria for horizontal and vertical alignment as well as typical section elements.

1. Design Speed

AASHTO criteria allow design speeds in the range of 30 mph to 60 mph for urban arterials. The design speed that will be used for Golf Course Road is **35 mph**. The criteria listed below are based on this design speed. The posted speed limit, typically lower than the design speed, will be 30 mph.

2. Design Vehicle

The design vehicle to be used is a **WB-40** or the equivalent of an intermediate semitrailer. For turning movements from minor side streets, a passenger vehicle will be used.

3. Levels of Service

Rural and suburban arterials should be designed to meet a level of service (LOS) of C. For heavily developed sections in metropolitan areas, LOS D may be appropriate. These values of LOS are applicable to the auxiliary facilities as well, including intersection and turning lanes.

4. Sight Distance

The minimum stopping sight distance is **250'**. Passing sight distance is not applicable because two driving lanes are provided in each direction.

5. Horizontal Curvature

Values for minimum radii of horizontal curves are presented in Exhibit 3-14 of *A Policy on Geometric Design of Highways and Streets,* however, those values are for the design of high-speed urban streets with superelevation rates ranging from 0.04 to 0.12. Golf Course Road is intended to be a low-speed road and since superelevation will not be applied (see Paragraph 7, below) those criteria do not apply. The minimum horizontal curve radius was calculated for the case of no superelevation using the formula provided below from Chapter 3:

$$R_{min} = \frac{V^2}{15(0.01 e_{max} + f_{max})}$$

Using values of V = 35 mph, e_{max} = 0.02 and f_{max} = 0.15, the minimum radius was calculated to be **545'**.

6. Vertical Curvature

Minimum rates of vertical curvature (K) based on stopping sight distance are as follows:

Crest vertical curve	K_{min} = 29
Sag vertical curve	K_{min} = 49

7. Grades

The maximum grade for urban arterials on level terrain is **7 percent**. Criteria for minimum grades are not discussed in *A Policy on Geometric Design of Highways and Streets*, therefore the City of Albuquerque's *Development Process Manual* was consulted; the minimum grade allowed is **0.5 percent**.

8. Superelevation

Superelevation is often not applied on curves of low-speed, curbed arterials. AASHTO guidelines permit this practice based on difficulties with drainage and driveways, among other reasons. Since Golf Course Road will be a low-speed, curbed arterial, **superelevation will not be applied** to the curves; the normal crowned cross slope will be continued through each curve. This will also discourage higher speeds.

9. Cross Slope

Cross slopes in the range of 1.5 to 3 percent should be used on urban arterials. AASHTO guidelines state that lower values of this range are appropriate when storm drain runoff is across one lane, whereas higher values of this range are used when runoff is across several lanes. The City's *DPM* was consulted as an additional guide; for arterial street sections without medians, the typical cross slope used in the City is 2 percent (reference City standard Drawing 2407). A cross slope of **2 percent** will be used for consistency with City standards.

10. Lane Widths

AASHTO recommends lane widths ranging from 10' to 12', with 11' lanes being very common for urban arterials. AASHTO guidelines state that an 11' lane width is adequate for through lanes and continuous two-way left-turn lanes.

11. Medians

Though a median is not included in the proposed improvements, a discussion of median width criteria is still appropriate for the north leg of the Golf Course Road/Paradise Boulevard intersection, where a dedicated left-turn lane is proposed. In this case, AASHTO recommends a minimum median width of 12'. The minimum desirable median width is 18', to provide a 12' turning lane and a 6' separation between opposing traffic.

12. Intersections

The following criteria from *A Policy on Geometric Design of Highways and Streets* will be used for intersection design:

a.) Intersection Sight Distance

Intersection sight distances were calculated for the following cases using the formula below:

$$ISD = 1.47(V_{major})(t_g)$$

Where ISD = intersection sight distance (ft)
V_{major} = design speed of the major road (35 mph for Golf Course)
t_g = time gap for the minor road vehicle to enter the major road (sec)

- Case B1 for left turns from the minor road, tg = 8.5 sec, so ISD = 440'.
- Case B2 for right turns from the minor road, tg = 7 sec, so ISD = 360'.

b.) Edge of Traveled Way Design

For turns at intersections, the minimum edge of traveled way design should be as follows for a WB-40 design vehicle:

- For a 120° angle of turn: 35' radius with a 5' offset
- For a 90° angle of turn: 45' radius with a 4' offset and 10:1 tapers
- For a 60° angle of turn: 60' radius (simple curve)

These criteria enable a WB-40 vehicle to execute the turn without off-tracking into adjacent lanes.

c.) Curb Radii

Because Golf Course Road will be curbed at all intersections, the criteria listed below will apply.

- minimum 25' curb radii at minor cross streets
- 30' curb radii where practical for trucks
- 40' curb radii for large truck combinations

d.) Lateral Clearances to Fixed Objects

A minimum horizontal clearance of 18" from the curb face to an object is required. Around turning radii at intersections, a lateral clearance of 3' should be provided.

13. Drivepad

a.) Widths

AASHTO's *A Policy on Geometric Design of Highways and Streets* does not specify recommended widths for driveways, but instead defers to state or local access management policies. Criteria in NMDOT's *State Highway Access Management Requirements Manual* (18.31.6 NMAC) are for access points along a state highway facility, therefore the City's *DPM* will be adhered to as the local policy. The *DPM* states that for access points to major streets (collectors or arterials) that are the only frontage to properties, the minimum width of drive is 16'. For local streets, the minimum width is 12'. Nine existing driveways range in widths of 10' to 14' wide. Those that are 10' wide will be increased to 12' to meet local street requirements. Those driveways that are 12' or 14' wide will be reconstructed to match existing widths, even though this would not comply with the 16' minimum on arterials.

b.) Maximum Grade

Per COA standard drawing 2425, the maximum driveway grade is 10 percent, not including the ADA portion of the drivepad, if required.

B. Hydrology and Hydraulics

The drainage analysis and design is being performed in accordance with the current Bernalillo County Code and the City of Albuquerque's *Development Process Manual (DPM)*, Section 22. Utilizing the *DPM* will provide consistency of analysis and design procedures with adjacent City projects. Some of the key design criteria are summarized below:

- Design storm: 100-year
- Allowable flow extent: limited to within right-of-way limits
- Allowable flow depth: 0.87' max. (keep flows within R.O.W.)
- Allowable spread: a 12' driving lane must be clear in each direction during the 10-year storm
- Gutter: 8" curb height, n=0.017
- Storm drain criteria:
  - Minimum diameter: 18"
  - Material: smooth wall pipe, n=0.013

C. Traffic

1. Signalized Intersection Analysis

Signalized intersection capacity analyses were performed using the Highway Capacity Software (HCS), which uses methodologies provided in the 2000 edition of the *Highway Capacity Manual.* HCS analyses for the Paradise Boulevard/Golf Course Road intersection were used to determine the recommended storage length for the southbound left-turn movement at that intersection.

2. Signal Warrant Analysis

Warrants from the *Manual on Uniform Traffic Control Devices, Millennium Edition* (MUTCD) were used to determine the eligibility of unsignalized intersections along the corridor for signalization. Assumptions for peak hour trips generated by side streets were made using the Institute of Transportation Engineers' publication *Trip Generation, 6th Edition.*

3. Pavement Marking and Signing

Pavement markings and signing included in the Golf Course Road design are according to the *MUTCD Millennium Edition* and AASHTO's *Guide for the Development of Bicycle Facilities, 3rd Edition.*

D. Street Lighting

Street lighting design is based on AASHTO's *An Informational Guide for Roadway Lighting,* 1984 edition. The Illuminance Method will be used, which uses the average, maximum and minimum maintained horizontal illuminance values and ratios thereof, to represent the desired level and uniformity of illuminance. The road surface classification, which represents the reflectance of different pavement types is a variable in lighting analyses. For this project, a pavement classification of R3 will be used. Class R3 represents an asphalt road surface with dark aggregates and rough texture after usage. The recommended average illuminance (L_{avg}) and uniformity ratio (L_{avg}/L_{min}) values for a residential collector street (this classification from *An Information Guide* best represents a minor arterial) with Class R3 pavement are as follows:

L_{avg} = 0.6 footcandles (fc)
L_{avg}/L_{min} = 4:1

Because the output of street lights is diminished by factors such as maintenance and light loss, the values above are considered minimum.

Lighting analyses will be performed using Advanced Graphical Interface (AGI), Version 3.2 lighting design software by Lighting Analysts, Inc. AGI is used to optimize a luminaire spacing based on inputs such as the lamp wattage, pole height, arm length and luminaire type. The data to be input into AGI was determined in coordination with the City of Albuquerque Traffic Division, since both ends of the project are within City limits. For consistency with City street lighting design and construction practices, the following data and specifications will be used:

- Full cut-off 250 watt high pressure sodium (hps) luminaire
- Type 2 distribution pattern
- 30' pole with 10' arm

V. Proposed Improvements

The Environmental Assessment (EA), approved in November 2002, for Golf Course Road recommended improvements to the existing roadway to meet the current and future transportation needs of the corridor. A four-lane facility was identified to meet those needs. This chapter describes the proposed improvements in terms of typical section, horizontal and vertical alignments, and drainage, and discusses the impacts to right-of-way and access.

A. Typical Section

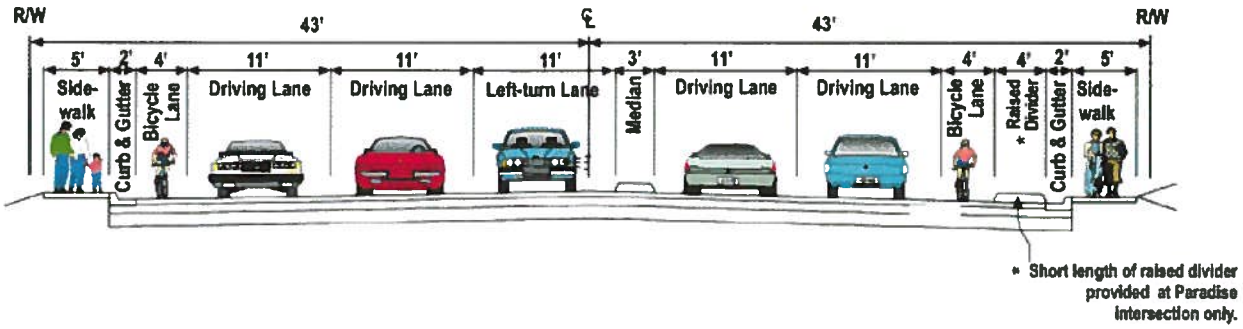
The proposed typical section recommended by the EA generally consists of the following elements:

- Two 11' driving lanes in each direction
- 12' two-way left-turn lane

- 4' continuous bicycle lane on the west side of the road (not including the gutter pan)
- 10' bicycle lane/access lane on the east side of the road
- Curb and gutter
- 2' or 3' landscape buffer
- 5' sidewalk (for most of the facility)
- 1'-wide retaining walls as needed

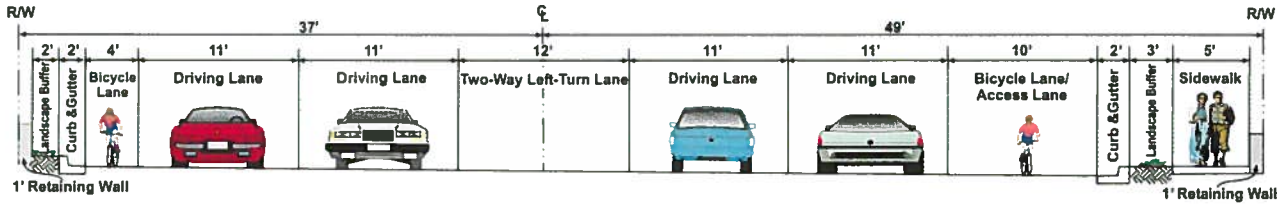
There are two variations of the typical section. Typical Section 1 is from Paradise Boulevard to Greene Avenue (south), and is shown in Exhibit 3. This typical section includes 5' sidewalks on both sides of the road and a 4' raised divider on the east side of the road at the Paradise Boulevard intersection that transitions into the typical 10' bicycle lane/access lane further north.

Exhibit 3 – Typical Section 1, Paradise Boulevard to Green Avenue (South)



The second roadway section, from Greene Avenue (south) to Greene Avenue (north) does not provide a sidewalk on the west side of the road, but instead allows that space to be used for a 2' landscape buffer on the west side, a 3' landscape buffer on the east side and adds the width needed to achieve the 10' bicycle lane/access lane. Typical Section 2 is shown in Exhibit 4 below.

Exhibit 4 – Typical Section 2, Between Greene Avenue South and North

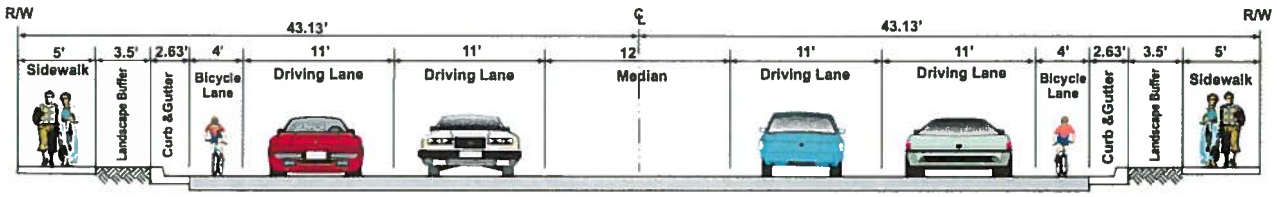


A third roadway section, Typical Section 3, transitions to match the typical section of the City's project which begins just north of Country Club Lane. The portion of Golf Course Road south of Irving Boulevard will be constructed with the following typical section elements:

- Two 11' driving lanes in each direction
- 12' striped, flush median
- 4' bicycle lane
- Curb and gutter
- 3.5' buffer/sidewalk setback
- 5' sidewalk

All of the elements listed above are continuous and are provided on both sides of the roadway, i.e. are symmetric about the median as shown in Exhibit 5 below.

Exhibit 5 – Typical Section 3, North of Country Club Lane



1. Retaining Walls

The elements of the proposed typical sections were developed to fit entirely within the 86' of right-of-way. Included in Typical Sections 1 and 2 are retaining walls that will allow the improvements to be contained within the available right-of-way. Due to the lowered profile grade of the roadway (see Section C below), the use of cut slopes would have required right-of-way acquisition, so retaining walls were proposed as a solution.

Retaining walls will be needed along portions of the west side of Golf Course Road where the maximum slope of 2.5:1 cannot be constructed within the existing right-of-way. A cost-effective alternative to retaining walls is slope paving at a 1:1 slope. The typical sections provide 12" from the back of the landscape buffer on the west side to the right-of-way line for retaining walls or slope paving where needed. Between Greene Avenue south and north, a soldier pile and lagging type of retaining wall is recommended. The construction techniques used to build this type of wall minimize impacts to the surrounding area compared to conventional excavation to footing level. The soldier pile and lagging walls will be constructed from the street side, thereby eliminating the need for temporary construction permits from the adjoining properties. Impacts to existing fences and walls are not anticipated, except for those walls that currently encroach into the right-of-way, which will have to be removed. A new safety wall will be constructed on top of the retaining wall for a uniform and consistent appearance, regardless of whether the existing privacy walls will be removed. Public involvement was conducted for input on the color of the safety wall.

Short walls or slope paving will also be required in certain fill conditions, where the embankment slope would have extended beyond the right-of-way line. These walls will be approximately 2' (at the highest). For pedestrian safety, a curb type of barrier at the back of sidewalk may be appropriate; hand-railing is not required, as the minimum height of vertical drop requiring hand rails is 30".

B. Horizontal Alignment

The horizontal alignment generally follows the centerline of right-of-way. No effort was made to straighten the alignment due to right-of-way constraints and the fact that residential developments surround the roadway and would have been significantly impacted if the centerline alignment were substantially changed.

C. Vertical Alignment

The vertical alignment, or profile grade, is proposed to be lowered for most of the length of the project. Currently Golf Course Road is slightly higher in elevation than the surrounding properties on the east side. The new sidewalk on the east side must be near existing ground elevations at the right-of-way line for driveway connections to the adjacent properties. The profile grade will be lowered by approximately 2.5' (at the lowest spot) but will transition to match the existing grades approaching Paradise Boulevard and Country Club Lane.

D. Drainage

The addition of curb and gutter to the roadway section will concentrate storm water flows in the gutter pan. A new storm drain system is proposed to collect the flows and discharge them into existing storm drains in the area. The storm drain will tie into existing storm drains at Paradise Boulevard and Academy Street. New storm drain is proposed from Greene Avenue (south) to Paradise Boulevard and from Country Club Lane to Sutton Street, connecting to existing facilities at Paradise Boulevard and Academy Street, respectively.

E. Right-of-Way and Encroachments

The minimum existing right-of-way width along the Golf Course Road project area is 86'. This is in concurrence with the Bernalillo County and COA street standards for minor arterial right-of-way requirements. No additional right-of-way will be required for the proposed improvements to Golf Course Road. However, there will be a need for a construction maintenance easement (CME) along Country Club Lane in front of the Paradise View Apartments. The CME is needed for maintenance of cut slopes behind the new curb and gutter, and for new drop inlets at the northwest corner of Golf Course Road and Country Club Lane.

As previously discussed, retaining walls will be used to keep the improvements within the right-of-way. Construction of some of the walls will require temporary construction permits (TCP's) from individual property owners. Additionally, TCP's will be needed to reconstruct drivepads that tie outside of the existing right-of-way.

As stated in Chapter III "Existing Conditions", there are currently some encroachments into the right-of-way. Right-of-way maps for the project were prepared and identify the locations of encroachments based on right-of-way and encroachment survey data. Bernalillo County officials will notify property owners that the encroachments will need to be removed prior to construction. If not removed prior to construction, the encroachments will be removed by the contractor.

F. Access Control

Bernalillo County ordinance prohibits access to individual single family residential lots from arterial streets where access to a lower functional classification street is also available. Accordingly, access to the properties along the east side of the road will remain unchanged as they only have Golf Course Road frontage. Along the west side of the corridor, however, some homes have secondary, backyard access points onto Golf Course Road for backyard maintenance or storage of recreational vehicles. These properties are not in compliance because Greene Avenue as a local street has the lower functional classification. The construction of new barrier curb, and in some areas a retaining wall, on the west side of Golf Course Road will prevent access to the backyards of these lots and bring the properties into compliance with the County's access ordinance. As another effort to comply with the County's access ordinance, the new safety walls will not include backyard gates.

For residences on corner lots at Greene Avenue, Congress Avenue, Sutton Street and Country Club Lane, those that have dual access points (access to both Golf Course Road and side street) will be evaluated on a case-by-case basis. At the direction of BCPWD, access to garages fronting Golf Course Road will be maintained, even though access should be taken off the local street according to the access ordinance.

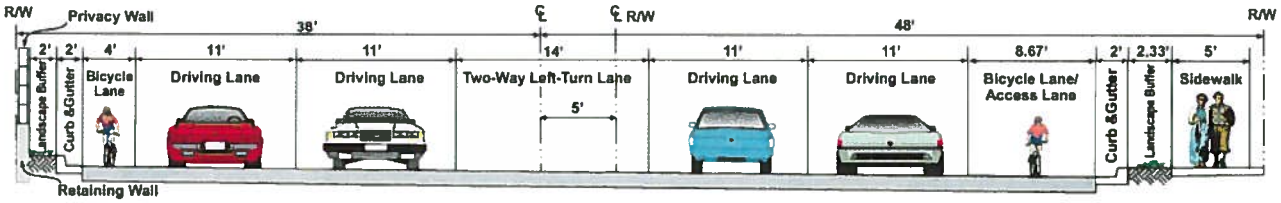
VI. Results of Engineering Analysis

A. Roadway Design

1. Typical Section

One of the environmental commitments was to further evaluate the widths of driving lanes and other typical section elements. Although AASHTO criteria state that an 11' lane can be used for two-way left-turn lanes, consideration was given to widening the proposed center turn lane from 12' to 14' to provide greater refuge space for left-turning vehicles to perform two-step left turn maneuvers onto Golf Course Road if needed. The additional space in the center turn lane can be obtained by including the gutter pan as part of the access lane width and by reducing the width of the landscape buffer on the east side from 3' to 2'-4". This modified typical section is shown in Exhibit 6 below. This revised typical section would be constructed between the south and north Greene Avenue intersections.

Exhibit 6 – Revised Typical Section 2
Between Greene Avenue South and North



This modification to Typical Section 2 was discussed with BCPWD on June 24, 2003. The County accepted this change, provided that it did not violate any environmental commitments, which it does not.

As a result of comments received from the Public Information Meeting held on August 20, 2003, the 2'-4" landscape buffer on the *east* side of the road as shown in Exhibit 6 above has been eliminated. Public support of this elimination is based on the desire to limit the impacts to the surroundings and maintain as much of the existing vegetation and landscaping as possible. This will be accomplished by shifting the east sidewalk immediately behind the curb and gutter, so that the improvements are as far away from the existing properties as possible.

A minor typical section change involves the short 4' raised divider in the northeast corner of Golf Course Road and Paradise Boulevard. This raised divider has essentially been integrated with the curb return and replaced with a curb "bulb-out".

a.) Curb and Gutter

Consideration was given to using the City's standard curb and gutter for consistency with the curb and gutter used at both ends of the project, which are within City limits. However, replacing the proposed curb and gutter (2' wide) with the City standard curb and gutter (2'-7 ½" wide) would have extended the improvements outside of the available right-of-way. A modification of the City's standard curb and gutter is proposed: one that matches the gutter slope and curb height and shape, but with a narrower gutter width. The total curb and gutter width is still 2'.

b.) Landscaping

Due to budget constraints, landscaping in the buffer areas has been eliminated from the project. The buffer area on the west side of the road will be paved with colored and patterned concrete pavement for ease of maintenance.

2. Horizontal Alignment

Horizontal curve radii range from 550' to 716.2', which meet minimum requirements. No variances or design exceptions are required.

3. Vertical Alignment

a.) Vertical Curvature

The profile grade contains ten vertical curves, all of which satisfy minimum vertical curve criteria per AASHTO. No variances or design exceptions are required, except that the first vertical curve is within City limits and per the DPM, the minimum K value for crest vertical curves is 120 for a minor arterial. However, this is based on a height of object of 6", whereas the AASHTO height of object has been revised to 24". Also, the DPM requires a design speed of 45 mph for a minor arterial, but this project is designed for 35 mph due to the existing constraints.

b.) Grades

To meet the City's minimum grade of 0.5 percent, a dip section is created between Congress Avenue and Sutton Street, resulting in excavation depths of up to 5' due to the topography, and thereby requiring retaining walls up to 5' or 6' high (exposed). A meeting was held with BCPW staff on July 25, 2003 to discuss wall options and the resulting construction impacts to the adjacent properties. Also discussed was the option to use a flatter slope. The consensus was to use a flatter grade of 0.3 percent in order to reduce the amount of excavation and the height of retaining walls.

4. Driveways

One proposed driveway grade is 13.2 percent, exceeding the maximum of 10 percent. This driveway is to the property located between north Greene Avenue and Country Club Lane on the west side of Golf Course Road. This variance will require approval by the County Traffic Engineer.

Preliminary plan and profile sheets are included in Appendix B.

B. Hydrology and Hydraulics

1. Existing Conditions Analysis

Existing drainage basins are shown in Appendix C. Existing peak flows in the project area were calculated with the rational method:

$$Q = CIA$$

Where: Q = peak flow in cfs
C = runoff coefficient
I = rainfall intensity in inches/hour
A = drainage area in acres

Peak flows are summarized in Table 1.

Table 1 – Existing Condition Peak Flows

Basin no.	Drainage Area ac	10-Year Peak Flow cfs	100-Year Peak Flow cfs
100	3.25	8	12
101.1	1.08	2	4
101.2	0.68	1	2
102	2.77	6	10
200	0.81	1	2
201	16.30	26	48
202	3.91	6	12
203.1	3.99	6	12
203.2	6.08	15	24
204	5.31	8	16

Generally, the existing roadway is narrow, with an approximate 24' pavement width and compacted earth within the remainder of the 86' right-of-way width. Several types of curb and gutter and paved shoulders exist along portions of the roadway. Existing drainage patterns are described below.

From Paradise Boulevard to Congress Avenue, drainage flows south along Golf Course Road to the intersection with Paradise Boulevard. Roll-over type curb exists south of Greene Avenue. At the Golf Course/Paradise intersection, an 8'x6' box culvert carries flow from the west under Paradise Boulevard, and then turns south along Golf Course Road. Drainage from this storm drain system eventually reaches the Piedras Marcadas Dam. Existing inlets capture the Golf Course Road surface flows south of Paradise Boulevard. Flow from Paradise Hills Golf Course northwest of the intersection is intercepted at a grate inlet within the Golf Course right-of-way.

The capacity of the downstream Piedras Marcadas Dam is limited by its function as a retention facility. A portion of the project area currently drains to the dam, and this area has been included in previous analyses (Bohannan Huston, 2003). The proposed design should attempt to minimize the increase in runoff to the dam.

From north of Congress Avenue to Country Club Lane, runoff generally flows to a low area at Sutton Street, then flows overland south along Academy Street to cattle-guard type inlets at the intersection of Academy and Bryan Avenue. These inlets were constructed as part of the SAD 226 project (Wilson & Co., 1999), and they connect to storm drain that ultimately outfalls into the Calabacillas Arroyo. A large area (0.25 square miles) west of Golf Course Road and north of Country Club Lane drains to the existing Golf Course roadway. The 100-year peak flow from that area is 152 cubic feet per second (cfs) (Wilson & Co., 1999). This water will overflow from a pond in the Paradise Hills Golf Course, then flow overland through a vacant lot and through the existing apartment complex at the northwest corner of Country Club Lane and Golf Course Road. A drainage easement exists north of the apartment complex, but it has not been graded or improved to handle drainage.

2. Proposed Conditions Analysis

Since the watershed upstream of Golf Course Road has been developed, under proposed conditions the off-site basins and flow rates will remain essentially unchanged. Major off-site flows will be intercepted with inlets

on the new roadway. The proposed roadway profile includes several low points where inlets will be needed. Proposed on-site drainage basins are shown in Appendix D. On-site peak flows are shown in Table 2.

Table 2 – Proposed On-Site Peak Flows

Basin no.	Drainage Area ac	10-Year Peak Flow cfs	100-Year Peak Flow cfs
100.1	0.84	2	4
100.2	0.68	2	3
100.3	0.16	0.5	1
100.4	0.17	0.5	1
100.5	0.45	1	2
100.6	0.46	1	2
101.1	0.25	1	1
101.2	0.25	1	1
101.3	0.53	2	2
101.4	0.55	2	2
102.1	0.31	1	1
102.2	0.31	1	1
102.3	1.03	3	5
102.4	1.01	3	4

The proposed storm drain system is designed to safely convey the on and off-site peak flows to suitable discharge points. The preliminary storm drain plans are included in Appendix E. Inlet capacity calculations are provided in Appendix F. Trunk line sizes were optimized for pressure flow, with the hydraulic grade line kept below the final grade for the 100-year storm.

Storm drain will be constructed from Paradise Boulevard north to the low point near station 19+00. Inlets will be constructed on Golf Course Road upstream of the Paradise Boulevard intersection and at low points. Off site flows from the west will be intercepted at the southern intersection with Greene Avenue. The proposed storm drain will connect to an existing drop inlet at the northwest corner of Paradise and Golf Course. From that inlet, two existing 30" diameter pipes drain into the 8'x6' box culvert in Paradise Boulevard. Based on the proposed design, the on-site 100-year peak flow contributing to the Paradise/Golf Course storm drain will decrease slightly (from 12.4 cfs existing to 12.1 cfs proposed). The proposed design should not affect the Piedras Marcadas Dam.

Another storm drain system will be constructed to intercept the existing 152 cfs flow at the northwest corner of the Golf Course Road/Country Club Lane intersection and carry the water to the existing storm drain system at Academy Street and Bryan Avenue, with inlets to handle flows along Golf Course Road. The 100-year peak flow from the Golf Course right-of-way in this area will increase from 16.1 cfs to 18.5 cfs. This minor increase should not affect downstream conditions.

References

Bohannan Huston, Inc. (2003). Piedras Marcadas Watershed and Lyon Boulevard Storm Drain Drainage Management Plan - Draft.

Wilson & Company (1999). City of Albuquerque, New Mexico, Public Works Department, Special Assessment District 226, Drainage Report.

C. Geotechnical Analysis

Please refer to the Geotechnical Investigations Report, July 2003, prepared by Vinyard & Associates for pavement, slope and foundation recommendations. This report is under separate cover.

Following discussions with BCPWD on November 4, 2003, the pavement design has been modified from 4 ½" of asphalt concrete over 8" of aggregate base course to **5" PMBP SP-III over 6" aggregate base course.**

The change to superpave was decided based on current practices by NMDOT and in consideration of the lower prices now available for superpave mixes. The reduction in thickness of the base course allows the base course to be applied in one lift of 6", rather than two lifts of 4", thus providing a time savings to the project. The overall structural number is maintained.

D. Traffic Engineering

1. Traffic Volumes

Traffic forecasts prepared by Bernalillo County Public Works staff for the year 2020 show a daily traffic volume on Golf Course Road between Paradise and Irving Boulevards of about 26,000 vehicles per day (vpd) with the new four-lane cross section. Count data collected in 1999 and 2000 showed a heavy vehicle proportion of 2.6 percent; that percentage is assumed to stay constant into the 2020 horizon year.

