

FINAL DRAINAGE REPORT

CANTERBURY PARK

~~WINDSOR PARK NORTH~~

1810 J 6/10 ROAD

FRUITA, CO

PREPARED FOR:

ZECK HOMES, INC.
1950 Hwy 6 & 50
Fruita, CO 81521

February 2005

SHARPER

Engineering Services, Inc.

1950 Hwy 6 & 50 - Fruita, CO 81521

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CERTIFICATION

I hereby certify that this Final Drainage Report for Windsor Park North subdivision was prepared by me or under my direct supervision. The report was prepared in accordance with the Stormwater Management Manual, adopted by the City of Grand Junction in May 1996.



Steven E. Sharpe
Registered Professional Engineer
State of Colorado #29547

FINAL DRAINAGE REPORT
WINDSOR PARK NORTH
CANTERBURY PARK (Revised)

I. GENERAL LOCATION AND DESCRIPTION

SITE LOCATION

The proposed Windsor Park North Subdivision is located at 1810 J.6 Road, and the site can also be described as being in Section 16, Township 1 North, Range 2 West of the Ute Meridian, Mesa County, Colorado. A Vicinity Map is included in Appendix A that shows the project limits in relation to the area. Vista Valley PUD borders this site on the north, large single-family parcels border this site on the west, a 10-acre vacant parcel borders the site on the east and J.6 Road borders the site on the south.

Primary access to the site will be from J.6 Road, which runs along the entire south property boundary. Secondary access will be provided by a connection to the existing Arches Drive (Vista Valley) on the north and a future connection to adjacent properties (Laura Avenue) has been provided on the west. Refer to the Final Plat for proposed street layouts.

SITE AND MAJOR BASIN DESCRIPTION

The 20-acre parcel that makes up Windsor Park North currently is covered by moderate weed growth with patches of bare ground. Historically, the site was utilized as a crop production field for cultivation although has not been irrigated for over a year.

In researching the soils type at this location, information was obtained from the Mesa County Soils Map web site. The soil type on this parcel, as shown on the geologic map in Appendix A, was found to be entirely Sagers Silty Clay Loam (Bc) as described also in Appendix A. This soil type can be generally categorized as hydrologic soil type "B", having moderate infiltration rates when thoroughly wetted.

II. EXISTING DRAINAGE CONDITIONS

MAJOR BASIN

The existing major drainage basin is delineated by Little Salt Wash on the west and north, Adobe Creek on the east and the Colorado River on the south. The general direction of drainage within the basin is from northeast to southwest.

In researching the floodplain hazard for the area, reference was made to the Flood Insurance Rate Map for Mesa County as produced by the Federal Emergency Management Agency (FEMA), revised July 1992. This site has been designated as within "Zone X", which are areas determined to be outside the 500-year flood plain.

SITE

The site drainage basin is shown on the Historic Drainage Map in Appendix B, which illustrates the basin draining from northeast to southwest at slopes ranging from 0.6 – 1.5% in irrigation furrows. This site is divided into two distinct drainage basins (west basin and east basin). Drainage from the west basin (approximately half of the site) collects at the south and is conveyed westward to the southwest corner of the site, where it historically discharged into a 12" CMP culvert under J.6 Road. From here drainage bisected the newly developed Windsor Park Subdivision enroute to the Pine Street Drain. The east basin collects at the south, is conveyed to the south-central region of the site and discharges into a 10" PVC culvert under J.6 Road. From here drainage is piped directly south, just east of the Windsor Park east property line, and discharges into the Compton Drain.

Historically, the west drain basin discharges runoff at a rate of 1.8 cfs for the 2-year and 8.9 cfs for the 100-year storm event. The east basin discharges runoff at a rate of 2.1 cfs for the 2-year and 9.7 cfs for the 100-year storm event (see Appendix C for historic basin computations).

