Harmon Rita T.

To: Cooper, Sonny
Cc: Wolfenbarger, Jeanne
Subject: DRC on Wed - Cypress Drive Project

Sonny,

I have some comments on Cypress Drive and will not be able to sign the DRC set on Wednesday until the following comments have been addressed:

-NOTE TO CONTRACTOR - TO PROTECT LATERALS DUE T TO LOW COVER.

1) Sht 3:
   a. Update manhole location Table so that Pipe ID matches plan.
   b. Label pipes at outfall to Isleta Drain.
   c. ~~Show the limits of the SFHA floodplain AH on this sheet.~~ – will be doing LOMR
2) Sht. 5: Rudy needs to email copy.
   a. General Note G: MH STD Dwgs are updated and are 2208, 2212, and 2210 respectively
   b. All new D-inlet build notes must include a build note to use the modified COA STD 2220 grate detail on Sht 12, or call it out in the Notes.
   c. The first D-inlet @ STA 54+65.39 needs to show the T.O.C. elevation
   d. The difference between the T.O.C. and Grate El. For all inlets Should be 0.33' rather than 0.3 ft. or 0.2 ft as shown.
   e. Inlet at STA 55+81.01 has a Grate El. = 51.14 and an invert el= 49.64. Top of pipe is same as grate el.
   f. Cover over the lateral at the inlet @ STA 57+68.82 is 0.74', but pavement section is 15". How do you propose to build road over lateral without damaging pipe?
   g. Provide certification from pipe manufacturer showing that 18" dia. Class IV pipe with 0.74' to top of asphalt is adequate, with construction loads considered.

   use elliptical pipe, CL III

3) Sht. 10:
   a. On MH curb detail, Clarify what is intended by "NOTE LOCATION OF RUNGS" – so not accident. turned
   b. MH-C CURB DETAIL: MH is called out as an inlet
   c. ~~Provide documentation that the proposed grate over the MH has sufficient capacity. How much flow was originally intended to be collected? Where in the report is this indicted?~~

From: Cooper, Sonny [mailto:Sonny.Cooper@WestonSolutions.com]
Sent: Monday, February 22, 2016 3:27 PM
To: Harmon Rita T.
Subject: RE: Cypress Drive Project

Rita,

I could not locate any drawings of the MH covers used on Phase I of Cypress Drive, but attached is a photo of one, and a drawing of a similar design from another Bernco project.

Not much detail. We are working with Rinker to see if they might have a shop drawing of something they have done before.

Thanks.

David "Sonny" Cooper, P.E.

Project Manager

Weston Solutions, Inc.
3840 Commons Ave. NE
Albuquerque, NM 87109
(505) 837-6524 fax: (505) 837-6595

From: Harmon Rita T. [mailto:rharmon@cabq.gov]
Sent: Thursday, February 11, 2016 8:39 AM
To: Cooper, Sonny
Subject: RE: Cypress Drive Project

Sure Sonny,
If you do get a copy of the MH covers that were used on Phase 1, I would appreciate it if you could send it to me. We have some consultants who want to put an inlet on top of a manhole, and that doesn't seem to be a good design at all. So I am looking to see what others have done.

Thanks,

Rita Harmon, P.E.
Senior Engineer
Planning Department
Development & Review Services Division
600 2nd St. NW, Suite 201
Albuquerque, NM 87102
t 505-924-3695

From: Cooper, Sonny [mailto:Sonny.Cooper@WestonSolutions.com]
Sent: Wednesday, February 10, 2016 5:04 PM
To: Harmon Rita T.
Subject: RE: Cypress Drive Project

Rita,

Thank you for getting this to me so quickly.

David "Sonny" Cooper, P.E.

Project Manager

Weston Solutions, Inc.
3840 Commons Ave. NE
Albuquerque, NM 87109
(505) 837-6524 fax: (505) 837-6595

From: Harmon Rita T. [mailto:rharmon@cabq.gov]
Sent: Wednesday, February 10, 2016 4:41 PM

To: Cooper, Sonny
Subject: Cypress Drive Project

Hi Sonny,

As we talked about at today's DRC meeting with the City, the Modified 2220 grate detail needs to be shown on the plan. See attached.
The FloodPlain permit is also attached. Please fill out and send to Rudy Rael at rrael@cabq.gov.

Thanks,

Rita Harmon, P.E.
Senior Engineer
Planning Department
Development & Review Services Division
600 2nd St. NW, Suite 201
Albuquerque, NM 87102
t 505-924-3695

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DESIGN BASIS REPORT
CYPRESS DRIVE ROAD IMPROVEMENTS (PHASE II)

Prepared For:

2400 Broadway SE
Albuquerque, New Mexico 87102

Prepared By:

3840 Commons Avenue, NE
Albuquerque, New Mexico 87109

January 2016

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1 INTRODUCTION

Weston Solutions, Inc. (Weston) was contracted by the Bernalillo County Public Works Department (County) to provide a Design update of the Cypress Drive Road Improvements, first designed in 2009 by Resources Technology, Inc. (RTI) (acquired by Weston in 2009). Most of the county portion of this project was constructed in 2011 and this design update will largely address the portion located within the City of Albuquerque (City) and the small county portion that remains to be built. The main objectives of this project are as follows:

- Revise and complete the construction documents for the portion of the project located within the city limits.
- Obtain a Letter of Map revision (LOMR) from the Federal Emergency Management Agency (FEMA).

2 DISCUSSION OF THE PREVIOUS DESIGN FEASIBILITY STUDY

During the preliminary design of this project a feasibility study was conducted by RTI in order to facilitate the final design issued in the fall of 2009. Much of this information remains valid and this study is included as Appendix A. Key items and changes to the project since the issue of this document are discussed below.

2.1 Feasibility Study Introduction

The county portion of this project constructed in 2011 is commonly referred to as Phase I. The remaining portion is commonly referred to as Phase II. This 2016 update evaluates the 2009 study and adopts the effects of Phase I construction.

2.2 Existing Site Conditions

Aside from Phase I construction, the site conditions remain largely the same, although an old hotel at the intersection of Cypress and Central has since been demolished and converted to a vacant lot. The FEMA Floodplain Map which the project site is located on was updated in August of 2012, but the floodplain affecting the project site was unchanged.

2.3 Topographic Design Survey and Utilities

Alpha Surveying produced a topographic and planimetric map from field surveys of the right-of-way in 2009. This survey is incorporated into the Plan and Profile sheet included in Appendix A. Additional survey conducted in 2015 is discussed in subsequent sections.

2.4 Hydrology

The hydrologic analysis was conducted using the hydrologic method Part A – Procedure for 40 Acres and Smaller Basins contained in the Development Process Manual (DPM, Chapter 22, Part A) of the Albuquerque Planning and Public Works Department. The study used the June 1997 update of the DPM; this was verified as current to the October 2008 Revision. The three drainage areas (A, B and C) delineated are shown on the map presented in Appendix A. The hydrologic results are presented in Table 1 (reproduced from the study).

Table 1: Proposed Hydrologic Calculations			
Basin ID	Area (acres)	10-Year Flow (cfs)	100-Year Flow (cfs)
A	5.17	9.7	17.0
B	6.08	13.1	21.7
C	2.46	5.3	8.8

2.5 Hydraulics

In order to overcome the hydraulic difficulties poised by the flat grades of Cypress Drive, an alternative approach, termed peaks and valleys, was adopted. In recent site visits, this approach appears to have been successfully implemented for Phase I. The underlying stormdrain was designed with inlets at each valley and six new drainage areas were created (one for each inlet). The 100-year flows are presented in Table 2 (reproduced from the study) along with the 2009 design and constructed conditions.

Table 2: Proposed vs. Designed vs. Constructed Inlets				
Inlet-Basin ID	100-Year Flow (cfs)	Proposed Inlet Type and Number	2009 Design Inlet Type and Number	Constructed Inlet Type and Number
1A	6.9	2 Double Ds (1 each left and right)	2 Double Ds (1 each left and right)	1 Single D (left) and 1 Double D (right)
1B	6.8	2 Double Ds (1 each left and right)	2 Double Ds (1 each left and right)	1 Single D (left) and 1 Double D (right)
2	9.3	2 Double Ds (1 each left and right)	2 Double Ds (1 each left and right)	N/A
3	5.2	2 Single Ds (1 each left and right)	2 Single Ds (1 each left and right)	N/A
4	3.5	1 Single D (left) & 1 Slotted MH Cover	1 Single D (left) & 1 Slotted MH Cover	N/A
5	10.2	2 Double Ds (1 each left and right)	2 Double Ds (1 each left and right)	N/A

The storm drain hydraulics were computed using Bentley's FlowMaster utilized to determine the required pipe diameter for the accumulated flow. This detailed analysis is included in Appendix A and the results are summarized in Table 3 (reproduced from the study).

Table 3: Storm Drain Hydraulics Summary					
Basin ID	Pipe IDs	Accumulated 100-Year Flow (cfs)	Pipe Size Rise x Span (inches)	Round Equivalent Pipe (inches)	Slope (%)
5	P-8 1	10.2	19 x 30	24	0.26
4	P-7 2	13.8	22 x 34	27	0.25
3	P-6 3	18.9	24 x 38	30	0.25
2	P-5, P-4 4,5	28.3	24 x 38	30	0.35
1B	P-3	35.1	29 x 45	36	0.48
1A	P-2, P-1	42.0	29 x 45	36	0.48

Labeling is opposite direction that shown on plan

2.6 Construction Considerations

The construction considerations of the previous study remain valid, which include:

- Construction will need to be carefully managed to facilitate homeowner access, maintain utility accessibility, and insure safety throughout the construction duration.
- The 16-inch waterline will need to be rerouted beneath the new storm drain. Proper clearances will need to be verified.
- The existing condition of the water main should be verified by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) prior to construction due to past experiences with faulty service welds on cast iron waterline.
- For more details, refer to the previous study (RTI 2009a).

Changes to the alignment of the Phase I storm drain affected the final alignment of Phase II. The location of Manhole E had to be shifted several feet to the west in order to prevent a conflict with an existing sanitary sewer manhole. The adjustment is not expected to negatively affect the constructability of the storm drain.

2.7 Feasibility Study Conclusions and Cost Estimate

The findings of the feasibility study were largely implemented in the 2009 design and Phase I construction. The preliminary cost estimate prepared alongside the previous design is presented in Appendix A, although it is superseded by the new cost estimate prepared for this report (see Appendix D).

3 CURRENT DESIGN

The following sections discuss the investigations and design modifications made to the original Cypress Drive design due to changes during construction of Phase I of the project.

3.1 As-Builts

Weston was provided with the as-built data that the County had available, which was primarily for the wet utility service connections of the Phase I construction. No as-built data was available for the roadway or stormdrain improvements. Therefore, Weston subcontracted a surveyor to collect several as-built data points of the Phase I roadway and storm drain.

Although the storm drain inlets were constructed at approximately the correct locations of the original design, the design of two were modified during construction. Manholes F and G (see the construction plans) were modified to combine the manhole and drop inlet at each of those locations. The resulting structure is a concrete manhole with a flat lid that has a rectangular opening with a standard Type D grate inlet per the City's standard specifications. The original design was separate manhole and drop inlet box with a standard Double Type D inlet. Therefore, the capacity at each of these inlets was reduced by half.

The location of the furthest upstream manhole constructed during Phase I (Manhole F) is slightly different than the original design (moved about 10 feet further north than designed), however the finished invert elevation (4945.60 feet) is only 0.06 feet lower than the original

design invert. Therefore, the alignment of the Phase II storm drain was modified, but the pipeline grades were kept approximately the same.

The next two manholes constructed (Manholes G and H) have finished invert elevations such that the storm drain is flatter than designed for both sections. Between Manholes F and G, the constructed storm drain has a slope of 0.16%, versus a design of 0.35%. The section between Manholes G and H has a constructed slope of 0.39%, versus a design of 0.48%. Due to this, the hydraulics of these modifications were checked as part of this design.

why not

3.2 Design Update

As discussed above, the hydrology is unchanged, and the Phase I portion of the Cypress Drive pavement appears to be constructed according to plan. As-built data is not available for the pavement, however "peaks" and "valleys" along street alignment were visible, with the valleys centered on the constructed storm drain inlets. This drainage approach was the intent of the original design, and appears to have been constructed as designed. Therefore, the Phase II street grades did not require design modifications due to the Phase I construction.

However, the section of storm drain constructed during Phase I required design modifications to the Phase II section of storm drain, which required updates to the hydraulics and alignment of the pipeline.

3.2.1 Storm Drain Hydraulics

Due to the as-built results of the section constructed during Phase I, Weston recalculated the pipeline hydraulics. As with the last design, FlowMaster was used to calculate the hydraulics using Manning's Formula for open-channel flow. However, the section of pipeline between Manholes F and G did not converge in the software, and required further analysis. To do this, Weston performed a calculation using Autodesk's Storm and Sanitary Analysis software which is capable of analyzing complex pipeline systems. A summary of the hydraulic results are listed in Table 4, and detailed output files are in Appendix B.

labeling is opposite of that on plan

Table 4: Updated Storm Drain Hydraulics Summary

Pipe IDs	Manholes	Accumulated 100-Year Flow (cfs)	Pipe Size Rise x Span (inches)	Slope (%)	Percent Full (%)	Flow Velocity (ft/s)
P-8	MH A to B	10.2	19 x 30	0.26	73	4.2
P-7	MH B to C	13.8	22 x 34	0.25	71	4.5
P-6	MH C to D	18.9	24 x 38	0.25	74	4.8
P-5	MH D to E	28.3	27 x 42	0.36	70	6.1
P-5	MH E to F	28.3	27 x 42	0.35	71	6.1
P-3	MH F to G	35.1	29 x 45*	0.16 (existing)	100**	4.1
P-2	MH G to H	42.0	29 x 45*	0.39 (existing)	81	6.8
P-1	MH H to Water Quality Manhole	42.0	29 x 45*	Pipe section might have been constructed. Existing conditions are not known		

* Pipe size was assumed. No as-built data is available.

** Based on the hydraulic calculations of this section, Manhole F will be surcharged and overflow approximately 7.5 cfs.

As shown in Table 4, the section of pipe between Manholes F and G was constructed flatter than designed and will surcharge, causing Manhole F to overflow approximately 7.5 cfs. Due to the peak and valley configuration of the street design, water will pond over the inlet at Manhole F until reaching a depth that will allow some runoff to flow east along Cypress Drive. Since Single Type D inlets (rather than the Double Type D inlets from the original design) were constructed on the south side of Cypress Drive at both Manholes F and G, this will compound the situation at Manhole F. The potential for ponding was further investigated by analyzing the street hydraulics.

3.2.2 Street Hydraulics

With approximately 7.5 cfs overflowing Manhole F during a 100-year rainfall event, the street hydraulics were checked to determine if the overflow would be contained within the curbs. Between storm drain inlets, the street surface design grades create peaks and valleys, with the valleys centered at the inlets. Therefore, the overflow would overtop one of the peaks, flowing into the next valley, so on until the water reached the rundown into the Isleta Drain. The street cross section hydraulics were calculated using the Manning's Formula in FlowMaster (See Appendix C).

The runoff flowing to Manhole F during a 100-year rainfall event is approximately 6.8 cfs. If the drop inlets at Manhole F overflow, the possible flow rate in the street is the sum of the runoff and the overflow, which is 14.3 cfs. At this flow rate, the flow depth was estimated to be 0.29 feet (from the curb flow line). The design curb height from the flow line is approximately 0.23 feet; therefore the 14.3 cfs would overtop the curbs and spread approximately 3 feet past the outside edge of curb.

4 ENGINEER'S OPINION OF ESTIMATED CONSTRUCTION COSTS

An updated cost estimate was prepared in conjunction with this design, which is included as Appendix D. The engineer's opinion of estimated construction cost is $450,844 (excluding New Mexico Gross Receipts Tax).

4.1 Unit Prices

The estimated construction costs for Phase II were determined using the *City Engineer's Estimated Unit Prices for Contract Items 2009,* published by the City of Albuquerque. The unit item costs were fixed to the Construction Cost Index (CCI) at a value of 221.7 as published by the American City and County Magazine. These values were adjusted using the December 2015 CCI of 259.7 (latest available value). This inflation adjustment increased the unit prices by 17.1%.

4.2 Quantities

The estimated quantities were determined through analysis of the Phase II design plans and the AutoCAD Civil 3D design model. The quantities of some items are likely to change during construction since some existing items from Phase I construction are not fully known. This includes the exact length of reinforced concrete pipe that has been installed and the water quality manhole at the downstream end of the storm drain. Some investigation by the contractor

will be required to determine the full scope of work for construction; therefore change orders are likely to be requested for changes in quantity.

5 REFERENCES

RTI 2009a. *Cypress Drive Road Improvements Feasibility Study*. RTI. 2009.

RTI 2009b. *Cypress Drive Road Improvements Construction Plans*. RTI 2009

COA 2009. *City Engineer's Estimated Unit Prices for Contract Items 2009*, City of Albuquerque.

COA 2008. *Albuquerque Development Process Manual, Volume II- Design Criteria*. City of Albuquerque. 2008 Edition.

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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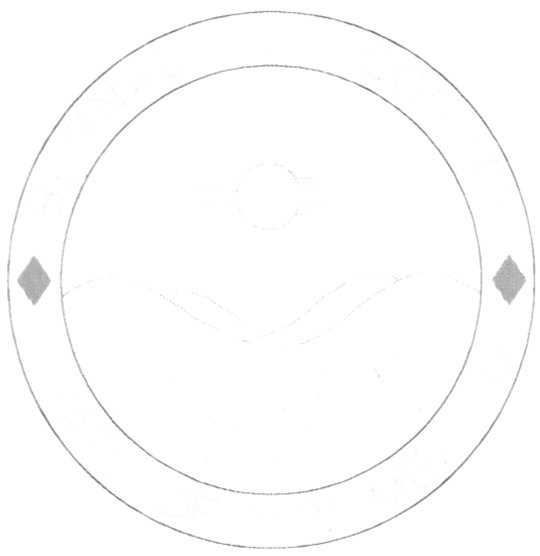
Cypress Drive Road Improvements Feasibility Study

Prepared For:



By:

Resource Technology, Inc.

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Environmental Sciences
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RTI Project Number: 08-260

March 2009

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Drainage Basin Map

Overall Plan and Profile

Plan Set Cover Sheet

Individual Plan and Profile Sheets

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

1.0 INTRODUCTION

Cypress Drive is located in Bernalillo County, situated in the Southwest Valley, south of Central Avenue between 48th Street and 51st Street. See the vicinity map on the cover sheet in the Exhibits. It is a two-lane asphalt paved road that stretches from Central Avenue to Atrisco Drive. There is essentially no curb and gutter on Cypress between Central and the Isleta Drain, and there is roll curb and gutter between the Isleta Drain and Atrisco.

The Cypress Drive Feasibility Study addresses the section from Central to the Isleta Drain and evaluates the feasibility of constructing a storm drain with associated road improvements including pavement removal and replacement and roll curb and gutter installation.

