

**Britton Engineering & Land Surveying, Inc**

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RECEIVED

APR 28 2010

Rapid City Growth  
Department

April 23, 2010

**PROPERTY**

Lots A, B, D and E of replat of Lot 13 of Block 31 of Boulevard Addition and a portion of Fairview Street Right-Of-Way, proposed to be replated into Lots 1 and 2 of Noyes Subdivision, Located in Section 2, Township 1 North, Range 7 East, B.H.M. Rapid City, Pennington County, South Dakota.

**PURPOSE**

This is a supplemental report to our original report dated February 4, 2010. This report addresses the master plan for the West Downtown Drainage Basin, and provides information demonstrating the proposed lots have sufficient water quantities for domestic use and fire flow conditions.

**DRAINAGE ANALYSIS**

The property described above is located in sub-basin G4A (175) and G4B (375) of the West Downtown Drainage Basin prepared by Davis-Atkins and Associates, Inc. The property in this study is located entirely in sub-basin G4A. As stated in the Downtown Drainage Basin study of the Land Use and Zoning section in the Basin Description, "more housing will be constructed in certain park and forest use areas, but these are not viewed as detrimental to the results of the design plan" (Page 7.) There are three conveyance elements in the sub-basins mentioned above. Conveyance Element 29 an existing retention cell located upstream of the project at the end of Forest Hills Drive. Conveyance Element 30 is proposed to be a channel with a 6' bottom with 8:1 side slopes and is located upstream of the project at the intersection of Forest Hills Drive and Forest Court. Conveyance Element 31 is a proposed storm drain inlet along Clark Street to be constructed during an extension of the West Boulevard storm drain network. The improvements made at the proposed development located within this sub-basin will have minimal impact on the basin and were accounted for during the Downtown Drainage Basin study.

**WATER ANALYSIS**

Based on the City of Rapid City's Fire Department tests for the fire hydrant located at the southerly edge of the parking lot for the 1<sup>st</sup> Congressional Church at 1200 Clark Street the estimated available discharge at a drawdown pressure of 20 psi is 3,194 gallons per minute and at the drawdown pressure of 0 psi the discharge is estimated at 3,292 gallons

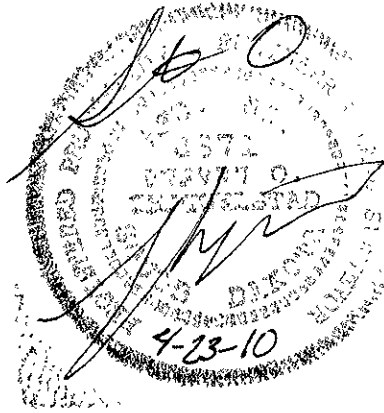
per minute. The available fire flow at the proposed lot development which is located approximately 350 feet northeast of the hydrant appears to be adequate. The reported static pressure at the test hydrant is 85 psi we estimate that the static pressures at the proposed house sites would be 92 psi +/- . We recommend to the owner that due to the high static pressures, that at the time of individual service line installation a pressure test be administered to determine if a pressure reducing valve should be installed for the individual homes.

We have included copies of the West Downtown Drainage Report and a copy of the fire hydrant test report

I hereby certify that the data herein being submitted was prepared by me or under my direct supervision and that to the best of my knowledge is true and correct.



Steven O. Thingelstad, PE/LS



## INTRODUCTION

### BACKGROUND

This report has been prepared for the City of Rapid City by Davis-Atkins and Associates, Inc.

This report represents a Conceptual Plan for long term drainage improvements for the Downtown Area Drainage Basin. Conceptual Planning includes investigation of various courses of actions and planning of drainage improvements to prevent or correct serious problems. Decisions made during this Conceptual Planning process include storage facilities, types of conveyance elements, route location, and magnitude of storm utilized for design.

This report is intended to be utilized as a guide for the City of Rapid City in providing a degree of protection from flooding for Downtown Area Drainage Basin properties. The recommended degree of protection is between a 10 year storm and a 100 year storm. This degree of protection was recommended by Davis-Atkins and Associates, Inc. and accepted by the Rapid City Common Council on March 28th, 1989 based on preliminary cost estimates.