This site is isolated from northern flows due to the presence of the J $\frac{3}{4}$ Drain along the north property line. This drainage-way is lower in elevation than this site and therefore no runoff will be introduced from the north. A small amount of historic flows exited this site to the west. Nonetheless, no

runoff is introduced to this site from the west due to topography. Approximately half of the east, adjacent 10-acre parcel drains through this site under historic conditions. This additional area has been included in the historic runoff rates for the site within the east basin calculations. There is no runoff introduced from the south due to the natural topography of the land sloping to the south.

Runoff exiting this site (for both the east and west basins) ultimately enters the recently improved Pine Street Drain, which runs parallel with 18 Road on the east side. This 36" drain pipe conveys runoff and drainage southward where flows ultimately discharge into the Colorado River.

III. PROPOSED DRAINAGE CONDITIONS

CHANGES IN DRAINAGE PATTERNS

No change in drainage patterns is proposed for the lands adjacent to Windsor Park North on the north, west and south. Historic drainage contributions from the east cannot be accommodated with the development of this site. It will be expected (and as also discussed with the City of Fruita) that the east, adjacent 10-acre parcel convey and discharge all drainage generated from that site. This can easily be accomplished by discharging the 10-acre drainage into the North Compton Drain, which currently bisects this parcel and possesses sufficient depth to accommodate all drainage from that site. A Major Basin Drainage Map is included in Appendix B that illustrates the existing drainage basin. Proposed drainage patterns within the Windsor Park North site will be modified to accommodate development and to better control surface flows to designated collection areas. A Developed Drainage Map is also included in Appendix B illustrating the site grading along with the Tc flow paths. Supporting documentation for the Tc determinations appear in Appendix D.

The developed site consists of two drainage basins, being the west basin and the east basin. The west basin area is 5.30 acres and the east basin area is 11.40 acres. Drainage from the developed east basin will flow southward and collect in a detention pond near the south-central region of the site. Drainage from the west basin will also flow south and collect in a second detention pond in the southwest corner of this site.

Runoff within Windsor Park North will be conveyed in street curb and gutter sections to the detention ponds (Tract B and Tract C). Appendix D includes the calculations for gutter capacity at several locations along the drainage route. The worse case gutter capacity is just prior to entering each of the individual detention ponds. The 100-year floodwater elevation will easily be contained within the roadway section at both low-points prior to discharging into the detention ponds. The 100-year storm elevation within each pond will be totally contained within the detention ponds (Tract B and Tract C).

The west drainage basin developed discharge rates are 2.2 cfs for the 2-year and 9.3 cfs for the 100-year storm (Appendix C). The east basin developed discharge rates are 3.8 cfs for the 2-year and 16.0 cfs for the 100-year storm. Refer to the Developed Drainage Map in Appendix B for Tc path and a summary of calculations. Developed runoff will be discharged from both detention ponds through v-notch weir outlet structures. This land lies within the master drainage basin study area that is designated/required to provide over-detention of stormwater accumulations. Per the requirements of the study (performed by Williams Engineering for the City of Fruita), this developed land shall release runoff at 48% (or less) of the historic release rates.

This site proposes to release developed runoff at 45% of the historic release rate value, for each of the two detention ponds. Proposed discharge rates for the developed west basin are 0.8 cfs (2-year storm) and 4.0 cfs (100-year storm). Discharge rates for the east basin shall be 0.9 cfs (2-year) and 4.4 cfs for the 100-year storm event. Drainage exiting each of the detention ponds will enter a proposed storm sewer system in J.6 Road that will discharge into the Murray Drain (Pine Street Drain) in 18 Road. Drainage will then essentially follow the same route as described in Section II of Historic Drainage Conditions and continue southward and ultimately discharge into the Colorado River. Historic and developed runoff rates (Appendix C) are illustrated in tabular form in Section V of this report.