2. Signal Warrant Analysis

Unsignalized T-intersections exist within the project limits at Country Club Lane, Sutton Street, Congress Avenue, and Greene Avenue (south), as well as a four-leg intersection at Greene Avenue (north). These intersections currently do not warrant traffic signals due to the relatively small number of homes generating trips onto Golf Course Road. Based on forecasted peak hour traffic volumes for the horizon year 2020 and the new four-lane section, none of the intersections within the project limits would warrant a traffic signal under the peak hour traffic volume warrant. All of these intersections should be monitored in the future to determine whether other characteristics of the intersections might warrant traffic signals.

3. Accident Analysis

Accident data for the corridor were compiled by Bernalillo County. Although some residents have expressed a common opinion that excessive speed has contributed to many accidents throughout the corridor, there is no pattern regarding speed as the highest contributing factor in the accidents throughout the corridor nor at any specific location. The highest contributing factors vary and include (in no specific order) alcohol involved, failure to yield, excessive speed, too fast for conditions, following too closely, left of center, passed red light, improper backing, defective brakes, improper turn, and driver inattention.

Generally, the types of accidents in the corridor are indications of congestion, difficulty turning into and out of side streets, and the lack of left-and right-turn refuge areas along the road. The new typical section includes left-turn areas in which turning vehicles can get out of the way of through-moving traffic to wait to make their maneuvers. The left-turn areas will also be wide enough (14') so that they can be used as a refuge area by traffic turning out of driveways or side streets to make their left-turn movement in two steps. The new typical section also provides a 10' access lane along the east side, wide enough that a right-turning vehicle can get out of the through lane of traffic. For traffic traveling north through the Paradise Boulevard/Golf Course Road intersection, the new typical section is expected to improve safety by eliminating the merge maneuver caused by the current situation, in which two through lanes are reduced to one in a short distance.

4. Special Pavement Marking and Signing

a.) Access Lane

The recommended pavement marking for the access lane on the east side of the road is similar to what the City of Albuquerque has been using on some of its four-lane collector and minor arterial roads that have been converted to two-lane sections with a center two-way left-turn lane and on-street bike lanes. Exhibit 7 shows this pavement marking plan. The City's design includes a 5' bicycle lane and 6' striped-out shoulder. The bicycle lane striping is 4" solid white on either side with a bicyclist symbol and arrow placed just downstream of each street intersection. The striped-out shoulder includes 12" solid white stripes spaced 50' apart at a 45° diagonal (pointing away from traffic). The striping out of the shoulder signifies that parking is prohibited in that area; however, regulatory signing will also be required in order for the parking prohibition to be enforced.

Exhibit 7 – COA bike lane striping.

The access lane for Golf Course Road would be a slight modification of the City's plan. It will consist of a 4' bicycle lane and a 4'-8" shoulder, with the 1'-4" gutter pan completing the 10' access lane. The bicycle lane striping will be 6" solid white on the inside (adjacent to the driving lane) per AASHTO's *Guide for the Development of Bicycle Facilities*, 1999 Edition. The outside striping will be 4" solid white. The shoulder will be striped out with 12" solid white striped diagonals at 45°.

Signing for the access lane will include "No Parking/Bike Lane" (R7-9a) signs as requested by the City. Additionally, a special regulatory sign (Exhibit 8, "Turning Traffic Yield to Bikes") will also be placed just downstream of each intersection. "Bike Route" signs (D11-1) will mark the bicycle lanes on both the northbound and southbound sides of the road.

Exhibit 8
Access Lane Signing

b). Through Pedestrians

Because no sidewalk will be constructed on the west side of Golf Course Road between north and south Greene Avenue, through pedestrians at the Paradise Boulevard and Irving Boulevard intersections will need to be guided to the east-side sidewalk. The signs shown in Exhibit 9 will be placed on the west side of the road just north of Paradise and just south of Irving.

Exhibit 9 - Pedestrian signing at Paradise Blvd & Irving Blvd

5. Effects on the Paradise Boulevard Intersection

Because this project will affect the northern leg of the Paradise Boulevard/Golf Course Road intersection, a capacity analysis of this intersection was run for both a build-out year (2004) and horizon year (2020) scenario

using the new geometrics. Horizon year turning movement volumes for the intersection were derived by Bernalillo County Public Works using projected volumes at the Irving Boulevard/Golf Course Road intersection. Build-out year 2004 turning movement volumes were derived using a straight-line interpolation between the current year (1999) counts and horizon year (2020) projections.

A single left-turn lane was assumed on the southbound approach. Although volumes justify dual left-turn lanes, Paradise Boulevard currently has just a single eastbound through lane on the departure. Even if Paradise Boulevard were to be reconstructed with two eastbound through lanes in a future year, a second left-turn lane on Golf Course Road would preclude the placement of an access lane in this area, due to the limited right-of-way width.

The capacity analyses project that with the Golf Course Road improvements, the Paradise Boulevard/Golf Course Road intersection will operate at an overall level of service "D" in the A.M. peak hour and "E" in the P.M. peak hour in the 2004 build-out year. The 2020 Metropolitan Transportation Plan shows the addition of a second through lane eastbound and westbound on Paradise Boulevard in the year 2015. Even with these additional lanes, the intersection is expected to fail in the P.M. peak hour in the horizon year 2020. The A.M. peak hour is projected to operate at a level of service "D" in the 2020 horizon year scenario.

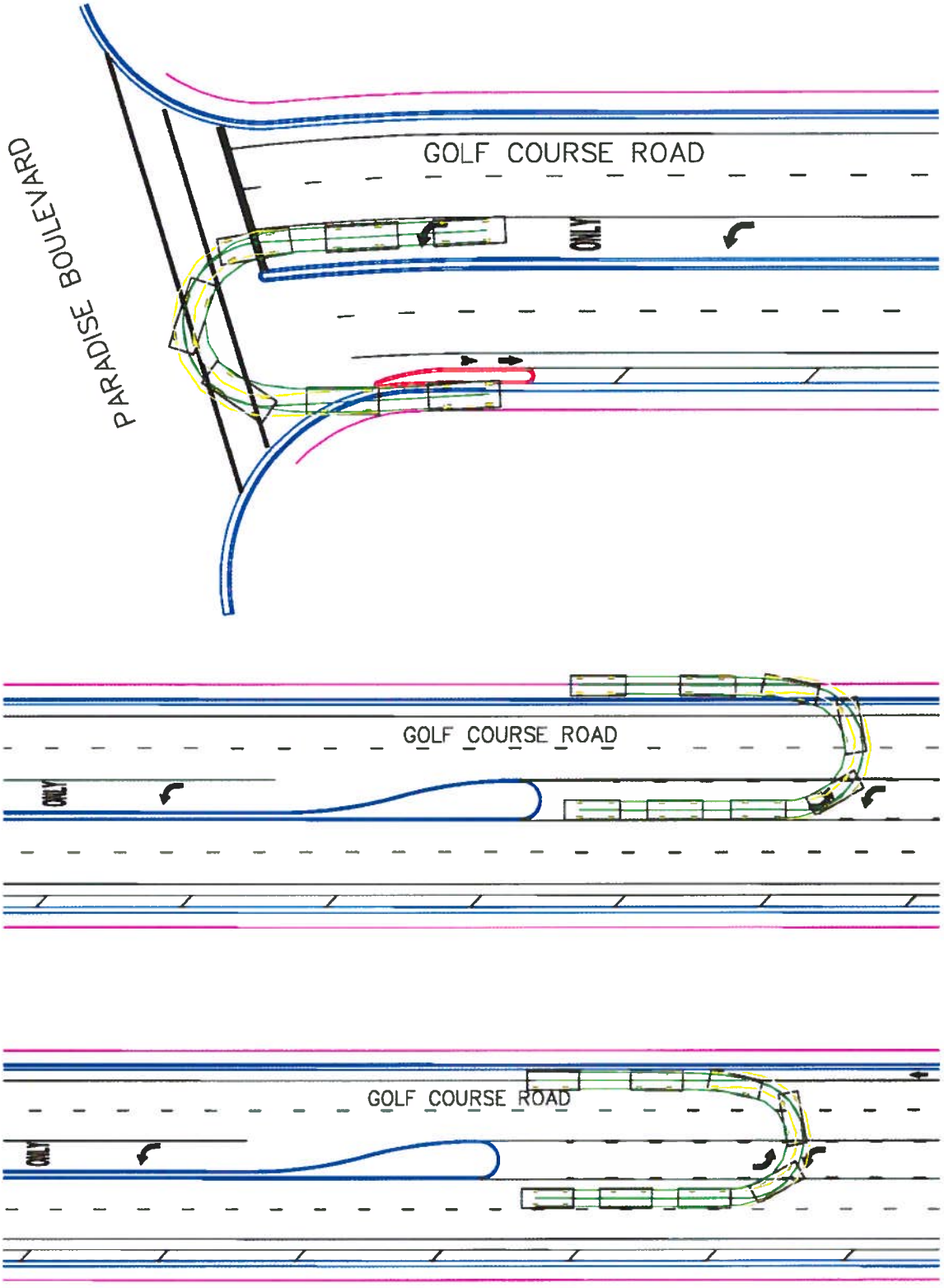
a.) Southbound Left Turn Length

The capacity analyses run for the Paradise/Golf Course intersection also projected left-turn storage requirements for the intersection based on an optimal timing scenario. The A.M. peak hour has the higher southbound left turn volume and is accordingly what determines the storage lane length. In the 2004 build-out year, the 95% confidence back-of-queue length is 14 vehicles (about 350'), and by the 2020 horizon year the 95% confidence back-of-queue length increases to 25 vehicles (about 625').

Typical Section 1 includes a raised median nose between the southbound left-turn lane and northbound traffic lanes. Construction of the left-turn lane, and hence, raised median, for the 2020 horizon year queue length would eliminate left-turn access into and out of properties for six homes on the east side and two homes on the west side of Golf Course Road. It would also reduce the length of center turn lane available for deceleration for northbound left-turning vehicles onto Greene Avenue (south). Out-of-direction travel would be required for property owners because u-turns will be prohibited at the Paradise Boulevard intersection and at the end of the raised median. AASHTO guidelines state that 30' of median space is required for a passenger vehicle to perform a u-turn. This maneuver cannot be accomplished from the two-way left-turn lane, but could only be accomplished from the inside through lane, thereby potentially blocking that lane. Exhibit 10 on the following page shows the turning path for a passenger vehicle, and demonstrates that a u-turn cannot be executed without blocking a through lane. Residents would have to use Congress Avenue and Academy Street as a bypass.

A meeting was held with BCPW staff on July 10, 2003 to discuss an interim solution for the long raised median on the north leg of the Paradise Boulevard intersection. The consensus was to construct the raised median to accommodate shorter-term expected queue lengths and to stripe out the remaining distance as a two-way left-turn lane, for conversion to a longer dedicated left-turn lane when warranted. A ten-year horizon (year 2014) was selected for design. The 95% queue length expected in the A.M. period in this scenario is 19 vehicles, or

Exhibit 10 - Passenger Car Turning Path



about 475'. In order to minimize the southbound left-turn queue length, a shorter cycle length (80 seconds) was assumed; however, the overall level of service on each approach remained at a level-of-service D or better.

Appendix G shows the level of service and queue worksheets for this scenario. The 475' raised median and advanced raised median curb would eliminate left-turn access for five homes on the east side and one home on the west side of Golf Course Road.

Property owner interviews were conducted in August 2003 with owners whose properties would be affected by the project. The residents whose access would be affected by the raised median voiced opposition to it. Following the City DRC Review Meeting on August 21, 2003, the City agreed to shorten the length of the raised median so that full access could be maintained to all of the properties. The resulting length of raised median is approximately 144'. The center turn lane striping will be extended south to the end of the raised median.

b.) Signal System Modifications

Modifications to the traffic signal at the Paradise/Golf Course intersection at project build-out would involve modifying camera detection areas on the southbound approach. Camera detection areas will need modification during construction of the project as well.

Signal modifications at the Paradise/Golf Course intersection are needed due to the changed geometrics of the southbound approach and its effects to the sight distance for the northbound left-turn movement. The new geometrics place the southbound left turn lane in the sight line of northbound left-turning vehicles, so that vehicles stacked in the southbound left turn lane may block the view of on-coming vehicles. This configuration, compounded by the horizontal curvature at the intersection, provides 140' to 150' of sight distance. For safety purposes, it is recommended that the phasing for the northbound left turn movement be modified to protected-only, instead of the existing protected-permissive condition. The southbound left turn phasing can remain protected-permissive.

Associated signal system modifications include:

- Removal of five-section heads on the signal mastarm and left-side pole for the northbound direction, and replacement with three-section (red left arrow, yellow left arrow, green left arrow) heads.
- Modifications to southbound detection areas in video detection system.
- Changes to northbound left turn phasing in the signal controller.
- Modifications to northbound left turn pavement markings and additional signs (R10-5, "Left Turn on Green Arrow Only")

c.) Provisions for Intelligent Transportation Systems (ITS)

This portion of Golf Course Road is classified as a Class 4 ITS facility on the *Draft ITS Long Range Map for the Albuquerque Urban Area* (7/30/02), indicating that the following technology has been planned for it in the long term:

- Closed-circuit television and pan-tilt-zoom
- Signal interconnect
- Mid-block traffic sensors
- Simple arrow light-emitting diode (LED) trail blazers

To facilitate the future implementation of these technologies, empty multiduct (four-cell) conduit and pullboxes will be installed along the Golf Course Road corridor as part of this project.

E. Street Lighting Design

Golf Course Road currently has street lighting along the west side of the road only. New street lighting will be installed along Golf Course Road from Paradise Boulevard to Country Club Lane. A lighting analysis was performed using AGI lighting design software to assess current lighting conditions and to optimize a new street lighting layout.

Lighting analyses for the new street lighting design were performed assuming street lighting on both sides of the roadway. As previously stated, there is currently no street lighting on the east side of Golf Course Road, which may be a contributing factor to traffic accidents because of lower visibility of turning vehicles from the side streets. Providing lighting on both sides of the roadway will increase visibility and improve safety conditions along the road.

Numerous iterations of the lighting analyses were conducted by varying the spacing between lamps. A staggered spacing was used for better uniformity; parallel spacing was not used to avoid alternating concentrated bright spots and dark spots along the roadway. A light loss factor of 0.8 was applied. The results of the lighting analyses are included in Table 3 below.

Table 3 – Lighting Analysis Results

Segment Analyzed	Luminaire Wattage	L_{avg} (fc)	L_{max} (fc)	L_{min} (fc)	L_{avg}/L_{min}	Spacing
Golf Course	250w hps	**1.55**	4.9	0.2	**7.75:1**	**225' staggered**
Golf Course	250w hps	**1.40**	4.80	0.2	**7:1**	**250' staggered**
Golf Course	250w hps	**1.27**	4.80	0.2	**6.35:1**	**275' staggered**
Golf Course	250w hps	**1.22**	4.80	0.1	**12.2:1**	**285' staggered**

The spacing that best meets the minimum criteria is 275' staggered, and is therefore recommended although both the average illuminance and uniformity ratio values exceed the recommended minimum values by a considerable amount. The recommended minimum values may be achieved by varying the lamp wattage or pole height, however, doing so would be a variance from City standard practices.

For comparison, an analysis was performed to determine the existing lighting conditions using the following assumed data:

- 100 watt high pressure sodium (hps) luminaire
- Type 3 distribution pattern (distribution patterns may have ranged from Type 2 to Type 5)
- 30' pole with 10' arm

The data above used to simulate the existing lighting conditions were determined in coordination with the City of Albuquerque Traffic Division, based on assumptions about the lamp types used when Golf Course Road was originally constructed. The table below lists the existing, recommended minimum and proposed values of illuminance:

Table 4 – Lighting Analysis Comparison

Segment Analyzed	Luminaire Wattage	L_{avg} (fc)	L_{max} (fc)	L_{min} (fc)	L_{avg}/L_{min}	Spacing
Existing Golf Course	100w hps	**0.27**	2.3	0	**--- ***	**450' one-side only**
AASHTO Minimum Values	---	**0.6**			**4:1**	
Proposed Golf Course	250w hps	**1.27**	4.80	0.2	**6.35:1**	**275' staggered**

* Uniformity ratio cannot be determined due to zero value of minimum illuminance.

The information in Table 4 shows that the proposed lighting design would be an improvement of the existing street lighting system.

Due to budget constraints and in consideration of adjoining sections of Golf Course Road, the proposed luminaire spacing has increased to 400'. This modification was approved by BCPWD on October 29, 2003. The City portions of Golf Course Road (south of Paradise Boulevard and north of Country Club Lane) only include lighting at major intersections (Paradise and Irving Boulevards) and at all intersecting side streets. There is currently no consistent street lighting south of Paradise Boulevard, nor is there any planned for the City's project north of Country Club Lane. For consistency with the lighting levels along the City sections, the spacing of the luminaires was increased. A lighting analysis was performed and the results are shown in Table 5 below.

Table 5 – Revised Lighting Analysis Results

Segment Analyzed	Luminaire Wattage	L_{avg} (fc)	L_{max} (fc)	L_{min} (fc)	L_{avg}/L_{min}	Spacing
Golf Course	250w hps	**0.91**	4.7	0.1	**9.1:1**	**400' staggered**

The revised spacing decreases the number of luminaires from 25 to 18, resulting in a cost savings to the project.

VII. Impacts on Utilities

A. Sanitary Sewer

Sanitary sewer services to the residences north of Paradise Boulevard on the east side of Golf Course Road are not expected to be impacted. The proposed storm drain is higher than the existing SAS main in this area and should not be in conflict.

B. Water

The existing 12" water line between Congress Avenue and Sutton Street, in the area where the profile grade has been lowered the most, will require relocation. In addition, an 8" water line crossing and a 1" service line crossing (around station 21+00) will require relocation. Test holes were performed to locate water lines potentially in conflict with the new storm drain, however, there were four locations where the water line could not be found at the test hole location. In instances where the water line could not be found, the depth was assumed to be the same as that indicated by an adjoining test hole.

C. Gas

The existing 6" gas line at Paradise Boulevard will need to be relocated due to a conflict with the new storm drain crossing at station 3+20.

D. Other Utilities

All other utilities (power, telephone and cable) are expected to be either directly or indirectly impacted by the construction of the new roadway and storm drain. Direct impacts include the need to adjust valves and manholes to grade, as well as conflicts with the proposed storm drain, which is generally about 10' deep. Indirect impacts include deficient cover depths as a result of the lowered profile grade of the roadway. Utility test holes were performed in October 2003 to locate the vertical positions of the existing utilities that appear to be in conflict with the improvements. The test hole data was used in the design of the storm drain.

VIII. Estimated Construction Cost

The current construction cost estimate is $2,879,552 including NMGRT and development review fees for the County and City. The estimate includes a non-participating cost of $73,563, for relocating water lines belonging to New Mexico Utilities.

IX. Project Design Schedule

The project design schedule is as follows:

Pre-Final Design Submittal	November 19, 2003
PS&E Design Submittal	January 16, 2004
Final Design Submittal	February 18, 2004

The right-of-way maps are on an earlier schedule to allow right-of-way activities to begin as soon as possible. The right-of-way deliverables schedule is as follows:

First Check R/W Maps Submittal	October 24, 2003
Second Check R/W Maps Submittal	November 14, 2003
Final R/W Maps Submittal	December 10, 2003

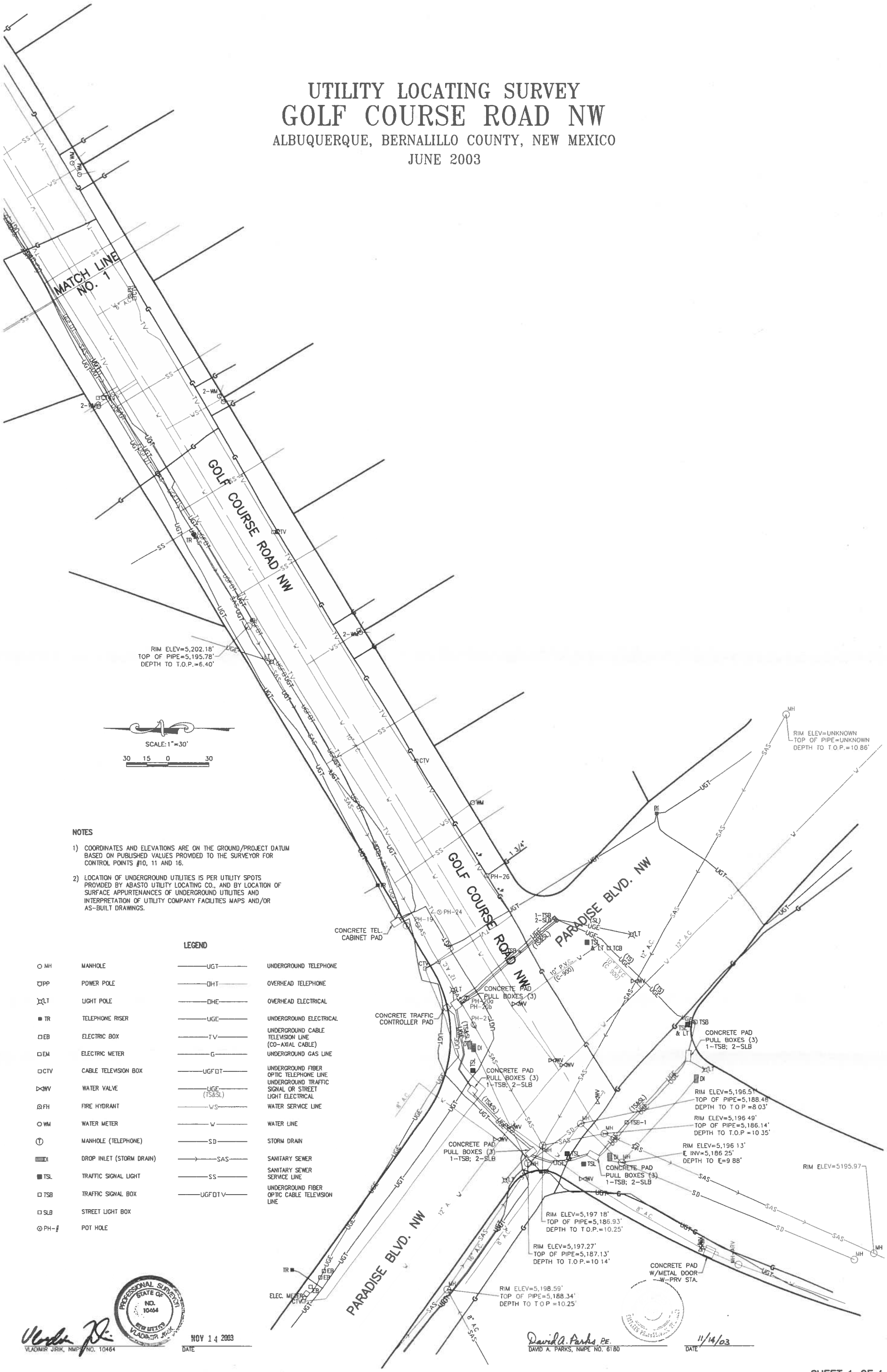
X. Estimated Construction Time Period

The estimated construction time period is 240 days (approximately 8 months).

APPENDICES

Appendix A
Utility Maps

UTILITY LOCATING SURVEY
GOLF COURSE ROAD NW
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
JUNE 2003



NOTES

1) COORDINATES AND ELEVATIONS ARE ON THE GROUND/PROJECT DATUM BASED ON PUBLISHED VALUES PROVIDED TO THE SURVEYOR FOR CONTROL POINTS #10, 11 AND 16.

2) LOCATION OF UNDERGROUND UTILITIES IS PER UTILITY SPOTS PROVIDED BY ABASTO UTILITY LOCATING CO., AND BY LOCATION OF SURFACE APPURTENANCES OF UNDERGROUND UTILITIES AND INTERPRETATION OF UTILITY COMPANY FACILITIES MAPS AND/OR AS-BUILT DRAWINGS.

LEGEND

MH	MANHOLE	UGT	UNDERGROUND TELEPHONE
PP	POWER POLE	OHT	OVERHEAD TELEPHONE
LT	LIGHT POLE	OHE	OVERHEAD ELECTRICAL
TR	TELEPHONE RISER	UGE	UNDERGROUND ELECTRICAL
EB	ELECTRIC BOX	TV	UNDERGROUND CABLE TELEVISION LINE (CO-AXIAL CABLE)
EM	ELECTRIC METER	G	UNDERGROUND GAS LINE
CTV	CABLE TELEVISION BOX	UGFOT	UNDERGROUND FIBER OPTIC TELEPHONE LINE
WV	WATER VALVE	UGE (TS&SL)	UNDERGROUND TRAFFIC SIGNAL OR STREET LIGHT ELECTRICAL
FH	FIRE HYDRANT	WS	WATER SERVICE LINE
WM	WATER METER	W	WATER LINE
T	MANHOLE (TELEPHONE)	SD	STORM DRAIN
DI	DROP INLET (STORM DRAIN)	SAS	SANITARY SEWER
TSL	TRAFFIC SIGNAL LIGHT	SS	SANITARY SEWER SERVICE LINE
TSB	TRAFFIC SIGNAL BOX	UGFOTV	UNDERGROUND FIBER OPTIC CABLE TELEVISION LINE
SLB	STREET LIGHT BOX		
PH-#	POT HOLE		

PROFESSIONAL SURVEYOR STATE OF NEW MEXICO NO. 10464 VLADIMIR JIRIK

VLADIMIR JIRIK, NMPS NO. 10464

NOV 14 2003
DATE

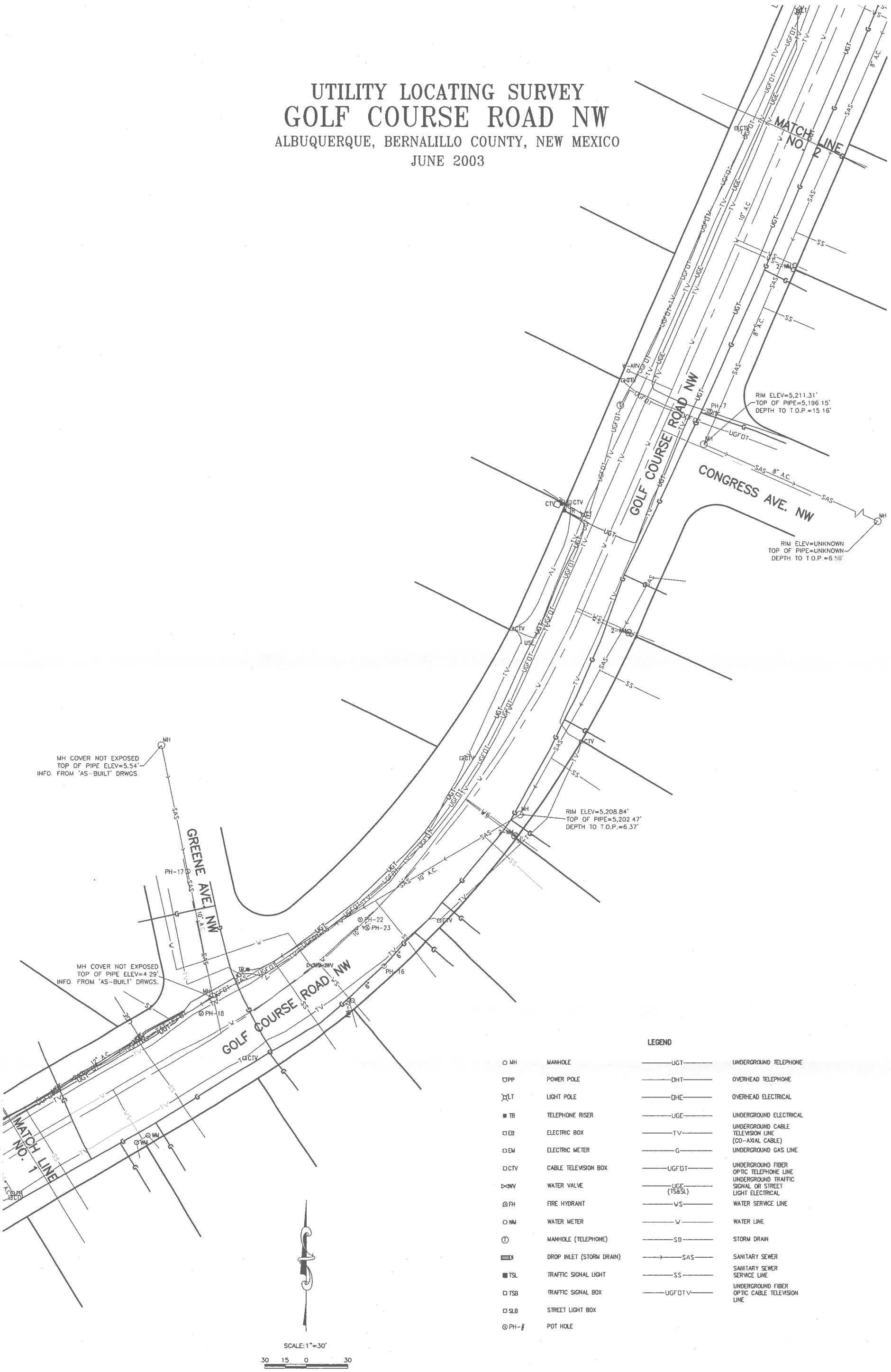
David A. Parks P.E.
DAVID A. PARKS, NMPE NO. 6180

11/14/03
DATE

Plat & Survey By:
ALBUQUERQUE SURVEYING CO. INC., 2119 Menaul Blvd. N.E., Albuquerque, New Mexico 87107 Ph. (505) 884-2036