The problems associated with the Downtown Area Drainage Basin are similar to drainage problems in many older developed areas. No real Master Planning has been completed. Improvements have been built as a problem became intolerable but the solutions in many cases were only designed to eliminate a menace type storm. Larger storms such as the 10 year, 50 year or 100 year event were something that were to be tolerated.

As the guidelines for urban drainage becomes more complex and property values increase, the degree of protection sought also increases. The currently accepted degree of protection is the 100 year event. In most cases new designs economically design for the 100 year event. In the case of the Downtown Area Drainage Basin, however the 100 year event protection has been determined to be uneconomical.

## LIMITATIONS OF DESIGN PLAN

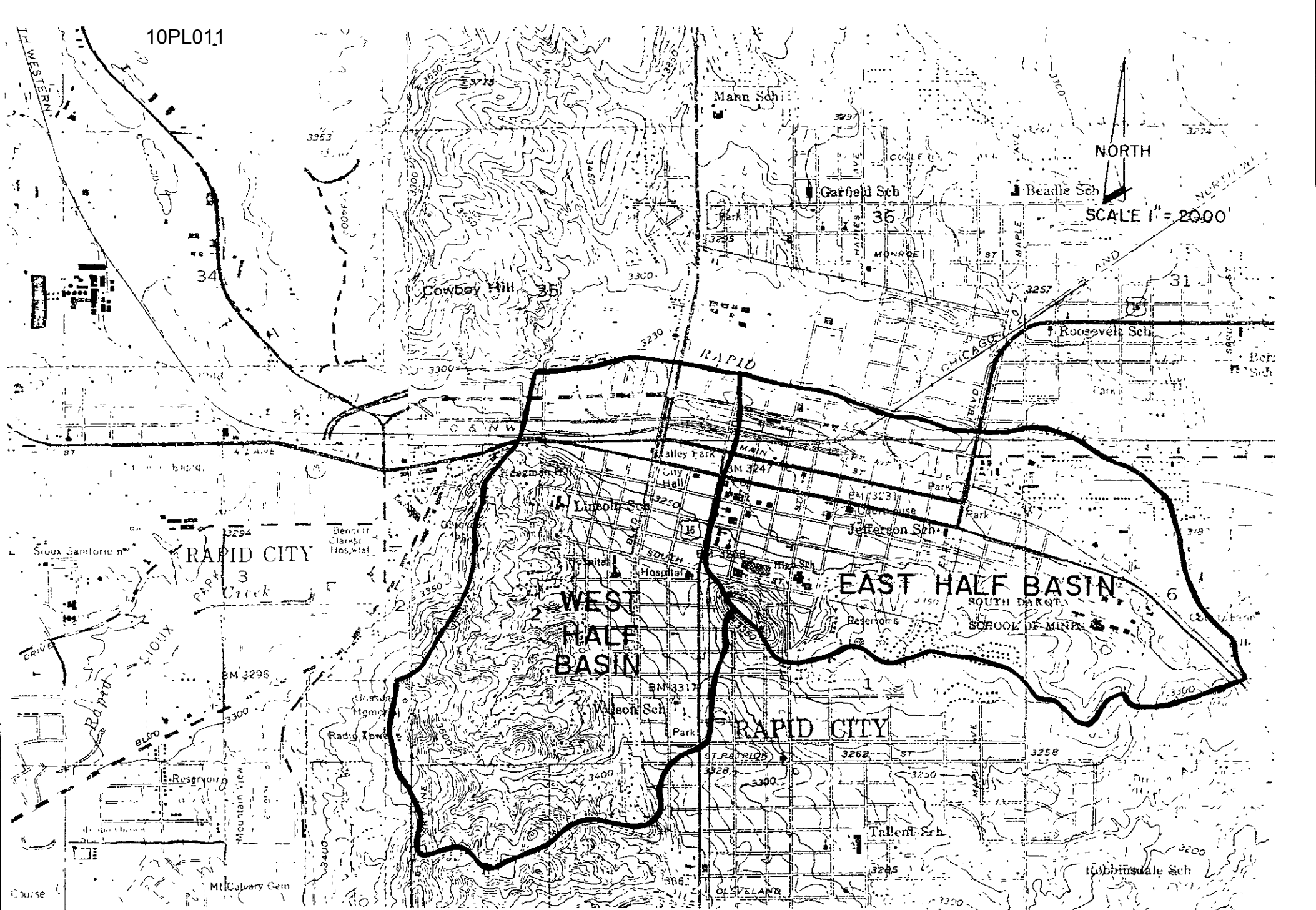
This Design Plan was completed based on no backwater affect from Rapid Creek. This assumption should be accurate based on the time of concentration of the Downtown Area Drainage Basin compared to the anticipated time required for Rapid Creek to reach a peak flow in a similar storm.