MAINTENANCE ISSUES

Access to the detention ponds (Tracts B and C) will be provided directly from the streets adjacent to each pond. A Homeowners Association will be formed and be responsible for maintaining the drainage improvements to insure proper performance and to avoid potential impacts to adjacent areas.

IV. DESIGN CRITERIA & APPROACH

GENERAL CONSIDERATIONS

A master drainage plan has been completed that determines the necessity for large-scale drainage improvements required in the immediate region. The master plan study suggests that future development in this region detain and release stormwater accumulations at approximately 48% of the historic release rates. This project proposes to detain and release drainage accumulations at 45% of the historic rates for both ponds. Since the location of the proposed detention basins are very near the natural collection points under existing conditions, adjacent lands should be unaffected by drainage improvements to this site.

HYDROLOGY

Calculations are based on 2-year & 100-year rainfall events and precipitation based on Intensity-Duration-Frequency (IDF), Table A-1a, City of Grand Junction Stormwater Management Manual, May 1996. Runoff calculations were performed using the Rational Method, for historic and developed release rates and Modified Rational Method, for detention pond sizing. Parameter selection and design procedures were based on using a composite runoff coefficient, the largest time of concentration (T_c) obtained for the drainage basin, and the basin area obtained by use of a computer.

HYDRAULICS

Hydraulic calculations were accomplished by AutoDesk software, Haestad Methods hydrology software, and Manning's equation. Parameter selection was determined by the various surfaces utilized, and the corresponding coefficients from the City of Grand Junction SWMM manual, May 1996.

V. RESULTS AND CONCLUSIONS

RUNOFF RATES

<u>West Drain Basin</u>	<u>2-Year Storm</u>	<u>100-Year Storm</u>
Historic Release Rate	1.8 cfs	8.9 cfs
Developed Release Rate	2.2 cfs	9.3 cfs
Design Release Rate*	0.8 cfs	4.0 cfs

<u>East Drain Basin</u>	<u>2-Year Storm</u>	<u>100-Year Storm</u>
Historic Release Rate	2.1 cfs	9.7 cfs
Developed Release Rate	3.8 cfs	16.0 cfs
Design Release Rate*	0.9 cfs	4.4 cfs