2.0 EXISTING SITE CONDITIONS

Cypress Drive is primarily a residential street with several businesses located at Central. On the east side and fronting Central Avenue is a motel and across the street to the west is a tire shop that also fronts Central Avenue. South of the tire shop is an auto repair business that fronts Cypress. On the west side of Cypress, adjacent to the tire shop, there is standard curb and gutter with a drive pad running approximately 100 feet next to the property. On the east side of Cypress there is an existing handicap ramp.

Cypress Drive is currently classified as a Local Residential Street with a 25 mph posted speed limit and is not projected to be classified as a collector or higher volume road according to Mid-Region Council of Government (MR COG), *Long Range Roadway System, Albuquerque Metropolitan Planning Area, 2004*. The Cypress Drive right-of-way width is 50 feet. In addition, there are "Deaf Child Ahead" warning signs located in conjunction with two speed humps situated near the southern portion of the study area.

Cypress Drive and its drainage area are located within one of two FEMA floodplain designations: Zone X or Zone AH with a base flood elevation of 4951 feet (NAVD '88). A copy of the FEMA Firmette and legend can be found in Appendix A.

3.0 TOPOGRAPHIC DESIGN SURVEY AND UTILITIES

Alpha Surveying produced a topographic and planimetric map from field surveys of the right-of-way. See the Plan and Profile sheet in Appendix B. All of the electronic survey data was used to create a digital terrain model (DTM) which was used to generate contours. The coordinate system for the survey is tied to Albuquerque Geodetic Reference System control referenced to New Mexico State Plane Coordinates, Central Zone, North American Datum (NAD) 83, North American Vertical Datum (NAVD) 88 datum. Vertical control precision was for a 1-foot contour interval. For the drainage area outside the right-of-way, the topographic survey was supplemented with contours from the Albuquerque/Bernalillo County LIDAR Mapping, 1999.

There are a number of overhead and underground utilities within the project corridor. These utilities include: 8" vitrified clay pipe sanitary sewer located approximately on the road centerline, 2" high pressure gas line in the south side of the right-of-way, 8" waterline in the south side of the right-of-way transitioning to a 16" waterline in the north side of the right-of-way, cable television lines, telephone lines in both sides of the right-of-way at the eastern end of the study area, and overhead power lines on both sides of the right-of-way. In addition, there is a fiber optic communication line crossing Cypress Drive running north south along the western edge of the Isleta Drain right-of-way. The utility information was derived from the planimetric survey, as-builts, potholing, and information provided by all utility companies with facilities on Cypress. See the plan and profile sheets in Appendix B.

To determine the depth of several utility lines, five potholes locations were investigated by Abasto Utility Locating Company, LC. Immediately prior to construction, it may be advantageous for the contractor or the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) to investigate the utility depth at several additional locations. In particular, an investigation between stations 61+50 and 63+00 may be beneficial since there appears to be an additional 8" waterline crossing of the SAS that is not shown in the as-builts. The utility type, material, depth and notes are shown below in Table 1.

Table 1: Pothole Summary

Pothole Number	Approx. Station	Utility	Material	Depth to Top (inches)	Notes
1	63+40	Water	Metallic	48	Although identified as 12", this is most likely a 16" Waterline.
2	64+80	Water	Metallic	44	Although identified as 12", this is most likely a 16" Waterline.
3	68+20	Water	Metallic	36	Although identified as 12", this is most likely a 16" Waterline.
4	53+20	SAS	VCP	56	8" SAS, Gas service line not located. Waterline not located at this location, there was a blue stake mistake.
5	52+50	Water	Metallic	21	8" waterline is very shallow at this location.

4.0 HYDROLOGY

4.1 Analysis Method

This study employs hydrologic method Part A – Procedure for 40 Acres and Smaller Basins contained in the Development Process Manual (DPM, Chapter 22, Part A) of the Albuquerque Planning and Public Works Department, which was also developed for Bernalillo County. This simplified procedure utilizes initial abstraction/uniform infiltration precipitation losses and the Rational Method. Cypress Drive is located in Precipitation Zone 1, "west of the Rio Grande."

4.2 Drainage Areas

Three drainage basins (A, B, and C) were delineated based upon the existing topography, and the areas were measured using AutoCAD. The total contributing watershed is approximately 13.7 acres. The computed total runoff volume and peak discharge rate were then calculated for both the 10-year, 6-hour storm and the 100-year, 6-hour storm. The resulting flows were the basis for sizing the drainage structures. See Appendix C for the Drainage Basin Map, and see Table 2 for the drainage areas.

This drainage area is included in the Southwest Valley Flood Damage Reduction Feasibility Study (Resource Technology, Inc., multiple volumes, multiple dates) and is identified as Subbasin 56. Subbasin 56 encompasses approximately 36 acres and is bounded by Central Avenue to the north, Isleta Drain to the east, the Arenal Main Canal to the west, and a berm immediately south of Cypress Drive lots. Draining just over one third of Subbasin 56, storm drain K-12-A was designated to convey runoff from Cypress Drive to the Isleta Drain. Storm drain K-12-A included 774 feet of 30" RCP, 956 feet of 36" RCP, 6 manholes and groups of inlets, and one branch that includes one additional manhole with inlets connected by 343 feet of 24" RCP. The branch was intended to drain the southwest corner of La Vida Nueva Subdivision; however, this branch is no longer needed since construction of the apartments at this location.

4.3 Land Treatment

The land treatments for each basin were determined by reviewing an updated orthophoto and identifying the land treatment of several typical lots from each basin. Also factored in were the roadway and the remainder of the right-of-way. For this developed neighborhood, only land treatment C (soil compacted by human activity) and land treatment D (impervious areas, pavements, and roofs) were used. The percentages of each land treatment can be found in Appendix C.

4.4 Hydrologic Results

Table 2 identifies the total estimated flow for each basin for the 10-year (10%-chance) and 100-year (1%-chance) storm events. See Appendix C for detailed hydrologic output.

Table 2: Proposed Hydrologic Calculations

Basin ID	Area (acres)	10-Year Flow (cfs)	100-Year Flow (cfs)
A	5.17	9.7	17.0
B	6.08	13.1	21.7
C	2.46	5.3	8.8

5.0 HYDRAULICS

5.1 Street Hydraulics

The existing street falls approximately 2.6 ft over 1760 feet resulting in a very flat slope of 0.00148 ft/ft (0.148%). With the use of a typical crown (2% cross slope) and roll type mountable curbs which have a depth of 0.333 feet, the carrying capacity of Cypress with a slope of 0.148% is 1.5 cfs per side for a total of 3.0 cfs. The number of inlets that would be required for this scenario is very cost prohibitive. Therefore, the carrying capacity of a street with an inverted crown and a slope of 0.148% was investigated. The street in this scenario would have a capacity of 13.4 cfs. Although this option works from a hydraulic standpoint, this option causes maintenance problems for Bernalillo County and therefore was rejected. It should be noted that a standard curb and gutter was not considered due to the increased cost of adding numerous drive pads, the logistics of locating the drive pads, and probable resistance of the neighborhood.

An alternative approach, termed peaks and valleys, was investigated. This approach requires regrading of the road to create a series of peaks and valleys resulting in an increased slope and therefore an increased carrying capacity of the street. This approach must be carefully employed in an existing development to insure that all properties continue to drain to the roadway. Since the existing properties are just above the existing road grade, six valleys of 0.5 feet deep were created by grading the roadway down at 0.5% and then up at 0.5%, matching existing ground at each end (the peaks). The street carrying capacity for this scenario of roll type mountable curbs with a longitudinal slope of 0.5% and a cross slope of 1.0% is 9.0 cfs. Detailed street hydraulic computations can be found in Appendix D. See the Exhibits for the Overall Plan and Profile and individual plan and profile sheets.

Six new drainage areas (1A through 5) were delineated for each valley where inlets will be placed. The locations of the proposed inlets are shown on the individual plan and profile sheets. Note, to avoid horizontal conflict with the SAS and to reduce construction cost by reducing the number of manholes by two, the storm drain alignment was modified necessitating the use of a slotted manhole cover in place of an inlet. Grating capacities were

determined from PLATE 22.3 D-5 and PLATE 22.3 D-6 from Chapter 22 in the Albuquerque Development Process Manual. Table 3 identifies the 100-year flows per basin and the required inlet type and number of inlets.

Table 3: Proposed Inlets

Inlet-Basin ID	100-Year Flow (cfs)	Inlet Type and Number
1A	6.9	2 Double Ds (1 each left and right)
1B	6.8	2 Double Ds (1 each left and right)
2	9.3	2 Double Ds (1 each left and right)
3	5.2	2 Single Ds (1 each left and right)
4	3.5	1 Single D (left) & 1 Slotted MH Cover
5	10.2	2 Double Ds (1 each left and right)

5.2 Storm Drain Hydraulics

The slope of the storm drain was limited by the relatively flat terrain and the necessity to cross the 8" sanitary sewer upstream of the Isleta Drain. Therefore, elliptical pipes were utilized at slopes from 0.25% to 0.48%. Bentley's FlowMaster was utilized to determine the required pipe diameter for the accumulated flow. Table 4 identifies the accumulated flow, internal pipe diameter, and the slope. See Appendix D for the detailed storm drain output information.

Table 4: Storm Drain Summary

Basin ID	Pipe IDs	Accumulated 100-Year Flow (cfs)	Pipe Size Rise/Span (inches)	Round Equivalent Pipe (inches)	Slope (%)
5	P-8	10.2	19/30	24	0.26
4	P-7	13.8	22/34	27	0.25
3	P-6	18.9	24/38	30	0.25
2	P-5, P-4	28.3	24/38	30	0.35
1B	P-3	35.1	29/45	36	0.48
1A	P-2, P-1	42.0	29/45	36	0.48

6.0 CONSTRUCTION CONSIDERATIONS

Construction will need to be carefully managed to facilitate homeowner access, maintain utility accessibility, and insure safety throughout the construction duration.

6.1 Waterline and Services

There are several construction considerations to take into account that could be clarified with additional potholing. The 16" waterline will need to be rerouted under the storm drain, and twenty-three water services will need to be rerouted over/under the storm drain. The alternative to rerouting these services is the addition of a water main; however, the cost for the additional main is most likely cost prohibitive. There are two surveyed waterline valves that do not match the as-built locations and an additional waterline valve not shown on the as-builts. Although the majority of the sanitary sewer line is VCP, there is 175 feet of ductile iron (DI) pipe. The DI pipe was utilized where the 8" (suspected crossing) and 16" waterlines cross the sanitary sewer with less than 1 foot of clearance.

The Albuquerque Bernalillo County Water Utility Authority expressed concerns regarding the service welds on the cast iron waterline main. ABCWUA discovered problems with the welds on a similar line in the general vicinity of this project. In order to prevent a delay during construction that would increase construction cost and cause additional inconvenience to homeowners, it is recommended that ABCWUA inspect the lines prior to construction to ascertain the soundness of the connections. If the connections are deteriorating, ABCWUA could prepare a Memo of Understanding with Bernalillo County to extend the scope to include replacing the waterline main and service lines.

6.2 Sanitary Sewer and Services

There will be approximately 0.48 feet (5.81 inches) of clearance for the storm drain over the 8" sanitary sewer; therefore, encasing the sanitary sewer line should be considered. To avoid horizontal conflict with the SAS main, one manhole with a slotted cover will be using in place of an inlet and two manholes will need to be placed outside the roadway within the right-of-way. With the exception of several tees near Central Avenue, risers from the 8" SAS main

line to the sewer services are used throughout the entire study area. From Station 54+81.76 (beginning of storm drain) to Station 66+00, the SAS main line is below the storm drain, and the sewer services could be easily reconnected after eliminating the risers and increasing the slope to the property line. This should only be required for the services on the north/east from Station 54+81.76 to approximately Station 63+00 (where storm drain crosses SAS) and on the south/west from Station 63+00 to Station 66+00. From Station 66+00 to Station 68+25 (last service before Isleta Drain), four to five services will need to be rerouted over the storm drain by extending the existing risers.

6.3 Other Utilities

A utility coordination meeting will need to be held at the inception of the design process with all utility companies with service in the project area. With the exception of water and sewer services, utilities will need to be relocated prior to construction to expedite completion of this project.

6.4 Roadway at Isleta Drain

A rundown into the Isleta Drain will be constructed to drain Cypress Drive and its contributing drainage area. From the last roadway "peak", Cypress will drain east approximately 170 feet to the rundown, and it will drain west the area over the Isleta Drain (approximately 50 feet). The existing rundown east of the drain will need minor rehabilitation to stabilize the structure against continued erosion along its edges.

7.0 CONCLUSIONS AND COST ESTIMATE

It is recommended that roll type mountable curbs and 1% crown be utilized in conjunction with peaks and valleys. This Draft Feasibility Study identifies a viable preliminary plan to present to the neighbors at a public meeting, date and time to be determined. Input from the neighbors will be collected at the meeting, summarized, and potential modifications discussed with Bernalillo County.

The engineer's estimated preliminary cost for this project with a detailed breakdown is included as Appendix E. This breakdown includes differentiation between the County's maintained portion of the roadway and the City's maintained portion of the roadway.

It should be noted that a portion of Cypress Drive is located within the City of Albuquerque, and the County will present this design to the City for input.

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX A: FEMA FIRMETTE AND LEGEND

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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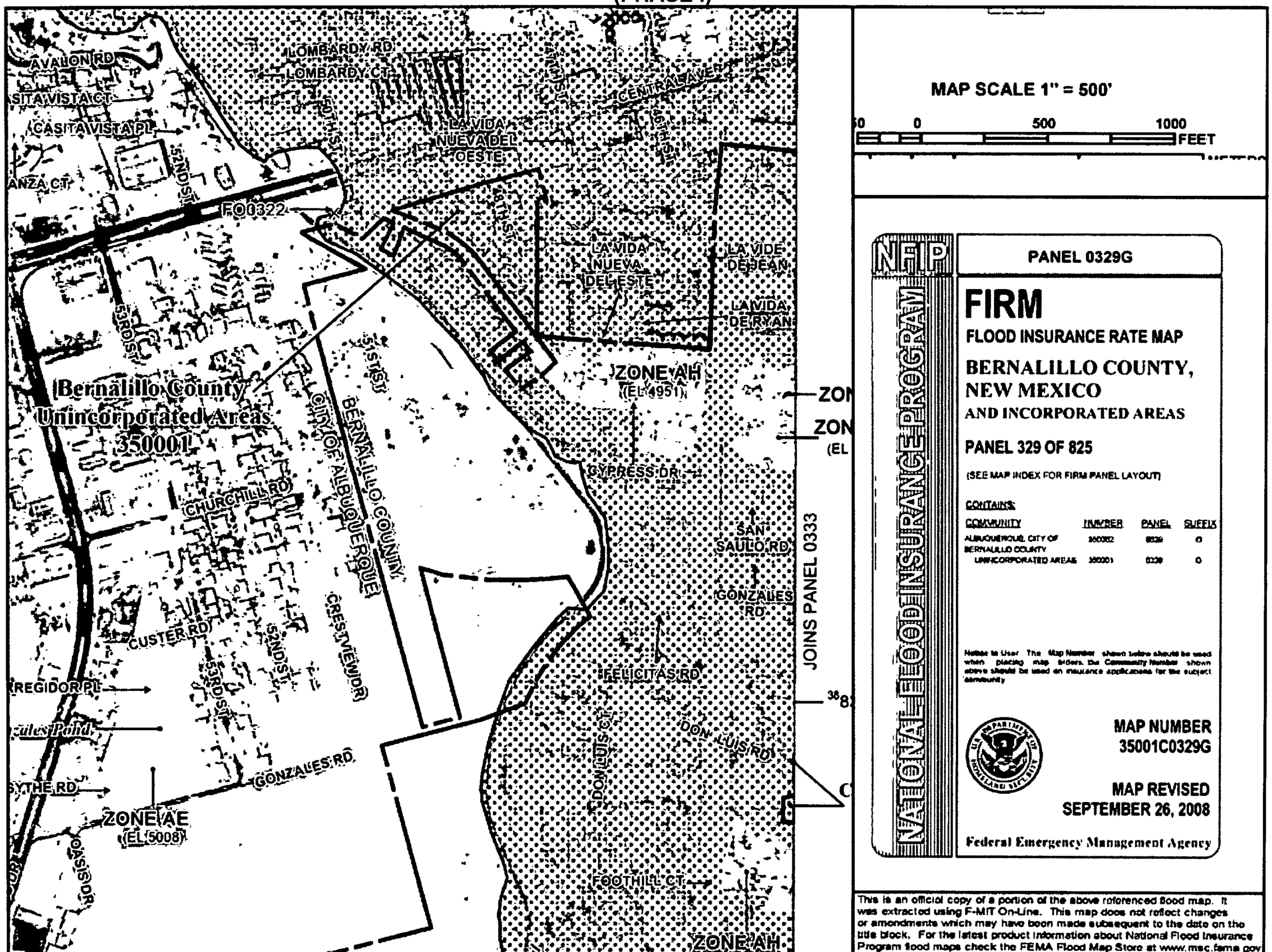
MAP SCALE 1" = 500'
0
500
1000
FEET
PANEL 0329G
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
BERNALILLO COUNTY, NEW MEXICO
AND INCORPORATED AREAS
PANEL 329 OF 825
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
ALBUQUERQUE, CITY OF 350002 0329 G
BERNALILLO COUNTY
UNINCORPORATED AREAS 350001 0329 G
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
35001C0329G
MAP REVISED
SEPTEMBER 26, 2008
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
LOMBARDY RD
LOMBARDY CT
AVALON RD
CASITA VISTA CT
CASITA VISTA PL
ANZA CT
52ND ST
FO0322
LA VIDA NUEVA DEL OESTE
CENTRAL AVE
LA VIDA NUEVA DEL ESTE
LA VIDA DE JEAN
LA VIDA DE RYAN
ZONE AH
(EL 4951)
ZON
ZON
(EL
Bernalillo County
Unincorporated Areas
350001
53RD ST
51ST ST
CHURCHILL RD
BERNALILLO COUNTY
CITY OF ALBUQUERQUE
CYPRESS DR
SAN SAULO RD
GONZALES RD
CUSTER RD
52ND ST
53RD ST
CRESTVIEW DR
FELICITAS RD
JOINS PANEL 0333
REGIDOR PL
DON LUIS RD
GONZALES RD
SYTHE RD
ZONE AE
(EL 5008)
OASIS DR
FOOTHILL CT
ZONE AH