This Design Plan is intended to provide the necessary information to begin final design of specific elements. These elements when completed will form a complete efficient, planned system of stormwater management.

It is highly unlikely that all final design will follow the Design Plan exactly. As modifications to the plan are completed it is essential to make the necessary modifications to the computer modeling in order to verify the requirements of other elements.

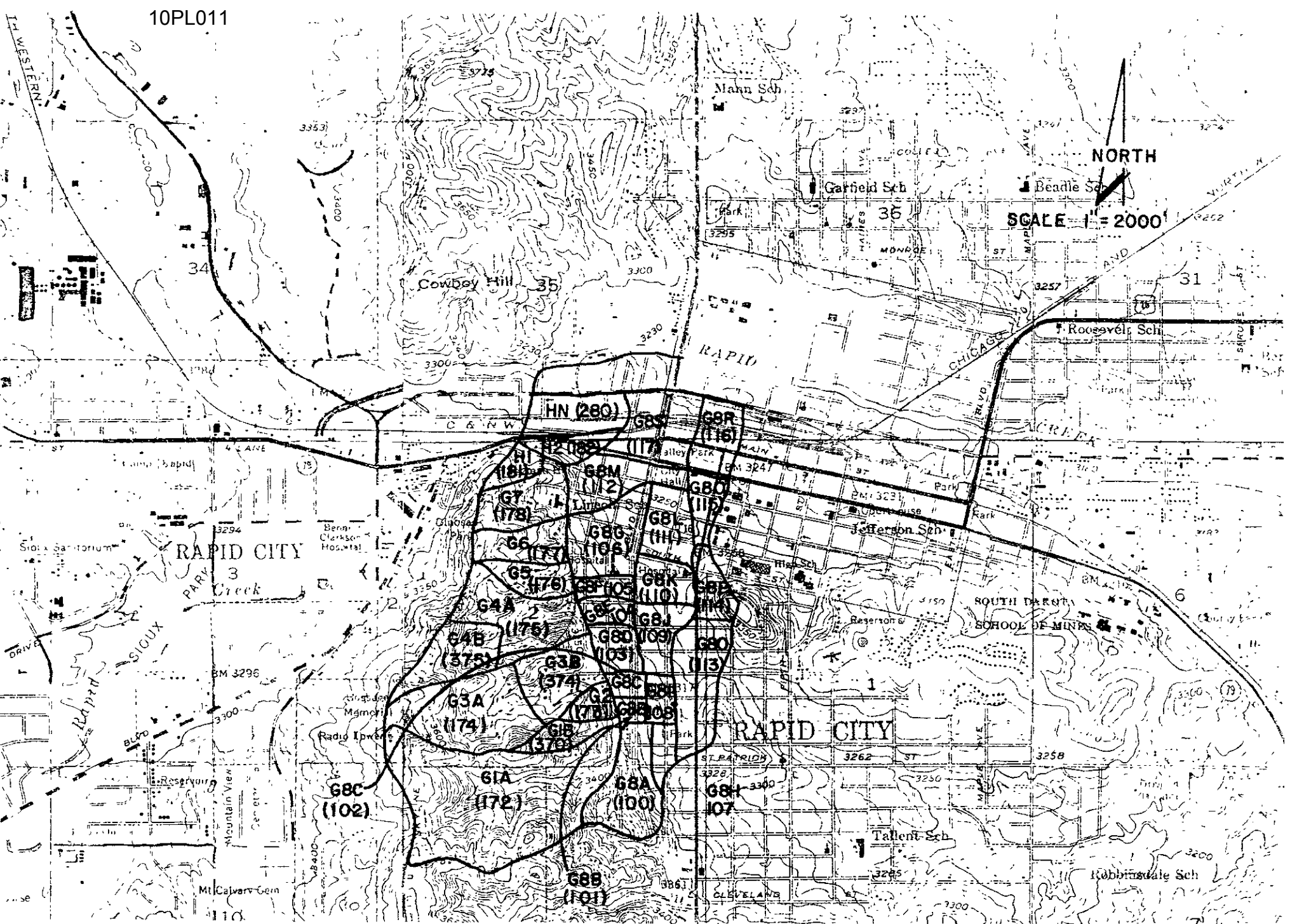
Since the plan lends itself to updating or revisions, users of the plan are advised to contact the City of Rapid City to determine if this document has been modified.