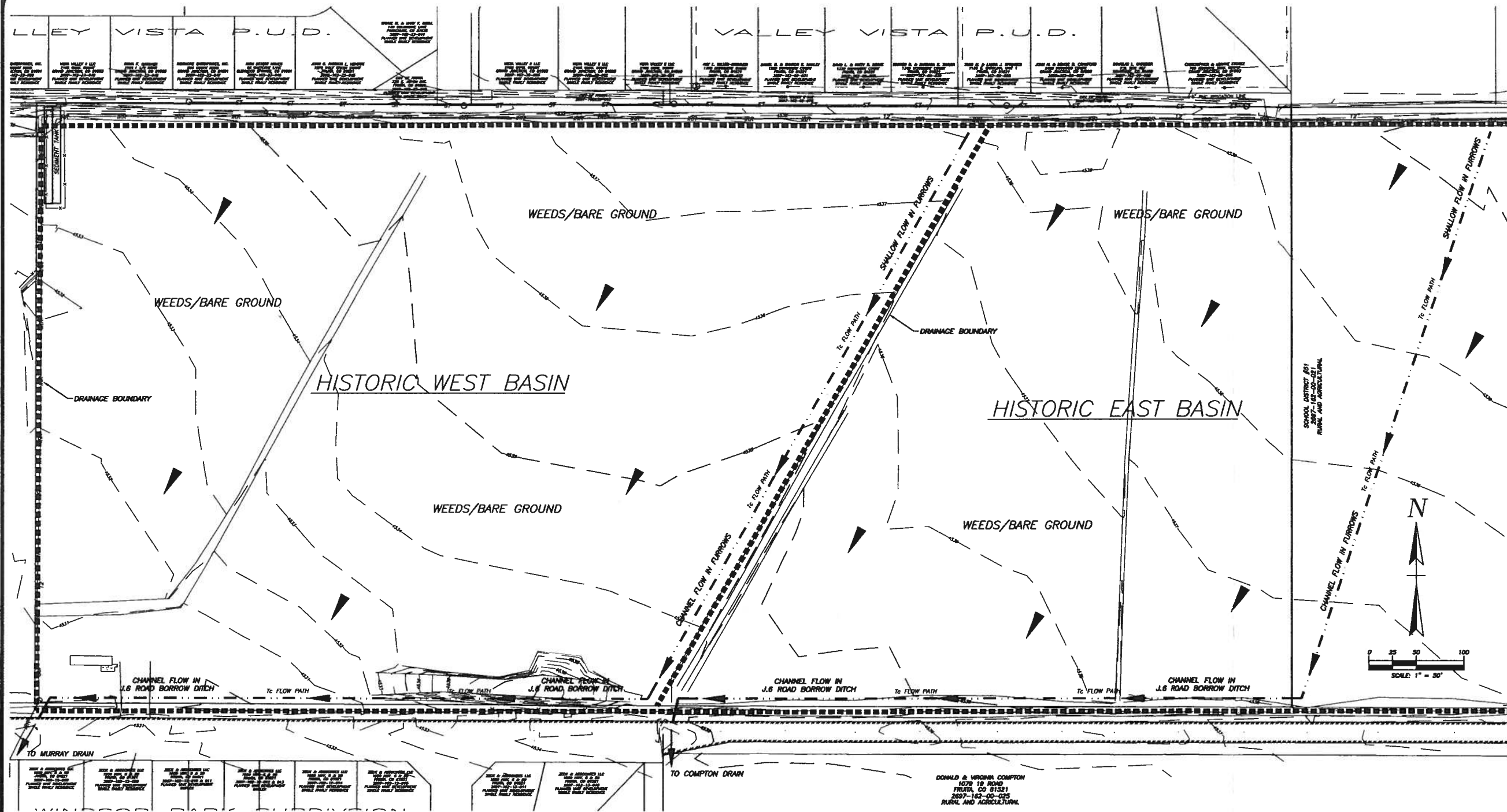
*Design Release Rate is 45% of the Historic Release Rate

Calculations to support the above runoff rates appear in Appendix C and D.

CONCLUSIONS

In developing this area into Windsor Park North, it is virtually impossible not to increase the amount of runoff. However, with proper design and construction of the proposed drainage system no impacts to the downstream systems are anticipated. The general concept of the drainage plan is to follow historic patterns of flow towards the southwest and south-central regions of the site. At these locations, the proposed detention pond outlet structures will control and convey stormwater releases at 45% of the historic rate for the 2-year storm and 100-year storm events.

The designed over-detention of stormwater accumulations proposed will reduce the impact on the existing downstream storm system during both the 2-year and 100-year storms. Due to over-detention, downstream drainage systems will receive less peak runoff than under historic conditions. This Drainage Report has been prepared to address site-specific drainage concerns in accordance with requirements of the City of Fruita. The appendices of this report include criteria, exhibits and calculations used in the design and analysis of this project. Finish floor elevations for housing structures in the detention pond vicinity and throughout the subdivision have been set at least one foot higher than the 100-year flood elevation.

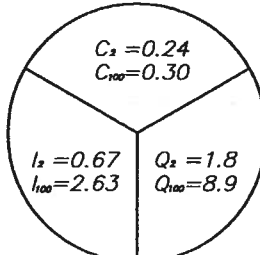


VALLEY VISTA P.U.D.