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX B: POTHOLE RESULTS

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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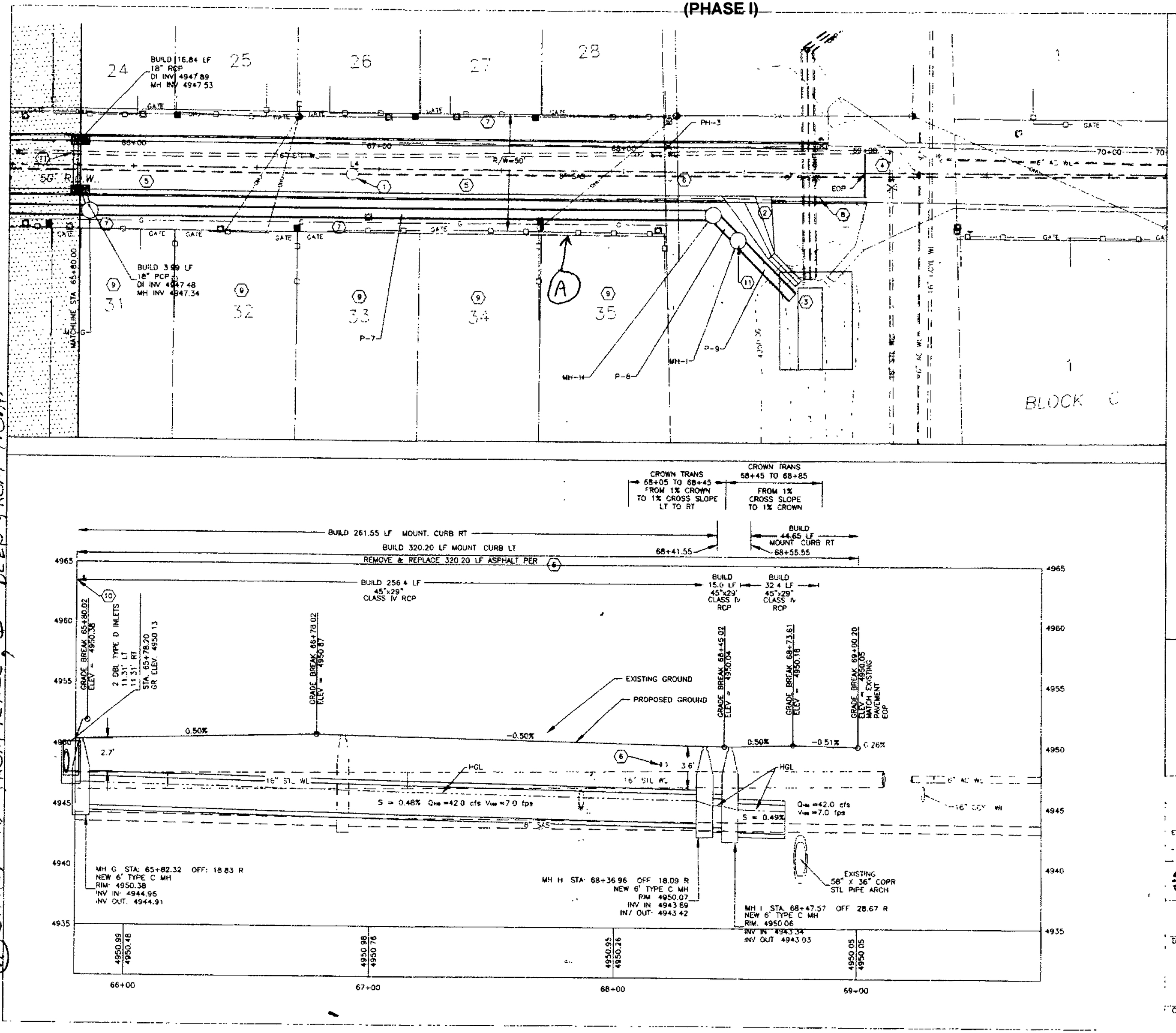


A SIPHON - 18' FROM FENCE, 6'0" DEEP FROM T.O.P.

GENERAL NOTES

1. SEE SHEET 10 FOR PAVEMENT DETAILS
2. CONTRACTOR IS RESPONSIBLE FOR VERIFYING HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES. UTILITY LOCATIONS SHOWN IN APPROXIMATE MANNER ONLY. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT COST OF UTILITY LINES DAMAGED IN THE COURSE OF CONSTRUCTION
3. CONSTRUCTION LIMITS/EASEMENTS ARE FROM FENCE LINE TO FENCE LINE. SO NOT DISTURB FENCE AND/OR WALL. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT COST OF FENCE AND/OR WALL DAMAGED IN THE COURSE OF CONSTRUCTION.
5. SEE SHEET 3 FOR POTHOLE TABLE AND LINE AND CURB TABLE.
6. RCP STORM DRAIN AND LATERALS SHALL BE GASKETED TONGUE AND GROOVE.
7. TYPE C MANHOLES CONSTRUCTED PER COA STD DWGS 2101, 2107 AND 2110 UNLESS OTHERWISE NOTED.

KEYED NOTES

1. ADJUST MANHOLE ELEV TO NEW GRADE, INCLUDE CONCRETE PAD PER COA STD DWG. 2101. CONCRETE PAD INCIDENTAL TO ADJUSTMENTS.
2. SEE SHEET 11 FOR RUNDOWN DETAILS
3. SEE SHEET 11 FOR EROSION PROTECTION DETAILS
4. SAWCUT PAVEMENT STA: 69+00.09
5. REMOVE AND DISPOSE OF EXISTING ASPHALT.
6. FIBER OPTIC LINE AND TELEPHONE LINE ELEVATIONS ARE APPROXIMATE. BOTH LINES SHALL BE SUPPORTED AND PROTECTED DURING CONSTRUCTION. CONTACT AT&T REP FOR STANDBY THREE DAYS PRIOR TO CONSTRUCTION NEAR FIBER OPTIC LINE
7. GRADE TO DRAIN FROM FENCE LINE TO MOUNTABLE CURB. DO NOT DISTURB EXISTING UTILITY POLES OR SERVICES (INCLUDING WATER METERS)
8. REPLACE SPEED HUMP PER SHEET 10
9. SEE SHEET 9 DETAIL 2 FOR SAS SERVICE MODIFICATION AND DETAIL 4 FOR WATER SERVICE MODIFICATION.
10. SEE SHEET 7 FOR RCP LENGTH AND TYPE
11. WATER QUALITY MH STC900 PRECAST CONCRETE STORMCEPTOR OR APPROVED EQUIVALENT.

VERTICAL 0 4' 8'
HORIZONTAL 0 20' 40'

AS-BUILT INFORMATION
CONTRACTOR
WORK STAKED BY
INSPECTED BY
FIELD VERIFIED BY
DRAWINGS MARKED BY
DATE
MICRO-FILM INFORMATION

BENCH MARKS
BEARINGS ARE BASED ON GEODETIC NORTH FROM GPS OBSERVATIONS. DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN US FEET. ELEVATIONS ARE BASED ON A.G.R.S. STATION "15-J12". ELEVATION OF STATION = 4965.627 (NAVD 1988 DATUM)

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL

REMARKS
REVISIONS
DESIGN
No. Date By

Environmental Services
Water Resources
Transportation Infrastructure
Planning

BERNALILLO COUNTY

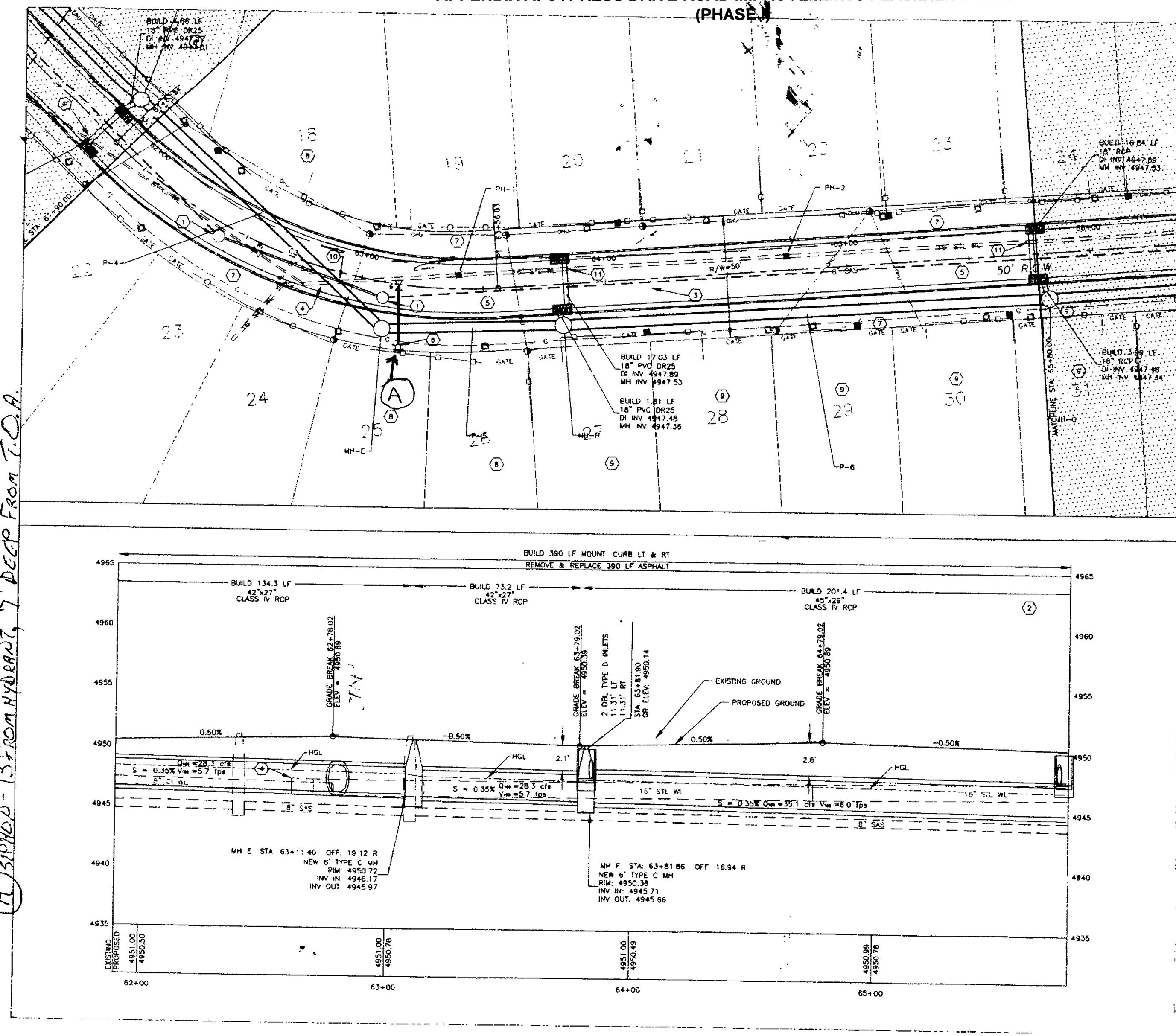
CYPRESS DRIVE STORM DRAIN
PLAN & PROFILE STA 65+80 TO EOP

Design Review Committee | City Engineer Approval | Design Update | Mo./Day/Yr. | Mo./Da.

County Project No.	City Project No.	Zone Map No.	Sheet	Of
TS08-04	601791	K-11/12	8	

GAS SVCS ALL 2'0 TO 3'0 FROM TOP OF ASPHALT

(A) SPHOLD - 13' FROM HYDRANT, 7' DEEP FROM T.O.A.



GENERAL NOTES

1. SEE SHEET 10 FOR PAVEMENT DETAILS
2. WATERLINE IS IN FOREGROUND; HOWEVER IT IS SHOWN IN PROFILE FOR INFORMATIONAL PURPOSES.
3. INLET OFFSET AND ELEV REFERS TO BACK OF GRATE
4. CONTRACTOR IS RESPONSIBLE FOR VERIFYING HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES. UTILITY LOCATIONS SHOWN IN APPROXIMATE MANNER ONLY. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT COST OF UTILITY LINES DAMAGED IN THE COURSE OF CONSTRUCTION
5. CONSTRUCTION LIMITS/EASEMENTS ARE FROM FENCE LINE TO FENCE LINE. SO NOT DISTURB FENCE AND/OR WALL. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT COST OF FENCE AND/OR WALL DAMAGED IN THE COURSE OF CONSTRUCTION.
5. SEE SHEET 3 FOR POTHOLE TABLE AND LINE AND CURB TABLE
6. RCP STORM DRAIN AND LATERALS SHALL BE GASKETED TONGUE AND GROOVE.
7. TYPE C MANHOLES CONSTRUCTED PER COA STD DWGS 2101, 2107 AND 2110 UNLESS OTHERWISE NOTED.

KEYED NOTES

1. ADJUST MANHOLE ELEV TO NEW GRADE, INCLUDE CONCRETE PAD PER COA STD DWG 2101. CONCRETE PAD INCIDENTAL TO ADJUSTMENTS.
2. SEE SHEET 8 FOR RCP END STATION
3. REPLACE SPEED HUMP PER SHEET 10
4. SEE SHEET 9 FOR WATERLINE MODIFICATION
5. REMOVE AND DISPOSE OF EXISTING ASPHALT FOR FULL STREET WIDTH.
6. NOTIFY FIRE MARSHAL SEVEN (7) DAYS PRIOR TO WATERLINE SHUTOFF THAT THE HYDRANT WILL BE TEMPORARILY OUT OF SERVICE COVER IN BLACK PLASTIC WHILE OUT OF SERVICE
7. GRADE TO DRAIN FROM FENCE LINE TO MOUNTABLE CURB. DO NOT DISTURB EXISTING UTILITY POLES OR SERVICES (INCLUDING WATER METERS).
8. SEE SHEET 9 DETAIL 2 FOR SAS SERVICE MODIFICATION AND DETAIL 4 FOR WATER SERVICE MODIFICATION.
9. SEE SHEET 9 DETAIL 1 FOR SAS SERVICE MODIFICATION
10. SEE SHEET 9 DETAIL 3 FOR RCP CROSSING OF SAS MAIN
11. SEE SHEET 9 DETAIL 5 FOR LEAN FILL DETAIL

0 4' 8'
VERTICAL
0 20' 40'
HORIZONTAL

AS-BUILT INFORMATION
CONTRACTOR
NOTES TAKEN BY DATE
ACCEPTANCE BY DATE
FIELD VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE
MICRO-FILM INFORMATION

BENCH MARKS
BEARINGS ARE BASED ON GEODETIC NORTH FROM GPS OBSERVATIONS. DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN US FEET. ELEVATIONS ARE BASED ON A.G.R.S. STATION "15-J12". ELEVATION OF STATION = 4965.627 (NAVD 1988 DATUM).

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL

REMARKS
REVISIONS
DESIGN

No. Date

City Engineering
Environmental Services
Design Services
Project Management
Design Approximate
8501 Jefferson N.E. Bldg. Suite 100
Albuquerque, New Mexico 87109
Email: [illegible]
Telephone: 505-243-7300
Fax: 505-243-7290

BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN & PROFILE STA 61+90 TO 65+80

Design Review Committee | City Engineer Approval | No./Date/Yr | No./Da

Design Update

County Project No TS08-04 | City Project No. 601791 | Zone Map No K-11/12 | Sheet 7 | Of

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX C: LAND TREATMENTS, 40 ACRE METHOD COMPUTATION SHEETS

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 1/6/2009
BASIN : Basin A
CONDITION: Existing

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	5.1700	A	0.00
2			B	0.00
3			C	72.00
4			D	28.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.1241
		24-hr	0.1796
		4-day	0.2351
		10-day	0.3014
	10-YR	6-hr	0.2861
		24-hr	0.3416
		4-day	0.3971
		10-day	0.4634
	100-YR	6-hr	0.5447
		24-hr	0.6002
		4-day	0.6557
		10-day	0.7221

		(cfs)
Q-Peak 6-Hour	2-YR	4.196
	10-YR	9.730
	100-YR	17.009

(cu ft)	23729

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 1/6/2009
BASIN : Basin B
CONDITION: Existing

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	6.0800	A	0.00
2			B	0.00
3			C	53.00
4			D	47.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.2037
		24-hr	0.3132
		4-day	0.4228
		10-day	0.5537
	10-YR	6-hr	0.4134
		24-hr	0.5230
		4-day	0.6325
		10-day	0.7635
	100-YR	6-hr	0.7350
		24-hr	0.8445
		4-day	0.9541
		10-day	1.0850

		(cfs)
Q-Peak 6-Hour	2-YR	6.344
	10-YR	13.060
	100-YR	21.736

(cu ft)	32015

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 1/6/2009
BASIN : Basin C
CONDITION: Existing

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	2.4600	A	0.00
2			B	0.00
3			C	53.00
4			D	47.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0824
		24-hr	0.1267
		4-day	0.1711
		10-day	0.2240
	10-YR	6-hr	0.1673
		24-hr	0.2116
		4-day	0.2559
		10-day	0.3089
	100-YR	6-hr	0.2974
		24-hr	0.3417
		4-day	0.3860
		10-day	0.4390

		(cfs)
Q-Peak 6-Hour	2-YR	2.567
	10-YR	5.284
	100-YR	8.795

(cu ft)	12954

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 1A
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	2.1100	A	0.00
2			B	0.00
3			C	72.00
4			D	28.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0506
		24-hr	0.0733
		4-day	0.0959
		10-day	0.1230
	10-YR	6-hr	0.1168
		24-hr	0.1394
		4-day	0.1620
		10-day	0.1891
	100-YR	6-hr	0.2223
		24-hr	0.2450
		4-day	0.2676
		10-day	0.2947

		(cfs)
Q-Peak 6-Hour	2-YR	1.712
	10-YR	3.971
	100-YR	6.942

(cu ft)	9684

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 1B
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	2.0800	A	0.00
2			B	0.00
3			C	72.00
4			D	28.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0499
		24-hr	0.0722
		4-day	0.0946
		10-day	0.1213
	10-YR	6-hr	0.1151
		24-hr	0.1374
		4-day	0.1597
		10-day	0.1864
	100-YR	6-hr	0.2192
		24-hr	0.2415
		4-day	0.2638
		10-day	0.2905

		(cfs)
Q-Peak 6-Hour	2-YR	1.688
	10-YR	3.915
	100-YR	6.843

(cu ft)	9547

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 2
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	2.8300	A	0.00
2			B	0.00
3			C	72.00
4			D	28.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0679
		24-hr	0.0983
		4-day	0.1287
		10-day	0.1650
	10-YR	6-hr	0.1566
		24-hr	0.1870
		4-day	0.2173
		10-day	0.2537
	100-YR	6-hr	0.2982
		24-hr	0.3286
		4-day	0.3589
		10-day	0.3953

Q-Peak 6-Hour		(cfs)
	2-YR	2.297
	10-YR	5.326
	100-YR	9.311

(cu ft)	12989

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 3
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	1.4500	A	0.00
2			B	0.00
3			C	53.00
4			D	47.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0486
		24-hr	0.0747
		4-day	0.1008
		10-day	0.1321
	10-YR	6-hr	0.0986
		24-hr	0.1247
		4-day	0.1508
		10-day	0.1821
	100-YR	6-hr	0.1753
		24-hr	0.2014
		4-day	0.2275
		10-day	0.2588

		(cfs)
Q-Peak 6-Hour	2-YR	1.513
	10-YR	3.115
	100-YR	5.184

(cu ft)	7635

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 4
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	0.9900	A	0.00
2			B	0.00
3			C	53.00
4			D	47.00
				100.00

Output

Volume

		(ac-ft)
2-YR	6-hr	0.0332
	24-hr	0.0510
	4-day	0.0688
	10-day	0.0902
10-YR	6-hr	0.0673
	24-hr	0.0852
	4-day	0.1030
	10-day	0.1243
100-YR	6-hr	0.1197
	24-hr	0.1375
	4-day	0.1553
	10-day	0.1767

		(cfs)
Q-Peak 6-Hour	2-YR	1.033
	10-YR	2.127
	100-YR	3.539

(cu ft)	5213

PROJECT: Cypress Dr **Project No.** 08-260 **Date:** 3/5/2009
BASIN : Basin 5
CONDITION: Proposed

Part A -- Procedure for 40 Acre and Smaller Basins*

Input

zone (x)		area (acres)	land treatment (%)	
1	X	2.8600	A	0.00
2			B	0.00
3			C	53.00
4			D	47.00
				100.00

Output

Volume			(ac-ft)
	2-YR	6-hr	0.0958
		24-hr	0.1473
		4-day	0.1989
		10-day	0.2605
	10-YR	6-hr	0.1945
		24-hr	0.2460
		4-day	0.2975
		10-day	0.3591
	100-YR	6-hr	0.3457
		24-hr	0.3973
		4-day	0.4488
		10-day	0.5104

		(cfs)
Q-Peak 6-Hour	2-YR	2.984
	10-YR	6.143
	100-YR	10.225

(cu ft)	15060

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX D: STREET AND STORM DRAIN HYDRAULICS

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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Worksheet : Crown, Half Street, 0.148%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.016	
Channel Slope:	0.00148	ft/ft
Elevation:	0.33	ft
Elevation Range:	0.00 to 0.37 ft	
Discharge:	1.49	ft³/s

Flow Area:	1.65	ft²
Wetted Perimeter:	13.07	ft
Hydraulic Radius:	0.13	ft
Top Width:	13.03	ft
Normal Depth:	0.33	ft
Critical Depth:	0.26	ft
Critical Slope:	0.00826	ft/ft
Velocity:	0.90	ft/s
Velocity Head	0.01	ft
Specific Energy:	0.35	ft
Froude Number:	0.45	
Flow Type:	Subcritical	

Edit Section Options

Calculation Successful.