It should be noted that local drainage problems were beyond the scope of this study.



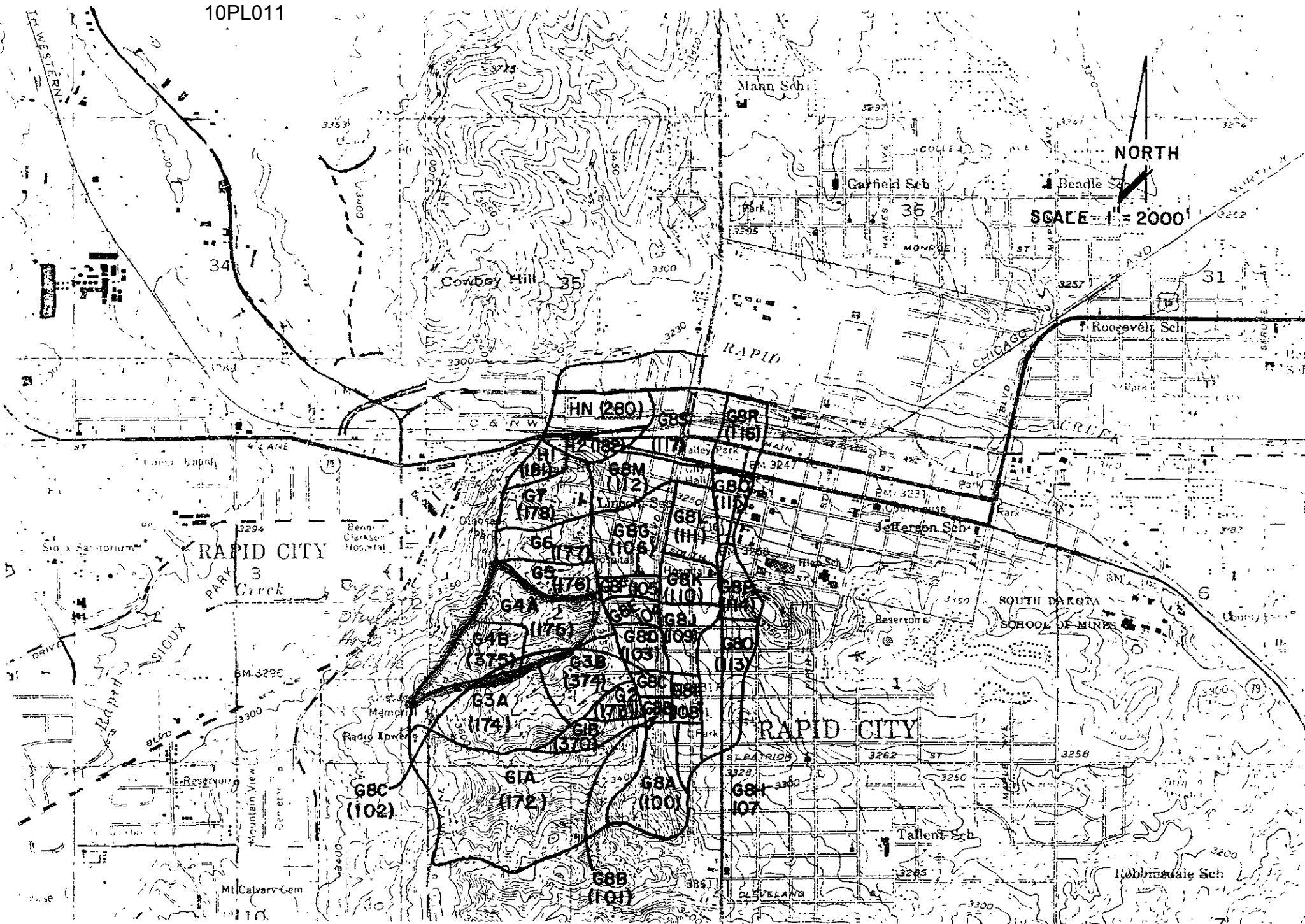
EAST HALF & WEST HALF BASINS-DOWNTOWN DRAINAGE

FIGURE I



WEST HALF DOWNTOWN DRAINAGE SUBCATCHMENT MAP

FIGURE 3



WEST HALF DOWNTOWN DRAINAGE SUBCATCHMENT MAP

FIGURE 3

**Britton Engineering & Land Surveying, Inc.**

PROJECT Noyes

SHEET 1 OF 1

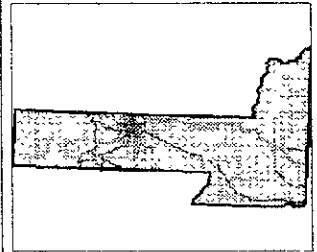
Supplement Drainage Information

DATE 4-22-10

<p>Sub-basin G4A (Davis Study)                  Size = 45.4 Acres  <math>Q_{100} = 108</math> cfs (CUHP)                  by Rational Estimates  <math>i = 6.3</math> in/hr  <math>C = 0.41</math>  <math>Q_{100} = 117</math> cfs</p>	<p>Totals Combined G4A &amp; G4B                  Size = 71.0 Acres  <math>Q_{100} = 175</math> cfs (CUHP)  <math>Q_{100} = 193</math> cfs (Rational)</p>
<p>Sub-basin G4B (Davis Study)                  Size = 25.6 Acres  <math>Q_{100} = 67</math> cfs (CUHP)  <math>i = 6.7</math> in/hr  <math>C = 0.49</math>  <math>Q_{100} = 76</math> cfs (Rational)</p>	
<p>Our Estimate for contributing basin. Does not include the Area from site to 12<sup>th</sup> Street (as included in Sub-basin G4A.)</p>	