SHEET 1 OF 4
23039-5-RS

UTILITY LOCATING SURVEY
GOLF COURSE ROAD NW
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
JUNE 2003



SCALE: 1"=30'

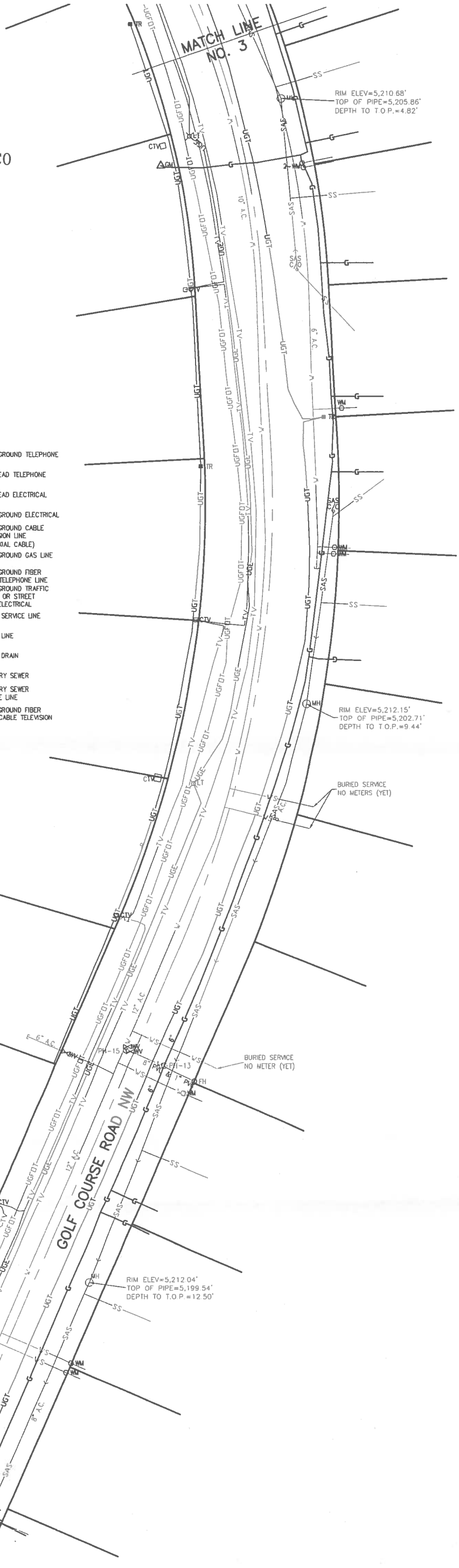
30 15 0 30

LEGEND

MH	MANHOLE	UGT	UNDERGROUND TELEPHONE
PP	POWER POLE	OHT	OVERHEAD TELEPHONE
LT	LIGHT POLE	OHE	OVERHEAD ELECTRICAL
TR	TELEPHONE RISER	UGE	UNDERGROUND ELECTRICAL
EB	ELECTRIC BOX	TV	UNDERGROUND CABLE TELEVISION LINE (CO-AXIAL CABLE)
EM	ELECTRIC METER	G	UNDERGROUND GAS LINE
CTV	CABLE TELEVISION BOX	UGFOT	UNDERGROUND FIBER OPTIC TELEPHONE LINE
WV	WATER VALVE	UGE (TS&SL)	UNDERGROUND TRAFFIC SIGNAL OR STREET LIGHT ELECTRICAL
FH	FIRE HYDRANT	WS	WATER SERVICE LINE
WM	WATER METER	W	WATER LINE
T	MANHOLE (TELEPHONE)	SD	STORM DRAIN
DI	DROP INLET (STORM DRAIN)	SAS	SANITARY SEWER
TSL	TRAFFIC SIGNAL LIGHT	SS	SANITARY SEWER SERVICE LINE
TSB	TRAFFIC SIGNAL BOX	UGFOTV	UNDERGROUND FIBER OPTIC CABLE TELEVISION LINE
SLB	STREET LIGHT BOX		
PH-#	POT HOLE		

Plat & Survey By:
ALBUQUERQUE SURVEYING CO. INC., 2119 Menaul Blvd. N.E., Albuquerque, New Mexico 87107 Ph. (505) 884-2036

UTILITY LOCATING SURVEY
GOLF COURSE ROAD NW
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
JUNE 2003



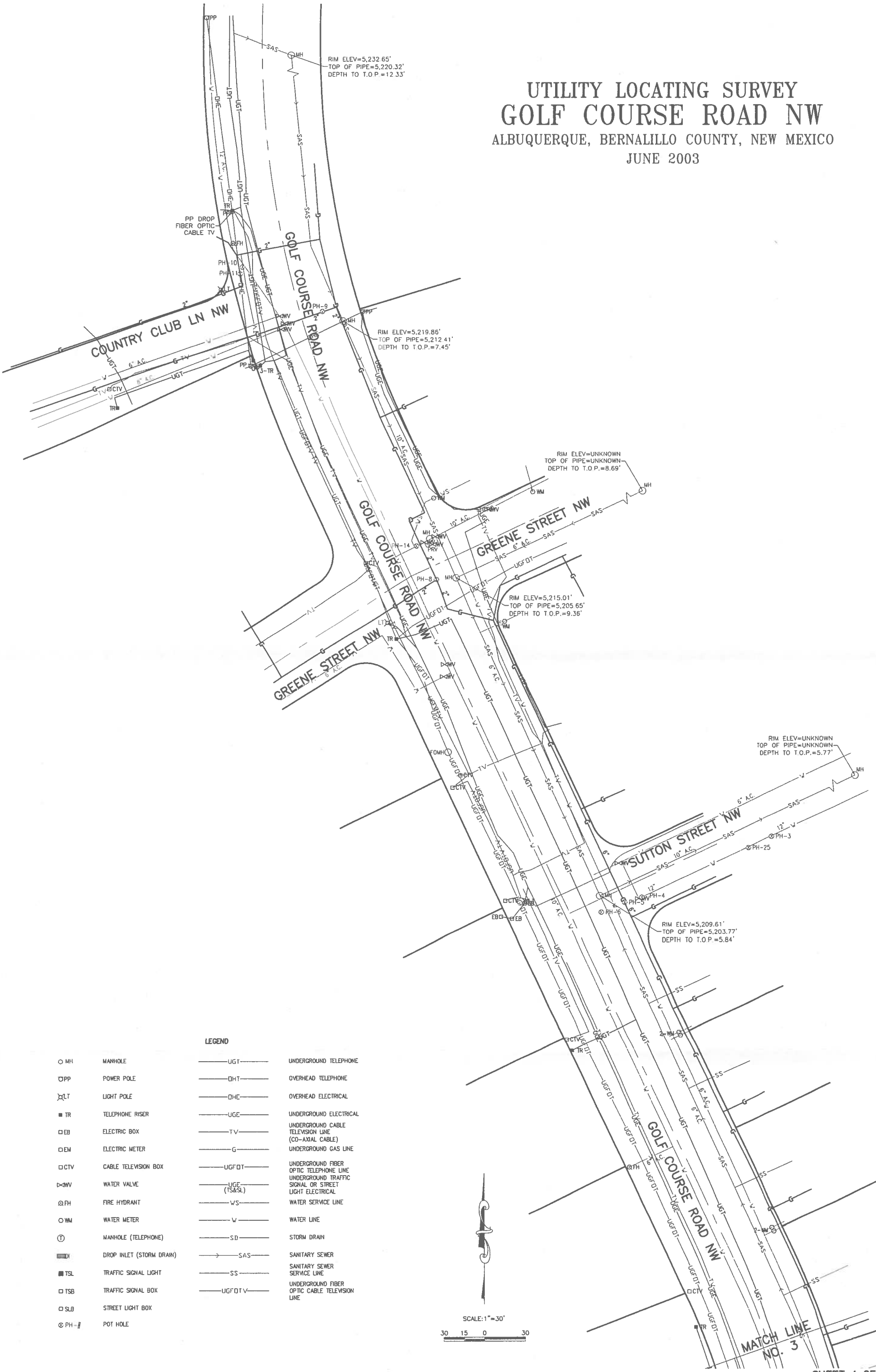
LEGEND

MH	MANHOLE	UGT	UNDERGROUND TELEPHONE
PP	POWER POLE	OHT	OVERHEAD TELEPHONE
LT	LIGHT POLE	OHE	OVERHEAD ELECTRICAL
TR	TELEPHONE RISER	UGE	UNDERGROUND ELECTRICAL
EB	ELECTRIC BOX	TV	UNDERGROUND CABLE TELEVISION LINE (CO-AXIAL CABLE)
EM	ELECTRIC METER	G	UNDERGROUND GAS LINE
CTV	CABLE TELEVISION BOX	UGFOT	UNDERGROUND FIBER OPTIC TELEPHONE LINE
WV	WATER VALVE	UGE (TS&SL)	UNDERGROUND TRAFFIC SIGNAL OR STREET LIGHT ELECTRICAL
FH	FIRE HYDRANT	WS	WATER SERVICE LINE
WM	WATER METER	W	WATER LINE
	MANHOLE (TELEPHONE)	SD	STORM DRAIN
	DROP INLET (STORM DRAIN)	SAS	SANITARY SEWER
TSL	TRAFFIC SIGNAL LIGHT	SS	SANITARY SEWER SERVICE LINE
TSB	TRAFFIC SIGNAL BOX	UGFOTV	UNDERGROUND FIBER OPTIC CABLE TELEVISION LINE
SLB	STREET LIGHT BOX		
PH-#	POT HOLE		

SCALE: 1"=30'
30 15 0 30

Plat & Survey By:
ALBUQUERQUE SURVEYING CO. INC., 2119 Menaul Blvd. N.E., Albuquerque, New Mexico 87107 Ph. (505) 884-2036

UTILITY LOCATING SURVEY
GOLF COURSE ROAD NW
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
JUNE 2003



LEGEND

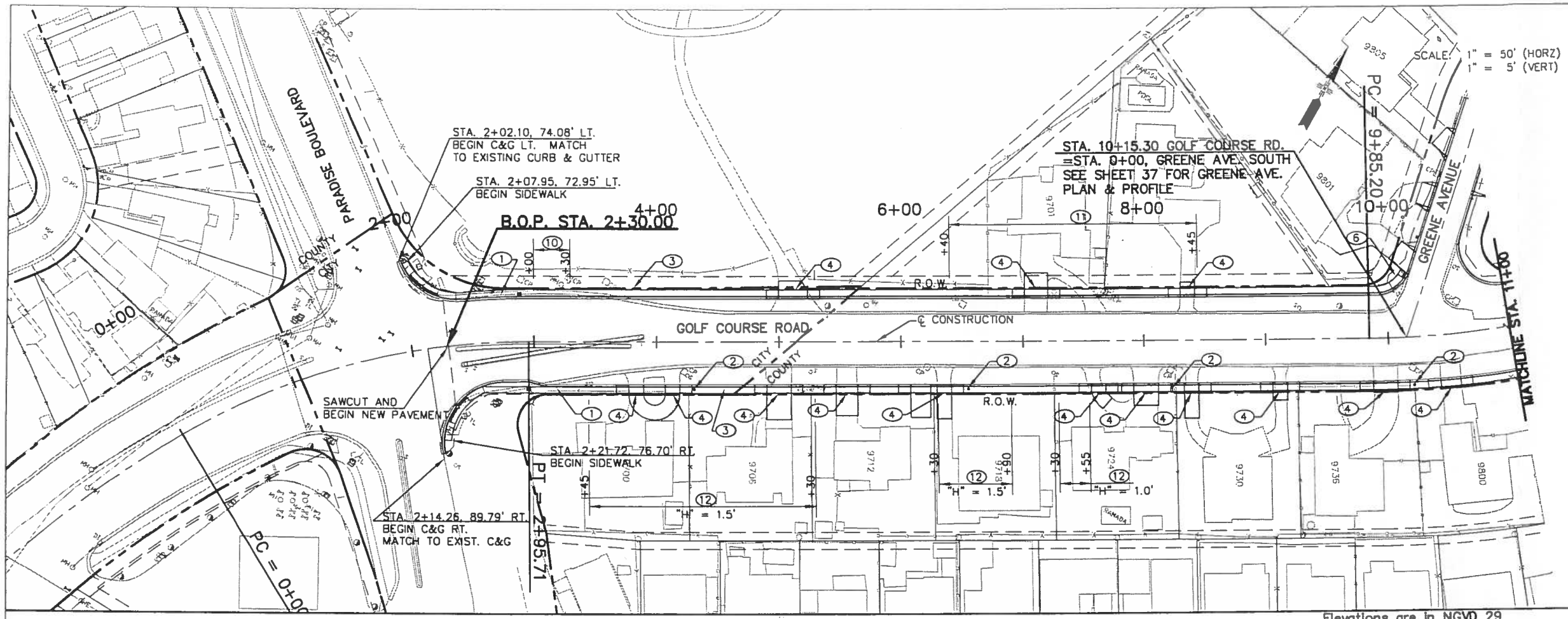
MH	MANHOLE	UGT	UNDERGROUND TELEPHONE
PP	POWER POLE	OHT	OVERHEAD TELEPHONE
LT	LIGHT POLE	OHE	OVERHEAD ELECTRICAL
TR	TELEPHONE RISER	UGE	UNDERGROUND ELECTRICAL
EB	ELECTRIC BOX	TV	UNDERGROUND CABLE TELEVISION LINE (CO-AXIAL CABLE)
EM	ELECTRIC METER	G	UNDERGROUND GAS LINE
CTV	CABLE TELEVISION BOX	UGFOT	UNDERGROUND FIBER OPTIC TELEPHONE LINE
WV	WATER VALVE	UGE (TS&SL)	UNDERGROUND TRAFFIC SIGNAL OR STREET LIGHT ELECTRICAL
FH	FIRE HYDRANT	WS	WATER SERVICE LINE
WM	WATER METER	W	WATER LINE
T	MANHOLE (TELEPHONE)	SD	STORM DRAIN
	DROP INLET (STORM DRAIN)	SAS	SANITARY SEWER
TSL	TRAFFIC SIGNAL LIGHT	SS	SANITARY SEWER SERVICE LINE
TSB	TRAFFIC SIGNAL BOX	UGFOTV	UNDERGROUND FIBER OPTIC CABLE TELEVISION LINE
SLB	STREET LIGHT BOX		
PH-#	POT HOLE		

SCALE: 1"=30'

30 15 0 30

Plat & Survey By:
ALBUQUERQUE SURVEYING CO. INC., 2119 Menaul Blvd. N.E., Albuquerque, New Mexico 87107 Ph. (505) 884-2036

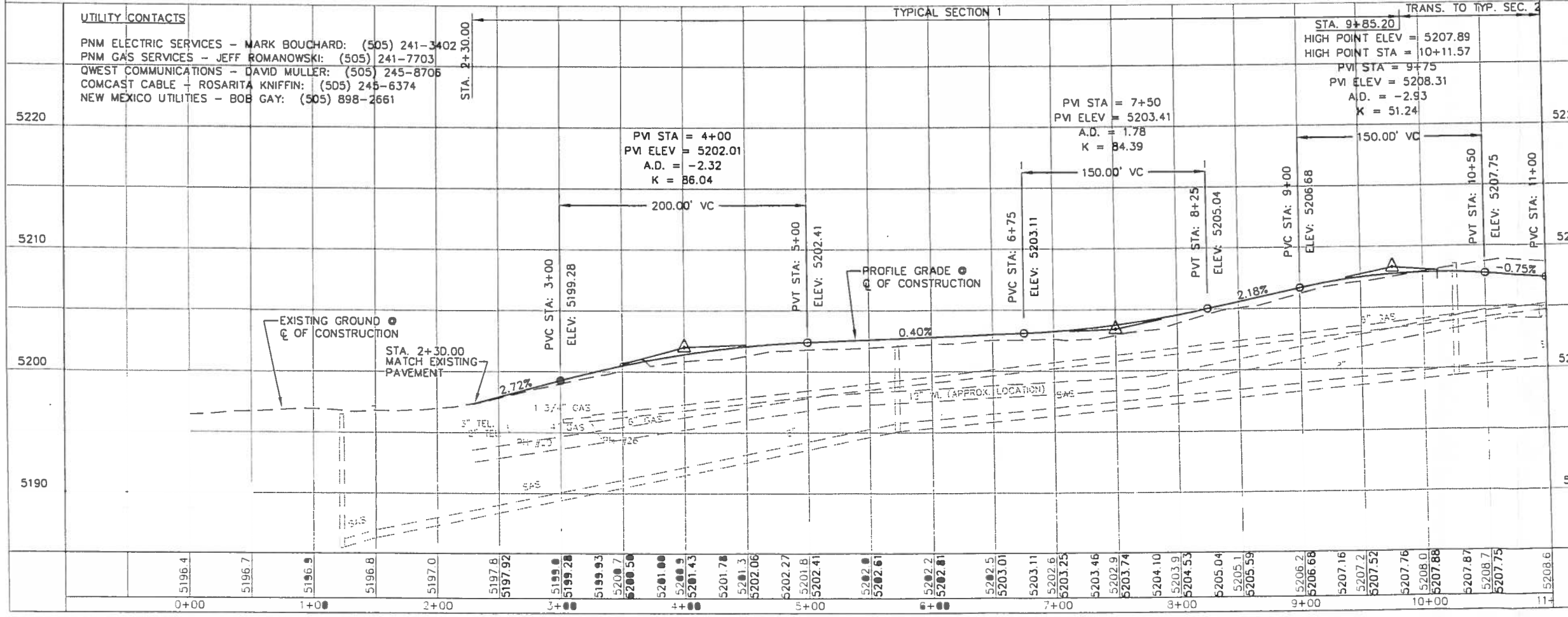
Appendix B
Plan and Profile Sheets



GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft

Elevations are in NGVD 29



UTILITY CONTACTS

PNM ELECTRIC SERVICES – MARK BOUCHARD: (505) 241-3402
PNM GAS SERVICES – JEFF ROMANOWSKI: (505) 241-7703
QWEST COMMUNICATIONS – DAVID MULLER: (505) 245-8706
COMCAST CABLE – ROSARITA KNIFFIN: (505) 245-6374
NEW MEXICO UTILITIES – BOB GAY: (505) 898-2661

KEYED NOTES:

1. BUILD MODIFIED CONCRETE BARRIER C&G TYPE "C" PER DETAIL SHEET 22.
2. INSTALL DOUBLE MAILBOX. SEE SCHEDULE SHEET 21.
3. BUILD CONCRETE SIDEWALK 4" THICK, 5' WIDE.
4. BUILD DRIVEPAD TYPE 1 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
5. BUILD DRIVEPAD TYPE 2 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
6. BUILD CURB RAMP TYPE "B" PER NMDOT STD. SERIAL PAD-001.
7. BUILD CURB RAMP TYPE "D" PER NMDOT STD. SERIAL PAD-001.
8. BUILD MODIFIED CURB RAMP TYPE "D" PER NMDOT STD. SERIAL PAD-001.
9. BUILD DRIVEPAD TYPE 3 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
10. BUILD THICKENED EDGE SIDEWALK PER DETAIL SHEET 53.
11. BUILD SIDEWALK FILL WALL PER DETAIL SHEET 53.
12. BUILD SIDEWALK CUT WALL PER DETAIL SHEET 53.
13. BUILD SAFETY WALL PER DETAIL SHEET 53.
14. BUILD SOLDIER PILE WALL PER DETAIL SHEET 52.

GENERAL NOTES

1. STA. AND OFFSET FOR C&G GIVEN TO FLOWLINE.
2. STA. AND OFFSET FOR SIDEWALK GIVEN TO BACK OF SIDEWALK.
3. FOR ℄ ALIGNMENT & DATA, SEE SHT. 3.

AS BUILT INFORMATION
CONTRACTOR — DATE
WORK STAMPED BY — DATE
INSPECTOR'S CERTIFICATE BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

BENCH MARKS
USGS Brass Tablet stamped "Block-2 1977" Intersection of Gulf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet |X=1,513,169.084, Y=1,530,307.59|
Transformed to Interim NAD83 by Corpscon V5.11.08

MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

SURVEY INFORMATION
FIELD NOTES
NO. | BY | DATE

ENGINEER'S SEAL

REMARKS | NO. | DATE | BY

DESIGN
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

PB Parsons Brinckerhoff

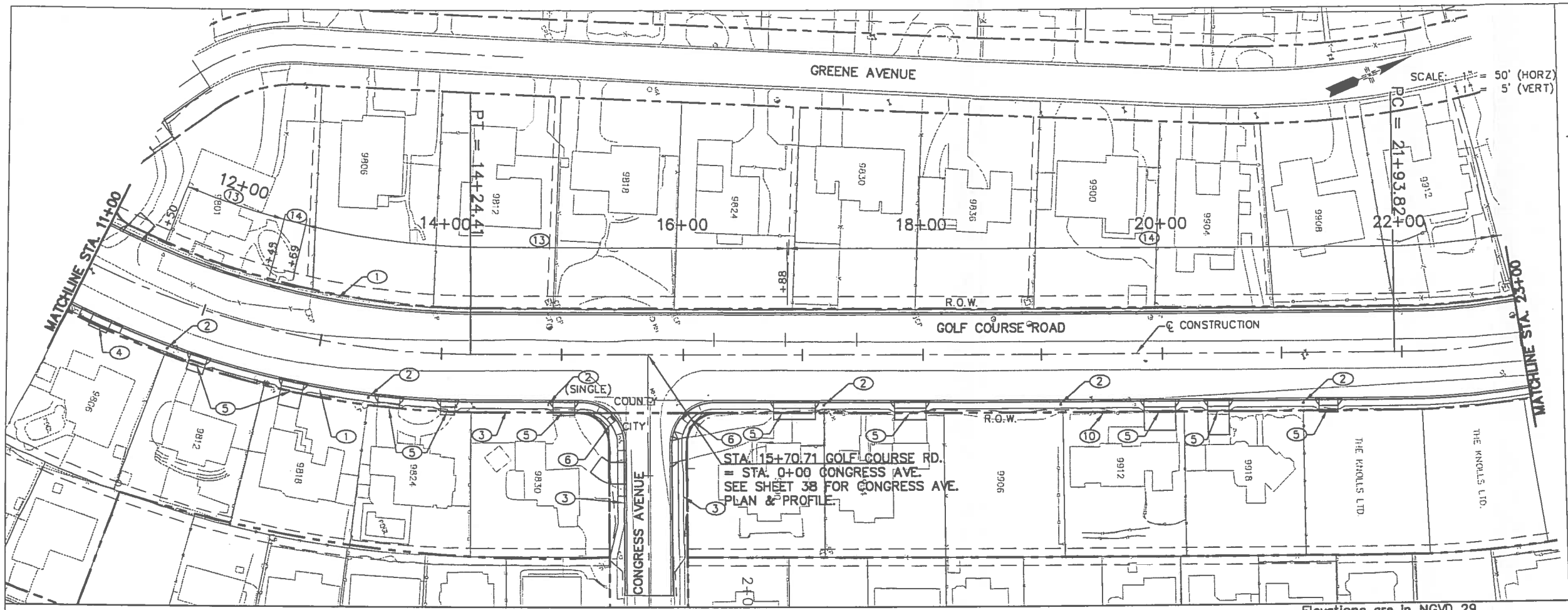
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

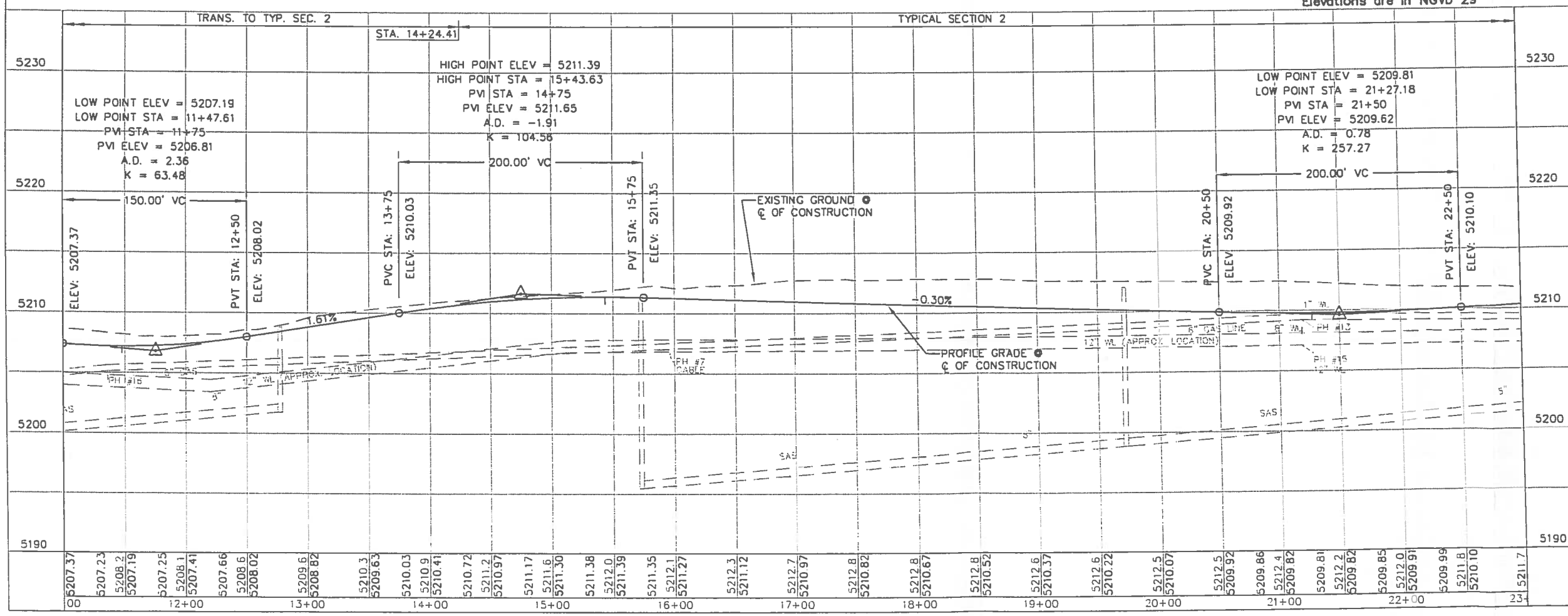
GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE ROAD PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 32 Of 135





GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.

KEYED NOTES:

1. BUILD MODIFIED CONCRETE BARRIER C&G TYPE "C" PER DETAIL SHEET 22.
2. INSTALL DOUBLE MAILBOX. SEE SCHEDULE SHEET 21.
3. BUILD CONCRETE SIDEWALK 4" THICK, 5' WIDE.
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8. BUILD MODIFIED CURB RAMP TYPE "D" PER NMDOT STD. SERIAL PAD-001.
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11. BUILD SIDEWALK FILL WALL PER DETAIL SHEET 53.
12. BUILD SIDEWALK CUT WALL PER DETAIL SHEET 53.
13. BUILD SAFETY WALL PER DETAIL SHEET 53.
14. BUILD SOLDIER PILE WALL PER DETAIL SHEET 52.

GENERAL NOTES

1. STA. AND OFFSET FOR C&G GIVEN TO FLOWLINE.
2. STA. AND OFFSET FOR SIDEWALK GIVEN TO BACK OF SIDEWALK.
3. FOR ℄ ALIGNMENT & DATA, SEE SHT. 3.