Worksheet : Inverted Crown Full Street, 0.148%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.016	
Channel Slope:	0.00148	ft/ft
Elevation:	0.45	ft
Elevation Range:	0.00 to 0.45 ft	
Discharge:	13.40	ft³/s

Flow Area:	8.05	ft²
Wetted Perimeter:	25.32	ft
Hydraulic Radius:	0.32	ft
Top Width:	25.25	ft
Normal Depth:	0.45	ft
Critical Depth:	0.33	ft
Critical Slope:	0.00629	ft/ft
Velocity:	1.66	ft/s
Velocity Head:	0.04	ft
Specific Energy:	0.49	ft
Froude Number:	0.52	
Flow Type:	Subcritical	

Edit Section Options

Calculation Successful.

Worksheet : 1% Crown, Half Street, 0.5%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.016	
Channel Slope:	0.00500	ft/ft
Elevation:	0.33	ft
Elevation Range:	0.00 to 0.33 ft	
Discharge:	4.43	ft³/s

Flow Area:	2.32	ft²
Wetted Perimeter:	14.76	ft
Hydraulic Radius:	0.16	ft
Top Width:	14.63	ft
Normal Depth:	0.33	ft
Critical Depth:	0.32	ft
Critical Slope:	0.00722	ft/ft
Velocity:	1.91	ft/s
Velocity Head:	0.06	ft
Specific Energy:	0.39	ft
Froude Number:	0.85	
Flow Type:	Subcritical	

Edit Section | Options

Calculation Successful.

Worksheet : Elliptical Pipe - 5@0.26%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.013	
Channel Slope:	0.00260	ft/ft
Normal Depth:	1.56	ft
Rise:	1.58	ft
Span:	2.50	ft
Discharge:	11.86	ft³/s

Flow Area:	3.09	ft²
Wetted Perimeter:	5.81	ft
Hydraulic Radius:	0.53	ft
Top Width:	0.56	ft
Critical Depth:	1.05	ft
Percent Full:	98.7	%
Critical Slope:	0.00465	ft/ft
Velocity:	3.83	ft/s
Velocity Head:	0.23	ft
Specific Energy:	1.79	ft
Froude Number:	0.29	
Discharge Full:	11.05	ft³/s
Slope Full:	0.00226	ft/ft
Maximum Discharge:	12.05	ft³/s
Flow Type:	Subcritical	

Calculation Successful

Worksheet : Elliptical Pipe - 4@0.25%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.014	
Channel Slope:	0.00250	ft/ft
Normal Depth:	1.83	ft
Rise:	1.83	ft
Span:	2.83	ft
Discharge	14.49	ft³/s

Flow Area:	4.07	ft²
Wetted Perimeter:	7.40	ft
Hydraulic Radius:	0.55	ft
Top Width:	0.00	ft
Critical Depth:	1.12	ft
Percent Full:	100.0	%
Critical Slope:	0.00491	ft/ft
Velocity:	3.56	ft/s
Velocity Head:	0.20	ft
Specific Energy:	2.03	ft
Froude Number:	0.00	
Discharge Full:	14.48	ft³/s
Slope Full:	0.00250	ft/ft
Maximum Discharge:	15.78	ft³/s
Flow Type:	Subcritical	

Calculation Successful.

Worksheet : Elliptical Pipe - 3@0.25%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.014	
Channel Slope:	0.00250	ft/ft
Normal Depth:	2.00	ft
Rise:	2.00	ft
Span:	3.17	ft
Discharge:	18.92	ft³/s

Flow Area:	4.98	ft²
Wetted Perimeter:	8.22	ft
Hydraulic Radius:	0.61	ft
Top Width:	0.00	ft
Critical Depth:	1.24	ft
Percent Full:	100.0	%
Critical Slope:	0.00474	ft/ft
Velocity:	3.80	ft/s
Velocity Head:	0.22	ft
Specific Energy:	2.22	ft
Froude Number:	0.00	
Discharge Full:	18.91	ft³/s
Slope Full:	0.00250	ft/ft
Maximum Discharge:	20.60	ft³/s
Flow Type:	Subcritical	

Calculation Successful.

Worksheet : Elliptical Pipe - 2@0.35%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.014	
Channel Slope:	0.00350	ft/ft
Normal Depth:	2.41	ft
Rise:	2.41	ft
Span:	3.75	ft
Discharge:	35.99	ft³/s

Flow Area:	7.10	ft²
Wetted Perimeter:	9.78	ft
Hydraulic Radius:	0.73	ft
Top Width:	0.00	ft
Critical Depth:	1.65	ft
Percent Full:	100.0	%
Critical Slope:	0.00492	ft/ft
Velocity:	5.07	ft/s
Velocity Head:	0.40	ft
Specific Energy:	2.81	ft
Froude Number:	0.00	
Discharge Full:	35.97	ft³/s
Slope Full:	0.00350	ft/ft
Maximum Discharge:	39.15	ft³/s
Flow Type:	Subcritical	

Calculation Successful.

Worksheet : Elliptical Pipe - 1@0.48%

Uniform Flow | Gradually Varied Flow | Messages

Solve For: Discharge

Friction Method: Manning Formula

Roughness Coefficient:	0.014	
Channel Slope:	0.00480	ft/ft
Normal Depth:	2.41	ft
Rise:	2.41	ft
Span:	3.75	ft
Discharge:	42.15	ft³/s

Flow Area:	7.10	ft²
Wetted Perimeter:	9.78	ft
Hydraulic Radius:	0.73	ft
Top Width:	0.00	ft
Critical Depth:	1.79	ft
Percent Full:	100.0	%
Critical Slope:	0.00550	ft/ft
Velocity:	5.94	ft/s
Velocity Head:	0.55	ft
Specific Energy:	2.96	ft
Froude Number:	0.00	
Discharge Full:	42.12	ft³/s
Slope Full:	0.00479	ft/ft
Maximum Discharge:	45.85	ft³/s
Flow Type:	Subcritical	

Calculation Successful.

APPENDIX E: ENGINEER'S ESTIMATE

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

This appendix contains four conceptual plan level engineer's estimates including a 20% contingency and NMGRT:

Complete Project Cost*	$702,611.85
Complete Project Cost for ABCWUA	$76,601.24
County Portion of Cost*	$387,817.88
County Portion of Cost for ABCWUA	$41,448.80
County Portion without ABCWUA	$346,369.08

* Includes ABCWUA cost

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

CONCEPTUAL DESIGN - ENGINEERS ESTIMATE -COMPLETE PROJECT

USES TLC BID LOT ITEMS AND VALUES WHERE APPLICABLE (THESE VALUES ARE DESIGNATED BY BID LOT NUMBERS WITHOUT DECIMALS)
ADDITIONAL ITEMS FROM RECENT BID TABS OR COA CIVIL ENGINEERS ESTIMATED UNIT PRICES FOR CONTRACT ITEMS, 2009

BID LOT 1

BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
6.050, 6.060	MOBILIZATION AND DEMOBILIZATION, 7%	LUMP	1	$ 35,915.00	$ 35,915.00
630.010	NPDES COMPLIANCE PERMITTING/SWPPP	LUMP	1	8000	$ 8,000.00
3	Construction Staking	HR	80	$ 150.00	$ 12,000.00
4	Site Density Testing or Material Sample Collection	HR	20	$ 100.00	$ 2,000.00
5	Laboratory Evaluation of Material Sample	UNIT	10	$ 750.00	$ 7,500.00
17	Export excess material	CY	400	$ 8.00	$ 3,200.00
28	Grading of areas to be paved, less than 2' excavation., no import or export of material. Complete in place, per SY (for quantities more than 3,000 SY per site.) INCLUDES AREAS NOT TO BE PAVED	SY	6420	$ 2.50	$ 16,050.00
33	Subgrade Preparation for Arterial, Collector, Residential roadways, 12" at 95% per ASTM D-1557, County Ordinances, and County Street Standards. Complete in place, per SY.	SY	5420	$ 1.00	$ 5,420.00
54	3" B Res. w/PG 70-22, Machine laydown CIP	SY	4500	$ 14.00	$ 63,000.00
68	Tack Coat	TON	1.5	$ 900.00	$ 1,350.00
87	Sawcut, Remove & Dispose Existing Asphalt 3.5" to 6" thickness, over 100sy	SY	4500	$ 3.00	$ 13,500.00
91	PCC Curb and gutter, all types in place in accordance with Bernalillo County Street Standards.	LF	3400	$ 30.00	$ 102,000.00
102	Adjust Existing Water Valve Box and Stem to Grade in accordance with City of Albuquerque requirements Dwgs 2330-2332. Complete in place, per EA.	EA	4	$ 400.00	$ 1,600.00
109	Adjust Existing Sewer Manhole Frame and Cover to Grade, to maximum allowable with adjusting rings and blocks. Complete in place, per EA.	EA	7	$ 550.00	$ 3,850.00
125	Speed Humps are to be bid per each, complete in place, in accordance with the latest Bernalillo County Speed Hump Design Standards. Unit bid price shall include all materials and labor for completed speed humps including speed hump ahead warning sign at the start of each new block, two delineators installed per Bernalillo County Traffic Engineering and associated thermoplastic pavement markings at each hump. See drawings attached at the end of this section.	EA	2	$ 1,800.00	$ 3,600.00
144	Traffic control per week (7days). Residential Road Classification, Through Streets. (20 lighted devices or less) Must comply with the most current edition of the Manual on Uniform Traffic Control Devices	WK	14	$ 600.00	$ 8,400.00
154	Flagmen, 2, for flagging operation for any traffic control set up, including two-way communication devices and signs for flagging operation complete per MUTCD.	DAY	10	$ 585.00	$ 5,850.00
233	Rip Rap wire enclosed 8 to 4 VL per COA specifications	CY	7	$ 250.00	$ 1,750.00

SUBTOTAL BID LOT 1 $ 294,985.00

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

BID LOT 2 BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
710.XXX	18" STEEL CARRIER PIPE AND APPURTENANCES, COMPL.	LF	25	$ 130.00	$ 3,250.00
801.007	16" PVC C-900 WTRLINE	LF	50	$ 71.00	$ 3,550.00
801.158	JOINT RESTRAINING HARNESS, DI & PVC PUSH ON BELLS, 14" - 24", CIP	EA	10	$ 650.00	
8	REM & DISP WATERLINE	LF	50	$ 3.50	$ 175.00
801.XXX	16" 45 DEGREE BEND, CIP	EA	4	$ 450.00	$ 1,800.00
802.300	3/4" SERVICE LINE REPLACEMENT & TRANSFER, INCL. TAPPING SADDLE & TUBING, CIP. SD 2362	EA	23	$ 755.00	$ 17,365.00
51	REM & DISP 4"-12" SAS	LF	560	$ 2.00	$ 1,120.00
905.030	4" SEWER SERVICE RISER, INCL. PLASTIC PIPE W/CASING, SADDLE & CONN, CIP, SD 2135	LF	20	$ 7.80	$ 156.00
905.200	RECONNECT EXISTING 4" SEWER SERVICE LINE TO REPLACEMENT MAIN, INCL. FIRST 5' OF NEW SERVICE LINE, CIP. SD 2134	EA	28	$ 944.00	$ 26,432.00
56	24" RCP CL III **(EQUIVALENT)**	LF	103	$ 37.00	$ 3,811.00
XXX.XXX	27 "RCP CL III **(EQUIVALENT)**	LF	190	$ 45.00	$ 8,550.00
57	30" RCP CL III **(EQUIVALENT)**	LF	411	$ 45.00	$ 18,495.00
58	36" RCP CL III **(EQUIVALENT)**	LF	748	$ 63.00	$ 47,124.00
67	CTH BSN D SGL 0-8'	EA	3	$ 1,600.00	$ 4,800.00
68	CTH BSN D DBL 0-8'	EA	8	$ 4,100.00	$ 32,800.00
70	TRCHG BF 16-36" 0'-8'	LF	293	$ 21.00	$ 6,153.00
72	TRCHG BF 42-48" 0'-8'	LF	1158	$ 26.00	$ 30,108.00
77	6' DIA MH 0'-6'	EA	5	$ 3,100.00	$ 15,500.00
920.210	MANHOLE, 8' DIA, TYPE C OR E, 6' TO 10' DEEP, CIP. SD2101	EA	3	$ 10,771.00	$ 32,313.00

SUBTOTAL BID LOT 2	$	253,502.00
SUBTOAL BID LOTS 1 AND 2	$	548,487.00
CONTINGENCY @ 20%	$	109,697.40
SUBTOTAL BID LOTS AND CONTINGENCY	$	658,184.40
NMGRT @ 6.75%	$	44,427.45
TOTAL ENGINEERS ESTIMATE	$	702,611.85

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY
(PHASE I)
CONCEPTUAL DESIGN - ENGINEERS ESTIMATE -COMPLETE PROJECT for ABCWUA

USES TLC BID LOT ITEMS AND VALUES WHERE APPLICABLE (THESE VALUES ARE DESIGNATED BY BID LOT NUMBERS WITHOUT DECIMALS)
ADDITIONAL ITEMS FROM RECENT BID TABS OR COA CIVIL ENGINEERS ESTIMATED UNIT PRICES FOR CONTRACT ITEMS, 2009

BID LOT 1

BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
4	Site Density Testing or Material Sample Collection	HR	5	$ 100.00	$ 500.00
102	Adjust Existing Water Valve Box and Stem to Grade in accordance with City of Albuquerque requirements Dwgs 2330-2332. Complete in place, per EA.	EA	4	$ 400.00	$ 1,600.00
109	Adjust Existing Sewer Manhole Frame and Cover to Grade, to maximum allowable with adjusting rings and blocks. Complete in place, per EA.	EA	7	$ 550.00	$ 3,850.00

SUBTOTAL BID LOT 1 $ 5,950.00

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

BID LOT 2 BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
710.XXX	18" STEEL CARRIER PIPE AND APPURTENANCES, COMPL.	LF	25	$ 130.00	$ 3,250.00
801.007	16" PVC C-900 WTRLINE	LF	50	$ 71.00	$ 3,550.00
801.158	JOINT RESTRAINING HARNESS, DI & PVC PUSH ON BELLS, 14" - 24", CIP	EA	10	$ 650.00	
8	REM & DISP WATERLINE	LF	50	$ 3.50	$ 175.00
801.XXX	16" 45 DEGREE BEND, CIP	EA	4	$ 450.00	$ 1,800.00
802.300	3/4" SERVICE LINE REPLACEMENT & TRANSFER, INCL. TAPPING SADDLE & TUBING, CIP. SD 2362	EA	23	$ 755.00	$ 17,365.00
51	REM & DISP 4"-12" SAS	LF	560	$ 2.00	$ 1,120.00
905.030	4" SEWER SERVICE RISER, INCL. PLASTIC PIPE W/CASING, SADDLE & CONN, CIP, SD 2135	LF	20	$ 7.80	$ 156.00
905.200	RECONNECT EXISTING 4" SEWER SERVICE LINE TO REPLACEMENT MAIN, INCL. FIRST 5' OF NEW SERVICE LINE, CIP. SD 2134	EA	28	$ 944.00	$ 26,432.00

SUBTOTAL BID LOT 2	$	53,848.00
SUBTOAL BID LOTS 1 AND 2	$	59,798.00
CONTINGENCY @ 20%	$	11,959.60
SUBTOTAL BID LOTS AND CONTINGENCY	$	71,757.60
NMGRT @ 6.75%	$	4,843.64
TOTAL ENGINEERS ESTIMATE	$	76,601.24

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

CONCEPTUAL DESIGN - ENGINEERS ESTIMATE -BERNALILLO COUNTY PORTION

USES TLC BID LOT ITEMS AND VALUES WHERE APPLICABLE (THESE VALUES ARE DESIGNATED BY BID LOT NUMBERS WITHOUT DECIMALS)
ADDITIONAL ITEMS FROM RECENT BID TABS OR COA CIVIL ENGINEERS ESTIMATED UNIT PRICES FOR CONTRACT ITEMS, 2009