<p>B.E. &amp; L.S.                  Area = 61.1 acres  <math>C = 0.49</math>  <math>i = 5.23</math>  <math>Q_{100} = 157.7</math></p>	<p>Combined (Differences)                  Area = <del>71.0</del> <sup>9.9</sup> Acres                  @ <math>C = 0.49</math>                  @ <math>i = 5.23</math>  <math>Q_{100} = 25.4</math> cfs                  Reduced flow</p>
<p>Our Area is 9.9 Acres smaller than G4A &amp; G4B combined based on our C &amp; i. The difference is approximate 8.8 cfs from Cuhp calculation (Davis) and 9.9 from Rational (Davis) or 5.9% larger than CUHP Estimate and 5.9% smaller than Davis's Rational Estimate.</p>	



10PL011



Legend

- Water Hydrants
- Roads
  - ✓ Not classified
  - ⚡ Interstate
  - ⚡ US Highway
  - ⚡ SD highway
  - ⚡ County Highway
  - ⚡ Main Road
  - ⚡ Minor Arterial
  - ⚡ Collector
  - ⚡ Ramp
  - ⚡ Paved Road
  - ⚡ Unpaved Road
  - ⚡ Unimproved Road
  - ⚡ Trail
  - ⚡ other
  - ⚡ Not yet coded
- Township/Section lines
  - ✓ SECTION
  - ⚡ TOWNSHIP
- Parcel Boundary
- Lot Lines
- COUNTY
- LOT LINE
- PARCEL LINE
- ROAD ROW
- RR ROW
- SECTION
- TOWNSHIP
- WATER LINE
- PLSS Sections
- County Line
- City Boundaries
- Rapid City

0 125 250 375 ft.