AS BUILT INFORMATION
CONTRACTOR — DATE
WORK STAKED BY — DATE
INSPECTION'S ACCEPTANCE BY — DATE
FIELD VERIFICATION BY — DATE
AS-BUILT CORRECTED BY — DATE

BENCH MARKS
USGS Brass Tablet stamped "Block-2 1977" Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.591]
Transformed to Interim NAD83 by Carpscon V5.11.08

MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN — DATE
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY

PB Parsons Brinckerhoff

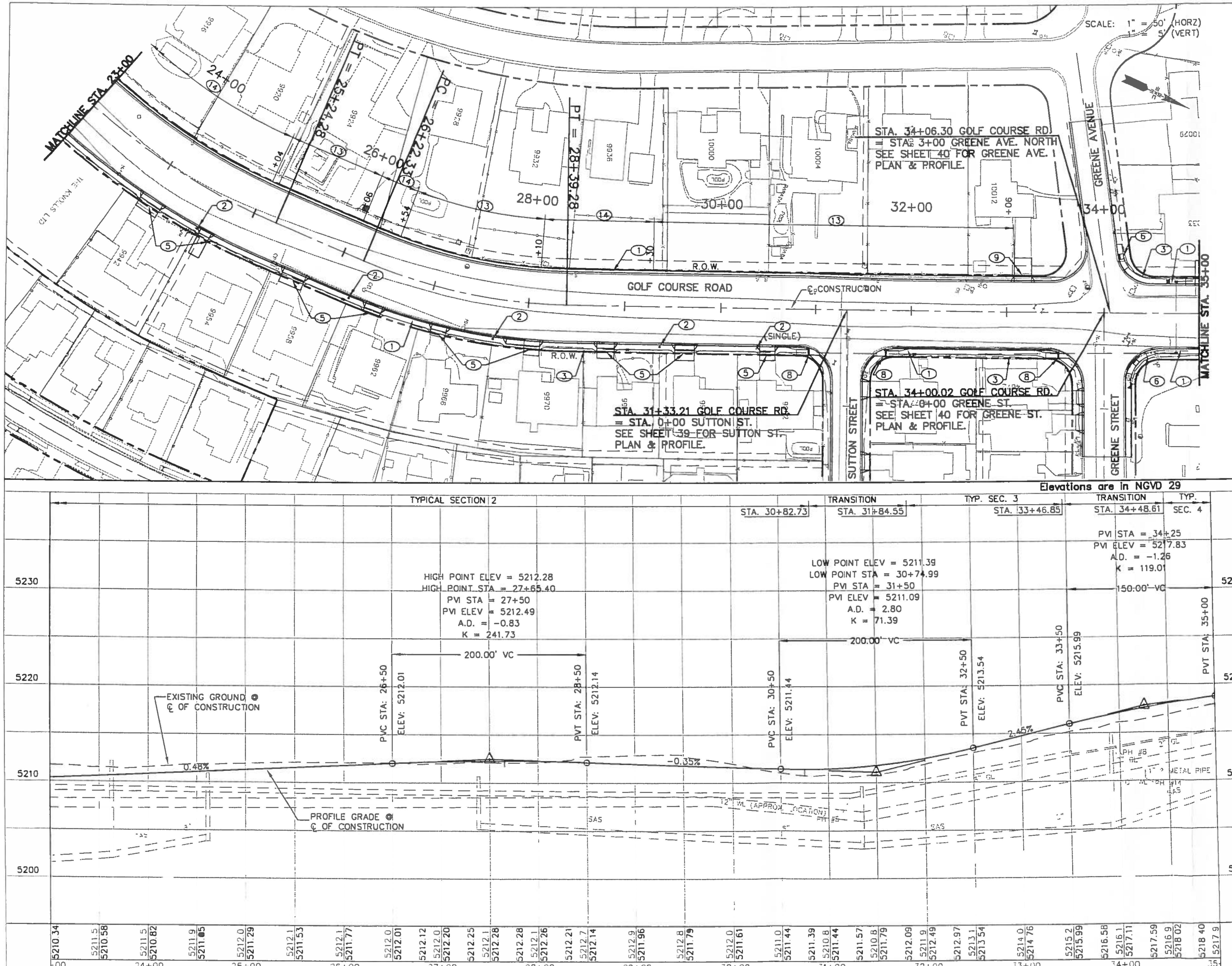
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE ROAD PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL		MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 33 Of 135



KEYED NOTES:

1. BUILD MODIFIED CONCRETE BARRIER C&G TYPE "C" PER DETAIL SHEET 22.
2. INSTALL DOUBLE MAILBOX. SEE SCHEDULE SHEET 21.
3. BUILD CONCRETE SIDEWALK 4" THICK, 5' WIDE.
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9. BUILD DRIVEPAD TYPE 3 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
10. BUILD THICKENED EDGE SIDEWALK PER DETAIL SHEET 53.
11. BUILD SIDEWALK FILL WALL PER DETAIL SHEET 53.
12. BUILD SIDEWALK CUT WALL PER DETAIL SHEET 53.
13. BUILD SAFETY WALL PER DETAIL SHEET 53.
14. BUILD SOLDIER PILE WALL PER DETAIL SHEET 52.

GENERAL NOTES

1. STA. AND OFFSET FOR C&G GIVEN TO FLOWLINE.
2. STA. AND OFFSET FOR SIDEWALK GIVEN TO BACK OF SIDEWALK.
3. FOR ℄ ALIGNMENT & DATA, SEE SHT. 3.

GRAPHIC SCALE (IN FEET) 1 inch = 50 ft.

AS BUILT INFORMATION: CONTRACTOR; WORK STAKED BY / DATE; INSPECTOR'S ACCEPTANCE BY / DATE; FIELD VERIFICATION BY / DATE; DRAWINGS CORRECTED BY / DATE

MICRO-FILM INFORMATION: RECORDED BY / DATE; NO.

BENCH MARKS

USGS Brass Tablet stamped "Black-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.59]
Transformed to Interim NAD83 by Corpscon V5.11.08

SURVEY INFORMATION — FIELD NOTES: NO. | BY | DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN: DESIGNED BY / DATE; DRAWN BY / DATE; CHECKED BY / DATE

PB Parsons Brinckerhoff

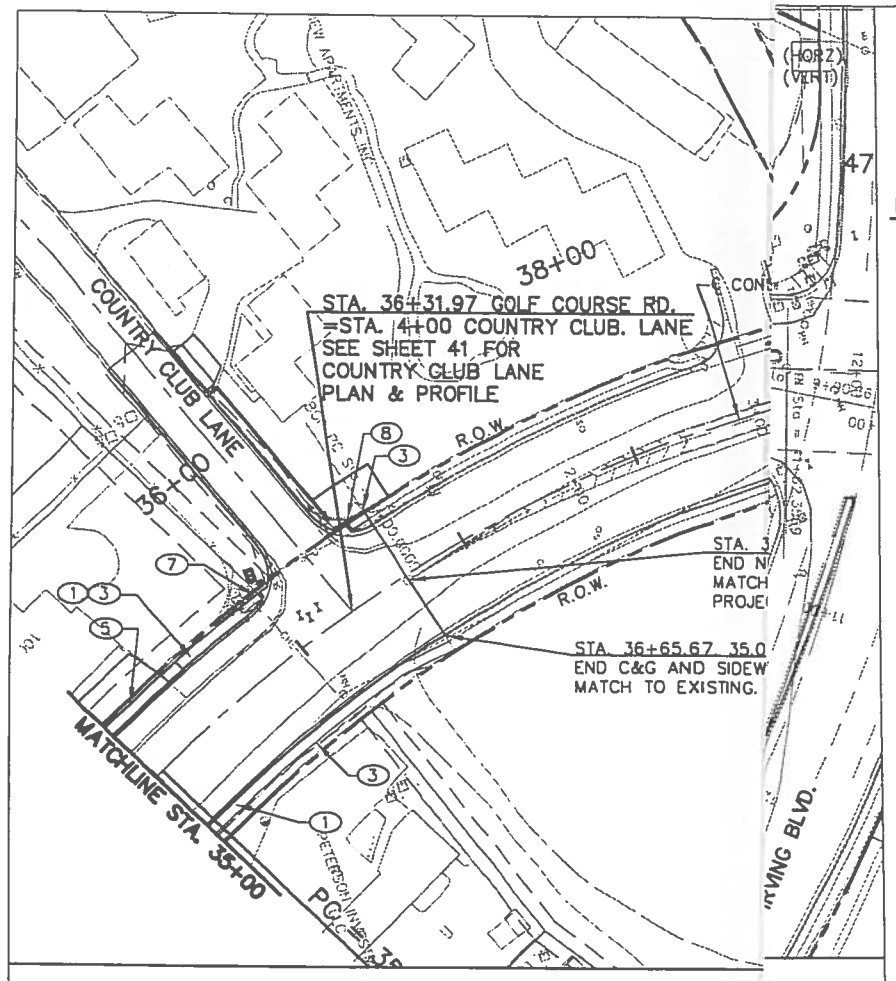
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

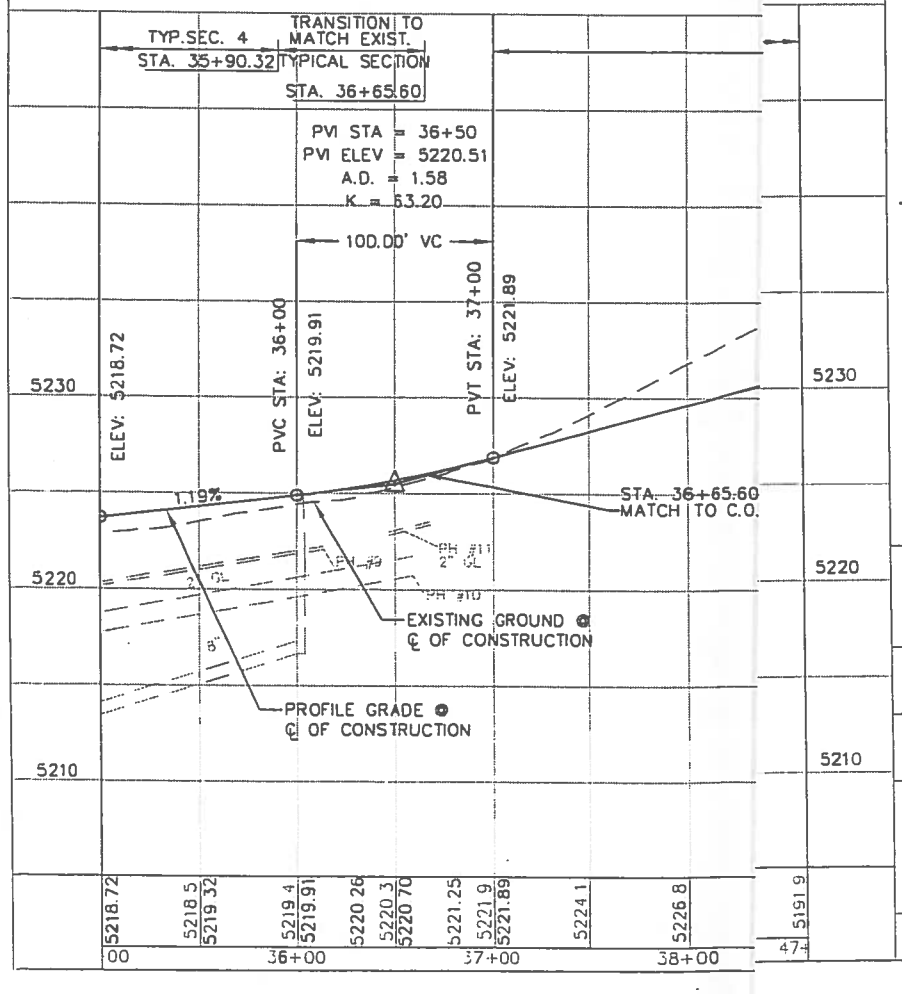
GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE ROAD PLAN AND PROFILE

DESIGN REVIEW COMMITTEE | CITY ENGINEER APPROVAL | MO./DAY/YR. | MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 34 Of 135





GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.

KEYED NOTES:

1. BUILD MODIFIED CONCRETE BARRIER C&G TYPE "C" PER DETAIL SHEET 22.
2. INSTALL DOUBLE MAILBOX. SEE SCHEDULE SHEET 21.
3. BUILD CONCRETE SIDEWALK 4" THICK, 5' WIDE.
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5. BUILD DRIVEPAD TYPE 2 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
6. BUILD CURB RAMP TYPE "B" PER NMDOT STD. SERIAL PAD-001.
7. BUILD CURB RAMP TYPE "D" PER NMDOT STD. SERIAL PAD-001.
8. BUILD MODIFIED CURB RAMP TYPE "D" PER NMDOT STD. SERIAL PAD-001.
9. BUILD DRIVEPAD TYPE 3 PER DETAIL SHEET 22. SEE DRIVEPAD SCHEDULE, SHEET 18 & 19.
10. BUILD THICKENED EDGE SIDEWALK PER DETAIL SHEET 53.
11. BUILD SIDEWALK FILL WALL PER DETAIL SHEET 53.
12. BUILD SIDEWALK CUT WALL PER DETAIL SHEET 53.
13. BUILD SAFETY WALL PER DETAIL SHEET 53.
14. BUILD SOLDIER PILE WALL PER DETAIL SHEET 52.

GENERAL NOTES

1. STA. AND OFFSET FOR C&G GIVEN TO FLOWLINE.
2. STA. AND OFFSET FOR SIDEWALK GIVEN TO BACK OF SIDEWALK.
3. FOR ℄ ALIGNMENT & DATA, SEE SHT. 3.

PB Parsons Brinckerhoff

BENCH MARKS

USGS Brass Tablet stamped "Black-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.59]
Transformed to interim NAD83 by Corpscon V5.11.08

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

AS BUILT INFORMATION

CONTRACTOR
WORK STARTED BY — DATE
INSPECTORS NAME(S) — DATE
ACCEPTANCE BY
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE
NO.

NO.	DATE	REMARKS	BY

DESIGN
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

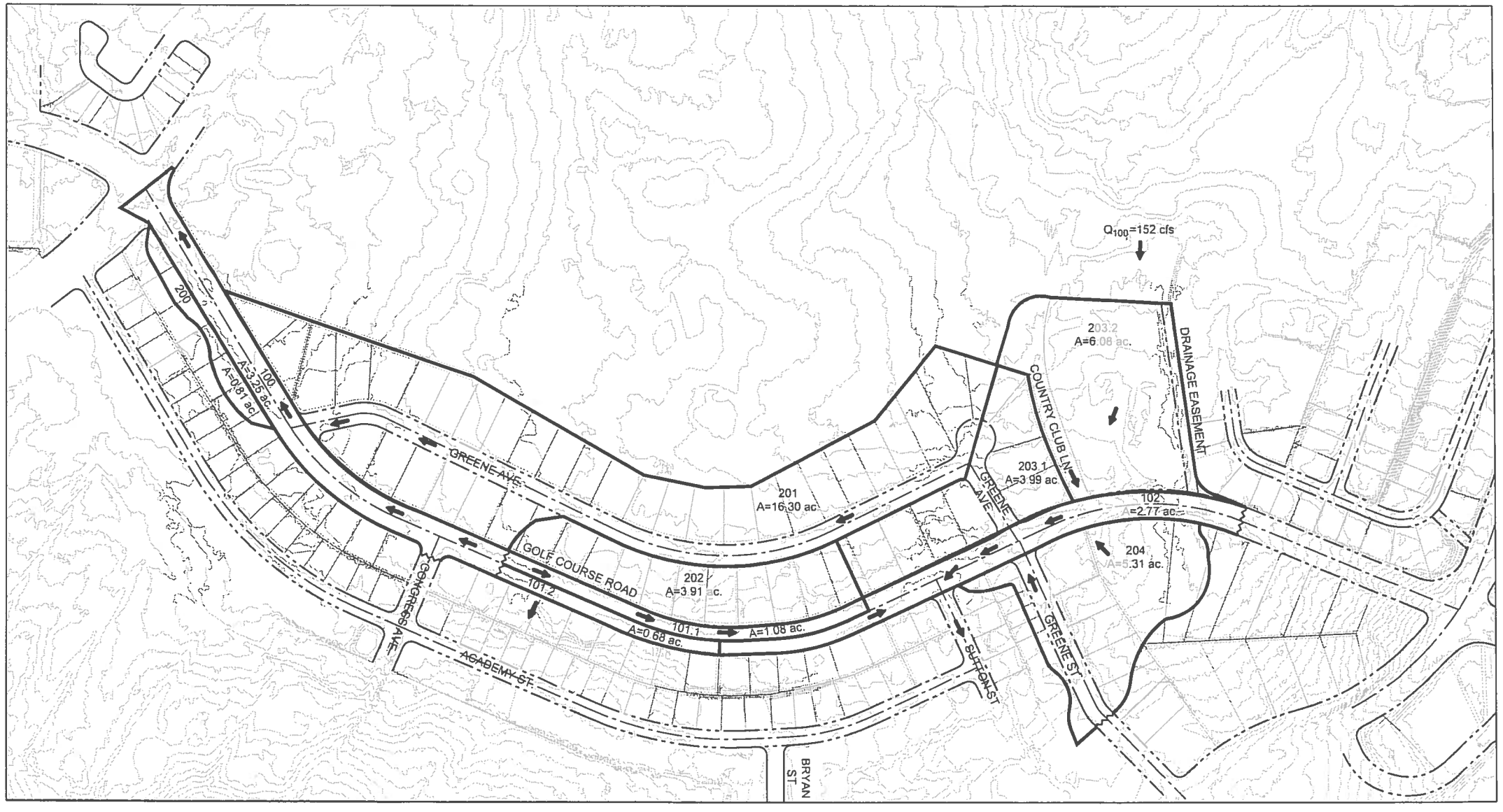
GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE ROAD PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. 8-12-Z | Sheet 35 Of 135

Appendix C
Existing Drainage Basins



EXISTING DRAINAGE BASINS

LEGEND

FLOW DIRECTION →

BASIN BOUNDARY ———

BASIN NUMBER 100.

SCALE 200' 0 200' 400'

HORIZ: 1" = 200'

AS BUILT INFORMATION
CONTRACTOR
WORK STAKED BY — DATE
INSPECTOR'S INITIALS/TASKS BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY
MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES
NO. | DATE | BY

ENGINEER'S SEAL

REMARKS
NO. | DATE | BY

DESIGN — DATE
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY

PB Parsons Brinckerhoff

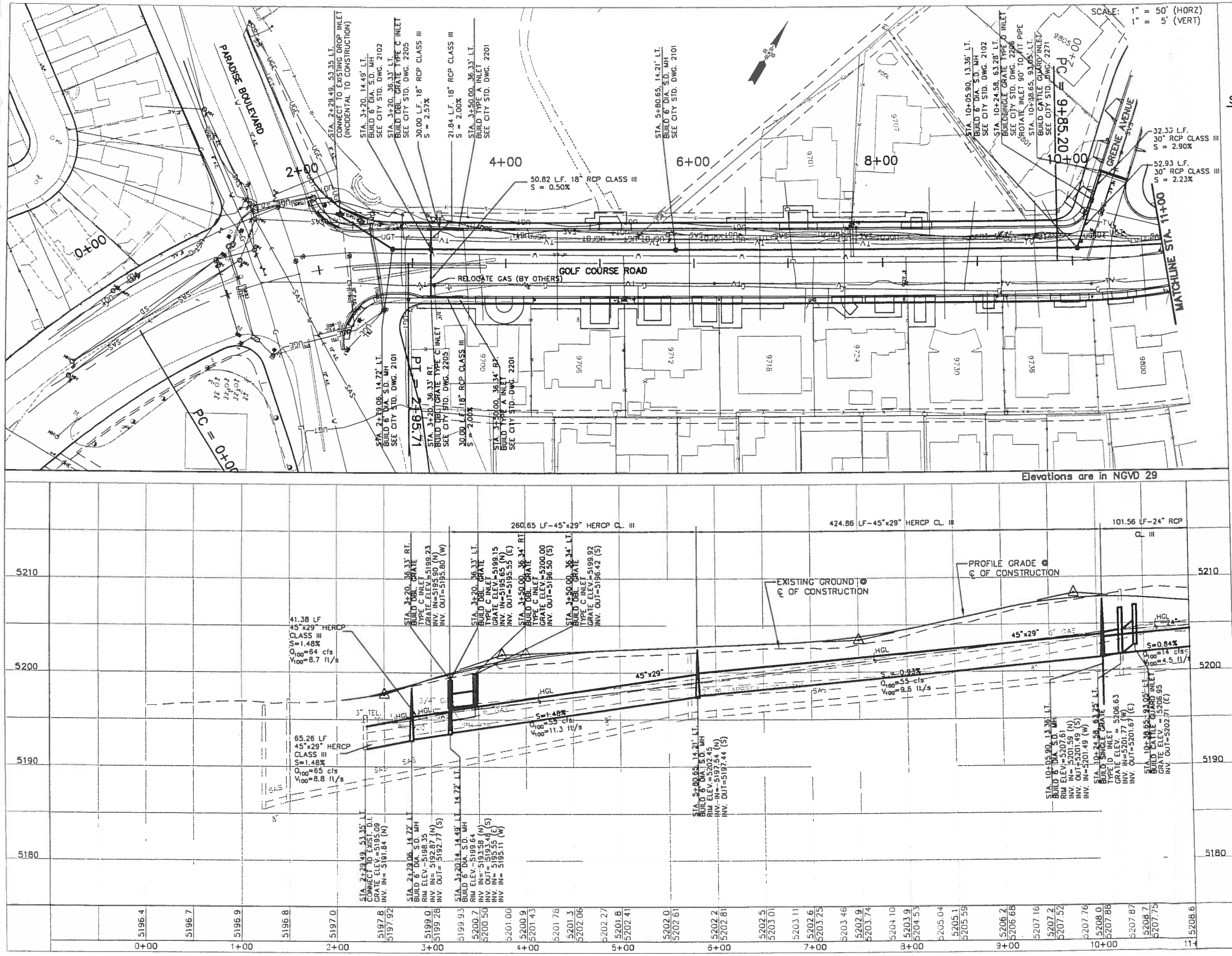
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL		MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet Of

Appendix D
Proposed Drainage Basins



GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB ft. MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

CONTRACTOR — DATE
WORK INSPECTOR'S ACCEPTANCE BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE
NO.

BENCH MARKS

USGS Brass Tablet stamped "Block-2 1977" Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.59]
Transformed to interim NAD83 by Corpscon V5.11.08

SURVEY INFORMATION

FIELD NOTES

NO.	DATE	BY

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

PB Parsons Brinckerhoff

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

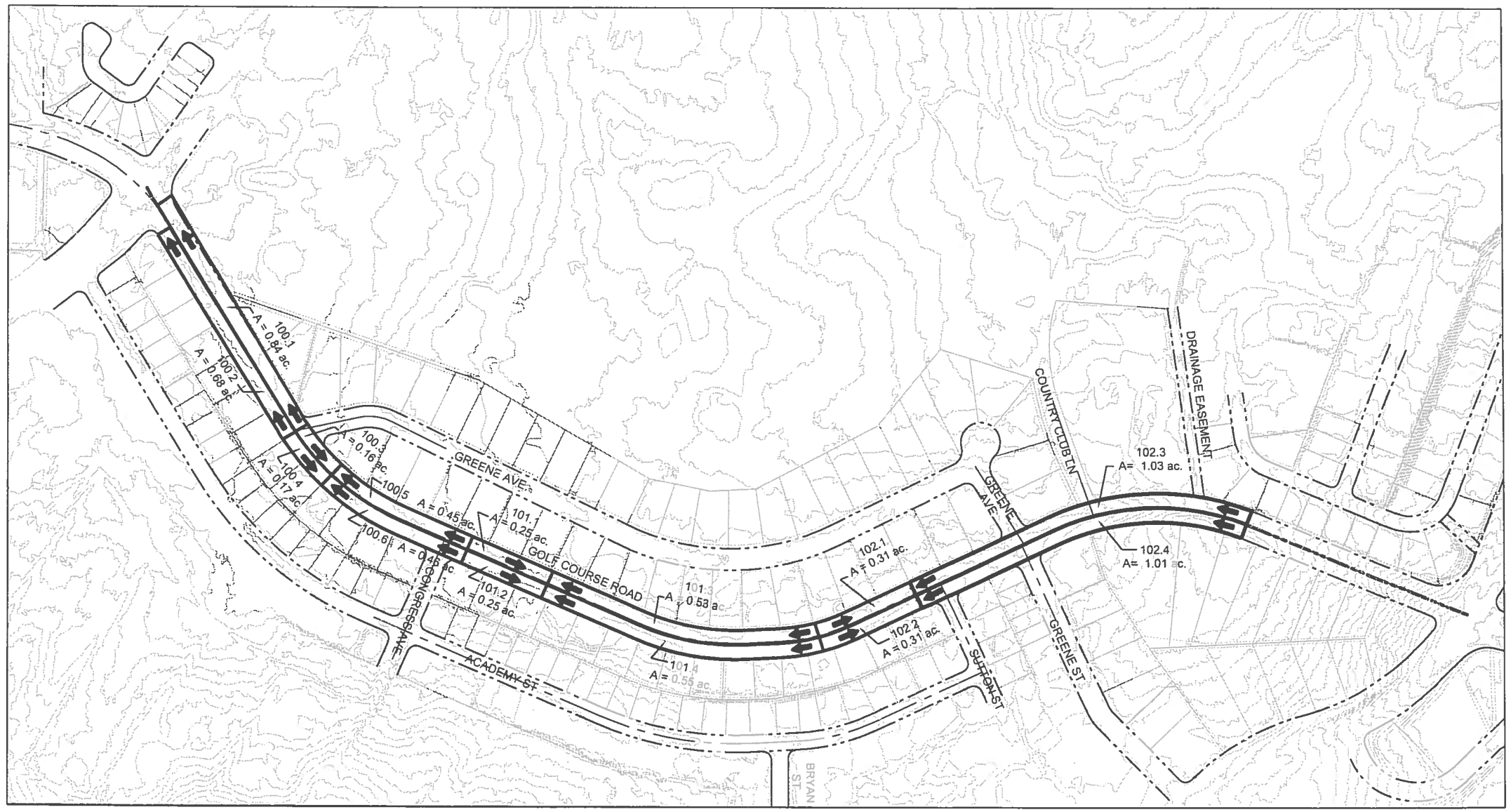
GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE RD. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 42 | Of 35

Appendix E
Storm Drain Plans



PROPOSED ON-SITE DRAINAGE BASINS

LEGEND

FLOW DIRECTION →

BASIN BOUNDARY ———

BASIN NUMBER 100.

SCALE 200' 0 200' 400'

HORIZ: 1" = 200'

AS BUILT INFORMATION

CONTRACTOR

WORK STAKED BY — DATE

INSPECTOR'S FIELD NOTES BY — DATE

FIELD VERIFICATION BY — DATE

DRAWING CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE

NO.

BENCH MARKS

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN — DATE

DESIGNED BY — DATE

DRAWN BY — DATE

CHECKED BY — DATE

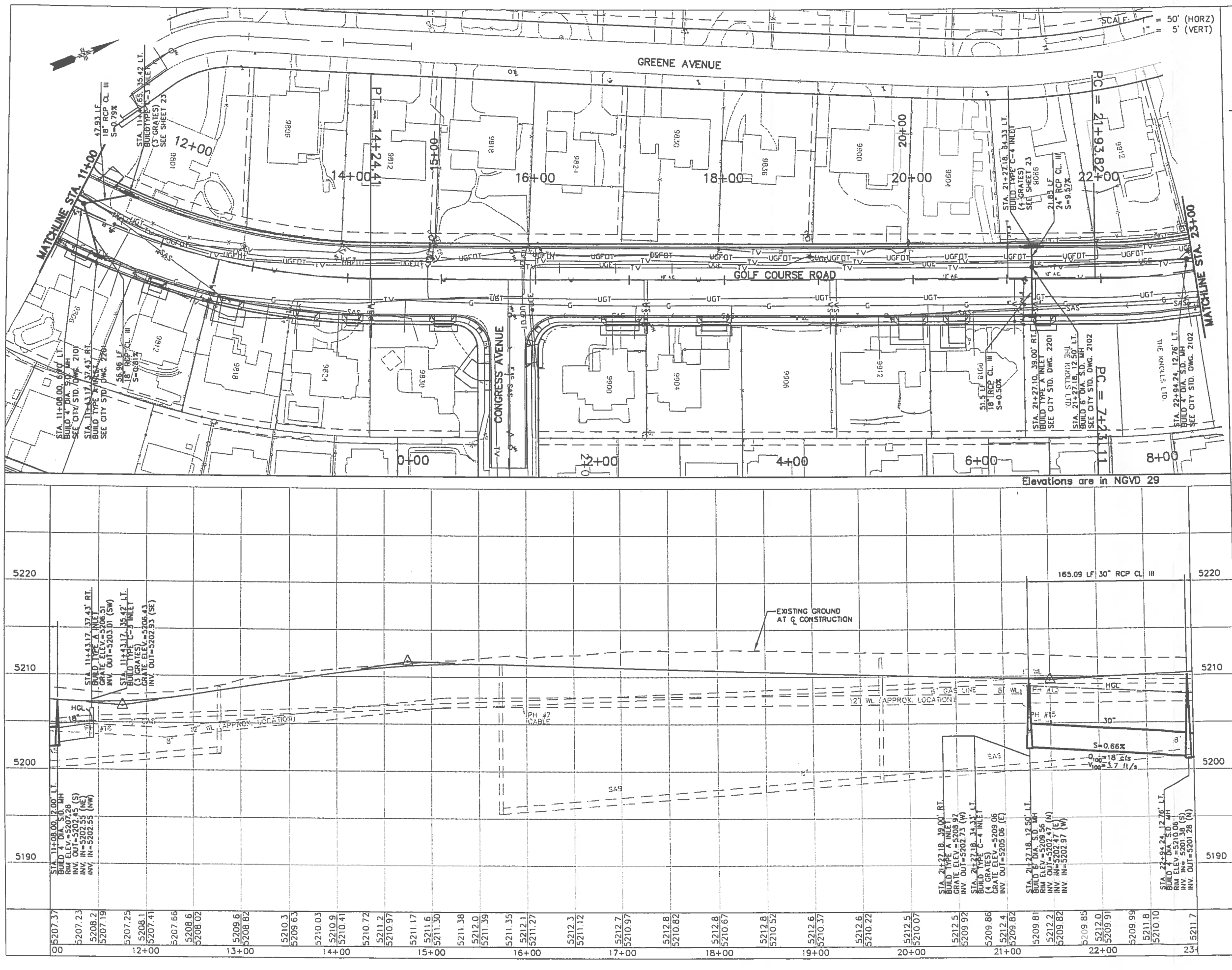
PB Parsons Brinckerhoff

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet Of



GRAPHIC SCALE

100 0 25 50 100

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB ℄, MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

BENCH MARKS

USGS Brass Tablet stamped "Block-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084,
Y=1,530,307.59]
Transformed to Interim NAD83 by Corpscon V5.11.08

CONTRACTOR

WORK STAKED BY — DATE
MISCELLANEOUS STAKES BY — DATE
FIELD VERIFICATION BY — DATE
DRAWING CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE
NO.