BID LOT 1

BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
6.050, 6.060	MOBILIZATION AND DEMOBILIZATION, 7%	LUMP	1	$ 19,806.00	$ 19,806.00
630.010	NPDES COMPLIANCE PERMITTING/SWPPP	LUMP	1	8000	$ 3,440.00
3	Construction Staking	HR	34.4	$ 150.00	$ 5,160.00
4	Site Density Testing or Material Sample Collection	HR	8.6	$ 100.00	$ 860.00
5	Laboratory Evaluation of Material Sample	UNIT	4.3	$ 750.00	$ 3,225.00
17	Export excess material	CY	172	$ 8.00	$ 1,376.00
28	Grading of areas to be paved, less than 2' excavation., no import or export of material. Complete in place, per SY (for quantities more than 3,000 SY per site.) INCLUDES AREAS NOT TO BE PAVED	SY	2760.6	$ 2.50	$ 6,901.50
33	Subgrade Preparation for Arterial, Collector, Residential roadways, 12" at 95% per ASTM D-1557, County Ordinances, and County Street Standards. Complete in place, per SY.	SY	2330.6	$ 1.00	$ 2,330.60
54	3" B Res. w/PG 70-22, Machine laydown CIP	SY	1935	$ 14.00	$ 27,090.00
68	Tack Coat	TON	0.645	$ 900.00	$ 580.50
87	Sawcut, Remove & Dispose Existing Asphalt 3.5" to 6" thickness, over 100sy	SY	1935	$ 3.00	$ 5,805.00
91	PCC Curb and gutter, all types in place in accordance with Bernalillo County Street Standards.	LF	1462	$ 30.00	$ 43,860.00
102	Adjust Existing Water Valve Box and Stem to Grade in accordance with City of Albuquerque requirements Dwgs 2330-2332. Complete in place, per EA.	EA	4	$ 400.00	$ 1,600.00
109	Adjust Existing Sewer Manhole Frame and Cover to Grade, to maximum allowable with adjusting rings and blocks. Complete in place, per EA.	EA	3	$ 550.00	$ 1,650.00
125	Speed Humps are to be bid per each, complete in place, in accordance with the latest Bernalillo County Speed Hump Design Standards. Unit bid price shall include all materials and labor for completed speed humps including speed hump ahead warning sign at the start of each new block, two delineators installed per Bernalillo County Traffic Engineering and associated thermoplastic pavement markings at each hump. See drawings attached at the end of this section.	EA	2	$ 1,800.00	$ 3,600.00
144	Traffic control per week (7days). Residential Road Classification, Through Streets. (20 lighted devices or less) Must comply with the most current edition of the Manual on Uniform Traffic Control	WK	6	$ 600.00	$ 3,600.00
154	Flagmen, 2, for flagging operation for any traffic control set up, including two-way communication devices and signs for flagging operation complete per MUTCD.	DAY	4	$ 585.00	$ 2,340.00
233	Rip Rap wire enclosed 8 to 4 VL per COA specifications	CY	7	$ 250.00	$ 1,750.00

SUBTOTAL BID LOT 1 $ 134,974.60

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

BID LOT 2 BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
710.XXX	18" STEEL CARRIER PIPE AND APPURTENANCES, COMPL.	LF	25	$ 130.00	$ 3,250.00
801.007	16" PVC C-900 WTRLINE	LF	50	$ 71.00	$ 3,550.00
801.158	JOINT RESTRAINING HARNESS, DI & PVC PUSH ON BELLS, 14" - 24", CIP	EA	10	$ 650.00	
8	REM & DISP WATERLINE	LF	50	$ 3.50	$ 175.00
801.XXX	16" 45 DEGREE BEND, CIP	EA	4	$ 450.00	$ 1,800.00
802.300	3/4" SERVICE LINE REPLACEMENT & TRANSFER, INCL. TAPPING SADDLE & TUBING, CIP. SD 2362	EA	12	$ 755.00	$ 9,060.00
51	REM & DISP 4"-12" SAS	LF	240.8	$ 2.00	$ 481.60
905.030	4" SEWER SERVICE RISER, INCL. PLASTIC PIPE W/CASING, SADDLE & CONN, CIP, SD 2135	LF	20	$ 7.80	$ 156.00
905.200	RECONNECT EXISTING 4" SEWER SERVICE LINE TO REPLACEMENT MAIN, INCL. FIRST 5' OF NEW SERVICE LINE, CIP. SD 2134	EA	11	$ 944.00	$ 10,384.00
56	24" RCP CL III **(EQUIVALENT)**	LF	0	$ 37.00	$ -
XXX.XXX	27 "RCP CL III **(EQUIVALENT)**	LF	0	$ 45.00	$ -
57	30" RCP CL III **(EQUIVALENT)**	LF	130	$ 45.00	$ 5,850.00
58	36" RCP CL III **(EQUIVALENT)**	LF	748	$ 63.00	$ 47,124.00
67	CTH BSN D SGL 0-8'	EA	0	$ 1,600.00	$ -
68	CTH BSN D DBL 0-8'	EA	6	$ 4,100.00	$ 24,600.00
70	TRCHG BF 16-36" 0'-8'	LF	0	$ 21.00	$ -
72	TRCHG BF 42-48" 0'-8'	LF	878	$ 26.00	$ 22,828.00
77	6' DIA MH 0'-6'	EA	2	$ 3,100.00	$ 6,200.00
920.210	MANHOLE, 8' DIA, TYPE C OR E, 6' TO 10' DEEP, CIP. SD2101	EA	3	$ 10,771.00	$ 32,313.00

SUBTOTAL BID LOT 2	$	167,771.60
SUBTOAL BID LOTS 1 AND 2	$	302,746.20
CONTINGENCY @ 20%	$	60,549.24
SUBTOTAL BID LOTS AND CONTINGENCY	$	363,295.44
NMGRT @ 6.75%	$	24,522.44
TOTAL ENGINEERS ESTIMATE	$	387,817.88

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

CONCEPTUAL DESIGN - ENGINEERS ESTIMATE -BERNALILLO COUNTY PORTION OF ABCWUA

USES TLC BID LOT ITEMS AND VALUES WHERE APPLICABLE (THESE VALUES ARE DESIGNATED BY BID LOT NUMBERS WITHOUT DECIMALS)
ADDITIONAL ITEMS FROM RECENT BID TABS OR COA CIVIL ENGINEERS ESTIMATED UNIT PRICES FOR CONTRACT ITEMS, 2009

BID LOT 1

BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
4	Site Density Testing or Material Sample Collection	HR	2.5	$ 100.00	$ 250.00
102	Adjust Existing Water Valve Box and Stem to Grade in accordance with City of Albuquerque requirements Dwgs 2330-2332. Complete in place, per EA.	EA	4	$ 400.00	$ 1,600.00
109	Adjust Existing Sewer Manhole Frame and Cover to Grade, to maximum allowable with adjusting rings and blocks. Complete in place, per EA.	EA	3	$ 550.00	$ 1,650.00

SUBTOTAL BID LOT 1 $ 3,500.00

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

BID LOT 2 BID LOT ITEM	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL AMOUNT
710.XXX	18" STEEL CARRIER PIPE AND APPURTENANCES, COMPL.	LF	25	$ 130.00	$ 3,250.00
801.007	16" PVC C-900 WTRLINE	LF	50	$ 71.00	$ 3,550.00
801.158	JOINT RESTRAINING HARNESS, DI & PVC PUSH ON BELLS, 14" - 24", CIP	EA	10	$ 650.00	
8	REM & DISP WATERLINE	LF	50	$ 3.50	$ 175.00
801.XXX	16" 45 DEGREE BEND, CIP	EA	4	$ 450.00	$ 1,800.00
802.300	3/4" SERVICE LINE REPLACEMENT & TRANSFER, INCL. TAPPING SADDLE & TUBING, CIP. SD 2362	EA	12	$ 755.00	$ 9,060.00
51	REM & DISP 4"-12" SAS	LF	240.8	$ 2.00	$ 481.60
905.030	4" SEWER SERVICE RISER, INCL. PLASTIC PIPE W/CASING, SADDLE & CONN, CIP, SD 2135	LF	20	$ 7.80	$ 156.00
905.200	RECONNECT EXISTING 4" SEWER SERVICE LINE TO REPLACEMENT MAIN, INCL. FIRST 5' OF NEW SERVICE LINE, CIP. SD 2134	EA	11	$ 944.00	$ 10,384.00

SUBTOTAL BID LOT 2	$	28,856.60
SUBTOAL BID LOTS 1 AND 2	$	32,356.60
CONTINGENCY @ 20%	$	6,471.32
SUBTOTAL BID LOTS AND CONTINGENCY	$	38,827.92
NMGRT @ 6.75%	$	2,620.88
TOTAL ENGINEERS ESTIMATE	$	41,448.80

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

EXHIBITS:

DRAINAGE BASIN MAP

OVERALL PLAN AND PROFILE

PLAN SET COVER SHEET

INDIVIDUAL PLAN AND PROFILE SHEETS

APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)

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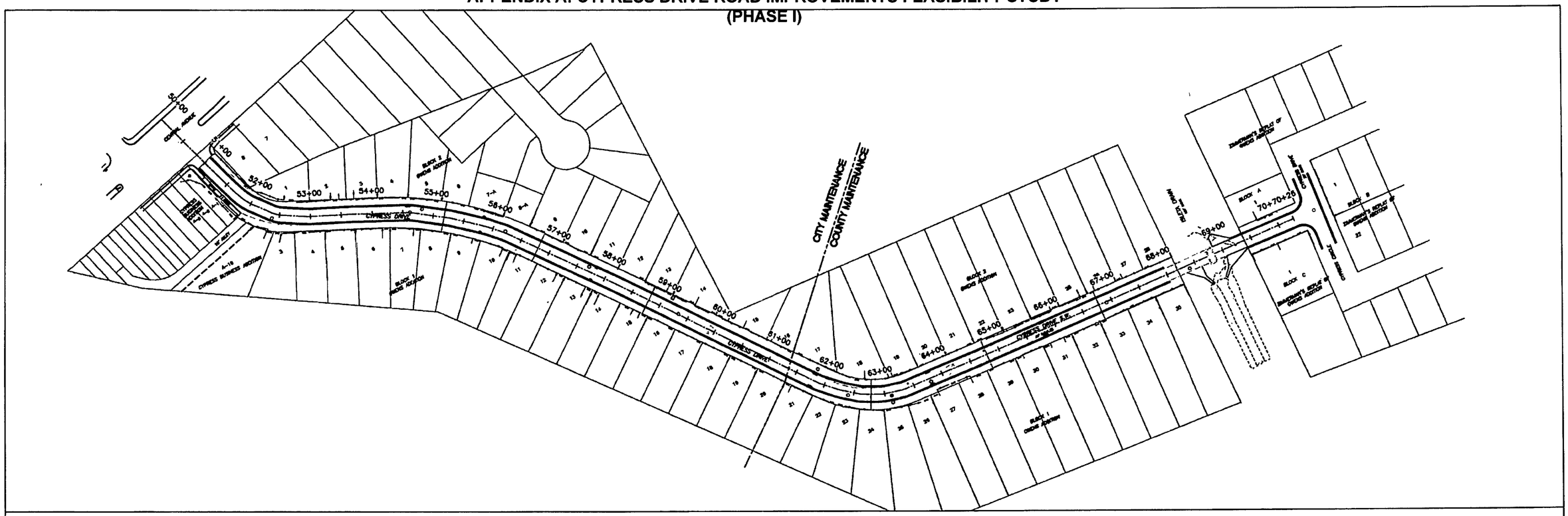

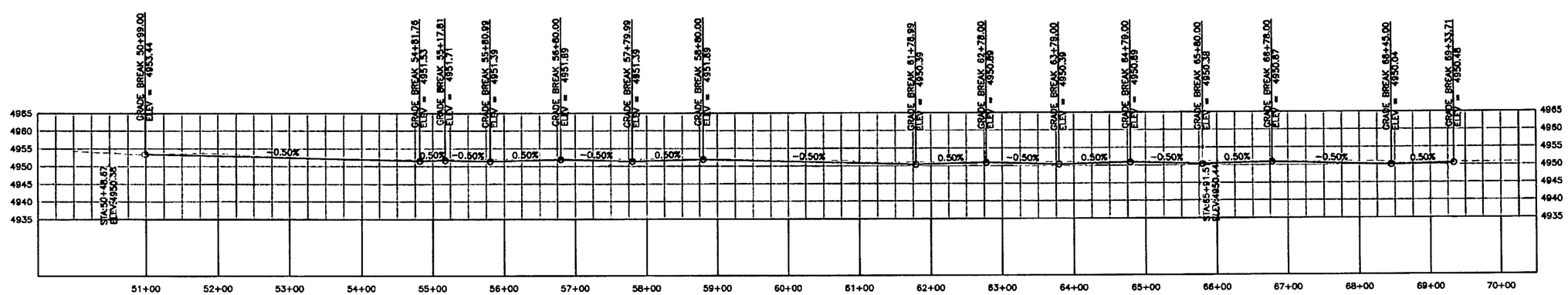

VERTICAL 0 4' 8'

HORIZONTAL 0 20' 40'

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OVERALL PLAN AND PROFILE

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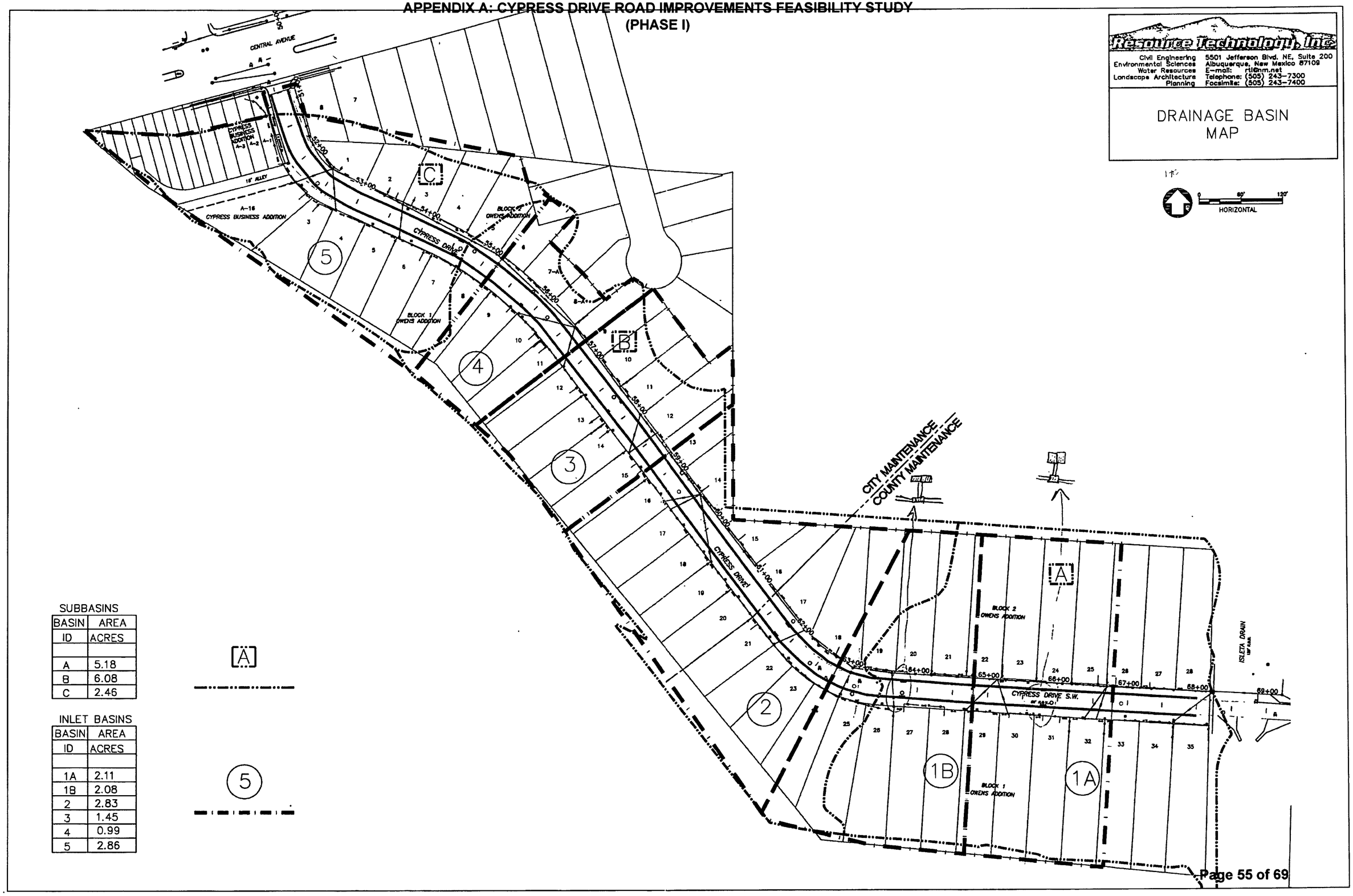

SUBBASINS

BASIN ID	AREA ACRES
A	5.18
B	6.08
C	2.46

INLET BASINS

BASIN ID	AREA ACRES
1A	2.11
1B	2.08
2	2.83
3	1.45
4	0.99
5	2.86

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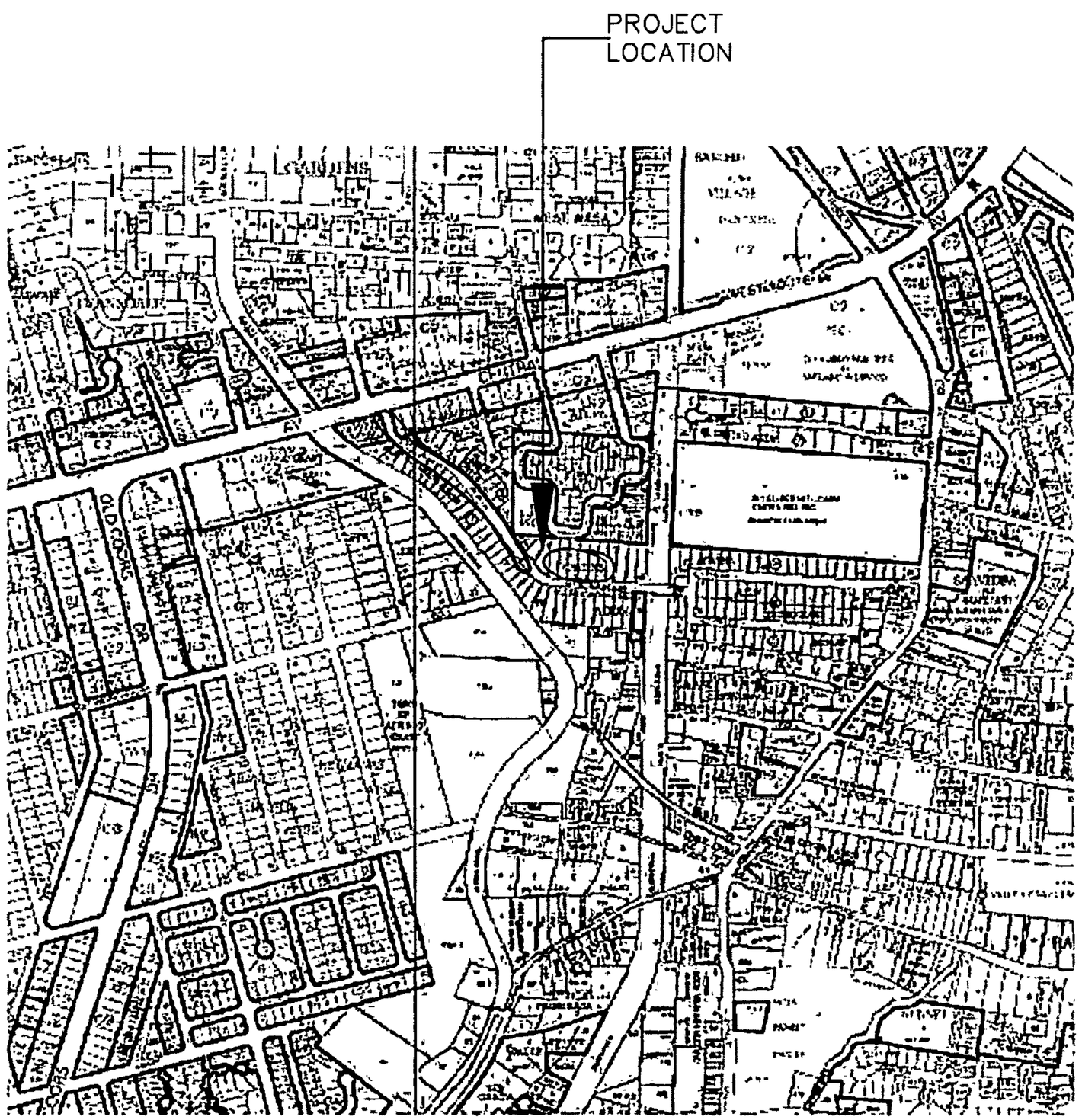
CYPRESS DRIVE STORM DRAIN

CONSTRUCTION PLANS
BERNALILLO COUNTY, NEW MEXICO



VICINITY MAP
NOT TO SCALE

INDEX OF SHEETS

	TITLE
1	COVER
2	GENERAL NOTES
3	PLAN VIEW
4	PLAN AND PROFILE STA 50+00 TO 54+10
5	PLAN AND PROFILE STA 54+10 TO 58+00
6	PLAN AND PROFILE STA 58+00 TO 61+90
7	PLAN AND PROFILE STA 61+90 TO 65+80
8	PLAN AND PROFILE STA 65+80 TO EOP
9	DETAILS

VERTICAL DATUM IS NAVD 88

Resource Technology, Inc.