Map center: 44° 4' 26.5" N, 103° 14' 32.9" W



Scale: 1:1,278

DISCLAIMER: This map is provided "as is" without warranty of any representation of accuracy, timeliness or completeness. The burden for determining accuracy, completeness, timeliness, merchantability, and fitness for or the appropriateness for use rests solely on the user. Rapid City and Pennington County make no warranties, express or implied, as to the use of the map. There are no implied warranties of merchantability or fitness for a particular purpose. The user acknowledges and accepts the limitations of the map, including the fact that the data used to create the map is dynamic and is in a constant state of maintenance, correction, and update. This document does not represent a legal survey of the land. There are no restrictions on the distribution of printed Rapid City-Pennington County maps, other than the City of Rapid City copyright notice which must be legible on the print. The user agrees to recognize and honor in perpetuity the copyrights and other proprietary claims for the map(s) established or produced by the City of Rapid City or the vendors furnishing said items to the City of Rapid City.

ADDRESS 0

DESCRIPTION

Flow Hydrant Location	Corner of Forest Dr & Clark Ct
Date	4/21/2010
Time	1:00:00 PM
Hydrant Manufacturer	
Year Manufactured	
Residual Street	
Residual hydrant location	South side of the parking lot for 1st Congregational Church
Outlet Diameter	2.5
Outlet Coefficient	0.9
Pitot Pressure	48
Static Pressure	85
Residual Pressure	75
Discharge	1162.51
Q20	3194.26
Q0	3692.18

NO sewer cards??  
SUB

1215 Clark Feb. 28, 1969 #14,719

L: 13 B: 31 Blvd.

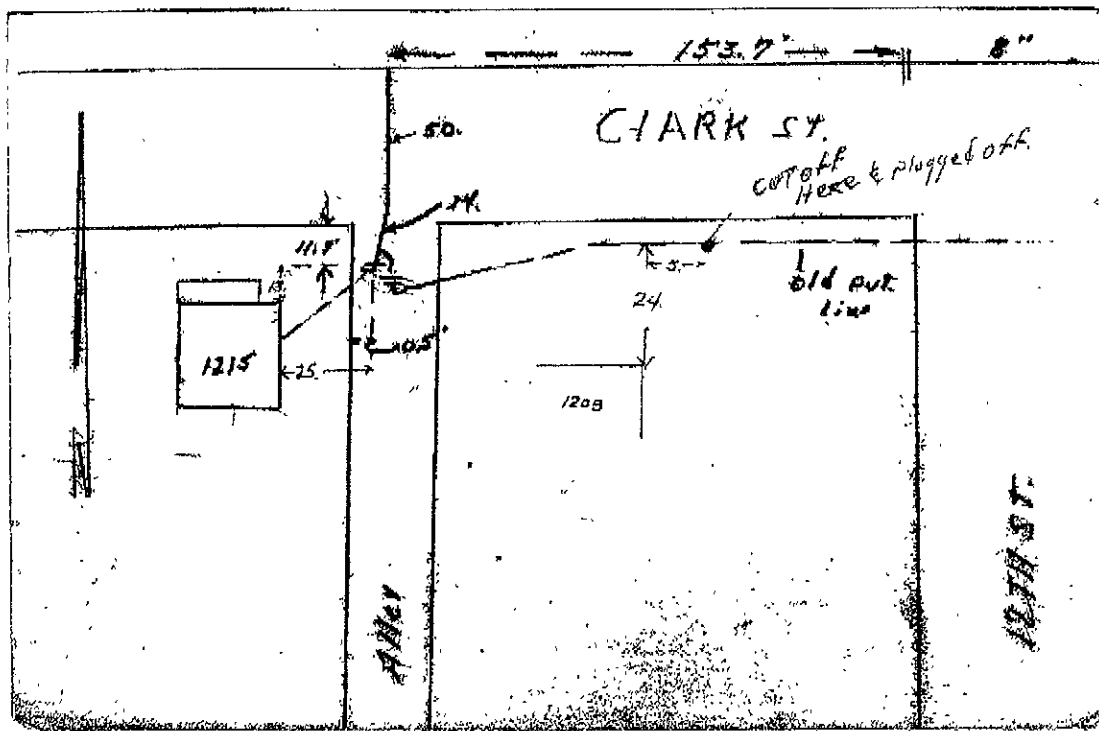
3/4" Tap 3/4" Copper from main to curb stop. Old Galve line on into house

C. E. Balcom

RETAP

Howard Jacobs Pabg.

Kline 2-28-69



WES