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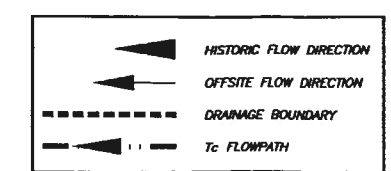
HISTORIC WEST BASIN

HISTORIC EAST BASIN

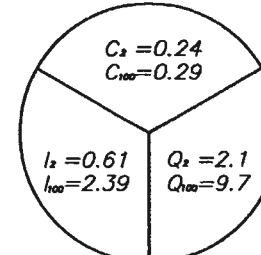


WEST BASIN AREA = 11.23 ACRES

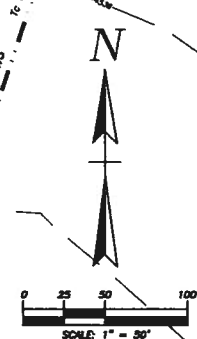
LEGEND



CONTOURS SHOWN ARE EXISTING



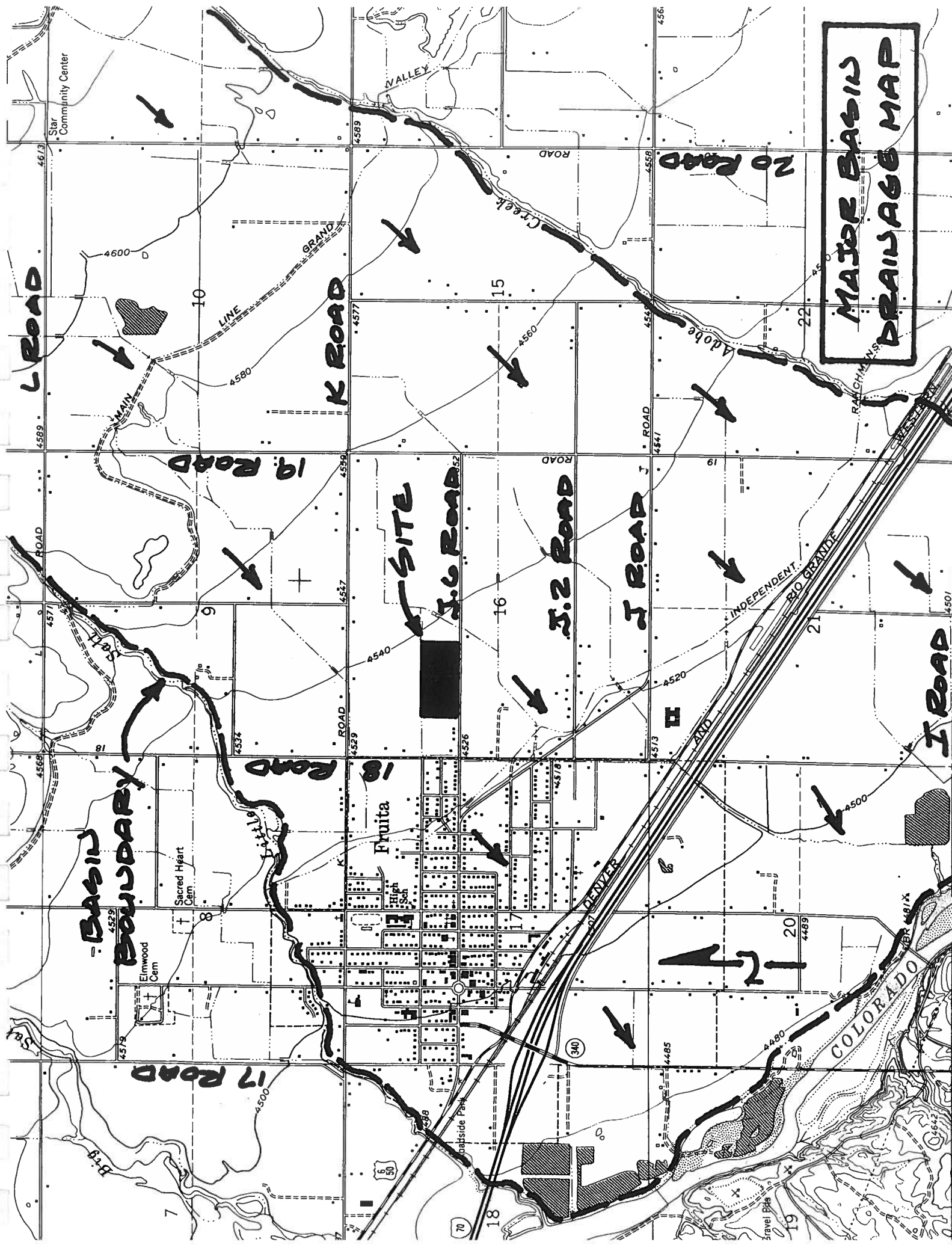
EAST BASIN AREA = 14.02 ACRES

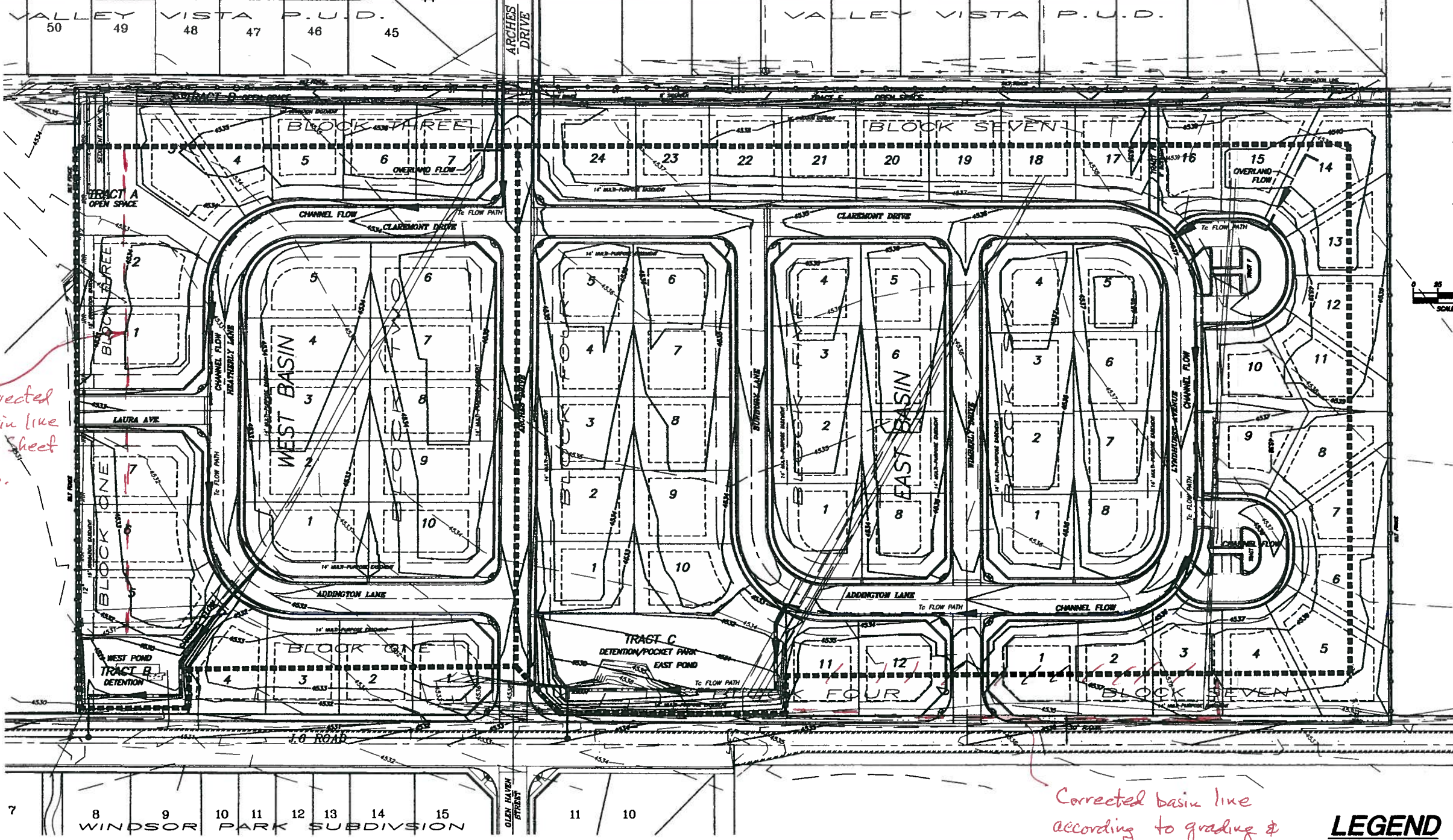


PROJECT BENCHMARK:
 W 1/4 CORNER, SECTION 16
 MCSM # 1049-1
 ELEVATION = 4524.39
 TRUE ELEVATION
 (NAVD 88) = 4524.89

BY:	REVISION:
DATE:	NO.:
HISTORIC DRAINAGE MAP	
WINDSOR PARK NORTH SUBDIVISION	
ZECK HOMES, INC.	
PROJECT NO.:	FILE NAME: WPN-Historic
DATE: 1-28-2003	DRAWN: RLC
	CHECKED: SES