REV.	SHEETS	CITY ENGINEER	DATE	USER DEPARTMENT	DATE	USER DEPARTMENT	DATE

ENGINEERS STAMP & SIGNATURE	APPROVALS	ENGINEER	DATE	APPROVED FOR CONSTRUCTION
				ENGINEER DATE
	COUNTY PROJECT NO. XXXXXX			SHEET 1 OF 9

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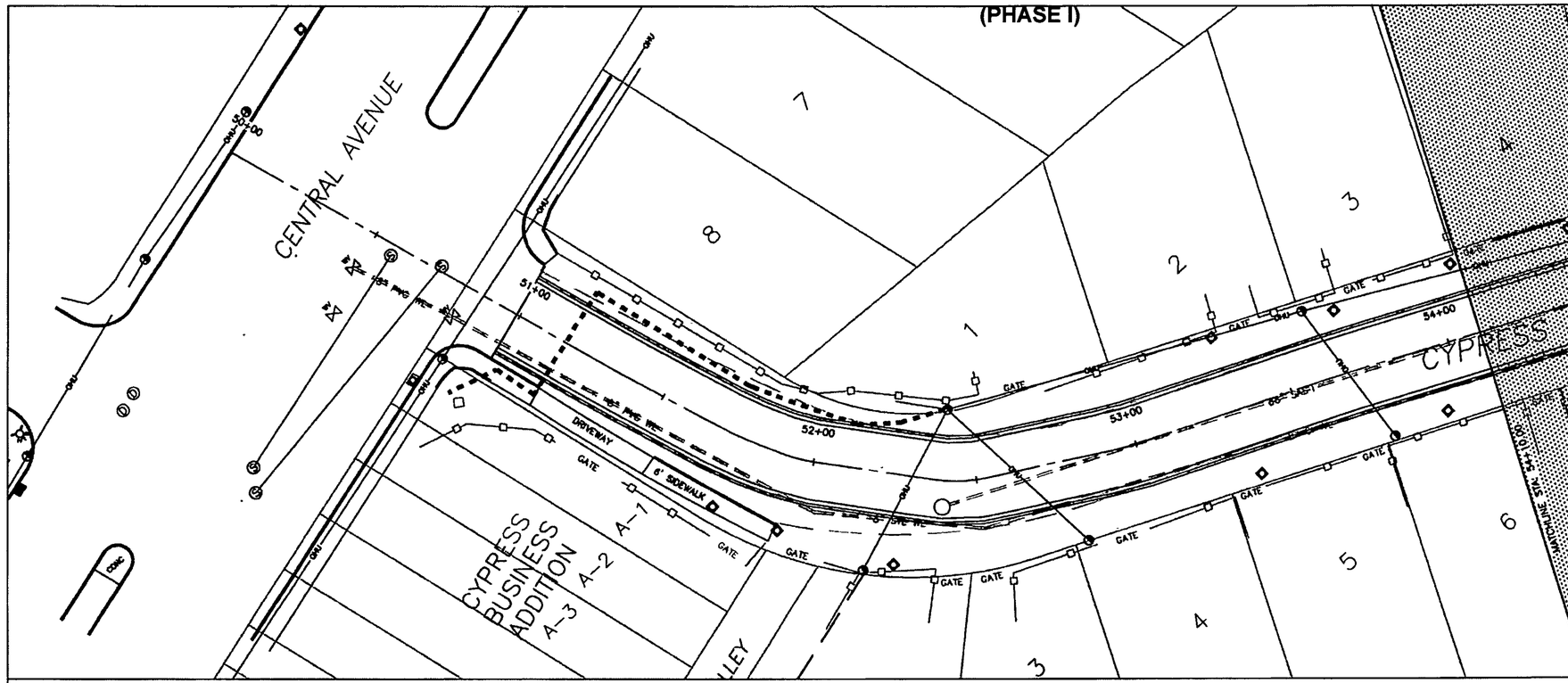

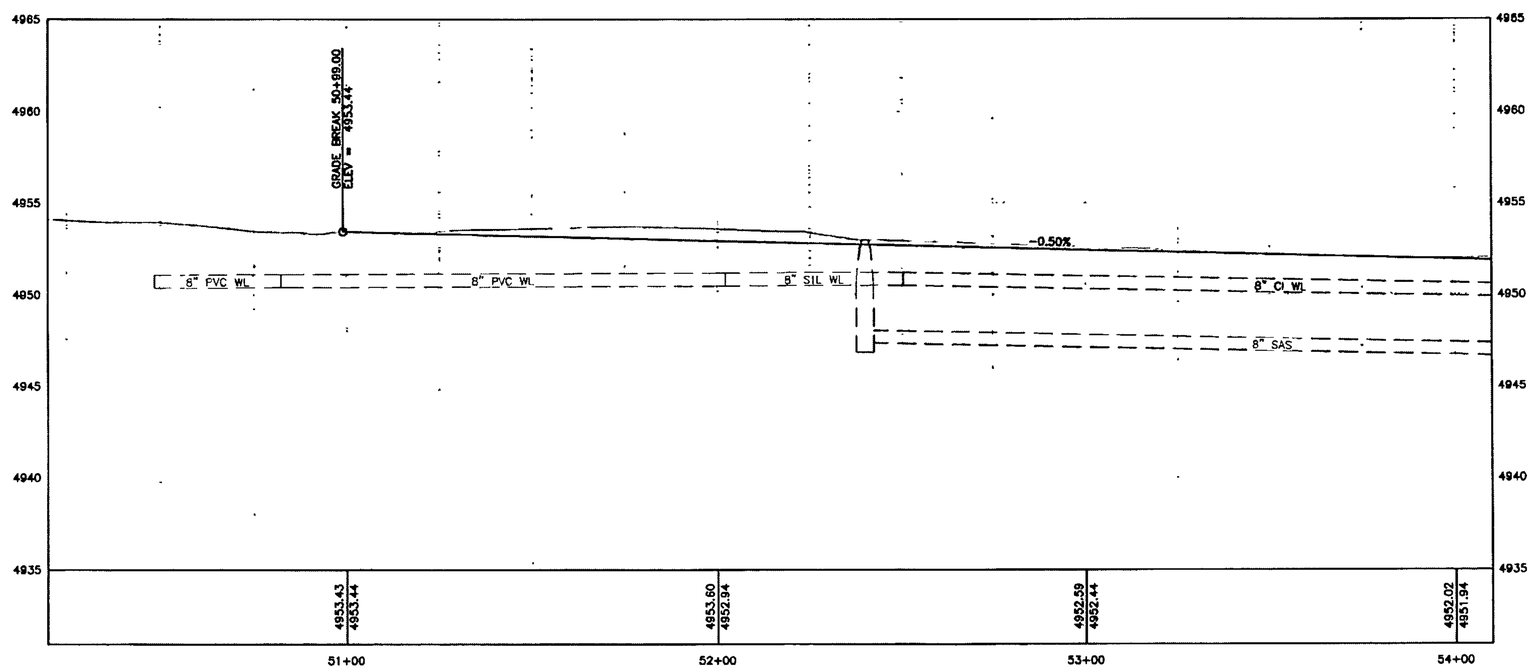

AS-BUILT INFORMATION

CONTRACTOR	DATE
STAKED BY	DATE
INSPECTOR'S CERTIFICATE BY	DATE
FIELD VERIFICATION BY	DATE
DRAWINGS CORRECTED BY	DATE

MICRO-FILM INFORMATION

RECORDED BY	DATE
NO.	

BENCH MARKS

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

BEARINGS ARE BASED ON GEODETIC NORTH FROM GPS OBSERVATIONS. DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN US FEET. ELEVATIONS ARE BASED ON A.G.R.S. STATION "15-J12". ELEVATION OF STATION = 4965.527 (NAVD 1988 DATUM).

ENGINEER'S SEAL

PRELIMINARY NOT FOR CONSTRUCTION

VERTICAL 0 4' 8'

HORIZONTAL 0 20' 40'

No.	Date	REMARKS	By
		REVISIONS	
		DESIGN	

Designed By: MDS DATE: MAR09
Drawn By: RW DATE: MAR09
Checked By: EVD DATE: MAR09

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BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN AND PROFILE STA 50+00 TO 54+10

Design Review Committee	City Engineer Approval	Post Design Upcate	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet	Of
9999.99	C-19	4	9

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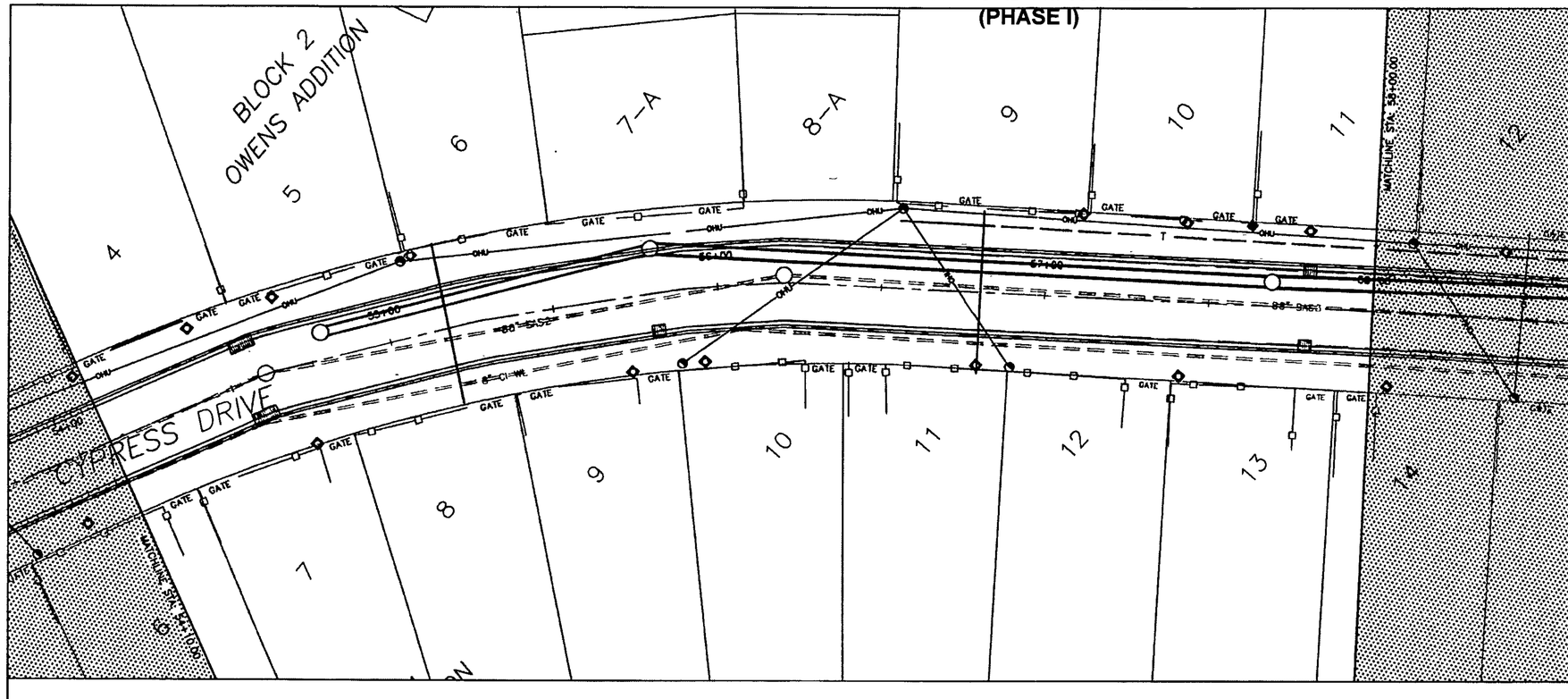

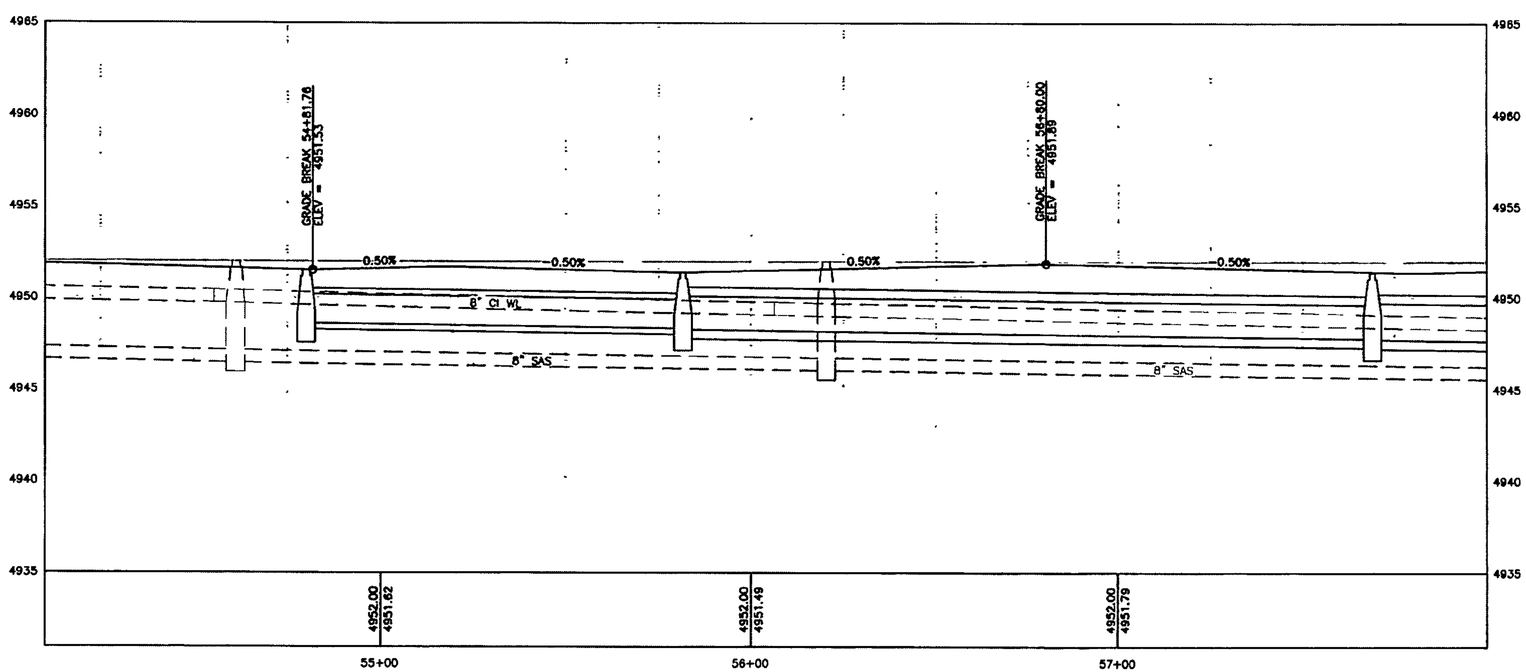

AS-BUILT INFORMATION
CONTRACTOR DATE
SURVEY BY DATE
INSPECTOR'S ACCEPTANCE BY DATE
VERIFICATION BY DATE
COMPUTED BY DATE
MICRO-FILM INFORMATION
RECORDED BY DATE
NO.

BENCH MARKS
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SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL

PRELIMINARY
NOT FOR
CONSTRUCTION

VERTICAL 0 4' 8'
HORIZONTAL 0 20' 40'

No. Date REMARKS By
REVISIONS
DESIGN
Designed By MDS DATE: MAR09
Drawn By: RW DATE: MAR09
Checked By: EVD DATE: MAR09

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BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN AND PROFILE STA 54+10 TO 58+00

Design Review Committee | City Engineer Approval | Last Design Update | Mo./Day/Yr. | Mo./Day/Yr.