SURVEY INFORMATION

FIELD NOTES

NO.	DATE	BY

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN — DATE
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY

PB Parsons Brinckerhoff

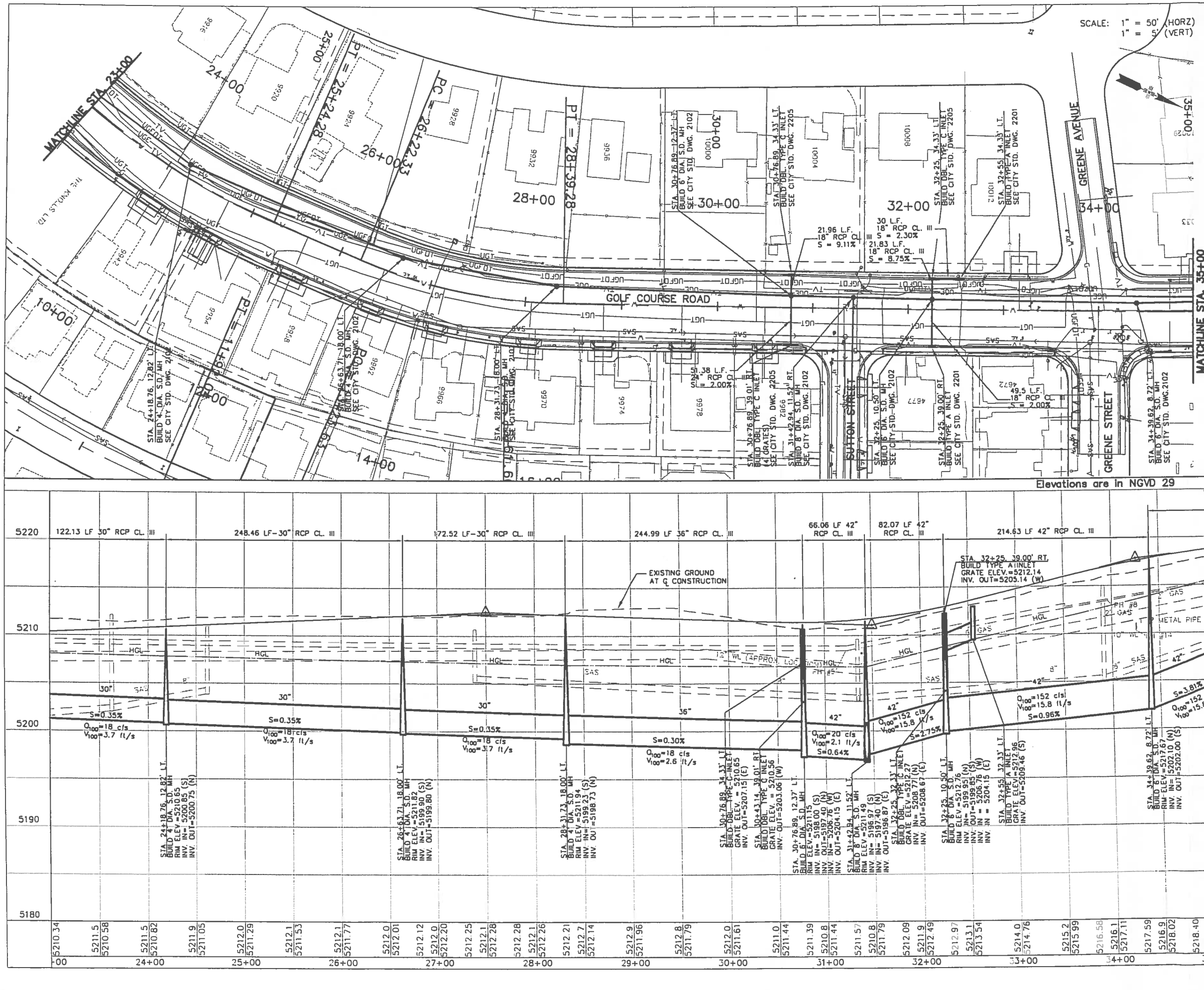
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE RD. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL		MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 43 Of 135



GRAPHIC SCALE

100 0 25 50 100

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB ℄. MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

CONTRACTOR

WORK STAKED BY — DATE

INSPECTOR'S CHANGES BY — DATE

FIELD VERIFICATION BY — DATE

DRAWING CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE

NO.

BENCH MARKS

USGS Brass Tablet stamped "Block-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
Geographic Position (Central Zone)
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet |X=1,513,169.084,
Y=1,530,307.59|
Transformed to Interim NAD83 by Corpscon V5.11.08

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN — DATE
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

PB Parsons Brinckerhoff

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

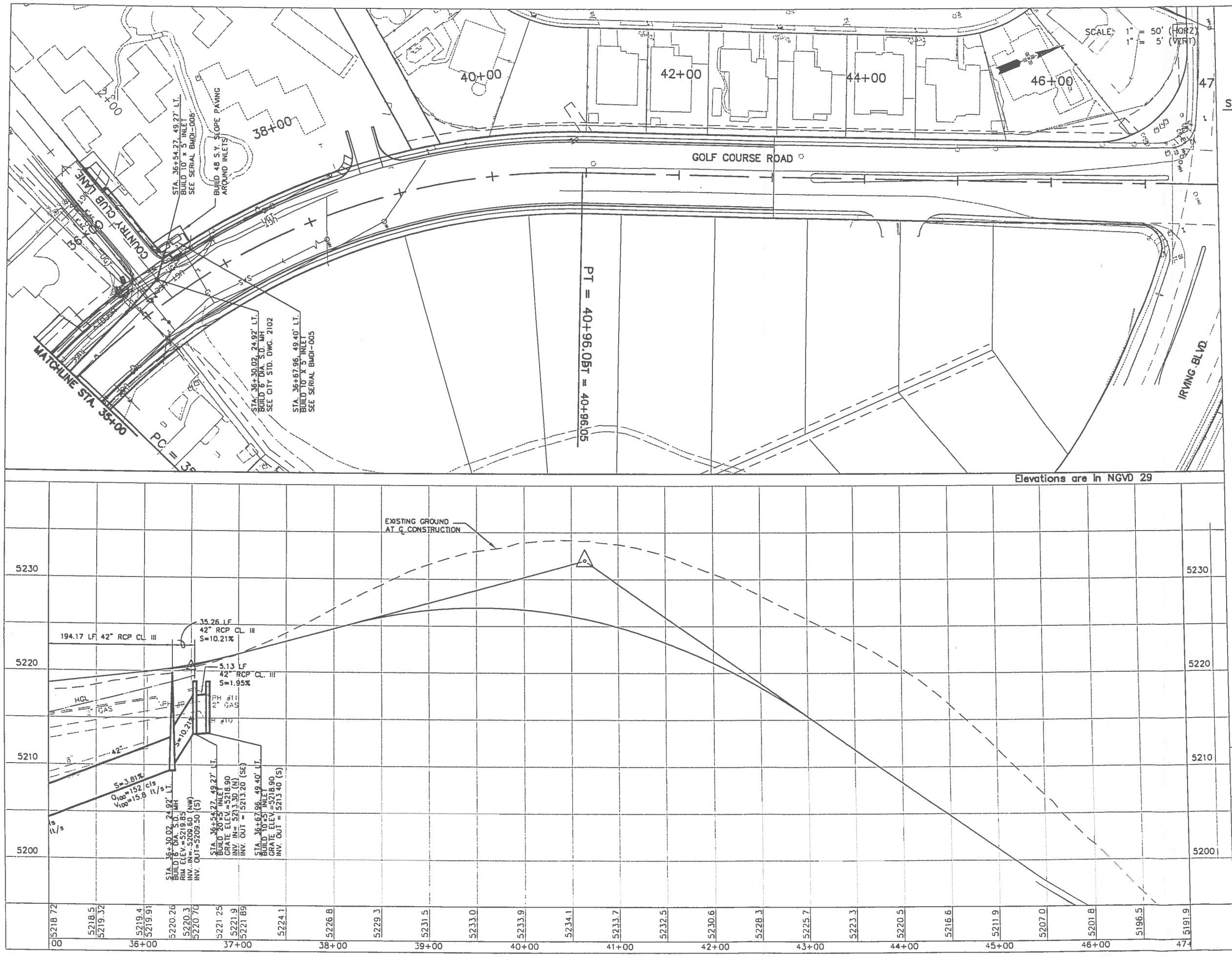
GOLF COURSE RD. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No.

Zone Map No. B-12-Z

Sheet 44 Of 135



GRAPHIC SCALE

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB ℄. MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

CONTRACTOR — DATE

WORK STAKED BY — DATE

INSPECTOR'S FIELD CHANGE BY — DATE

FIELD VERIFICATION BY — DATE

DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION

RECORDED BY — DATE

NO.

BENCH MARKS

USGS Brass Tablet stamped "Block-2 1977" Intersection of Golf Course Rd. & McMahon Blvd.

Geographic Position (NAD 27), in feet

N.M. State Plane Coordinates (Central Zone)

X=372,920.43, Y=1,530,241.52

Elevation=5213.926 NGVD29, in feet

Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.59]

Transformed to Interim NAD83 by Corpscon V5.11.08

SURVEY INFORMATION

FIELD NOTES

NO.	DATE	BY

ENGINEER'S SEAL

REMARKS

NO.	DATE	BY

DESIGN

DESIGNED BY — DATE

DRAWN BY — DATE

CHECKED BY — DATE

Parsons Brinckerhoff

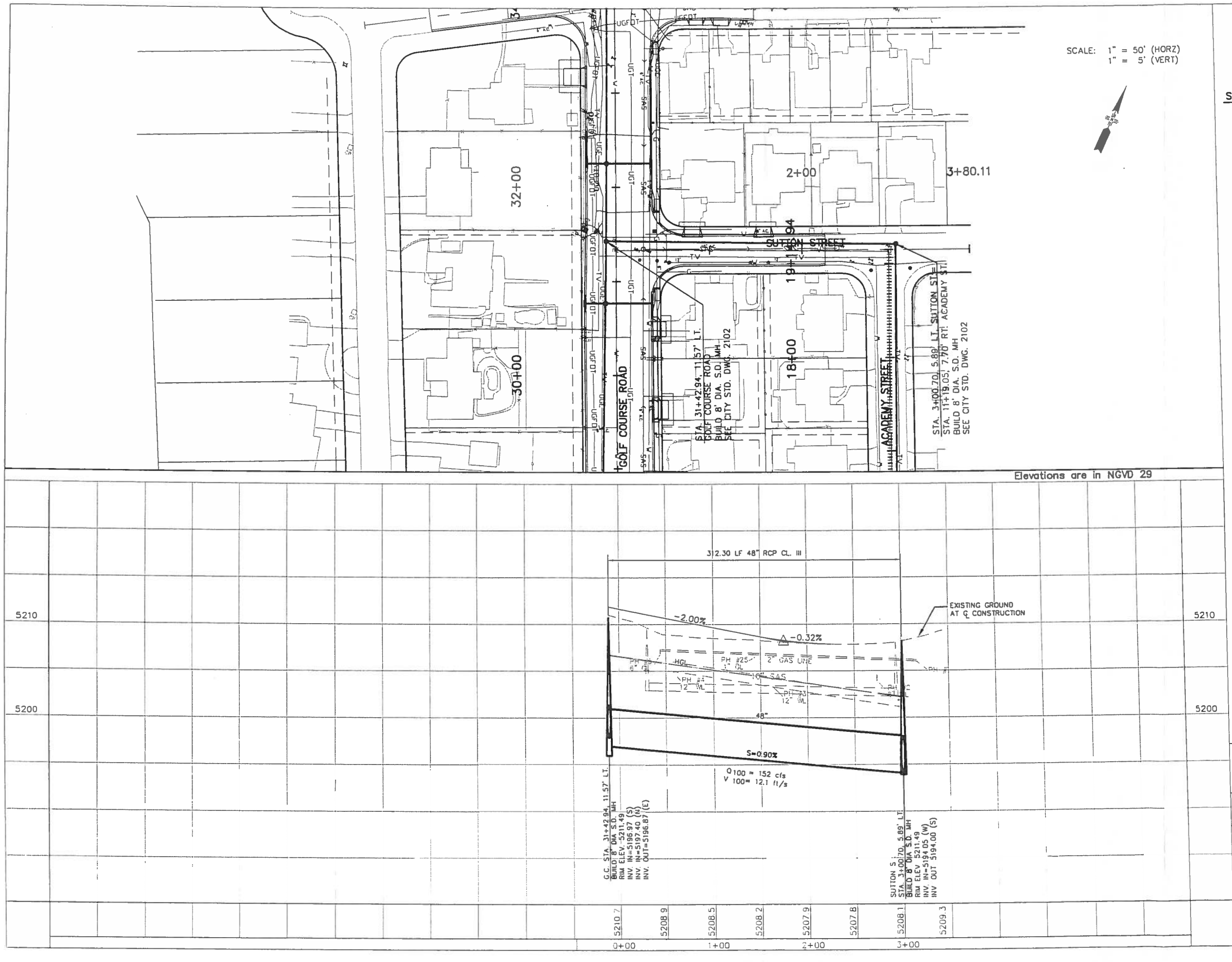
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

GOLF COURSE RD. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 45 Of 135



GRAPHIC SCALE

100 0 25 50 100

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB ℄. MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

BENCH MARKS

USGS Brass Tablet stamped "Black-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
x=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084,
Y=1,530,307.59]
Transformed to interim NAD83 by Corpscon V5.11.08

CONTRACTOR
WORK STARTED BY — DATE
INSPECTOR'S ACCEPTANCE BY — DATE
AS-BUILT VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

SURVEY INFORMATION
FIELD NOTES
NO. | BY | DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN
DESIGNED BY — DATE
DRAWN BY — DATE

PB Parsons Brinckerhoff

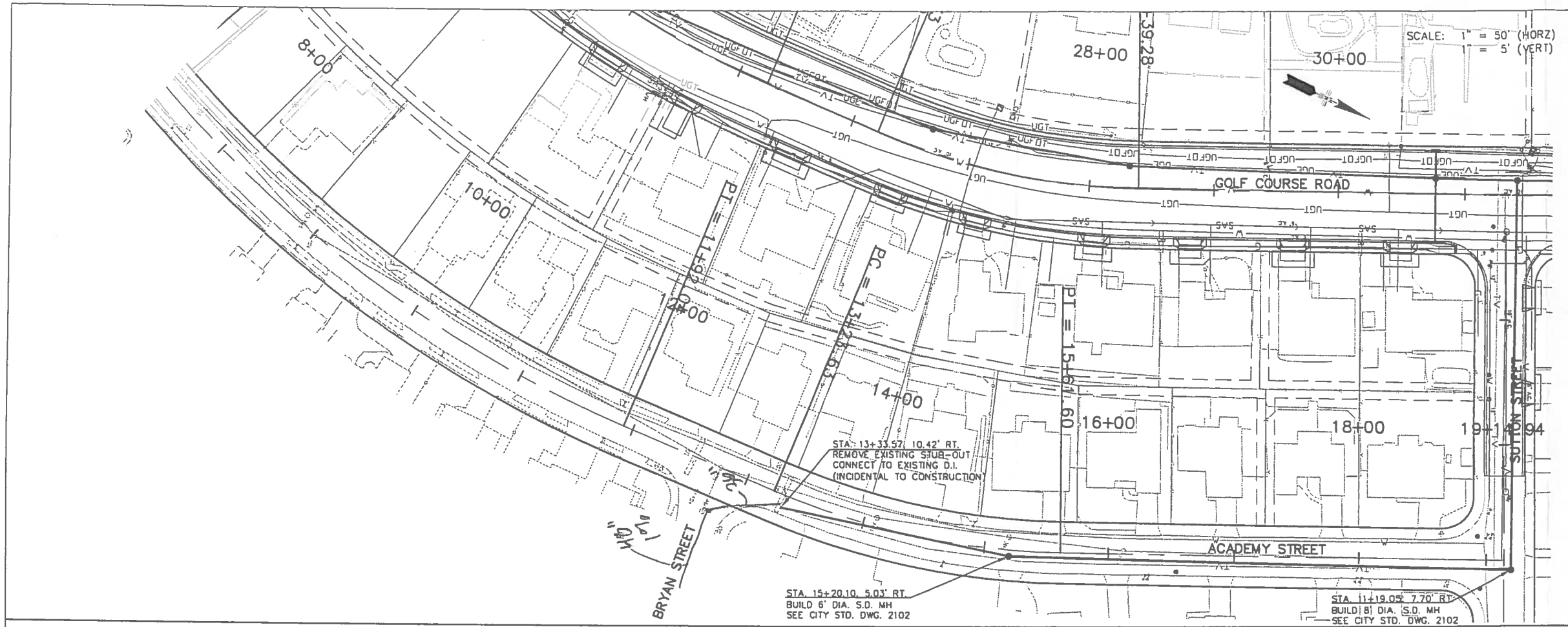
COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

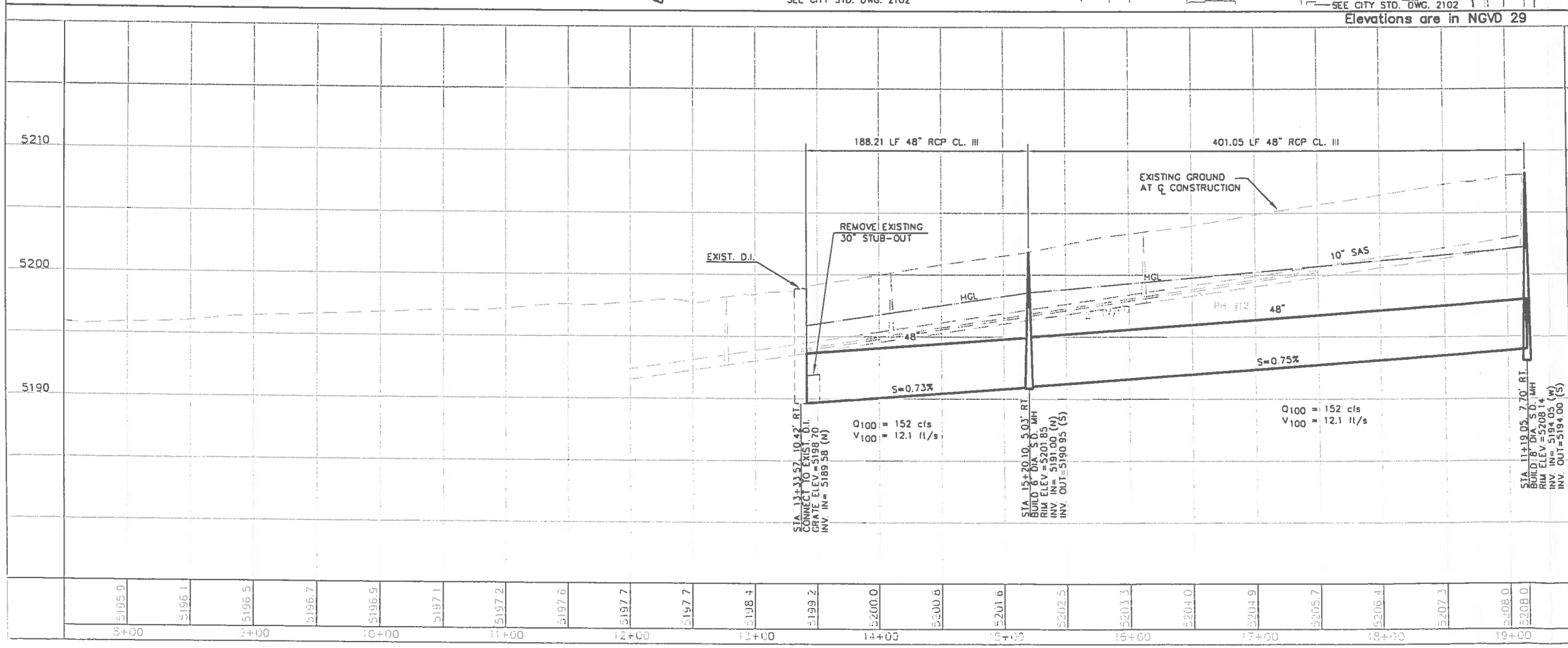
GOLF COURSE ROAD RECONSTRUCTION

SUTTON ST. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL		MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 46 Of 135





GRAPHIC SCALE

100 0 25 50 100

(IN FEET)
1 inch = 50 ft.

STORM DRAIN NOTES.

1. LINE LENGTHS ARE COMPUTED FROM ℄ TO ℄ OF STRUCTURE ALONG THE HORIZONTAL.
2. SLOPES ARE COMPUTED ℄ TO ℄.
3. GRATE ELEVATIONS ARE GIVEN AT THE NORMAL CURB FL. MH RIM ELEVATIONS ARE APPROXIMATE. CONTRACTOR SHALL ADJUST RIMS TO FINAL GRADE.

AS BUILT INFORMATION

CONTRACTOR
WORK STAKED BY — DATE
WORK WITNESSED & ACCEPTANCE BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE
RECORDED BY — DATE
NO.

BENCH MARKS

USGS Brass Tablet stamped "Block-2 1977"
Intersection of Golf Course Rd. & McMahon Blvd.
Geographic Position (NAD 27), in feet
N.M. State Plane Coordinates (Central Zone)
X=372,920.43, Y=1,530,241.52
Elevation=5213.926 NGVD29, in feet
Interim NAD 83, in feet [X=1,513,169.084, Y=1,530,307.59]
Transformed to interim NAD83 by Corpscon V5.11.08

MICRO-FILM INFORMATION

SURVEY INFORMATION

FIELD NOTES

NO.	DATE	BY

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

DESIGN — DATE
DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

PB Parsons Brinckerhoff

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

ACADEMY ST. DRAINAGE PLAN AND PROFILE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO./DAY/YR.	MO./DAY/YR.

City Project No. | Zone Map No. B-12-Z | Sheet 47 Of 135

Appendix F
Inlet Capacity Calculations

GOLF COURSE ROAD
DRAINAGE REVISIONS—95%
J. Buckman
Checked by: NVA
11/12/03

Updated inlet flows:

Inlet 9a/9: Q100=19.6 cfs—Basin 203.2 is now intercepted at Inlet 11, moved to the NW corner of Golf Course and Country Club.

Inlet 10: With proposed grading, bypass flow from Inlet 10a will flow east down Sutton to existing inlets at Academy and Bryan (similar to existing conditions). Therefore at Inlet 10, Q100=1.36 cfs from Basin 102.2.

Updated inlet sizes:

Inlet 9: Double type C inlet (see attached Pavement Drainage spreadsheet)
Inlet 10: Double type C inlet assumed
Inlet 11: Use (2)-10' x 5' drop inlets (see attached HEC-12 calculation)

Hydraulic Grade Lines:

See attached Summary of Hydraulic Calculations spreadsheets.

95%
Pavement Drainage
Golf Course Road

		Capture Ratios:	67%	80%	50%	
JOB: 33515			LT	LT	LT	LT
Inlet Number:				9a	9a	9a
Drainage Area Reference	(Input Data)		9	9.2	9.1	9.1
Return Period:			100	100	100	100
Allowable Spread:			34	34	34	34
RATIONAL METHOD HYDROLOGY COMPUTATION:			⇓	⇐	⇐	⇐
Structure Station: (Stationing off of Rt. 66 CL)			30+43	32+25	32+45	32+45
Location Description:			grate	grate	grate	curb
Pavement Area (ac):			0.000	0.000	0.000	0.000
Adjacent Area (ac):						
Contributing watershed area (acres):			0.000	0.000	0.000	0.000
Pavement Runoff Coefficient "C":			0.95	0.95	0.95	0.95
Adjacent Runoff Coefficient "C":			0.71	0.71	0.71	0.71
Composite Runoff Coefficient "C":			0.95	0.95	0.95	0.95
Precipitation intensity (in/hr):			6.10	6.10	6.10	6.10
Subarea discharge Q (cfs):			0.00	0.00	0.00	0.00
Previous by-pass flow (cfs):			7.23	12.48	18.18	
Discharge added by operator:			—	—	—	19.6
Total discharge Q (cfs):			7.23	12.48	18.18	19.60
CA			0.00	0.00	0.00	0.00
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:			0.017	0.017	0.017	0.017
Longitudinal slope S (ft/ft):			0.0010	0.0180	0.0200	0.0200
Inlet type (1=grate, 2=curb opening, 3=slotted):			1	1	1	2
Longitudinal profile (1=on-grade, 2=sag):			2	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):			2	2	2	2
Capture Ratio Used:			50%	50%	50%	80%
Inlet Standard:			dbl type C	dbl type C	type A	type A
Grate width:			2	2	2	n/a
Grate length:			6.6	6.6	3.3	n/a
Pavement cross-slope (Sx):			0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):			2.00	2.00	2.00	2.00
Gutter depression from horizontal @ lip (ft):			0.125	0.125	0.125	0.125
Gutter cross-slope Sw: (S'w=Sw-Sx)			0.063	0.063	0.063	0.063
Flooded Width from flowline (ft): before inlet		NA		16.6	18.8	19.4
Depth at flowline (ft): before inlet			0.00	0.42	0.46	0.47
Water cross-area (sq.ft): before inlet			0.00	2.84	3.63	3.85
Velocity V for total discharge (fps): before inlet			0.00	4.40	5.00	5.10
Ratio of gutter depression flow to total Q (Eod):			100.0%	33.7%	29.7%	28.9%
Equivalent cross-slope (Se):			0.063	0.034	0.033	0.032
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:		----		33.7%	29.7%	----
Inlet frontal flow in cfs (Qw):		----		4.21	5.40	----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):		----		11.0	7.2	----
Fraction of frontal flow intercepted (Rf):		----		100.0%	100.0%	----
Side flow in cfs (Qs):		----		8.28	12.78	----
Effective grate length w/clogging:		----		3.30	1.67	----
Fraction of side flow interception (Rs):		----		12.6%	2.3%	----
Grate Efficiency (E):		----		42.1%	31.3%	----
Total flow intercepted (cfs):		----		5.25	5.70	----
Grate flow-by (cfs):		----		7.23	12.48	----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft) w/clogging			----	----	----	73.2
Length of inlet provided L (ft):			0	0		3
Interception for length L (cfs):			----	----	----	1.42
Efficiency for length L:			----	----	----	0.07
Slotted drain or curb opening flow-by (cfs):			----	----	----	18.18
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):			0.67			
Capacity of grate in a sag (3-sided weir):		8.72		Head Available?	Head Available?	----
Capacity of grate in a sag (4-sided weir):		14.1		Head Available?	Head Available?	----
Length provided of curb-opening or slotted drain at sag:						
Capacity of curb-opening or slotted drain in a sag (weir):		----		----	----	----
Length of the vertical curve (ft x 100):						
approach grade #1 (%):						
approach grade #2 (%):						
ABS (algebraic diff. in approach grades) (%):			0.00	----	----	----
K = Min(Lc/A,167) (Table 5, HEC-12):		#DIV/0!		----	----	----
Flanking inlets maximum distance (ft):		#DIV/0!		----	----	----
TRIANGULAR MEDIAN HYDRAULICS:						
Manning's n for median finish:						
Cross-slope of median sides:						
Depth of flow at center of median (ft):		----		----	----	----
Flooded width in the median (ft):		----		----	----	----
Water velocity in the median (fps):		----		----	----	----

Design by: JBuckman

PROJECT 33515
HEC12 Version: V2.91 1-10'x5' inlet (50% clogging assumed) Run Date: 11-10-2003

==========

INLET NUMBER ~~N/A~~ 11 LENGTH 0.0 STATION 36+50 LT

TOTAL PEAK DISCHARGE = 76.00 (cfs)

XXXXXXXXXX GRATE INLET IN A TRAPEZOIDAL CHANNEL XXXXXXXXXX
DEPTH OF WATER (ft)= 1.24 PERIMETER OF GRATE (ft)= 18.40 AREA (sq ft)= 21.10

SUMMARY OF HYDRAULIC CALCULATIONS																						BY:	JBUCKMAN
CLOSED CONDUIT																						DATE:	11/1/2003
																						SHEET:	
PROJECT:				LINE:	run 1																		
100-year																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
										JUNCTION		LOSSES											
STATION	STRUCT	D	Q	A	V	K	Sf	L	DELTA	D	ANGLE	hf	hb	hj	hmh	ht	hmisc	SUM	E.G.	hv	H.G.	REMARKS	
		IN	CFS	FT^2	FT/S		FT/FT	FT				FT	FT	FT	FT	FT	FT	FT					
		29																			94.24	STARTING HGL	
2+29	exist di												0.00					0.00	95.44	1.20	94.24		
		29	65	7.40	8.78	767	0.0072	62.8				0.45						0.45	95.89	1.20	94.69		
2+79	mh								30	24	90		0.13	0.07	0.00	0.00		0.21	96.06	1.16	94.90		
		29	64	7.40	8.65	767	0.0070	41				0.29						0.29	96.35	1.16	95.18		
3+20	mh									30	90		0.00	0.61	0.00	0.00		0.61	96.65	0.86	95.79		
		29	55	7.40	11.26	767	0.0051	260				1.34						1.34	100.86	1.97	98.89		
5+80	mh												0.00	0.00	0.07	0.00		0.07	100.39	1.43	98.96		
		29	55	7.40	9.60	767	0.0051	426				2.19						2.19	104.61	1.43	103.18		
10+06	mh									24	70		0.00	0.96	0.00	0.00		0.96	104.53	0.38	104.14		
		24	14	3.14	4.46	226.24	0.0038	103				0.39						0.39	104.85	0.31	104.54		
11+08	mh									30	45		0.00	0.27	0.00	0.00		0.27	105.12	0.32	104.80		
		18	8	1.77	4.53	105.05	0.0058	53.8				0.31						0.31	105.43	0.32	105.11		
11+45	cdi												0.00	0.00	0.00	0.00		0.00	105.11	0.00	105.11		
		18	0	1.77																		DUMMY U.S. DATA	
REMARKS:										Manning's n=		0.013											

SUMMARY OF HYDRAULIC CALCULATIONS
CLOSED CONDUIT

BY: JBUCKMAN
DATE: 11/1/2003
SHEET:

PROJECT: LINE: run 2
100-year

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
										JUNCTION		LOSSES										
STATION	STRUCT	D	Q	A	V	K	Sf	L	DELTA	D	ANGLE	hf	hb	hj	hmh	ht	hmisc	SUM	E.G.	hv	H.G.	REMARKS
		IN	CFS	FT^2	FT/S		FT/FT	FT				FT	FT	FT	FT	FT	FT	FT				
		42																			106.72	STARTING HGL
31+43	mh												0.00					0.00	106.79	0.07	106.72	
		42	20	9.62	2.08	1006.2	0.0004	66				0.03						0.03	106.81	0.07	106.75	
30+77										30	90		0.00	0.02	0.00	0.00		0.02	106.86	0.10	106.76	
		36	18	7.07	2.55	667.03	0.0007	245				0.18						0.18	107.04	0.10	106.94	
28+32									10				0.01	0.00	0.01	0.00		0.03	107.18	0.21	106.97	
		30	18	4.91	3.67	410.2	0.0019	168				0.32						0.32	107.50	0.21	107.29	
26+64									15				0.02	0.00	0.01	0.00		0.03	107.53	0.21	107.32	
		30	18	4.91	3.67	410.2	0.0019	245				0.47						0.47	108.00	0.21	107.79	
24+19									10				0.01	0.00	0.01	0.00		0.02	108.02	0.21	107.82	
		30	18	4.91	3.67	410.2	0.0019	125				0.24						0.24	108.27	0.21	108.06	
22+94									10				0.01	0.00	0.01	0.00		0.02	108.29	0.21	108.08	
		30	18	4.91	3.67	410.2	0.0019	167				0.32						0.32	108.61	0.21	108.40	
21+27										24	90		0.00	0.57	0.00	0.00		0.57	109.01	0.04	108.97	
		18	3	1.77	1.70	105.05	0.0008	51				0.04						0.04	109.06	0.04	109.01	
21+27													0.00	0.00	0.00	0.00		0.00	109.01	0.00	109.01	
		18	0	1.77																		DUMMY U.S. DATA

REMARKS: Manning's n= 0.013

SUMMARY OF HYDRAULIC CALCULATIONS
CLOSED CONDUIT

BY: JBUCKMAN
DATE: 11/1/2003
SHEET:

PROJECT:
LINE: run 3
100-year

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
										JUNCTION		LOSSES										
STATION	STRUCT	D	Q	A	V	K	Sf	L	DELTA	D	ANGLE	hf	hb	hj	hmh	ht	hmisc	SUM	E.G.	hv	H.G.	REMARKS
		IN	CFS	FT^2	FT/S		FT/FT	FT				FT	FT	FT	FT	FT	FT	FT				
		36																			93.20	STARTING HGL
26+09	ex mh												0.00					0.00	100.38	7.18	93.20	
		36	152	7.07	21.50	667.03	0.0519	47				2.44						2.44	102.82	7.18	95.64	
26+50	ex di												0.00	0.00	0.11	0.14		0.25	98.16	2.27	95.89	
		48	152	12.57	12.10	1436.5	0.0112	122				1.37						1.37	99.53	2.27	97.26	
27+72	mh								10				0.15	0.00	0.11	0.00		0.27	99.80	2.27	97.53	
		48	152	12.57	12.10	1436.5	0.0112	367				4.11						4.11	103.91	2.27	101.64	
31+39	mh								90				0.45	0.00	0.11	0.00		0.57	104.48	2.27	102.20	
		48	152	12.57	12.10	1436.5	0.0112	313				3.50						3.50	107.98	2.27	105.71	
31+43	mh								90				0.78	0.00	0.19	0.04		1.01	110.60	3.88	106.72	
		42	152	9.62	15.80	1006.2	0.0228	82				1.87						1.87	112.47	3.88	108.59	
32+25	mh												0.00	0.00	0.19	0.00		0.19	112.66	3.88	108.79	
		42	152	9.62	15.80	1006.2	0.0228	215				4.91						4.91	117.57	3.88	113.69	
34+40	mh												0.00	0.00	0.19	0.00		0.19	117.76	3.88	113.89	
		42	152	9.62	15.80	1006.2	0.0228	190				4.35						4.35	122.11	3.88	118.23	
36+30	mh								30				0.45	0.00	0.19	0.00		0.64	122.75	3.88	118.87	
		42	152	9.62	15.80	1006.2	0.0228	30.6				0.70						0.70	123.45	3.88	119.57	
36+54	di												0.00	0.00	0.00	0.00		0.00	119.57	0.00	119.57	
		42	0	9.62																		DUMMY U.S. DATA

REMARKS: Manning's n= 0.013

GOLF COURSE ROAD
EXISTING C COEFFICIENTS
JBuckman, 6/24/03

	10-YR									100-YR								
	LAND TREATMENT								COMPOS-	LAND TREATMENT								COMPOS-
	A		B		C		D		ITE	A		B		C		D		ITE
BASIN	%	C	%	C	%	C	%	C	C	%	C	%	C	%	C	%	C	C
100		0.08		0.24	37	0.47	63	0.92	0.75		0.27		0.43	37	0.61	63	0.93	0.81
101.1		0.08		0.24	74	0.47	26	0.92	0.59		0.27		0.43	74	0.61	26	0.93	0.69
101.2		0.08		0.24	74	0.47	26	0.92	0.59		0.27		0.43	74	0.61	26	0.93	0.69
102		0.08		0.24	43	0.47	57	0.92	0.73		0.27		0.43	43	0.61	57	0.93	0.79
200		0.08	37	0.24	37	0.47	26	0.92	0.50		0.27	37	0.43	37	0.61	26	0.93	0.63
201		0.08	37	0.24	37	0.47	26	0.92	0.50		0.27	37	0.43	37	0.61	26	0.93	0.63
202		0.08	37	0.24	37	0.47	26	0.92	0.50		0.27	37	0.43	37	0.61	26	0.93	0.63
203.1		0.08	37	0.24	37	0.47	26	0.92	0.50		0.27	37	0.43	37	0.61	26	0.93	0.63
203.2		0.08	10	0.24	10	0.47	80	0.92	0.81		0.27	10	0.43	10	0.61	80	0.93	0.85
204		0.08	37	0.24	37	0.47	26	0.92	0.50		0.27	37	0.43	37	0.61	26	0.93	0.63

GOLF COURSE ROAD
PROPOSED C COEFFICIENTS
FJohnston, 7/9/03

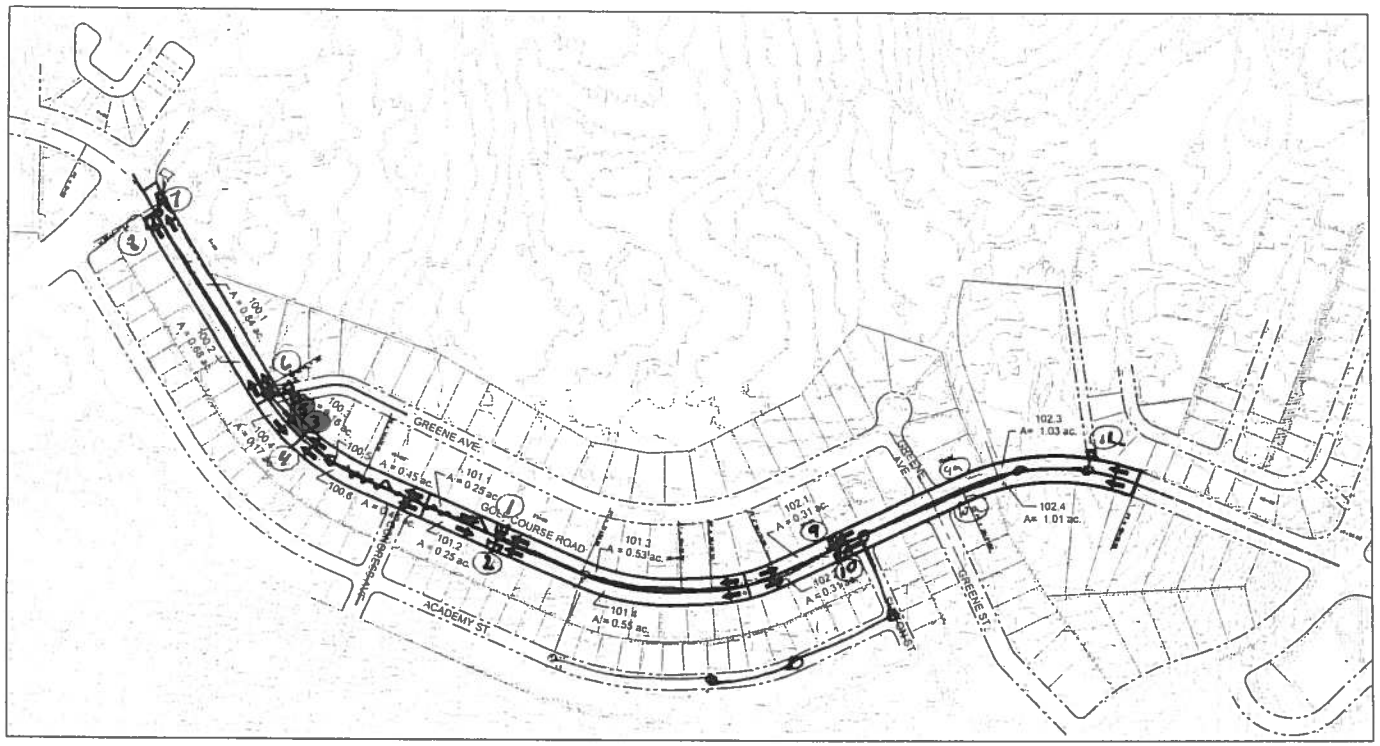
	10-YR									100-YR								
	LAND TREATMENT								COMPOS-	LAND TREATMENT								COMPOS-
	A		B		C		D		ITE	A		B		C		D		ITE
BASIN	%	C	%	C	%	C	%	C	C	%	C	%	C	%	C	%	C	C
100.1		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
100.2		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
100.3		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
100.4		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
100.5		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
100.6		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
101.1		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
101.2		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
101.3		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
101.4		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
102.1		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
102.2		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
102.3		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93
102.4		0.08		0.24		0.47	100	0.92	0.92		0.27		0.43		0.61	100	0.93	0.93

GOLF COURSE ROAD
EXISTING PEAK FLOW CALCULATIONS
JBuckman, 6/24/03

		10-Year					100-Year				
Basin no.	Drainage Area ac	Time of Concentration hrs	C	P_{60} in	I in/hr	Peak Flow cfs	C	P_{60} in	I in/hr	Peak Flow cfs	Remarks
100	3.25	0.20	0.75	1.25	3.14	7.69	0.81	1.87	4.70	12.40	
101.1	1.08	0.20	0.59	1.25	3.14	1.99	0.69	1.87	4.70	3.52	
101.2	0.68	0.20	0.59	1.25	3.14	1.25	0.69	1.87	4.70	2.22	
102	2.77	0.20	0.73	1.25	3.14	6.32	0.79	1.87	4.70	10.32	
200	0.81	0.20	0.50	1.25	3.14	1.28	0.63	1.87	4.70	2.39	
201	16.30	0.20	0.50	1.25	3.14	25.69	0.63	1.87	4.70	48.00	
202	3.91	0.20	0.50	1.25	3.14	6.16	0.63	1.87	4.70	11.52	
203.1	3.99	0.20	0.50	1.25	3.14	6.29	0.63	1.87	4.70	11.75	
203.2	6.08	0.20	0.81	1.25	3.14	15.41	0.85	1.87	4.70	24.23	
204	5.31	0.20	0.50	1.25	3.14	8.37	0.63	1.87	4.70	15.64	

GOLF COURSE ROAD
PROPOSED PEAK FLOW CALCULATIONS
FJohnston, 7/9/03

Basin no.	Drainage Area ac	Time of Concentration hrs	10-Year				100-Year				Remarks
			C	P_{60} in	I in/hr	Peak Flow cfs	C	P_{60} in	I in/hr	Peak Flow cfs	
100.1	0.84	0.20	0.92	1.25	3.14	2.43	0.93	1.87	4.70	3.67	
100.2	0.68	0.20	0.92	1.25	3.14	1.96	0.93	1.87	4.70	2.97	
100.3	0.16	0.20	0.92	1.25	3.14	0.46	0.93	1.87	4.70	0.70	
100.4	0.17	0.20	0.92	1.25	3.14	0.49	0.93	1.87	4.70	0.74	
100.5	0.45	0.20	0.92	1.25	3.14	1.30	0.93	1.87	4.70	1.97	
100.6	0.46	0.20	0.92	1.25	3.14	1.33	0.93	1.87	4.70	2.01	
101.1	0.25	0.20	0.92	1.25	3.14	0.72	0.93	1.87	4.70	1.09	
101.2	0.25	0.20	0.92	1.25	3.14	0.72	0.93	1.87	4.70	1.09	
101.3	0.53	0.20	0.92	1.25	3.14	1.53	0.93	1.87	4.70	2.32	
101.4	0.55	0.20	0.92	1.25	3.14	1.59	0.93	1.87	4.70	2.40	
102.1	0.31	0.20	0.92	1.25	3.14	0.90	0.93	1.87	4.70	1.36	
102.2	0.31	0.20	0.92	1.25	3.14	0.90	0.93	1.87	4.70	1.36	
102.3	1.03	0.20	0.92	1.25	3.14	2.98	0.93	1.87	4.70	4.50	
102.4	1.01	0.20	0.92	1.25	3.14	2.92	0.93	1.87	4.70	4.41	



PROPOSED DRAINAGE BASINS

LEGEND

FLOW DIRECTION ➡

BASIN BOUNDARY ———

BASIN NUMBER 100.

INLET NO. (1)

SCALE 200' 0 200' 400'
HORIZ. 1" = 200'

AS BUILT INFORMATION
CONTRACTOR
WORK STARTED BY / DATE
WORK ACCEPTED BY / DATE
FINAL INSPECTION BY / DATE
CERTIFICATE OF COMPLETION BY / DATE
MICRO-FILM INFORMATION
RECORDED BY / DATE
MD

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL

NO	DATE	REMARKS	BY

DESIGN
DESIGNED BY / DATE
DRAWN BY / DATE
CHECKED BY / DATE

PB Parsons Brinckerhoff

COUNTY OF BERNALILLO
PUBLIC WORKS DIVISION
TECHNICAL SERVICES ENGINEERING SECTION

GOLF COURSE ROAD RECONSTRUCTION

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MD/DAT/YR	MD/DAT/YR

City Project No. | Zone Map No. B-12-Z | Sheet Of

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page 1 of 33515

Subject Golf Course Road
Drainage Analysis

Made by AJohnston
Date 7/29/03
Checked by DBG
Date 7/29/03

Drainage basins + flows ⇒ see attached maps and spreadsheets

Inlet Layout ⇒ see attached map

Inlet #	Existing (off-site) Basin #	100-yr Flow	Proposed (on-site) Basin #	100-yr Flow (cfs)	Total Flows (cfs)
1	202	$\frac{3.23}{3.91}(11.52) = 9.52$	101.1	1.09	14.67
2	201	$\frac{0.67}{16.35}(48.00) = 1.74$	101.3	2.32	
			101.2	1.09	3.49
			101.4	2.40	
3	201	$\frac{1.25}{16.35}(48.00) = 5.45$	100.3	0.70	8.12
			100.5	1.97	
4			100.4	0.74	2.75
			100.6	2.01	
5	201	$\frac{1}{2}\left(\frac{13.86}{16.35}(48.00)\right) = 20.41$			20.41
6	201	$\frac{1}{2}\left(\frac{13.86}{16.35}(48.00)\right) = 20.41$			20.41
7			100.1	3.67	3.67
8	200	2.39	100.2	2.97	5.36
9	202	$\frac{0.67}{3.91}(11.52) = 2.00$			
	203.1	11.75	102.1	1.36	41.84
	203.2	24.23	102.3	4.50	
10	204	15.64	102.2	1.36	21.41
			102.4	4.41	
11	N/A	152	N/A	—	152

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
Street capacity @ Inlet 1
July 10, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	14.67
Channel Bottom Slope (ft/ft)	0.002
Manning's Roughness Coefficient (n-value)	0.017
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	50.0
Channel Bottom Width (ft)	0.01

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.59
Flow Velocity (fps)	1.71
Froude Number	0.556
Velocity Head (ft)	0.05
Energy Head (ft)	0.63
Cross-Sectional Area of Flow (sq ft)	8.59
Top Width of Flow (ft)	29.31

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
Street Capacity @ Inlet 3
July 10, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	8.12
Channel Bottom Slope (ft/ft)	0.002
Manning's Roughness Coefficient (n-value)	0.017
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	50.0
Channel Bottom Width (ft)	0.01

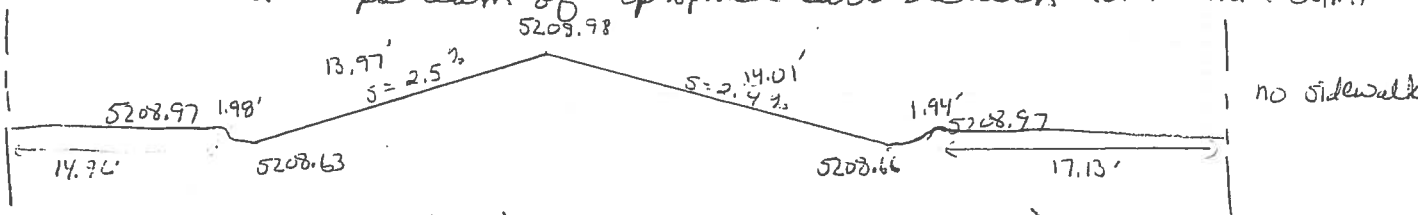
COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.47
Flow Velocity (fps)	1.47
Froude Number	0.537
Velocity Head (ft)	0.03
Energy Head (ft)	0.5
Cross-Sectional Area of Flow (sq ft)	5.51
Top Width of Flow (ft)	23.47

Street Capacity con't:

Green Ave. assumptions for inlets 5+6

20' upstream of proposed curb return (elev. from dtm)



street grade (from DTM + mapping) = 1.19%

Inlet 5+6

Q = 20.41 cfs bottom slope = 0.0119 n=0.017 left = 0

right side slope (2.5%) = 40 ft/ft bottom width = 0.01

222 print out of program results

- normal depth = 0.52' > 0.34' of curb
- top width of flow = 20.67' > 13.[illegible]' to crown

run additional program

```
0.000000 9.500000
0.010000 8.970000
15.000000 8.970000
17.000000 8.630000
31.000000 8.980000
31.010000 9.500000
```

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
Street Capacity @ Inlet 8
July 14, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	5.36
Channel Bottom Slope (ft/ft)	0.0252
Manning's Roughness Coefficient (n-value)	0.017
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	50.0
Channel Bottom Width (ft)	0.01

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.25
Flow Velocity (fps)	3.45
Froude Number	1.72
Velocity Head (ft)	0.18
Energy Head (ft)	0.43
Cross-Sectional Area of Flow (sq ft)	1.56
Top Width of Flow (ft)	12.47

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
Street Capacity @ Inlet 9
July 10, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	43.84
Channel Bottom Slope (ft/ft)	0.002
Manning's Roughness Coefficient (n-value)	0.017
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	50.0
Channel Bottom Width (ft)	0.01

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.89
Flow Velocity (fps)	2.24
Froude Number	0.592
Velocity Head (ft)	0.08
Energy Head (ft)	0.96
Cross-Sectional Area of Flow (sq ft)	19.61
Top Width of Flow (ft)	44.28

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
Street Capacity @ Inlet 10
July 10, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	21.41
Channel Bottom Slope (ft/ft)	0.002
Manning's Roughness Coefficient (n-value)	0.017
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	50.0
Channel Bottom Width (ft)	0.01

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.68
Flow Velocity (fps)	1.88
Froude Number	0.569
Velocity Head (ft)	0.05
Energy Head (ft)	0.73
Cross-Sectional Area of Flow (sq ft)	11.42
Top Width of Flow (ft)	33.79

Subject Golf Course Road Drainage Analysis

Inlet sizing

Inlet 1 @ sta. ≈ 19+76.77 lt (low pt. sta)
normal depth = 0.59'
profile grade @ 19+76.77 low pt. = 0.002

Q_{pr} = 14.67 cfs $Q_{0.59} \simeq 7.2$ cfs $Q_{0.67} \simeq 9$ cfs use 2 double
clogging factor 15% $Q_{0.67} \simeq 9 - 1.35 = 7.65$ cfs ∴ grate C

Inlet 2 @ sta ≈ 19+76.77 rt (low pt. sta)
normal depth = 0.84'
profile grade @ 19+76.77 low pt = 0.002

Q_{pr} = 3.41 cfs $Q_{0.84} \simeq 1.65$ $Q_{0.67} \simeq 7.2$ cfs ∴ use single grate A

Inlet 3 @ sta ≈ 11+84.79 lt (low pt. sta)
normal depth = 0.47'
profile grade @ 11+84.79 low pt = 0.002

Q_{pr} = 8.12 cfs $Q_{0.47} \simeq 3.5$ cfs $Q_{0.67} \simeq 7.2$ cfs

Inlet 4 @ sta ≈ 11+84.79 rt (low pt sta)
normal depth = 0.31'
profile grade @ 11+84.79 low pt = 0.002

Q_{pr} = 2.75 cfs $Q_{0.31} \simeq 1.3$ cfs $Q_{0.67} \simeq 7.2$ cfs ∴ use single grate A

Inlets 5+6 @ Arlene Ave.
normal depth = 0.46'
assumed profile grade = 1.19% = 0.0119

Q_{pr} = 20.1 cfs $Q_{0.46}$ = 6.5 cfs ← use single grate A
left over: Q = 13.91 cfs / each

Q_5 = 13.91 cfs heads south
Q_6 = 13.91 cfs heads south

Subject Golf Course Road
Drainage Analysis

Inlet sizing con't

Inlet 8 @ ≈ sta. 3+20 rt
normal depth = 0.28'
profile grade @ 3+20 = 2% = 0.02

Q_{pr} = 5.36 $Q_{0.28}$ = 2.5 cfs ~~$Q_{0.67}$ = 12.25~~ ∴ use single grate A
Q_{left} = 2.86 depth = 0.20' $Q_{0.20}$ = 1.55 ∴ use dble C

Inlet 9a @ ≈ sta. 32+45 lt
normal depth = 0.57'
profile grade @ 32+25 = 2.00% = 0.02

Q_{pr} = 43.84 cfs $Q_{0.57'}$ = 9.75 single grate A
Q_{left} = 34.09 depth = 0.52' $Q_{0.52}$ = 10.25

∴ use dble grate C remainder of flow to inlet 9

Inlet 9 @ ≈ ~~30+51.18~~ 30+43.14 lt (low pt. sta)
normal depth = 0.70
profile grade @ 30+51.18 low pt = 0.002

Q_{left} = 23.94 cfs ~~$Q_{0.7}$ = 8.2~~ $Q_{0.47}$ = 9 ∴ use ~~2 grate C~~ 3.5 dble C
15% clogging factor Q = 9 - 1.35 = 7.65

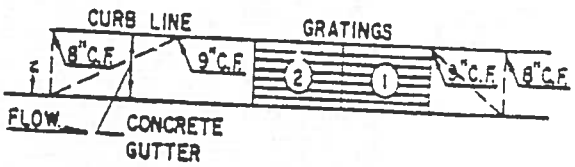
Inlet 10a @ ≈ sta. 32+25 lt
normal depth = 0.44'
profile grade @ 32+20 = 2.00% = 0.02

Q_{pr} = 21.41 cfs $Q_{0.44}$ = 6.4 ∴ use single grate A
remainder of flow to inlet 10

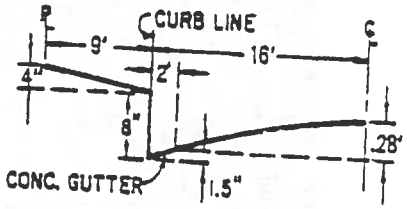
Inlet 1 @ low pt. 19+76.77 lt

Page 21 of ____ PB 100 Years
Made by TJ Date 7/11/03
Checked by DBS Date 7/29/03

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

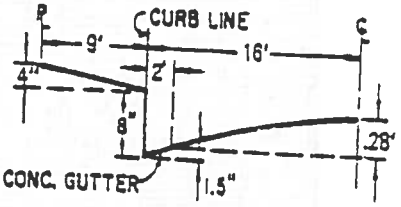
PLATE 22.3 D-6

Inlet 3 @ low pt. 11+84.79 LT

Page 23 of ____ PB100 Years
Made by Ghorbanian
Date 7/18/03
Checked by DBG
Date 7/29/03

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

PLATE 22.3 D-6

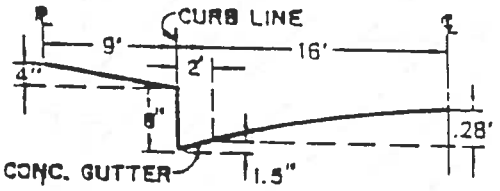
Inlet 4 @ low pt. 11+84.79 rt

22

Page 22 of ____ **PB**100 Years
Made by TJH Date 7/10/03
Checked by DBG Date 7/10/03

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

GRATING & GUTTER PLAN



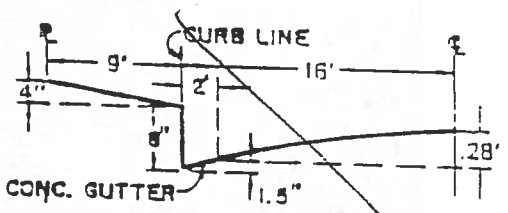
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

Inlets 5+6 @ Greene Ave.

Page 26 of ____
Made by TJH Date 7/15/03
Checked by PBG Date 7/20/03
PB100 Years

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

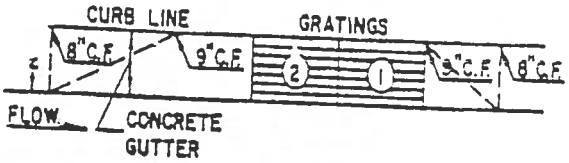
REV. 3-83

PLATE 2C3.0-5

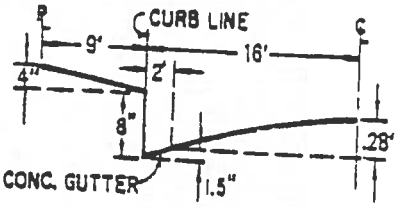
Inlet 7@ 2+45 (use D/ Type A at 2+65)

Page 28 of ____ PB 100 Years
Made by [illegible]
Date 7/11/03
Checked by [illegible]
Date 7/29/03

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



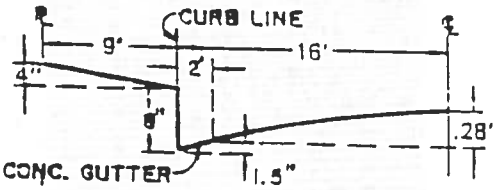
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

PLATE 22.3 D-6

Inlet 9a1 @ 32+45

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

GRATING & GUTTER PLAN

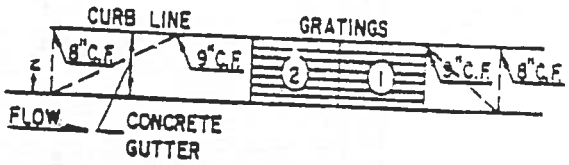


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

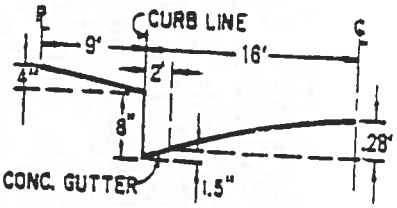
Inlet 9 @ low pt. 30+51.18 LT.