SHARPER Engineering Services, Inc.	
1950 HIGHWAY 6 & 50 FRUITA, COLORADO 81521 TELEPHONE (970) 855-9671 FAX (970) 855-0221	
SHEET 1	OF 1

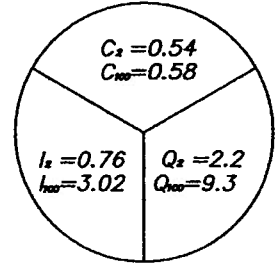
MAJOR BASIN DRAINAGE MAP





Corrected basin line per sheet 23.

Corrected basin line according to grading & drainage sheet 23 of construction drawing

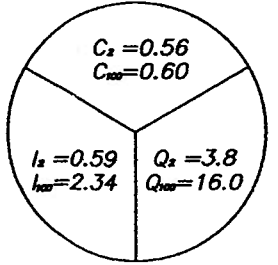


WEST BASIN A = 5.30 ACRES

W. DETENTION POND

2 YR. DETENTION VOL. = 1972 CF
 2 YR. STORAGE ELEV. = 4528.92
 POND BOTTOM ELEV. = 4527.59
 2 YR. RELEASE RATE = 0.80 CFS

100 YR. DETENTION VOL. = 7909 CF
 100 YR. STORAGE ELEV. = 4530.15
 100 YR. RELEASE RATE = 4.00 CFS



EAST BASIN A = 11.40 ACRES

E. DETENTION POND

2 YR. DETENTION VOL. = 5761 CF
 2 YR. STORAGE ELEV. = 4530.61
 POND BOTTOM ELEV. = 4529.33
 2 YR. RELEASE RATE = 0.90 CFS

100 YR. DETENTION VOL. = 22908 CF
 100 YR. STORAGE ELEV. = 4531.75
 100 YR. RELEASE RATE = 4.40 CFS

LEGEND

- ← OFFSITE FLOW DIRECTION
- DRAINAGE BOUNDARY
- To FLOWPATH

CITY OF FRUITA

ACCEPTED FOR CONSTRUCTION FOR ONE YEAR FROM THIS DATE.

Date _____

ACCEPTED AS CONSTRUCTED

Date _____

REVISION: _____

DATE: _____

DEVELOPED DRAINAGE MAP

WINDSOR PARK NORTH SUBDIVISION

ZECK HOMES, INC.

FILE NAME: WPN-developed

DATE: 2-1-2005

DRAWN: RLC

CHECKED: SES

PROJECT NO.:

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COLORADO REGISTERED
 STEVEN E. SHARPER
 29547
 PROFESSIONAL ENGINEER

SHEET 1 OF 1