City Project No. 9999.99 | Zone Map No. C-19 | Sheet 5 Of 9

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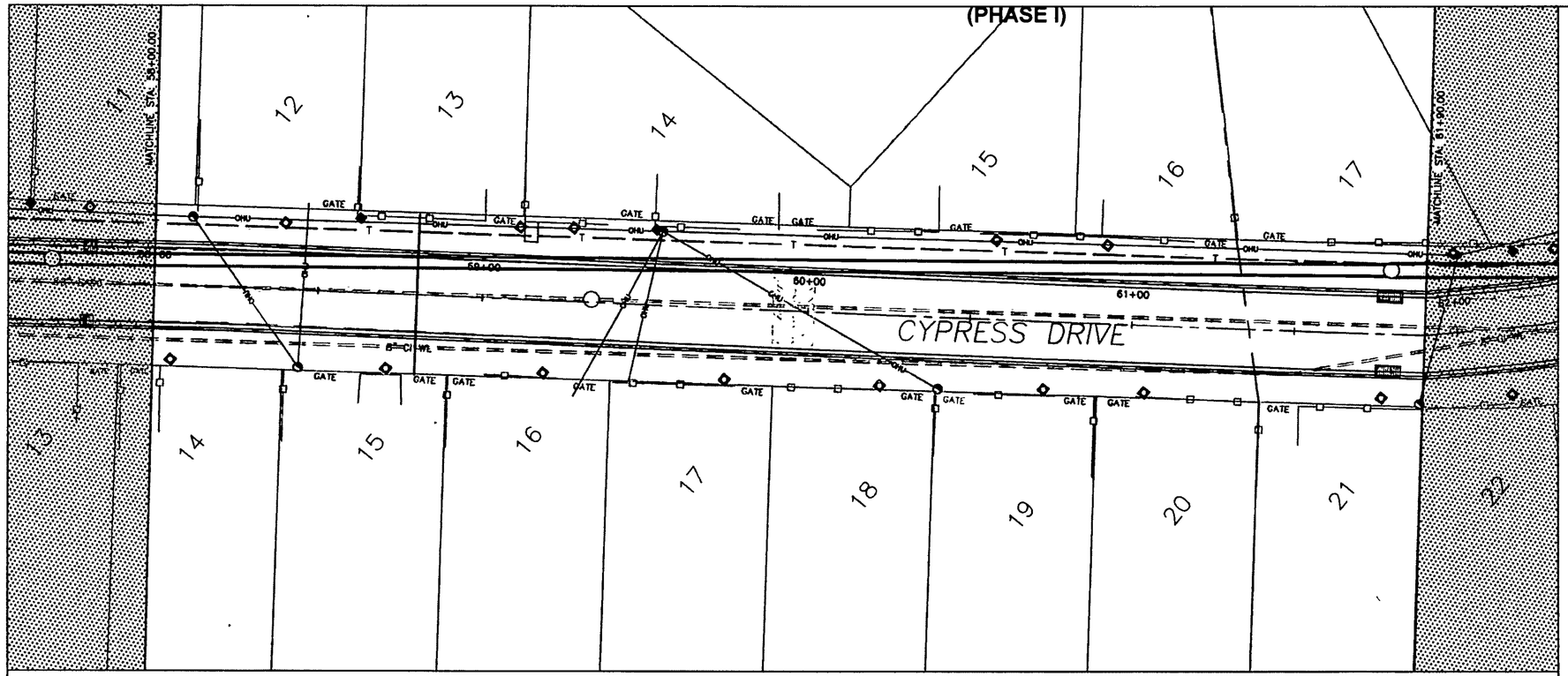
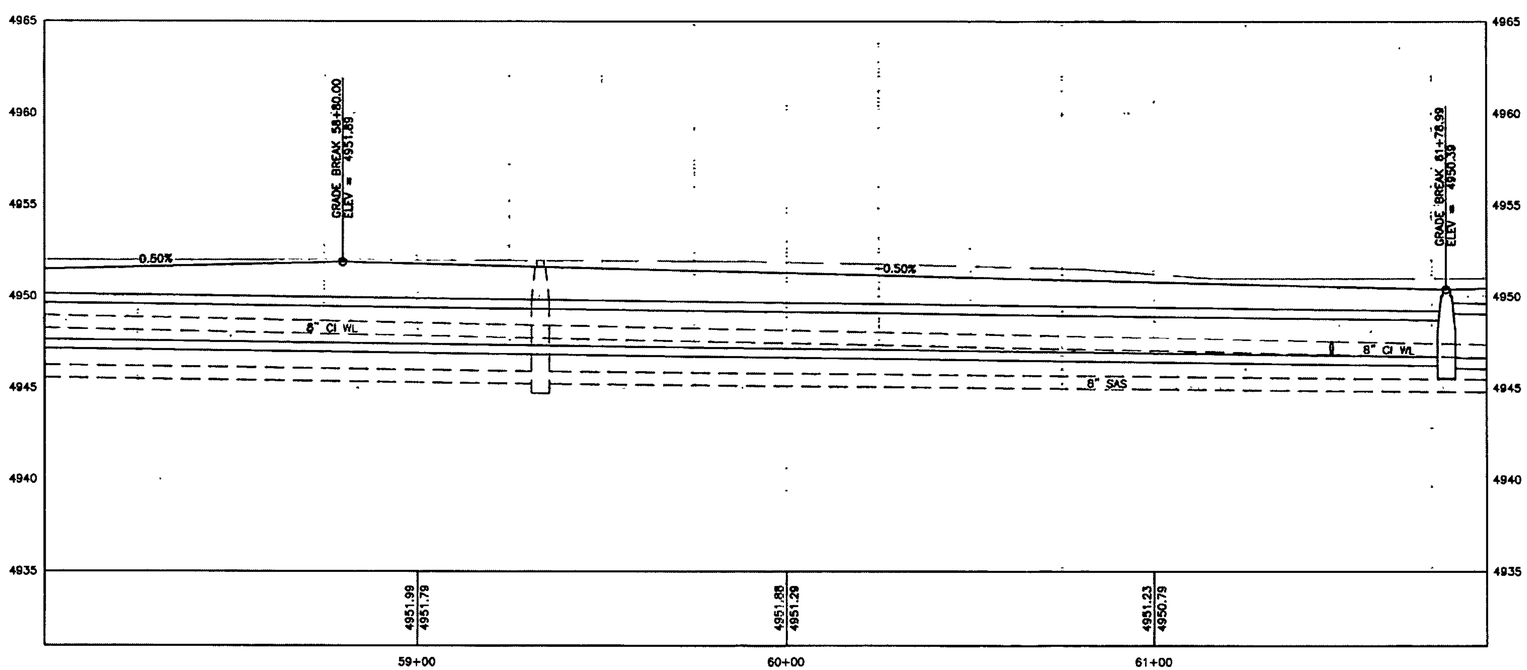
APPENDIX A: CYPRESS DRIVE ROAD IMPROVEMENTS FEASIBILITY STUDY (PHASE I)





AS-BUILT INFORMATION

CONTRACTOR — DATE
STAMED BY — DATE
INSPECTOR'S CERTIFICATE BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

BENCH MARKS

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SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

PRELIMINARY NOT FOR CONSTRUCTION

VERTICAL 0 4' 8'
HORIZONTAL 0 20' 40'

No.	Date	REMARKS	By
		REVISIONS	
		DESIGN	

Designed By: MDS — DATE: MAR09
Drawn By: RW — DATE: MAR09
Checked By: EVD — DATE: MAR09

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BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN AND PROFILE STA 58+00 TO 61+90

Design Review Committee | City Engineer Approval | Last Design Update | Mo./Day/Yr. | Mo./Day/Yr.

City Project No. 9999.99 | Zone Map No. C-19 | Sheet 6 | Of 9

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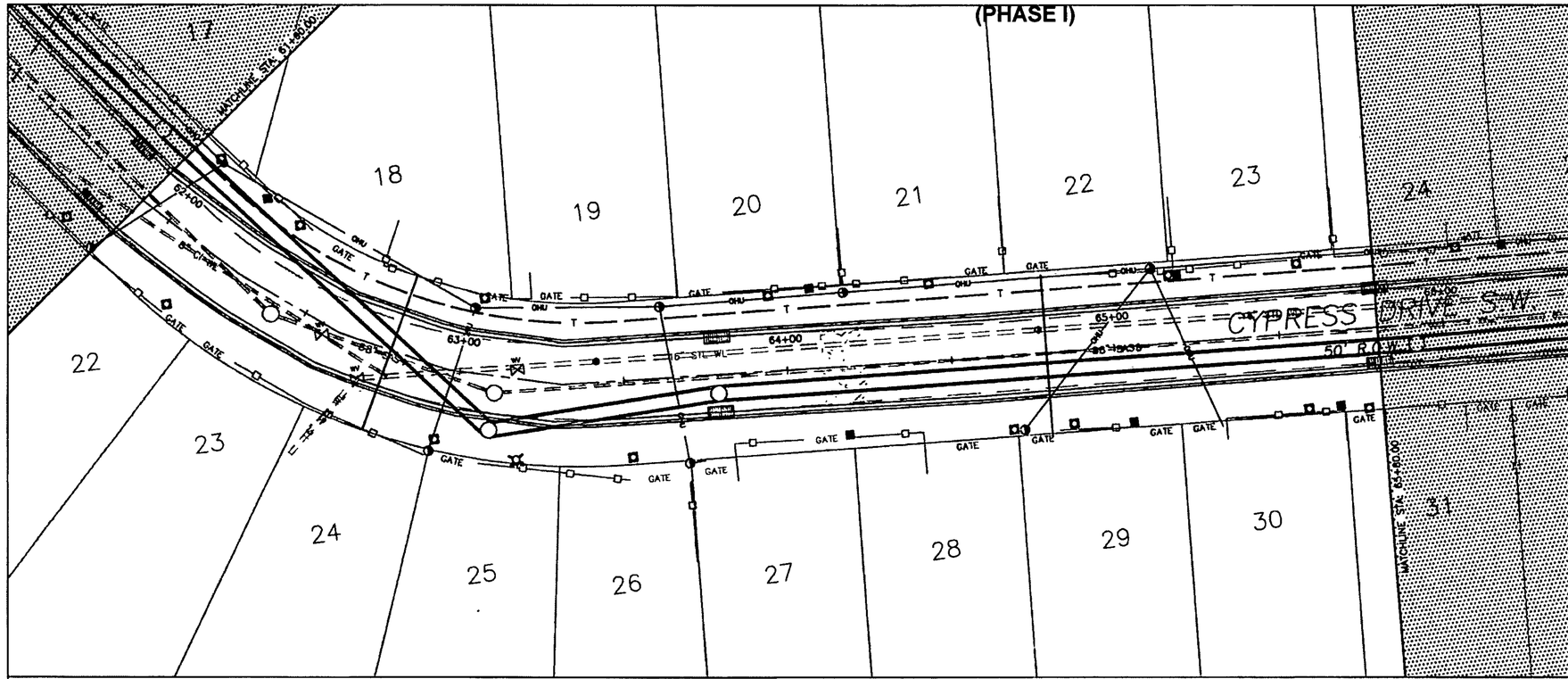

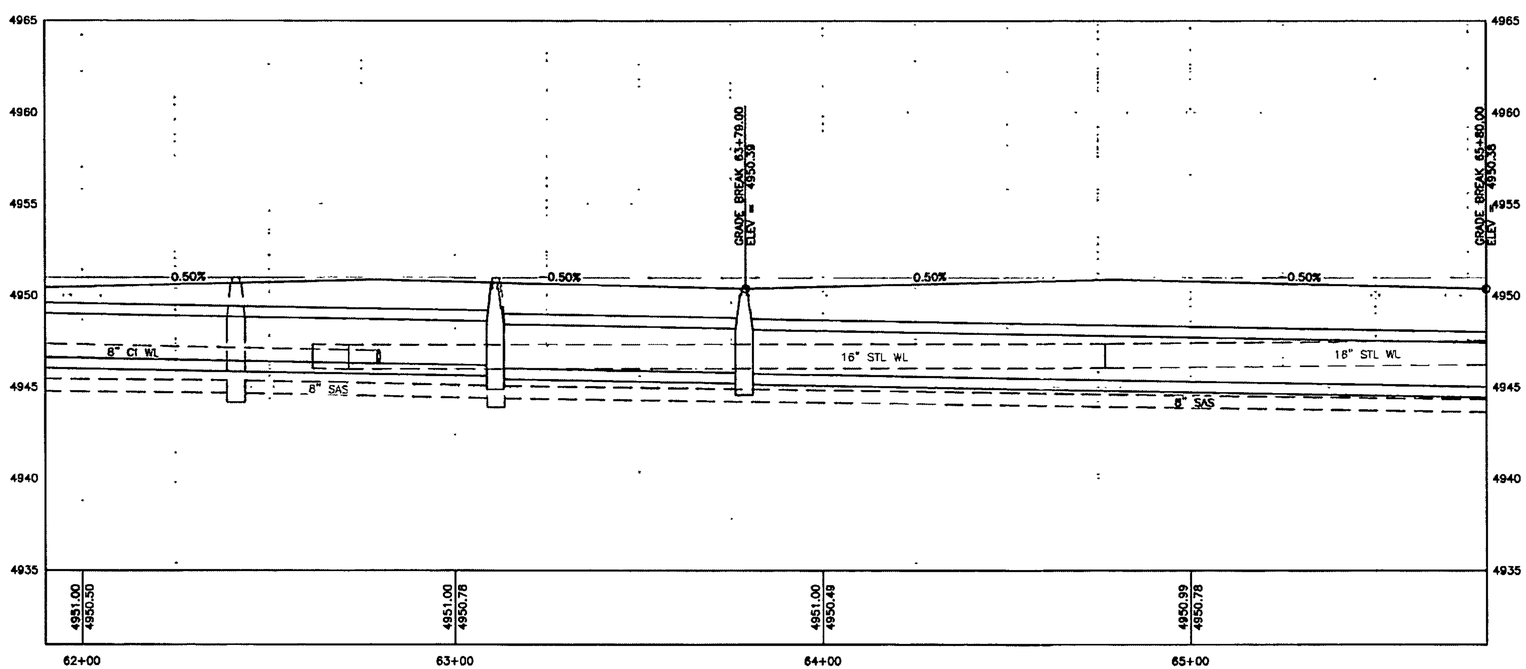

AS-BUILT INFORMATION

CONTRACTOR	DATE
STAKED BY	DATE
INSPECTOR'S ACCEPTANCE BY	DATE
FIELD VERIFICATION BY	DATE
DRAWINGS CORRECTED BY	DATE

MICRO-FILM INFORMATION

RECORDED BY	DATE
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SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

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REVISIONS

DESIGN

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BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN AND PROFILE STA 61+90 TO 65+80

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet	Of
9999.99	C-19	7	9

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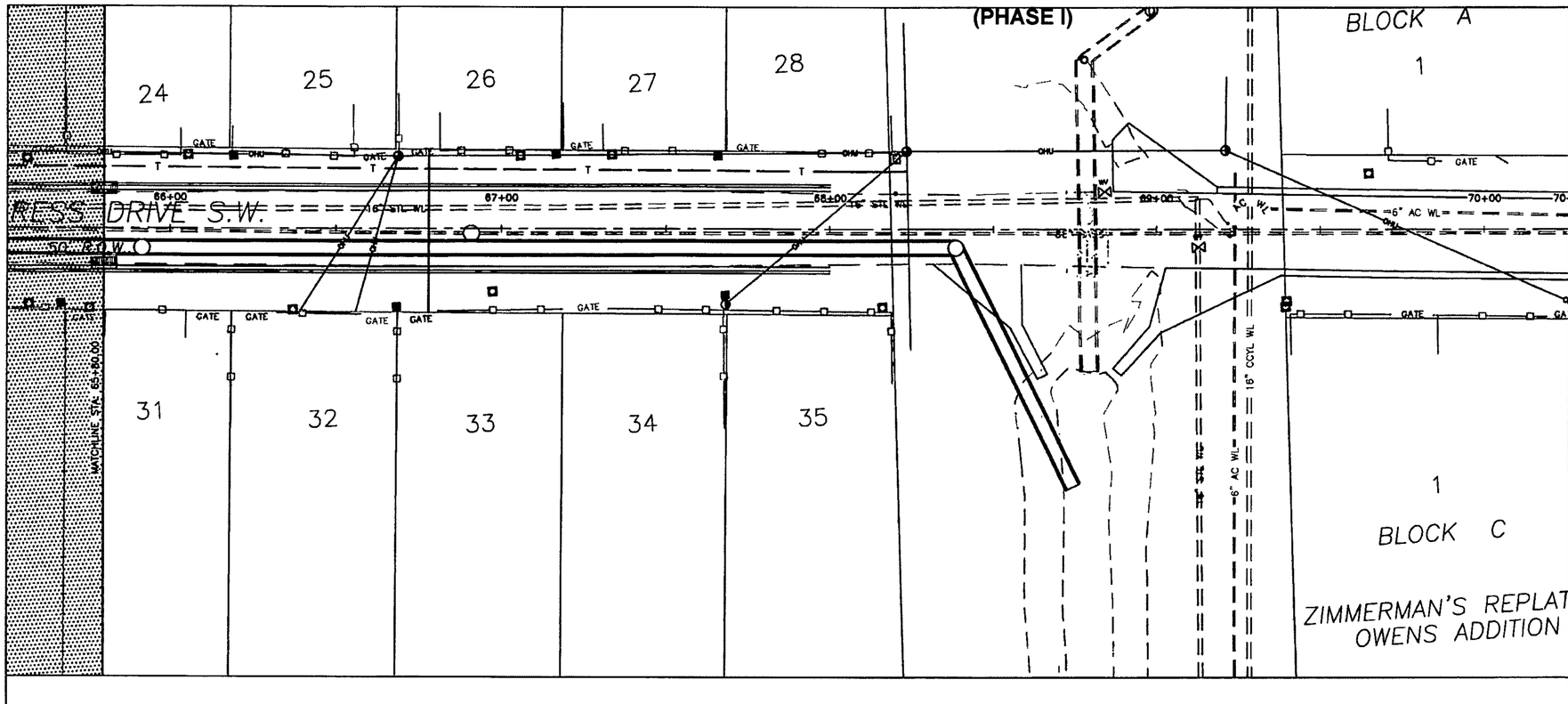

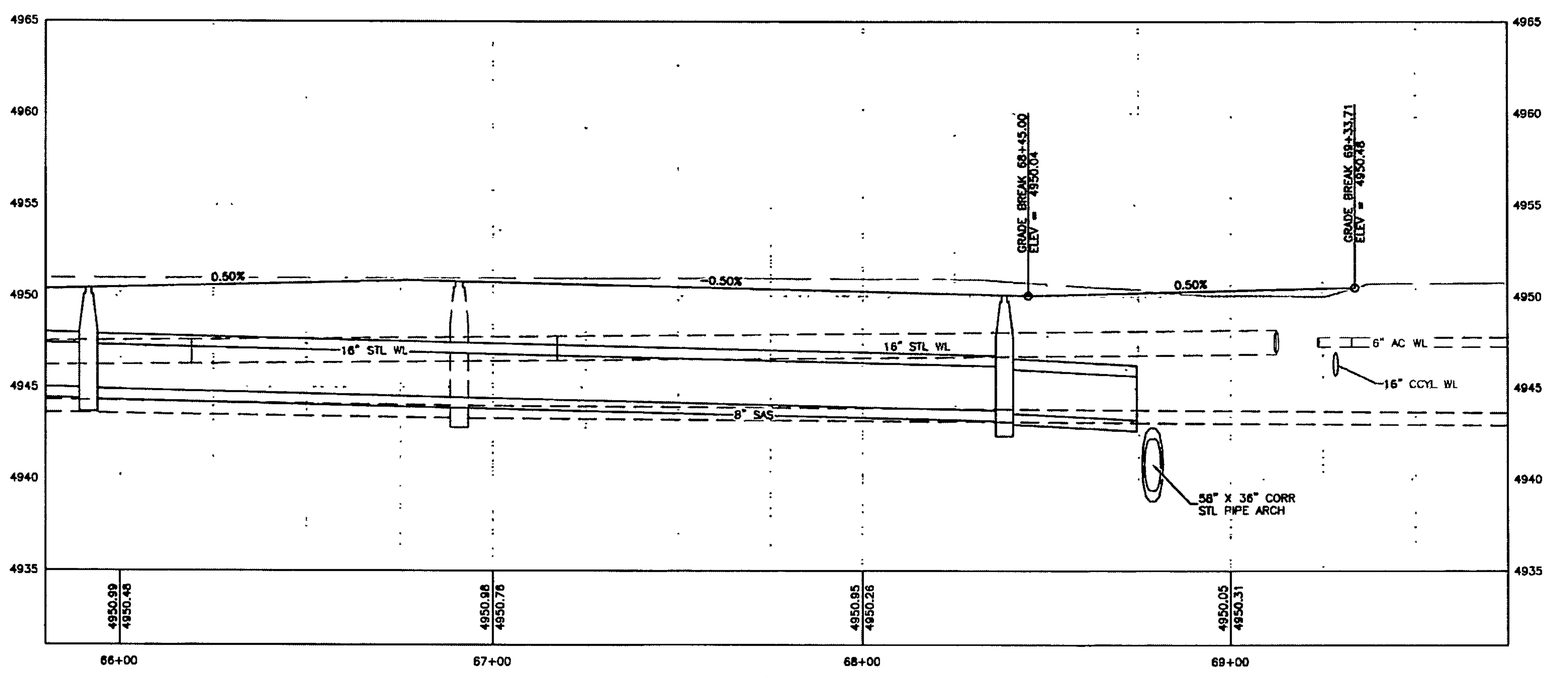

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HORIZONTAL 0 20' 40'