Page 32 of ____ **PB** 100 Years
Made by TJH Date 7/18/03
Checked by DBG Date 7/29/03

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



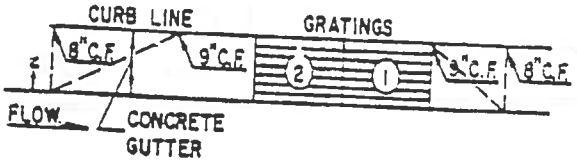
TYPICAL HALF STREET SECTION (ABOVE BASIN)

PLATE 22.3 D-6

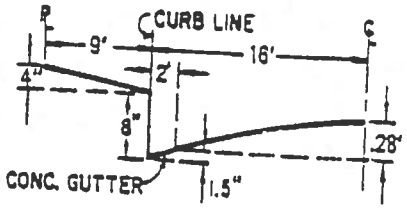
Inlet 10 @ Loc pt. 30+51.18

Page 34 of ____ **PB**100 Years
Made by YA Date 7/11/03
Checked by DBG Date 7/29/03

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION (ABOVE BASIN)

PLATE 22.3 D-6

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page 36 X of X | 33515

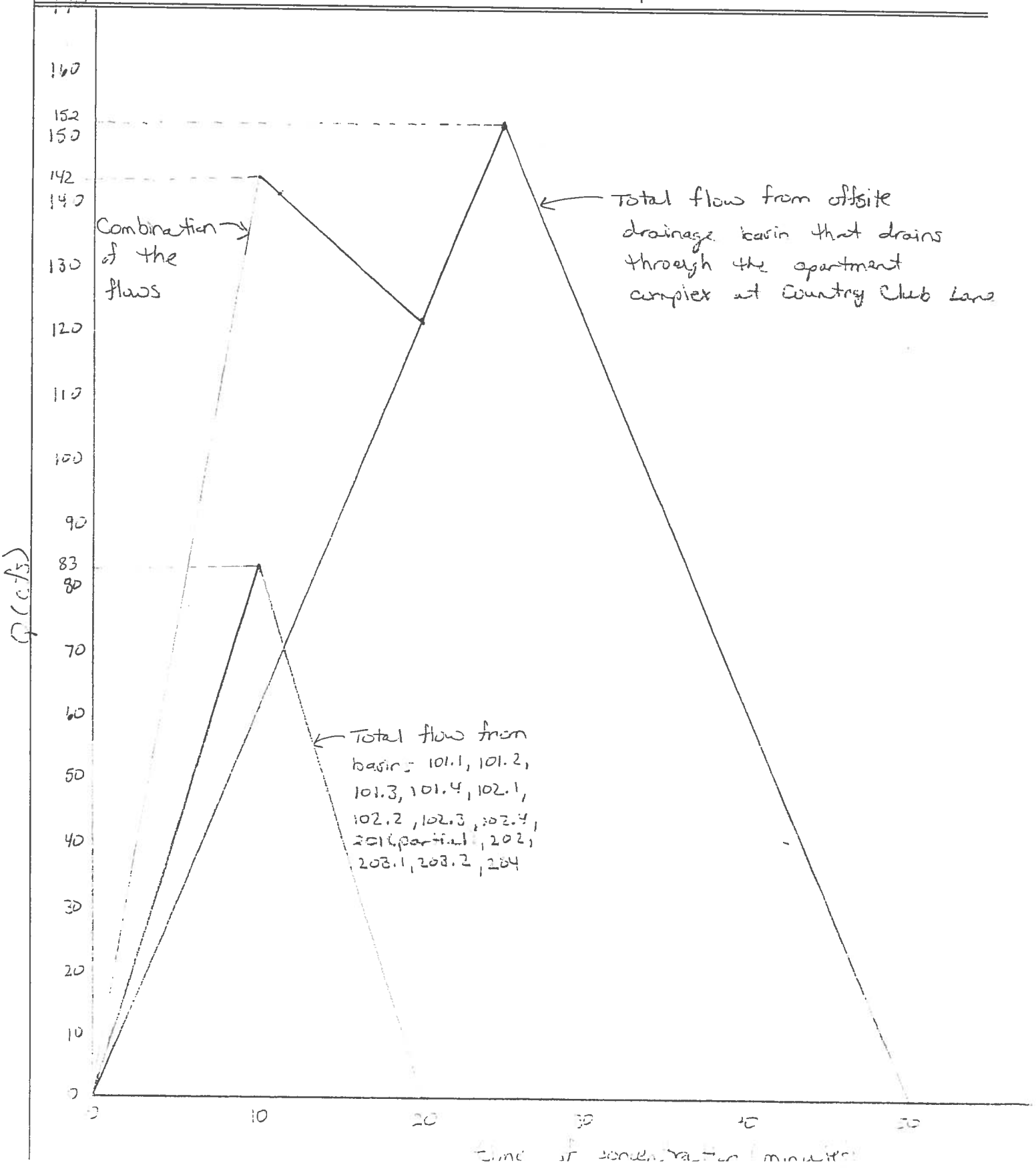
Subject Golf Course Road Drainage Analysis

Made by YPhan

Date 7/17/03

Checked by DBG

Date 7/29/03

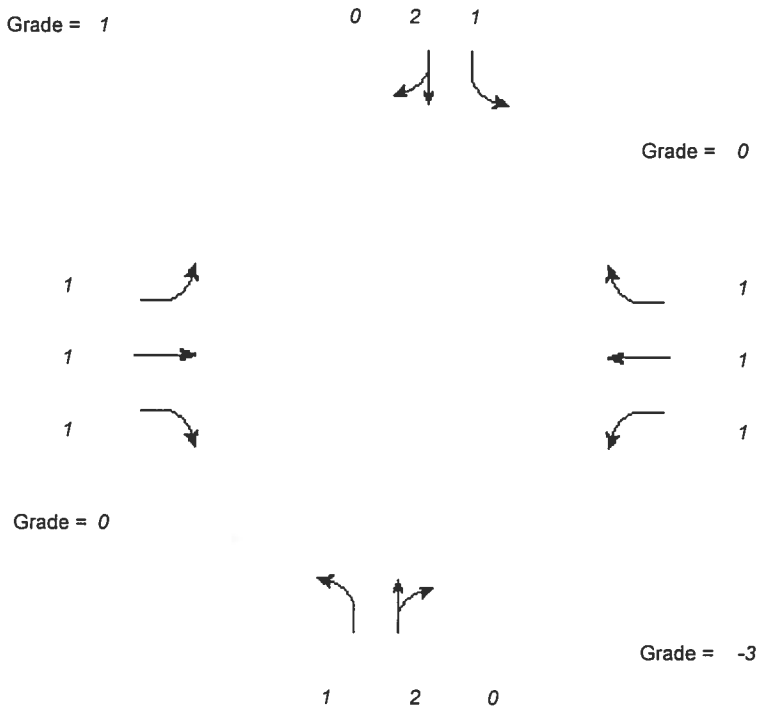


Appendix G
Traffic Analysis Worksheets

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*A.M. Peak*	Analysis Year	*1999*

Intersection Geometry EXISTING CONDITIONS



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	30	585	609	51	123	57	179	399	47	226	529	23
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	4	4	4	4	4	4	4	4		4	4	
Unit Extension	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	1		123	1		18	0		2	0		2
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	NS Perm	07	08
Timing	G = 12.0	G = 50.0	G =	G =	G = 13.0	G = 48.0	G =	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 143.0		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 EXISTING CONDITIONS*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	33	650	540	57	137	43	199	493		251	611	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3503		1744	3468	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.47	0.35	0.48	0.47	0.35	0.48	0.46	0.34		0.46	0.34	
Lane group cap.	566	645	746	199	645	746	352	1176		395	1164	
v/c ratio	0.06	1.01	0.72	0.29	0.21	0.06	0.57	0.42		0.64	0.52	
Flow ratio		0.35	0.34		0.07	0.03		0.14			0.18	
Crit. lane group	N	Y	N	N	N	N	N	N		N	Y	
Sum flow ratios	0.65											
Lost time/cycle	20.00											
Critical v/c ratio	0.76											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	33	650	540	57	137	43	199	493		251	611	
Lane group cap.	566	645	746	199	645	746	352	1176		395	1164	
v/c ratio	0.06	1.01	0.72	0.29	0.21	0.06	0.57	0.42		0.64	0.52	
Green ratio	0.47	0.35	0.48	0.47	0.35	0.48	0.46	0.34		0.46	0.34	
Unif. delay d1	20.7	46.5	30.0	30.3	32.7	20.2	24.9	36.7		25.2	38.3	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	0.2	37.4	6.0	3.6	0.8	0.1	6.4	1.1		7.6	1.7	
PF factor	0.812	0.944	0.802	0.812	0.944	0.802	0.821	0.956		0.821	0.956	
Control delay	17.0	81.3	30.1	28.2	31.6	16.4	26.9	36.2		28.3	38.3	
Lane group LOS	B	F	C	C	C	B	C	D		C	D	
Apprch. delay	56.9			28.0			33.5			35.4		
Approach LOS	E			C			C			D		
Intersec. delay	43.1			Intersection LOS						D		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 EXISTING CONDITIONS*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*33*	*650*	*540*	*57*	*137*	*43*	*199*	*493*		*251*	*611*	
Satflow per lane	*1209*	*1845*	*1568*	*424*	*1845*	*1568*	*762*	*1843*		*854*	*1825*	
Capacity/lane	*566*	*645*	*746*	*199*	*645*	*746*	*352*	*1176*		*395*	*1164*	
Flow ratio	*0.03*	*0.35*	*0.34*	*0.13*	*0.07*	*0.03*	*0.26*	*0.14*		*0.29*	0.18	
v/c ratio	*0.06*	*1.01*	*0.72*	*0.29*	*0.21*	*0.06*	*0.57*	*0.42*		*0.64*	*0.52*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*		*4*	*4*	
Platoon ratio	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*		*1.33*	*1.33*	
PF factor	*0.71*	*1.00*	*0.85*	*0.74*	*0.84*	*0.70*	*0.81*	*0.88*		*0.83*	*0.90*	
Q_1	*0.5*	*25.8*	*14.5*	*0.9*	*3.2*	*0.6*	*3.6*	*7.0*		*4.7*	*9.2*	
k_B	*1.1*	*1.2*	*1.3*	*0.5*	*1.2*	*1.3*	*0.8*	*1.1*		*0.8*	*1.1*	
Q_2	*0.1*	*10.0*	*3.0*	*0.2*	*0.3*	*0.1*	*0.9*	*0.8*		*1.3*	*1.2*	
Q avg.	*0.6*	*35.9*	*17.5*	*1.1*	*3.5*	*0.7*	*4.6*	*7.8*		*6.1*	*10.4*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.5*	*1.6*	*1.6*	*2.4*	*2.1*	*2.5*	*2.0*	*1.8*		*1.9*	*1.7*	
BOQ, $Q_{\%}$	*1.4*	*57.4*	*28.6*	*2.7*	*7.4*	*1.8*	*9.2*	*14.1*		*11.5*	*17.9*	

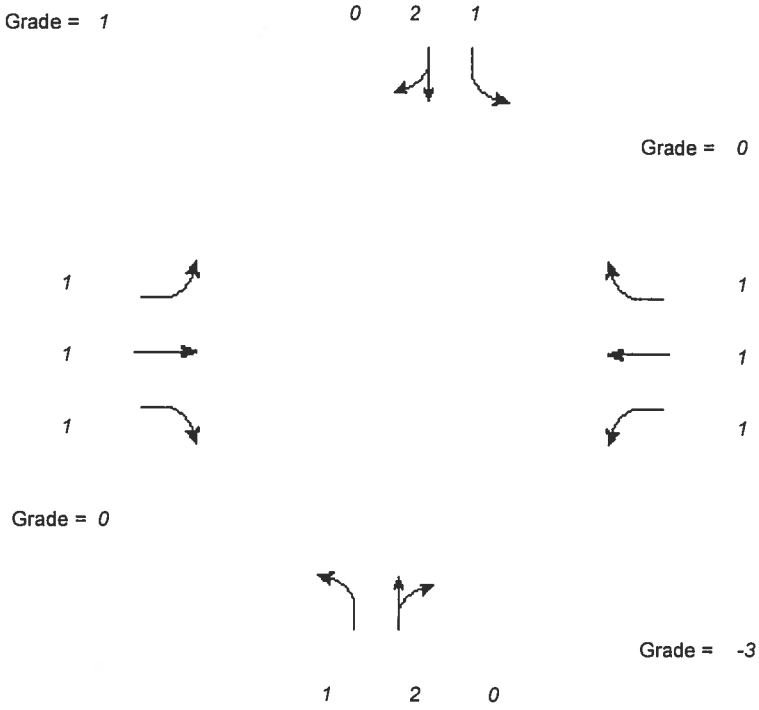
Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*P.M. Peak*	Analysis Year	*1999*

Intersection Geometry EXISTING CONDITIONS



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*66*	*244*	*364*	*108*	*669*	*108*	*460*	*560*	*61*	*77*	*429*	*63*
% Heavy veh	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Actuated (P/A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Startup lost time	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Ext. eff. green	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival type	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*		*4*	*4*	
Unit Extension	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*2*		*78*	*2*		*23*	*0*		*1*	*0*		*6*
Lane Width	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Ped timing	*3.2*			*3.2*			*3.2*			*3.2*		

	Excl. Left	EW Perm	03	04	Excl. Left	NS Perm	07	08
Timing	G = *12.0*	G = *50.0*	G =	G =	G = *13.0*	G = *48.0*	G =	G =
	Y = *5*	Y = *5*	Y =	Y =	Y = *5*	Y = *5*	Y =	Y =
Duration of Analysis (hrs) = *0.25*					Cycle Length C = *143.0*			

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 EXISTING CONDITIONS*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	73	271	318	120	743	94	511	689		86	540	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3506		1744	3426	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.47	0.35	0.48	0.47	0.35	0.48	0.46	0.34		0.46	0.34	
Lane group cap.	199	645	746	457	645	746	381	1177		315	1150	
v/c ratio	0.37	0.42	0.43	0.26	1.15	0.13	1.34	0.59		0.27	0.47	
Flow ratio		0.15	0.20		0.35	0.06		0.20			0.16	
Crit. lane group	N	N	N	N	Y	N	N	N		N	N	
Sum flow ratios	1.10											
Lost time/cycle	15.00											
Critical v/c ratio	1.23											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	73	271	318	120	743	94	511	689		86	540	
Lane group cap.	199	645	746	457	645	746	381	1177		315	1150	
v/c ratio	0.37	0.42	0.43	0.26	1.15	0.13	1.34	0.59		0.27	0.47	
Green ratio	0.47	0.35	0.48	0.47	0.35	0.48	0.46	0.34		0.46	0.34	
Unif. delay d1	30.5	35.4	24.7	22.5	46.5	20.9	48.5	39.3		23.7	37.5	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	5.1	2.0	1.8	1.4	85.3	0.3	170.3	2.1		2.1	1.4	
PF factor	0.812	0.944	0.802	0.812	0.944	0.802	0.821	0.956		0.821	0.956	
Control delay	30.0	35.5	21.6	19.7	129.2	17.1	210.1	39.7		21.6	37.2	
Lane group LOS	C	D	C	B	F	B	F	D		C	D	
Apprch. delay	28.2			104.5			112.3			35.1		
Approach LOS	C			F			F			D		
Intersec. delay	79.9			Intersection LOS						E		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 EXISTING CONDITIONS*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*73*	*271*	*318*	*120*	*743*	*94*	*511*	*689*		*86*	*540*	
Satflow per lane	*424*	*1845*	*1568*	*976*	*1845*	*1568*	*826*	*1845*		*682*	*1803*	
Capacity/lane	*199*	*645*	*746*	*457*	*645*	*746*	*381*	*1177*		*315*	*1150*	
Flow ratio	*0.17*	*0.15*	*0.20*	*0.12*	*0.40*	*0.06*	*0.62*	*0.20*		*0.13*	0.16	
v/c ratio	*0.37*	*0.42*	*0.43*	*0.26*	*1.15*	*0.13*	*1.34*	*0.59*		*0.27*	*0.47*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*		*4*	*4*	
Platoon ratio	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*	*1.33*		*1.33*	*1.33*	
PF factor	*0.76*	*0.87*	*0.76*	*0.74*	*1.00*	*0.71*	*1.00*	*0.91*		*0.75*	*0.89*	
Q_1	*1.2*	*7.1*	*6.3*	*1.9*	*29.5*	*1.5*	*12.0*	*10.8*		*1.4*	*7.9*	
k_B	*0.5*	*1.2*	*1.3*	*0.9*	*1.2*	*1.3*	*0.8*	*1.1*		*0.7*	*1.1*	
Q_2	*0.3*	*0.8*	*0.9*	*0.3*	*18.2*	*0.2*	*19.0*	*1.5*		*0.3*	*1.0*	
Q avg.	*1.5*	*8.0*	*7.3*	*2.2*	*47.7*	*1.7*	*31.0*	*12.3*		*1.7*	*8.8*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.3*	*1.8*	*1.8*	*2.2*	*1.6*	*2.3*	*1.6*	*1.7*		*2.3*	*1.8*	
BOQ, Q%	*3.5*	*14.4*	*13.3*	*5.0*	*76.3*	*3.9*	*49.6*	*20.7*		*3.9*	*15.7*	

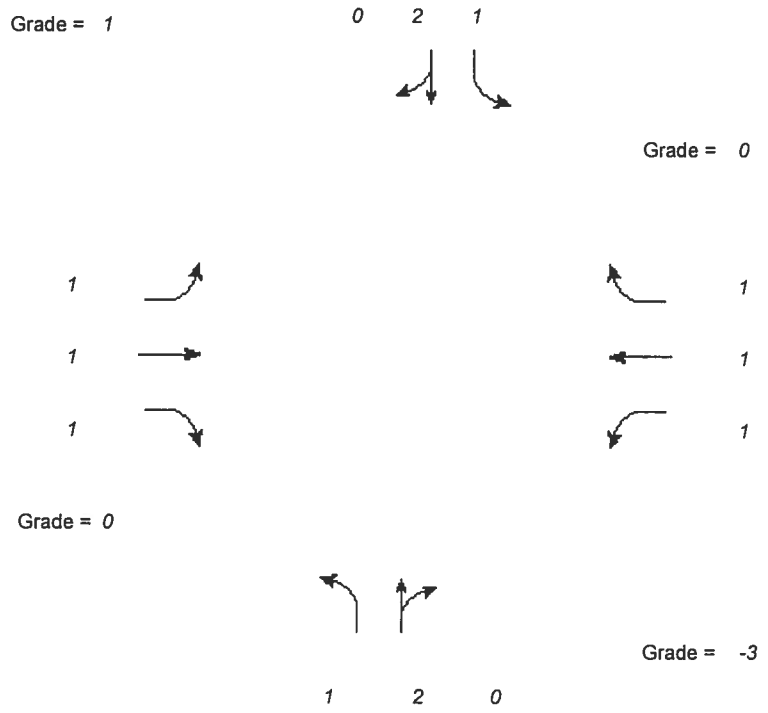
Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*A.M. Peak*	Analysis Year	*2004 (Buildout)*

Intersection Geometry ALL LEFTS PROTECTED - PERMITTED



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	42	560	490	51	132	67	167	473	43	270	594	34
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3	3	3	3	3	3	3		3	3	
Unit Extension	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	2		50	2		20	0		20	0		20
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	SB Only	NS Perm	08
Timing	G = 5.3	G = 29.7	G =	G =	G = 5.1	G = 5.0	G = 17.2	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 87.3		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 ALL LEFTS PROTECTED-PERMITTED*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	47	622	489	57	147	52	186	552		300	676	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3532		1744	3475	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.46	0.34	0.46	0.46	0.34	0.57	0.26	0.20		0.43	0.31	
Lane group cap.	521	628	715	191	628	894	250	696		386	1083	
v/c ratio	0.09	0.99	0.68	0.30	0.23	0.06	0.74	0.79		0.78	0.62	
Flow ratio		0.34	0.31		0.08	0.03		0.16			0.19	
Crit. lane group	N	Y	N	N	N	N	N	Y		N	N	
Sum flow ratios	0.70											
Lost time/cycle	20.00											
Critical v/c ratio	0.91											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	47	622	489	57	147	52	186	552		300	676	
Lane group cap.	521	628	715	191	628	894	250	696		386	1083	
v/c ratio	0.09	0.99	0.68	0.30	0.23	0.06	0.74	0.79		0.78	0.62	
Green ratio	0.46	0.34	0.46	0.46	0.34	0.57	0.26	0.20		0.43	0.31	
Unif. delay d1	13.3	28.7	18.8	18.7	20.6	8.3	31.5	33.4		18.9	25.7	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	0.3	33.7	5.3	4.0	0.9	0.1	18.1	9.0		14.2	2.7	
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	13.7	62.3	24.0	22.7	21.5	8.5	49.6	42.4		33.2	28.4	
Lane group LOS	B	E	C	C	C	A	D	D		C	C	
Apprch. delay	44.2			19.1			44.2			29.9		
Approach LOS	D			B			D			C		
Intersec. delay	37.7			Intersection LOS						D		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 ALL LEFTS PROTECTED-PERMITTED*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*47*	*622*	*489*	*57*	*147*	*52*	*186*	*552*		*300*	*676*	
Satflow per lane	*1137*	*1845*	*1568*	*417*	*1845*	*1568*	*977*	*1858*		*903*	*1828*	
Capacity/lane	*521*	*628*	*715*	*191*	*628*	*894*	*250*	*696*		*386*	*1083*	
Flow ratio	*0.04*	*0.34*	*0.31*	*0.14*	*0.08*	*0.03*	*0.19*	*0.16*		*0.33*	0.19	
v/c ratio	*0.09*	*0.99*	*0.68*	*0.30*	*0.23*	*0.06*	*0.74*	*0.79*		*0.78*	*0.62*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*0.6*	*15.0*	*9.4*	*0.8*	*2.6*	*0.6*	*3.5*	*6.7*		*4.8*	*7.4*	
k_B	*0.7*	*0.8*	*0.9*	*0.4*	*0.8*	*1.0*	*0.4*	*0.6*		*0.6*	*0.8*	
Q_2	*0.1*	*7.6*	*1.8*	*0.1*	*0.2*	*0.1*	*1.1*	*1.8*		*1.7*	*1.2*	
Q avg.	*0.7*	*22.6*	*11.2*	*0.9*	*2.8*	*0.6*	*4.6*	*8.5*		*6.5*	*8.5*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.5*	*1.6*	*1.7*	*2.4*	*2.2*	*2.5*	*2.0*	*1.8*		*1.9*	*1.8*	
BOQ, Q%	*1.7*	*36.4*	*19.1*	*2.2*	*6.1*	*1.5*	*9.2*	*15.1*		*12.2*	*15.2*	

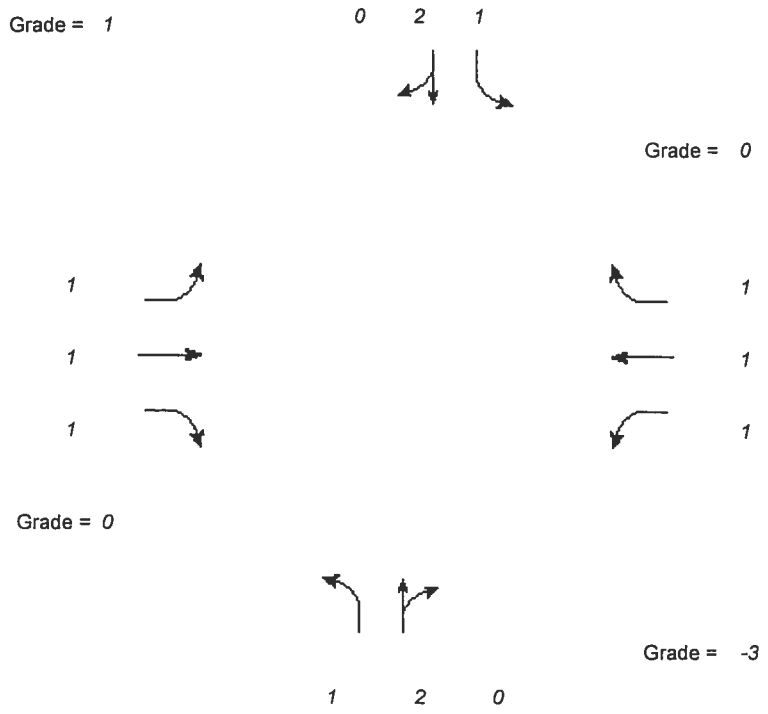
Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*P.M. Peak*	Analysis Year	*2004 (Buildout)*

Intersection Geometry ALL LEFTS PROTECTED-PERMITTED



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	72	257	318	111	598	137	412	641	70	104	558	84
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3	3	3	3	3	3	3		3	3	
Unit Extension	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	2		50	2		20	0		20	0		20
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	NB Only	NS Perm	08
Timing	G = 5.0	G = 28.0	G =	G =	G = 5.4	G = 6.1	G = 18.5	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 88.0		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 ALL LEFTS PROTECTED-PERMITTED*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	80	286	298	123	664	130	458	768		116	691	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3519		1744	3434	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.43	0.32	0.56	0.43	0.32	0.44	0.45	0.34		0.27	0.21	
Lane group cap.	184	587	882	366	587	684	419	1184		246	722	
v/c ratio	0.43	0.49	0.34	0.34	1.13	0.19	1.09	0.65		0.47	0.96	
Flow ratio		0.16	0.19		0.32	0.08		0.22			0.20	
Crit. lane group	N	N	N	N	Y	N	N	N		N	N	
Sum flow ratios	0.95											
Lost time/cycle	15.00											
Critical v/c ratio	1.15											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	80	286	298	123	664	130	458	768		116	691	
Lane group cap.	184	587	882	366	587	684	419	1184		246	722	
v/c ratio	0.43	0.49	0.34	0.34	1.13	0.19	1.09	0.65		0.47	0.96	
Green ratio	0.43	0.32	0.56	0.43	0.32	0.44	0.45	0.34		0.27	0.21	
Unif. delay d1	19.9	24.2	10.4	16.1	30.0	15.2	23.7	24.8		25.0	34.4	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	7.3	2.9	1.0	2.5	78.8	0.6	71.5	2.8		6.4	24.5	
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	27.2	27.1	11.4	18.6	108.8	15.9	95.2	27.5		31.4	58.9	
Lane group LOS	C	C	B	B	F	B	F	C		C	E	
Apprch. delay	20.1			83.5			52.8			54.9		
Approach LOS	C			F			D			D		
Intersec. delay	55.1			Intersection LOS						E		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 ALL LEFTS PROTECTED-PERMITTED*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*80*	*286*	*298*	*123*	*664*	*130*	*458*	*768*		*116*	*691*	
Satflow per lane	*425*	*1845*	*1568*	*845*	*1845*	*1568*	*921*	*1852*		*906*	*1807*	
Capacity/lane	*184*	*587*	*882*	*366*	*587*	*684*	*419*	*1184*		*246*	*722*	
Flow ratio	*0.19*	*0.16*	*0.19*	*0.15*	*0.36*	*0.08*	*0.50*	*0.22*		*0.13*	0.20	
v/c ratio	*0.43*	*0.49*	*0.34*	*0.34*	*1.13*	*0.19*	*1.09*	*0.65*		*0.47*	*0.96*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*1.1*	*5.6*	*3.9*	*1.7*	*16.2*	*2.0*	*7.5*	*8.4*		*2.1*	*8.8*	
k_B	*0.3*	*0.8*	*1.0*	*0.6*	*0.8*	*0.9*	*0.6*	*0.8*		*0.4*	*0.6*	
Q_2	*0.3*	*0.7*	*0.5*	*0.3*	*14.2*	*0.2*	*8.8*	*1.4*		*0.4*	*4.1*	
Q avg.	*1.4*	*6.4*	*4.5*	*2.0*	*30.4*	*2.2*	*16.4*	*9.8*		*2.5*	*12.9*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.4*	*1.9*	*2.0*	*2.3*	*1.6*	*2.2*	*1.6*	*1.7*		*2.2*	*1.7*	
BOQ, Q%	*3.3*	*12.0*	*9.0*	*4.6*	*48.7*	*4.8*	*26.8*	*17.1*		*5.5*	*21.6*	

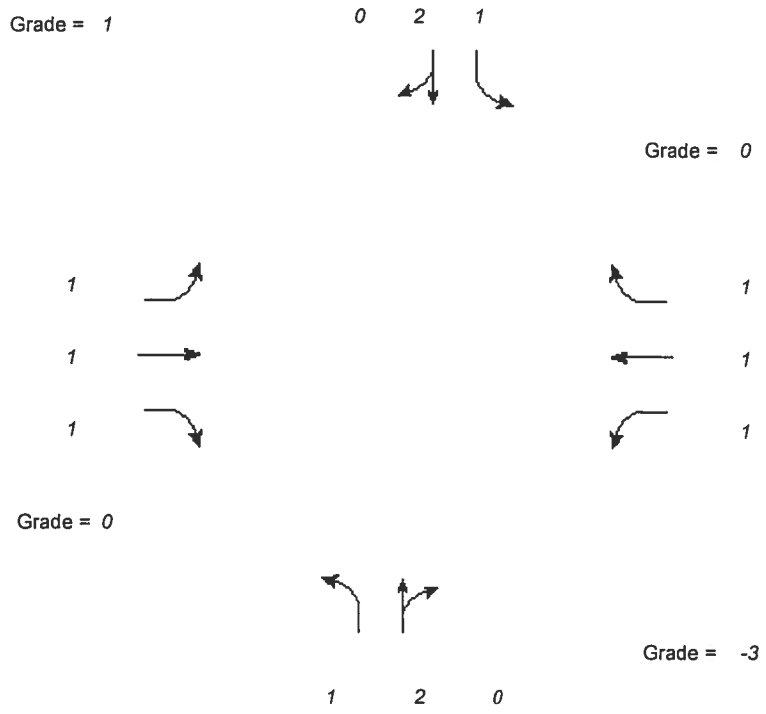
Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*A.M. Peak*	Analysis Year	*2004 (Buildout)*

Intersection Geometry NORTHBOUND LEFTS PROTECTED-ONLY



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	42	560	490	51	132	67	167	473	43	270	594	34
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3	3	3	3	3	3	3		3	3	
Unit Extension	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	2		50	2		20	0		20	0		20
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	SB Only	NS Perm	08
Timing	G = 5.4	G = 31.8	G =	G =	G = 10.0	G = 5.0	G = 16.3	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 93.5		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 NORTHBOUND LEFTS PROTECTED ONLY*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	47	622	489	57	147	52	186	552		300	676	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3532		1744	3475	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.45	0.34	0.50	0.45	0.34	0.61	0.11	0.17		0.44	0.28	
Lane group cap.	511	627	785	180	627	953	190	616		452	977	
v/c ratio	0.09	0.99	0.62	0.32	0.23	0.05	0.98	0.90		0.66	0.69	
Flow ratio		0.34	0.31		0.08	0.03	0.10	0.16			0.19	
Crit. lane group	N	Y	N	N	N	N	N	Y		N	N	
Sum flow ratios	0.70											
Lost time/cycle	20.00											
Critical v/c ratio	0.89											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	47	622	489	57	147	52	186	552		300	676	
Lane group cap.	511	627	785	180	627	953	190	616		452	977	
v/c ratio	0.09	0.99	0.62	0.32	0.23	0.05	0.98	0.90		0.66	0.69	
Green ratio	0.45	0.34	0.50	0.45	0.34	0.61	0.11	0.17		0.44	0.28	
Unif. delay d1	14.6	30.7	16.9	20.4	22.1	7.4	41.6	37.8		19.2	30.0	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	0.4	34.0	3.7	4.6	0.9	0.1	60.0	18.2		7.5	4.0	
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	15.0	64.8	20.7	25.0	23.0	7.6	101.7	55.9		26.7	34.0	
Lane group LOS	B	E	C	C	C	A	F	E		C	C	
Apprch. delay	44.1			20.3			67.5			31.8		
Approach LOS	D			C			E			C		
Intersec. delay	43.8			Intersection LOS						D		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 NORTHBOUND LEFTS PROTECTED ONLY*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*47*	*622*	*489*	*57*	*147*	*52*	*186*	*552*		*300*	*676*	
Satflow per lane	*1132*	*1845*	*1568*	*399*	*1845*	*1568*	*1779*	*1858*		*1022*	*1828*	
Capacity/lane	*511*	*627*	*785*	*180*	*627*	*953*	*190*	*616*		*452*	*977*	
Flow ratio	*0.04*	*0.34*	*0.31*	*0.14*	*0.08*	*0.03*	*0.10*	*0.16*		*0.29*	0.19	
v/c ratio	*0.09*	*0.99*	*0.62*	*0.32*	*0.23*	*0.05*	*0.98*	*0.90*		*0.66*	*0.69*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*0.7*	*16.1*	*9.2*	*0.8*	*2.7*	*0.5*	*4.8*	*7.4*		*5.1*	*8.2*	
k_B	*0.7*	*0.8*	*1.0*	*0.4*	*0.8*	*1.1*	*0.4*	*0.5*		*0.7*	*0.7*	
Q_2	*0.1*	*7.8*	*1.6*	*0.2*	*0.3*	*0.1*	*2.7*	*2.8*		*1.2*	*1.5*	
Q avg.	*0.7*	*23.9*	*10.8*	*1.0*	*3.0*	*0.6*	*7.5*	*10.1*		*6.3*	*9.8*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.5*	*1.6*	*1.7*	*2.4*	*2.1*	*2.5*	*1.8*	*1.7*		*1.9*	*1.7*	
BOQ, Q%	*1.8*	*38.4*	*18.5*	*2.4*	*6.4*	*1.5*	*13.7*	*17.5*		*11.9*	*17.0*	

Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

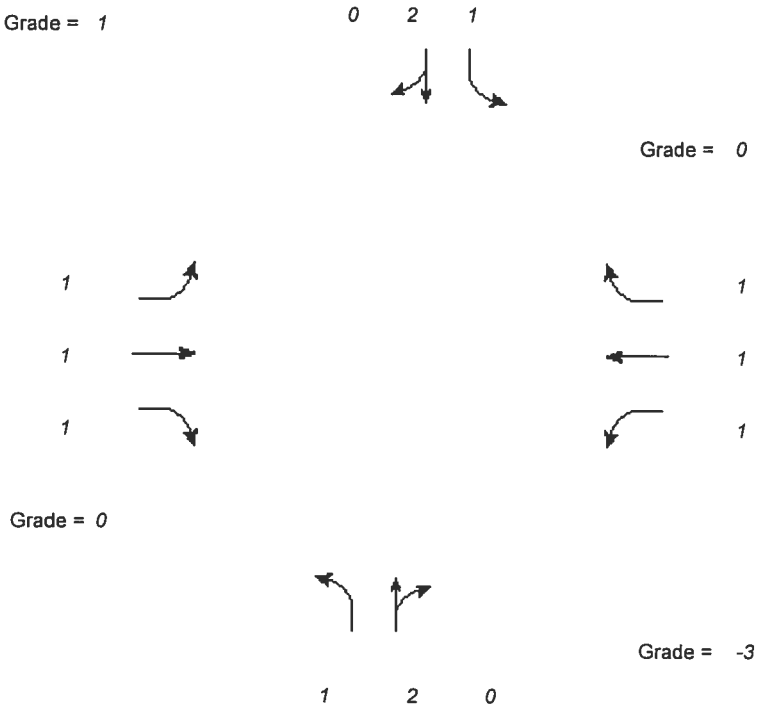
HCS2000™

Version 4.1d

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*P.M. Peak*	Analysis Year	*2004 (Buildout)*

Intersection Geometry NORTHBOUND LEFTS PROTECTED ONLY



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*72*	*257*	*318*	*111*	*598*	*137*	*412*	*641*	*70*	*104*	*558*	*84*
% Heavy veh	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Actuated (P/A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Startup lost time	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Ext. eff. green	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Unit Extension	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*2*		*50*	*2*		*20*	*0*		*20*	*0*		*20*
Lane Width	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*	*12.0*		*12.0*	*12.0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Ped timing	*3.2*			*3.2*			*3.2*			*3.2*		

	Excl. Left	EW Perm	03	04	Excl. Left	NB Only	NS Perm	08
Timing	G = *5.2*	G = *31.4*	G =	G =	G = *11.1*	G = *5.7*	G = *20.2*	G =
	Y = *5*	Y = *5*	Y =	Y =	Y = *5*	Y = *5*	Y = *5*	Y =
Duration of Analysis (hrs) = *0.25*					Cycle Length C = *98.6*			

CAPACITY AND LOS WORKSHEET

General Information

Project Description *33495 NORTHBOUND LEFTS PROTECTED ONLY*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	80	286	298	123	664	130	458	768		116	691	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3519		1744	3434	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.42	0.32	0.59	0.42	0.32	0.48	0.22	0.31		0.32	0.20	
Lane group cap.	167	588	926	351	588	755	393	1103		332	704	
v/c ratio	0.48	0.49	0.32	0.35	1.13	0.17	1.17	0.70		0.35	0.98	
Flow ratio		0.16	0.19		0.32	0.08	0.26	0.22			0.20	
Crit. lane group	N	N	N	N	Y	N	Y	N		N	Y	
Sum flow ratios	0.83											
Lost time/cycle	20.00											
Critical v/c ratio	1.04											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	80	286	298	123	664	130	458	768		116	691	
Lane group cap.	167	588	926	351	588	755	393	1103		332	704	
v/c ratio	0.48	0.49	0.32	0.35	1.13	0.17	1.17	0.70		0.35	0.98	
Green ratio	0.42	0.32	0.59	0.42	0.32	0.48	0.22	0.31		0.32	0.20	
Unif. delay d1	22.8	27.1	10.2	18.6	33.6	14.4	38.4	29.7		24.6	39.0	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	9.5	2.9	0.9	2.7	78.1	0.5	98.8	3.6		2.9	29.7	
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	32.4	30.0	11.1	21.4	111.7	14.9	137.2	33.4		27.5	68.7	
Lane group LOS	C	C	B	C	F	B	F	C		C	E	
Apprch. delay	21.8			85.9			72.1			62.8		
Approach LOS	C			F			E			E		
Intersec. delay	64.3			Intersection LOS						E		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *33495 NORTHBOUND LEFTS PROTECTED ONLY*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*80*	*286*	*298*	*123*	*664*	*130*	*458*	*768*		*116*	*691*	
Satflow per lane	*397*	*1845*	*1568*	*833*	*1845*	*1568*	*1779*	*1852*		*1046*	*1807*	
Capacity/lane	*167*	*588*	*926*	*351*	*588*	*755*	*393*	*1103*		*332*	*704*	
Flow ratio	*0.20*	*0.16*	*0.19*	*0.15*	*0.36*	*0.08*	*0.26*	*0.22*		*0.11*	0.20	
v/c ratio	*0.48*	*0.49*	*0.32*	*0.35*	*1.13*	*0.17*	*1.17*	*0.70*		*0.35*	*0.98*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*1.3*	*6.3*	*4.1*	*2.0*	*18.2*	*2.0*	*12.5*	*9.7*		*2.3*	*9.9*	
k_B	*0.3*	*0.8*	*1.2*	*0.6*	*0.8*	*1.0*	*0.6*	*0.8*		*0.6*	*0.6*	
Q_2	*0.3*	*0.8*	*0.5*	*0.3*	*14.4*	*0.2*	*11.3*	*1.8*		*0.3*	*4.8*	
Q avg.	*1.6*	*7.1*	*4.7*	*2.3*	*32.5*	*2.2*	*23.9*	*11.5*		*2.6*	*14.7*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.3*	*1.8*	*2.0*	*2.2*	*1.6*	*2.2*	*1.6*	*1.7*		*2.2*	*1.7*	
BOQ, Q%	*3.7*	*13.1*	*9.3*	*5.1*	*52.1*	*5.0*	*38.4*	*19.5*		*5.6*	*24.3*	

Queue Storage Ratio

Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

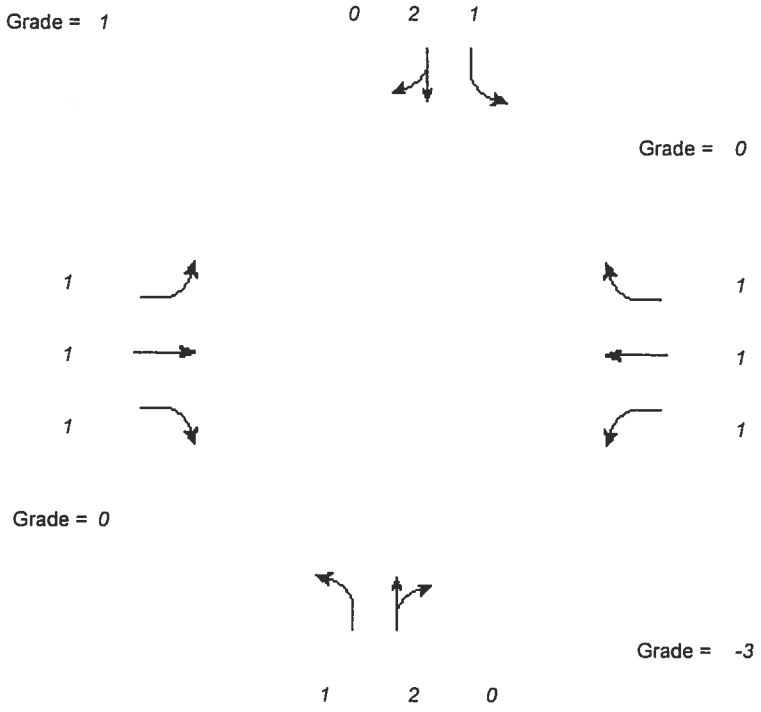
HCS2000™

Version 4.1d

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*A.M. Peak*	Analysis Year	*2014 (10 year horizon)*

Intersection Geometry ALL LEFTS PROTECTED-PERMITTED (TO DETERMINE SB QUEUE LENGTH)



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	66	510	253	51	149	88	214	621	35	357	723	57
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival type	3	3	3	3	3	3	3	3		3	3	
Unit Extension	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	2		50	2		20	0		20	0		20
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	SB Only	NS Perm	08
Timing	G = 5.4	G = 28.0	G =	G =	G = 6.5	G = 5.8	G = 20.7	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 91.4		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *ALL LEFTS PROTECTED-PERMITTED (TO DETERMINE SB LEFT QUEUE)*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	73	567	226	57	166	76	238	707		397	844	
Satflow rate	1752	1845	1568	1752	1845	1568	1779	3545		1744	3462	
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Green ratio	0.42	0.31	0.43	0.42	0.31	0.55	0.30	0.23		0.47	0.34	
Lane group cap.	453	565	678	185	565	863	269	803		410	1193	
v/c ratio	0.16	1.00	0.33	0.31	0.29	0.09	0.88	0.88		0.97	0.71	
Flow ratio		0.31	0.14		0.09	0.05		0.20			0.24	
Crit. lane group	N	Y	N	N	N	N	N	N		N	N	
Sum flow ratios	0.77											
Lost time/cycle	15.00											
Critical v/c ratio	0.92											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	TR		L	TR	
Adj. flow rate	73	567	226	57	166	76	238	707		397	844	
Lane group cap.	453	565	678	185	565	863	269	803		410	1193	
v/c ratio	0.16	1.00	0.33	0.31	0.29	0.09	0.88	0.88		0.97	0.71	
Green ratio	0.42	0.31	0.43	0.42	0.31	0.55	0.30	0.23		0.47	0.34	
Unif. delay d1	16.3	31.7	17.2	20.6	24.2	9.7	35.3	34.2		24.5	26.0	
Delay factor k	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		0.50	0.50	
Increm. delay d2	0.8	38.7	1.3	4.3	1.3	0.2	31.8	13.2		37.2	3.6	
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Control delay	17.0	70.4	18.5	24.9	25.5	9.9	67.1	47.4		61.7	29.5	
Lane group LOS	B	E	B	C	C	A	E	D		E	C	
Apprch. delay	52.4			21.4			52.4			39.8		
Approach LOS	D			C			D			D		
Intersec. delay	45.0			Intersection LOS						D		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *ALL LEFTS PROTECTED-PERMITTED (TO DETERMINE SB LEFT QUEUE)*

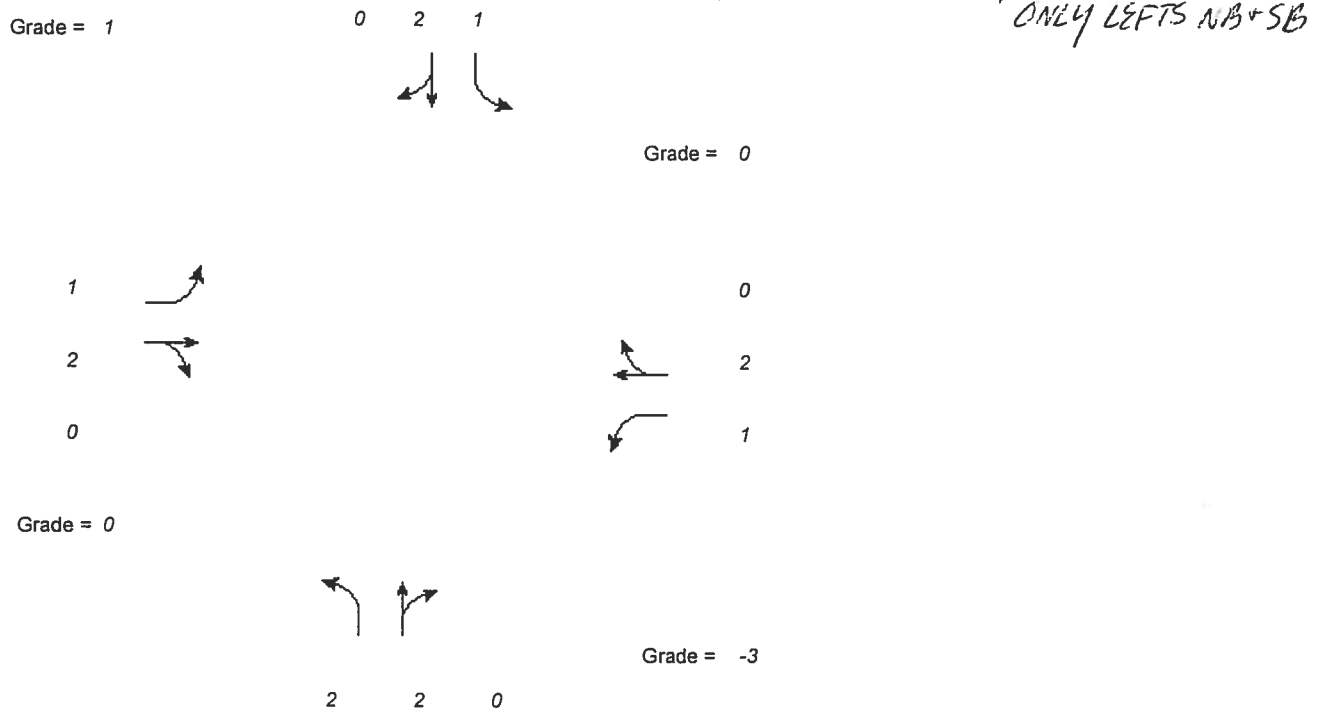
Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*73*	*567*	*226*	*57*	*166*	*76*	*238*	*707*		*397*	*844*	
Satflow per lane	*1078*	*1845*	*1568*	*439*	*1845*	*1568*	*902*	*1865*		*873*	*1822*	
Capacity/lane	*453*	*565*	*678*	*185*	*565*	*863*	*269*	*803*		*410*	*1193*	
Flow ratio	*0.07*	*0.31*	*0.14*	*0.13*	*0.09*	*0.05*	*0.26*	*0.20*		*0.45*	0.24	
v/c ratio	*0.16*	*1.00*	*0.33*	*0.31*	*0.29*	*0.09*	*0.88*	*0.88*		*0.97*	*0.71*	
I factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*1.1*	*14.4*	*3.8*	*0.9*	*3.2*	*0.9*	*4.5*	*9.1*		*6.5*	*9.8*	
k_B	*0.7*	*0.8*	*0.9*	*0.4*	*0.8*	*1.0*	*0.5*	*0.6*		*0.6*	*0.8*	
Q_2	*0.1*	*7.5*	*0.4*	*0.2*	*0.3*	*0.1*	*2.2*	*3.1*		*4.8*	*1.9*	
Q avg.	*1.2*	*21.9*	*4.2*	*1.0*	*3.5*	*1.0*	*6.8*	*12.3*		*11.3*	*11.6*	
Percentile Back of Queue (95th percentile)												
$f_{B\%}$	*2.4*	*1.6*	*2.0*	*2.4*	*2.1*	*2.4*	*1.9*	*1.7*		*1.7*	*1.7*	
BOQ, $Q_{\%}$	*2.9*	*35.4*	*8.6*	*2.4*	*7.4*	*2.4*	*12.6*	*20.7*		*19.3*	*19.8*	
Queue Storage Ratio												
Q spacing	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*A.M. Peak*	Analysis Year	*2020*

Intersection Geometry 2 THRU LANES EB+WB, DUAL NB LEFTS, PROTECTED— ONLY LEFTS NB+SB



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	80	480	110	50	160	100	130	710	30	410	800	70
% Heavy veh	3	3	3	3	3	3	3	3	3	3	3	3
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3		3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	2		50	2		20	0		20	0		20
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	
Ped timing	3.2			3.2			3.2			3.2		

	Excl. Left	EW Perm	03	04	Excl. Left	SB Only	Thru & RT	08
Timing	G = 5.2	G = 12.5	G =	G =	G = 10.3	G = 6.4	G = 21.0	G =
	Y = 5	Y = 5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 80.4		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *2 THRU LANES EAST-WEST, DUAL ~~SB~~ NB LEFTS, PROT-ONLY LEFTS N-S*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj. flow rate	89	600		56	267		144	800		456	945	
Satflow rate	1752	3446		1752	3330		3451	3550		1744	3456	
Lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Green ratio	0.28	0.16		0.28	0.16		0.13	0.26		0.27	0.40	
Lane group cap.	271	536		205	518		442	927		471	1393	
v/c ratio	0.33	1.12		0.27	0.52		0.33	0.86		0.97	0.68	
Flow ratio		0.16			0.08		0.04	0.23		0.26	0.27	
Crit. lane group	N	Y		N	N		N	Y		Y	N	
Sum flow ratios	0.69											
Lost time/cycle	20.00											
Critical v/c ratio	0.92											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj. flow rate	89	600		56	267		144	800		456	945	
Lane group cap.	271	536		205	518		442	927		471	1393	
v/c ratio	0.33	1.12		0.27	0.52		0.33	0.86		0.97	0.68	
Green ratio	0.28	0.16		0.28	0.16		0.13	0.26		0.27	0.40	
Unif. delay d1	22.0	34.0		22.6	31.2		31.9	28.3		29.0	19.7	
Delay factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	
Increm. delay d2	3.2	76.0		3.3	3.6		2.0	10.5		34.3	2.7	
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Control delay	25.3	109.9		25.8	34.8		33.8	38.8		63.3	22.4	
Lane group LOS	C	F		C	C		C	D		E	C	
Apprch. delay	99.0			33.2			38.0			35.7		
Approach LOS	F			C			D			D		
Intersec. delay	49.1			Intersection LOS						D		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *2 THRU LANES EAST-WEST, DUAL SB LEFTS, PROT-ONLY LEFTS N-S*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*TR*		*L*	*TR*		*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*		*0.0*	*0.0*		*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*89*	*600*		*56*	*267*		*144*	*800*		*456*	*945*	
Satflow per lane	*962*	*1813*		*727*	*1752*		*1779*	*1868*		*1744*	*1818*	
Capacity/lane	*271*	*536*		*205*	*518*		*442*	*927*		*471*	*1393*	
Flow ratio	*0.09*	*0.17*		*0.08*	*0.08*		*0.04*	*0.23*		*0.26*	0.27	
v/c ratio	*0.33*	*1.12*		*0.27*	*0.52*		*0.33*	*0.86*		*0.97*	*0.68*	
I factor	*1.000*	*1.000*		*1.000*	*1.000*		*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*		*3*	*3*		*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*1.5*	*7.0*		*0.9*	*2.9*		*1.5*	*9.0*		*10.1*	*9.1*	
k_B	*0.4*	*0.4*		*0.3*	*0.4*		*0.4*	*0.6*		*0.6*	*0.8*	
Q_2	*0.2*	*6.7*		*0.1*	*0.4*		*0.2*	*3.0*		*5.1*	*1.7*	
Q avg.	*1.7*	*13.7*		*1.0*	*3.3*		*1.7*	*12.0*		*15.2*	*10.8*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.3*	*1.7*		*2.4*	*2.1*		*2.3*	*1.7*		*1.6*	*1.7*	
BOQ, $Q_{\%}$	*3.9*	*22.8*		*2.5*	*7.0*		*3.9*	*20.2*		*25.0*	*18.5*	

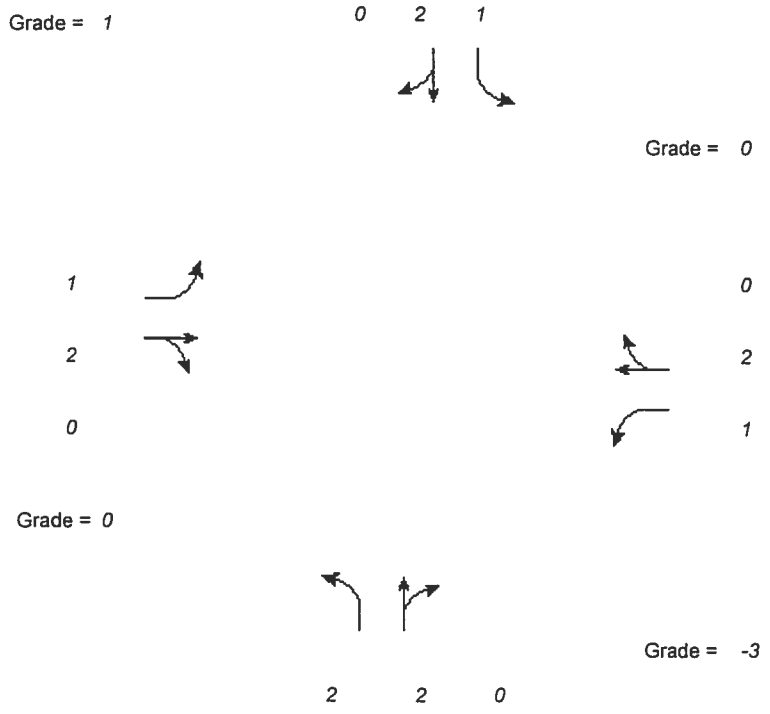
Queue Storage Ratio

Q spacing	*24.9*	*24.9*		*24.9*	*24.9*		*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*		*0*	*0*		*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												

LONG REPORT

General Information		Site Information	
Analyst	*Karen Aspelin*	Intersection	*Golf Course/Paradise Blvd.*
Agency or Co.	*Parsons Brinckerhoff*	Area Type	*All other areas*
Date Performed	*6-18-03*	Jurisdiction	
Time Period	*P.M. Peak*	Analysis Year	*2020*

Intersection Geometry 2 THRU LANES SB+WB, DUAL NB LEFTS, PROTECTED-ONLY LEFTS NB+SB



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*90*	*300*	*170*	*120*	*370*	*230*	*260*	*900*	*100*	*190*	*970*	*150*
% Heavy veh	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Actuated (P/A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Startup lost time	*2.0*	*2.0*		*2.0*	*2.0*		*2.0*	*2.0*		*2.0*	*2.0*	
Ext. eff. green	*2.0*	*2.0*		*2.0*	*2.0*		*2.0*	*2.0*		*2.0*	*2.0*	
Arrival type	*3*	*3*		*3*	*3*		*3*	*3*		*3*	*3*	
Unit Extension	*3.0*	*3.0*		*3.0*	*3.0*		*3.0*	*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*5*		*50*	*5*		*20*	*0*		*20*	*0*		*20*
Lane Width	*12.0*	*12.0*		*12.0*	*12.0*		*12.0*	*12.0*		*12.0*	*12.0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*	*0*		*0*	*0*		*0*	*0*		*0*	*0*	
Ped timing	*3.2*			*3.2*			*3.2*			*3.2*		

	Excl. Left	EW Perm	03	04	Excl. Left	SB Only	Thru & RT	08
Timing	G = *9.5*	G = *11.5*	G =	G =	G = *8.0*	G = *5.3*	G = *23.2*	G =
	Y = *5*	Y = *5*	Y =	Y =	Y = *5*	Y = *5*	Y = *5*	Y =
Duration of Analysis (hrs) = *0.25*					Cycle Length C = *82.5*			

CAPACITY AND LOS WORKSHEET

General Information

Project Description *2 THRU LANES EAST-WEST, DUAL SB LEFTS, PROT-ONLY LEFTS N-S*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj. flow rate	100	466		133	644		289	1089		211	1222	
Satflow rate	1752	3355		1752	3315		3451	3514		1744	3426	
Lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Green ratio	0.32	0.14		0.32	0.14		0.10	0.28		0.22	0.41	
Lane group cap.	291	468		291	462		335	988		387	1391	
v/c ratio	0.34	1.00		0.46	1.39		0.86	1.10		0.55	0.88	
Flow ratio		0.14			0.14		0.08	0.31		0.12	0.36	
Crit. lane group	N	N		N	Y		Y	N		N	Y	
Sum flow ratios	0.66											
Lost time/cycle	20.00											
Critical v/c ratio	0.87											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj. flow rate	100	466		133	644		289	1089		211	1222	
Lane group cap.	291	468		291	462		335	988		387	1391	
v/c ratio	0.34	1.00		0.46	1.39		0.86	1.10		0.55	0.88	
Green ratio	0.32	0.14		0.32	0.14		0.10	0.28		0.22	0.41	
Unif. delay d1	21.5	35.5		21.8	35.5		36.7	29.6		28.4	22.6	
Delay factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	
Increm. delay d2	3.2	40.6		5.1	190.1		24.2	60.9		5.4	8.1	
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Control delay	24.7	76.0		26.9	225.6		61.0	90.5		33.8	30.8	
Lane group LOS	C	E		C	F		E	F		C	C	
Apprch. delay	67.0			191.6			84.3			31.2		
Approach LOS	E			F			F			C		
Intersec. delay	83.7			Intersection LOS						F		

BACK-OF-QUEUE WORKSHEET

General Information

Project Description *2 THRU LANES EAST-WEST, DUAL ~~SB~~ NB LEFTS, PROT-ONLY LEFTS N-S*

Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane group	*L*	*TR*		*L*	*TR*		*L*	*TR*		*L*	*TR*	
Init. queue/lane	*0.0*	*0.0*		*0.0*	*0.0*		*0.0*	*0.0*		*0.0*	*0.0*	
Flow rate/lane	*100*	*466*		*133*	*644*		*289*	*1089*		*211*	*1222*	
Satflow per lane	*924*	*1765*		*924*	*1744*		*1779*	*1849*		*1744*	*1803*	
Capacity/lane	*291*	*468*		*291*	*462*		*335*	*988*		*387*	*1391*	
Flow ratio	*0.11*	*0.14*		*0.14*	*0.19*		*0.08*	*0.31*		*0.12*	*0.36*	
v/c ratio	*0.34*	*1.00*		*0.46*	*1.39*		*0.86*	*1.10*		*0.55*	*0.88*	
I factor	*1.000*	*1.000*		*1.000*	*1.000*		*1.000*	*1.000*		*1.000*	*1.000*	
Arrival type	*3*	*3*		*3*	*3*		*3*	*3*		*3*	*3*	
Platoon ratio	*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*	
PF factor	*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*		*1.00*	*1.00*	
Q_1	*1.6*	*5.6*		*2.2*	*7.7*		*3.3*	*13.1*		*4.3*	*13.6*	
k_B	*0.5*	*0.4*		*0.5*	*0.4*		*0.3*	*0.7*		*0.6*	*0.9*	
Q_2	*0.2*	*3.4*		*0.4*	*13.2*		*1.3*	*11.0*		*0.6*	*4.5*	
Q avg.	*1.9*	*9.1*		*2.6*	*20.9*		*4.7*	*24.2*		*4.9*	*18.1*	

Percentile Back of Queue (95th percentile)

$f_{B\%}$	*2.3*	*1.8*		*2.2*	*1.6*		*2.0*	*1.6*		*2.0*	*1.6*	
BOQ, $Q_{\%}$	*4.3*	*16.0*		*5.7*	*33.8*		*9.3*	*38.9*		*9.7*	*29.4*	

Queue Storage Ratio

Q spacing	*24.9*	*24.9*		*24.9*	*24.9*		*24.9*	*24.9*		*24.9*	*24.9*	
Q storage	*0*	*0*		*0*	*0*		*0*	*0*		*0*	*0*	
Avg. R_Q												
95% $R_{Q\%}$												