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STAKED BY — DATE
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AS-BUILT CORRECTED BY — DATE

BENCH MARKS

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MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

PRELIMINARY
NOT FOR
CONSTRUCTION

No.	Date	REMARKS	By
		REVISIONS	
		DESIGN	

Designed By: MDS — DATE: MAR09
Drawn By: RW — DATE: MAR09
Checked By: EVD — DATE: MAR09

BERNALILLO COUNTY

CYPRESS DRIVE STORM DRAIN
PLAN AND PROFILE STA 65+80 TO EOP

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No. 9999.99 | Zone Map No. C-19 | Sheet 8 Of 9

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APPENDIX B: PHASE II STORM DRAIN HYDRAULIC CALCULATIONS

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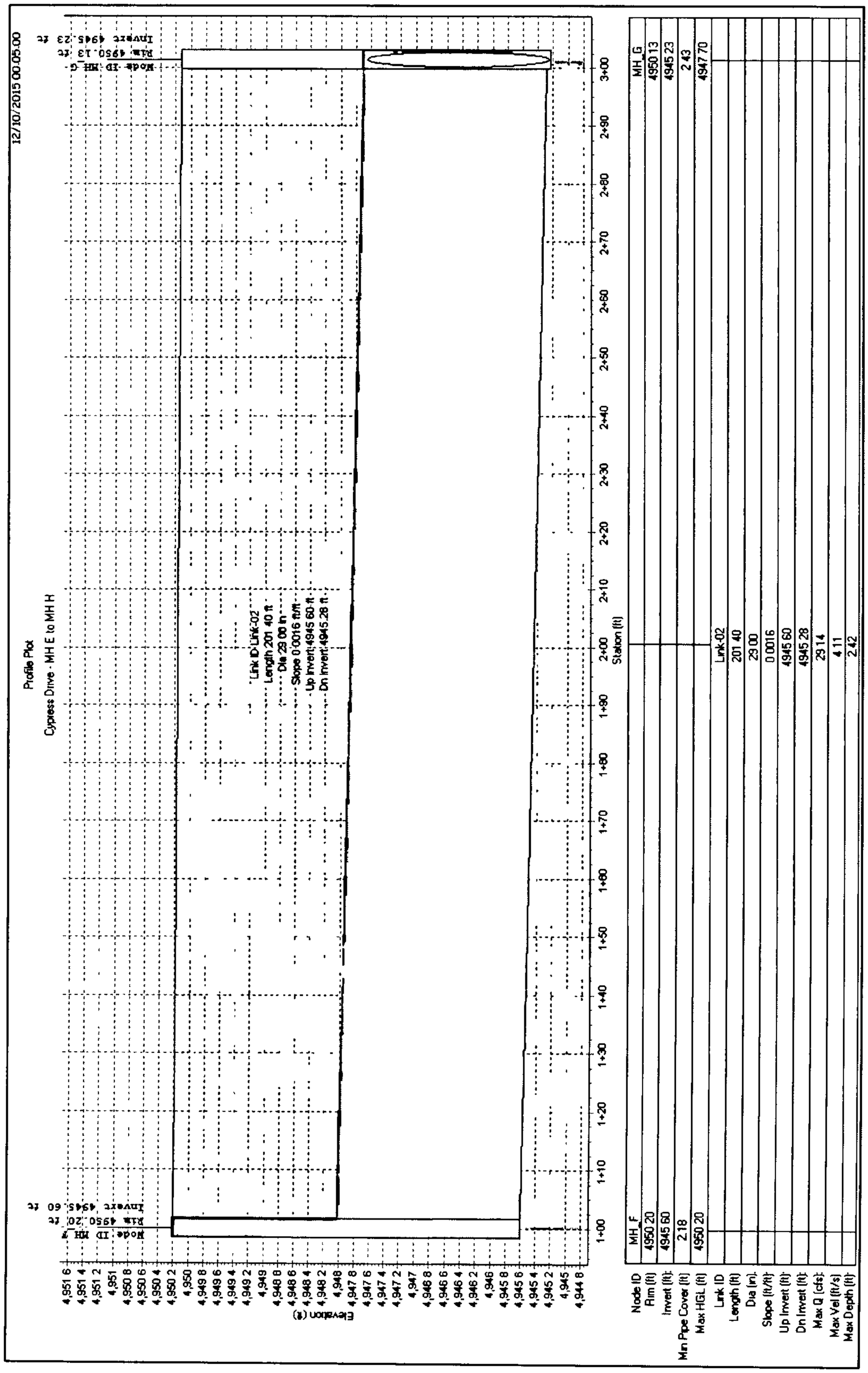
Elliptical Pipe (Cypres Drive Phase II.fm8) Report

Label	Roughness Coefficient	Channel Slope (%)	Normal Depth (ft)	Rise (in)	Span (in)	Discharge (cfs)	Flow Area (ft^2)	Percent Full (%)	Velocity (ft/s)	Discharge Full (ft^3/s)	Max Discharge (ft^3/s)
MH A to MH B - 30x19	0.013	0.26000	1.16	19.00	30 00	10.20	2.44	73.3	4.18	11.09	12.09
MH B to MH C - 34x22	0.013	0.25000	1.30	22.00	34.00	13.80	3.09	70.9	4.46	15.66	17.06
MH C to MH D - 38x24	0.013	0.25000	1.48	24.00	38.00	18.90	3.94	73.9	4.80	20.34	22.16
MH D to MH E - 42x27	0.013	0.36000	1.57	27.00	42.00	28.30	4.62	69.9	6.13	32.70	35.63
MH E to MH F - 42x27	0.013	0.35000	1.59	27.00	42.00	28.30	4.67	70.7	6.06	32.24	35.13
MH F to MH G - 45x29 - Existing	0.013	0.16000	1.92	29.00	45.00	35.10	6.05	79.3	5.80	35.08	38.17
MH G to MH H - 45x29 - Existing	0.013	0.39000	1.97	29.00	45.00	42.00	6.20	81.3	6.77	41.05	44.67

APPENDIX B: PHASE II STORM DRAIN HYDRAULIC CALCULATIONS



Junctions

General

Junction ID: MH_F

Flow properties

External inflows: YES

Treatments: NO

Delete | Show | Report

Description:

Physical properties

Invert elevation:	4945.60	ft	Surcharge elev.:	0	ft
Max/rim elev.:	4950.2	ft	Ponded area:	0	ft²
WSEL initial:	0	ft			

Analysis summary

Max water depth:	4.60	ft	Peak inflow:	35.10	cfs
Max water elevation:	4950.20	ft	Max flooded overflow	7.47	cfs
Total flooded vol.:	177.94	ac-in	Total time flooded:	1441	min

	ID	Invert Elev.	Max/Rim Elev.	WSEL Initial	Sur. Elev.	Ponded Area	Lateral Inflows	Treatments
1	MH_F	4945.60	4950.2	0	0	0	YES	NO
2	MH_G	4945.23	4950.13	0	0	0	YES	NO

Close | Help

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APPENDIX C: PHASE II STREET HYDRAULIC CALCULATIONS

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Worksheet for Cypress Drive Street Section Overflow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Discharge	14.30	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.33
0+05	0.23
0+07	0.00
0+20	0.15
0+34	0.00
0+36	0.23
0+41	0.33

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.33)	(0+05, 0.23)	0.020
(0+05, 0.23)	(0+36, 0.23)	0.015
(0+36, 0.23)	(0+41, 0 33)	0.020

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.29	ft
Elevation Range	0.00 to 0.33 ft		
Flow Area		6.75	ft^2
Wetted Perimeter		36.91	ft

Worksheet for Cypress Drive Street Section Overflow

Results

Hydraulic Radius	0.18	ft
Top Width	36.88	ft
Normal Depth	0.29	ft
Critical Depth	0.27	ft
Critical Slope	0.00668	ft/ft
Velocity	2 12	ft/s
Velocity Head	0.07	ft
Specific Energy	0.36	ft
Froude Number	0.87	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0 00	ft
Profile Description		
Profile Headloss	0 00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft
Critical Depth	0.27	ft
Channel Slope	0.50000	%
Critical Slope	0.00668	ft/ft

Messages

Notes

Calculated flow rate (14 3 cfs) is the sum of the estimated runoff of the small sub-basin that drains to Manhole F (6.8 cfs) and the estimated overflow of Manhole F (7.5 cfs) from surcharging

Cross Section for Cypress Drive Street Section Overflow

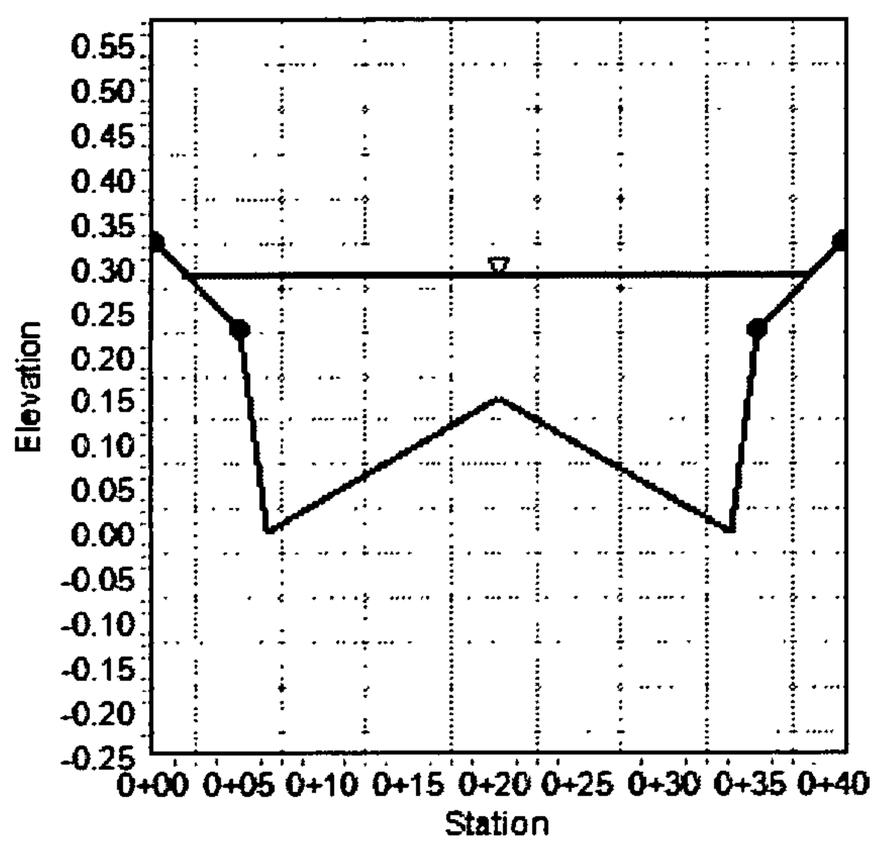
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50000	%
Normal Depth	0.29	ft
Discharge	14.30	cfs

Cross Section Image



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APPENDIX D: ENGINEER'S OPINION OF ESTIMATED CONSTRUCTION COSTS

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CYPRESS DRIVE PHASE II ROAD IMPROVEMENTS
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COST
JANUARY 2016

COA ITEM #	BID ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT COST	EXTENDED COST
004.010	1	CONSTRUCTION STAKING, COMPL.	LS	1	$ 5,310.76	$ 5,310.76
004.020	2	CONSTRUCTION SURVEYING, COMPL.	LS	1	$ 4,969.36	$ 4,969.36
006.010	3	CONSTRUCTION PROJECT SIGN, PER CONTRACT, CIP	EA	2	$ 746.10	$ 1,492.20
006.050/60	4	CONSTRUCTION MOBILIZATION/DEMOBILIZATION, COMPL.	LS	1	$ 19,232.55	$ 19,232.55
019.010	5	CONSTRUCTION TRAFFIC CONTROL & BARRICADING, COMPL.	LS	1	$ 7,966.14	$ 7,966.14
030.010	6	FLOOD PROTECTION, COMPL.	LS	1	$ 1,403.56	$ 1,403.56
030.020	7	NPDES PERMITTING, COMPL.	LS	1	$ 2,389.84	$ 2,389.84
116.030	8	RESIDENTIAL ASPHALT CONCRETE TYPE C, COMPL.	TON	503	$ 81.20	$ 40,844.43
201.010	9	SITE CLEARING AND GRUBBING, COMPL.	AC	0.5	$ 1,501.66	$ 750.83
202.011	10	EXCAVATE & DISPOSE OF EXCESS SOIL, COMPL.	CY	200	$ 10.02	$ 2,003.10
301.010	11	GRADING AREAS NOT TO BE PAVED, WITH LESS THAN 2' EXCAVATION, COMPL.	SY	1,400	$ 3.39	$ 4,739.50
301.020	12	SUBGRADE PREP, 12" AT 95% COMPACTION, CIP.	SY	3,080	$ 2.34	$ 7,215.84
336.120	13	TACK COAT, CATIONIC EMULSIFIED ASPHALT, CIP.	SY	3,080	$ 0.43	$ 1,334.93
336.xxx	14	ASPHALT CONCRETE SPEED HUMP, INCL. TACK COAT, CIP.	EA	1	$ 1,500.00	$ 1,500.00
340.050	15	CURB & GUTTER, STANDARD, PORTLAND CEMENT CONCRETE, INCL. SUBGRADE PREPARATION, CIP. SD 2415	LF	30	$ 23.79	$ 713.74
340.061	16	ROLL TYPE, MOUNTABLE CURB & GUTTER (INCL. STD. TO MOUNT. TRANS.), PORTLAND CEMENT CONCRETE, INCL. SUBGRADE PREP. CIP. SD 2415	LF	2,490	$ 27.39	$ 68,194.62
343.020	17	EXISTING PAVEMENT, ASPHALT CONCTETE, UP TO 4" THICK, SAWCUT, REMOVE & DISPOSE, COMPL.	SY	3,360	$ 7.30	$ 24,520.74
602.030	18	CHANNEL LINING (RUNDOWN), 8" THICK, REINFORCED PC CONCRETE, CIP. SD 2260, INCLUDING 12" THICK SILL	SF	340	$ 19.08	$ 6,487.93
603.010	19	WIRE ENCLOSED RIPRAP, CIP.	CY	55	$ 190.44	$ 10,474.20
603.050	20	FILTER CLOTH, CIP.	SF	1,400	$ 0.13	$ 180.40
701.100	21	TRENCHING, BACKFILLING & COMPACTION, FOR 18" TO 36" SEWER PIPE, UP TO 8' IN DEPTH, PIPE NOT INCL., COMPL., ROUND EQUIVALENT PIPE	LF	1,052	$ 28.14	$ 29,600.22
710.052	22	18" STEEL CARRIER PIPE AND APPURTENANCES, COMPL.	LF	20	$ 144.81	$ 2,896.18
801.007	23	16" WATERLINE PIPE EXCL. FITTINGS, (STD. SPEC. SEC. 801), INCL. TRENCH, & COMPACTED BACKFILL, TO 6' DEPTH,CIP.	LF	40	$ 82.70	$ 3,308.04
801.056	24	EXISTING WATERLINE, 16" TO 36", WITH FITTINGS, REMOVE & DISPOSE, TRENCHING NOT INCL., COMPL.	LF	40	$ 14.33	$ 573.05
801.158	25	JOINT RESTRAINING HARNESS, DI & PVC PUSH-ON BELLS, 14"-24", CIP.	EA	8	$ 1,009.69	$ 8,077.53
801.xxx	26	16" 45 DEGREE BEND, CIP	EA	4	$ 527.13	$ 2,108.53
802.300	27	3/4" SERVICE LINE REPLACEMENT & TRANSFER, INCL. TAPPING SADDLE & TUBING, CIP. SD 2362	EA	16	$ 884.22	$ 14,147.55
905.200	28	RECONNECT EXISTING 4" SEWER SERVICE LINE TO REPLACEMENT MAIN, INCL. FIRST 5' OF NEW SERVICE LINE, CIP. SD 2134	EA	16	$ 1,105.41	$ 17,686.50
910.006	29	18" REINFORCED CONCRETE PIPE, CLASS IV, FURNISH AND PLACE IN OPEN TRENCH, CIP.	LF	78	$ 45.68	$ 3,563.41
910.010x	30	19" X 30" ELLIPTICAL REINFORCED CONCRETE PIPE (24" EQUIVALENT), CLASS IV, FURNISH & PLACE IN OPEN TRENCH, CIP.	LF	103	$ 58.62	$ 6,037.55
910.012x	31	22" X 34" ELLIPTICAL REINFORCED CONCRETE PIPE (27" EQUIVALENT), CLASS IV, FURNISH & PLACE IN OPEN TRENCH, CIP.	LF	190	$ 65.13	$ 12,374.70
910.014x	32	24" X 38" ELLIPTICAL REINFORCED CONCRETE PIPE (30" EQUIVALENT), CLASS IV, FURNISH & PLACE IN OPEN TRENCH, CIP.	LF	411	$ 71.63	$ 29,440.46
910.018x	33	27" X 42" ELLIPTICAL REINFORCED CONCRETE PIPE (33" EQUIVALENT), CLASS IV, FURNISH & PLACE IN OPEN TRENCH, CIP.	LF	208	$ 89.21	$ 18,556.52
910.020x	34	29" X 45" ELLIPTICAL REINFORCED CONCRETE PIPE (36" EQUIVALENT), CLASS IV, FURNISH & PLACE IN OPEN TRENCH, CIP. (IF NOT EXISTING)	LF	62	$ 106.80	$ 6,621.40
915.050	35	CATCH BASIN, TYPE "D", SINGLE GRATE, CIP. SD 2206	EA	2	$ 2,899.49	$ 5,798.98
915.060	36	CATCH BASIN, TYPE "D", DOUBLE GRATE, CIP. SD 2206	EA	4	$ 5,082.44	$ 20,329.74
920.130	37	MANHOLE, 6' DIA., TYPE "C", LESS THAN 6' DEEP, CIP. SD2101	EA	3	$ 4,239.30	$ 12,717.89
920.130x	38	MODIFIED MANHOLE, 6' DIA., TYPE "C", WITH SINGLE TYPE "D" INLET GRATE, LESS THAN 6' DEEP, CIP. SD2101	EA	2	$ 4,875.19	$ 9,750.38
920.130x	39	MANHOLE, 6' DIA., STORMWATER QUALITY, LESS THAN 6' DEEP (IF NOT EXISTING)	EA	1	$ 5,299.12	$ 5,299.12

SUBTOTAL	$ 420,612.38
NMGRT (7.1875% FOR CITY OF ALBUQUERQUE)	$ 30,231.52
GRAND TOTAL	**$ 450,843.90**