HYDROLOGY K12/D2 1 PLAN

K12/D2

1 Plan

K12/D2

1 PLAN

BOVAY ENGINEERS, INC.
HOUSTON • SPOKANE • BATON ROUGE
AUSTIN • ALBUQUERQUE • WASHINGTON, D. C.

April 20, 1981

Mr. Richard S. Heller, P.E.
City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Proposed Grandy's Restaurant
4517 Central Avenue NW
Zone Atlas Page K-12-Z
BEI No. 6014-159

Dear Mr. Heller:

On February 12, 1981, we submitted a Drainage Report for the above referenced project which you subsequently approved.

The purpose of this letter is to submit a different pump manufacturer's catalogue data and to request approval for using this manufacturer's pump. The drainage concept nor the computations have been changed.

If you should have any questions, please don't hesitate to call.

Sincerely,

BOVAY ENGINEERS, INC.

Stephen F. Fritz, P.E.
NM P.E. No. 6804

APPROVED FOR DRAINAGE
4-21-81
DATE

SFF:kh

SIGNATURE

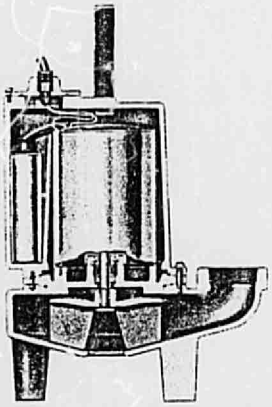
cc: Mr. Roger C. Finholt

ADVISE UPON COMPLETION
WHEN GRADING EXECUTED

PROFESSIONAL ENGINEERS AND PLANNERS TEL 505/884-0700
P. O. BOX 30068 • 3125 CARLISLE BOULEVARD, N.E. • ALBUQUERQUE, NEW MEXICO 87190 • [redacted] • CABLE BOVENG

Heavy Duty Submersible Wastewater Pumps

3" Discharge Medium Head



Models

3SE151
3SE153
3SE154
3SE201
3SE203
3SE204

Size

3" Discharge

2-1/2" Spherical Solids Handling

Pump Specifications

Size: 3" Discharge, 2½" Suction Opening
Impeller: 2 Vane, Cast Iron with Pressure Vanes on Back Side
Seal: Mechanical Type in Oil-Filled Chamber with Secondary Exclusion Seal, Ceramic and Carbon Faces
Pump Body: Cast Iron
Motor Housing: Cast Iron
Hardware: 300 Series Stainless Steel
Suitable For: 160°F. Liquids

Standard Equipment: All Models Equipped with Legs.

Models 3SE151, 201 - Equipped with 30' of 10/3 SO Cable
Models 3SE153, 154, 203, 204 - Equipped with 30' 10/4 SO Cable

Additional cable available.
Carbide seal faces available.

Motor Specifications

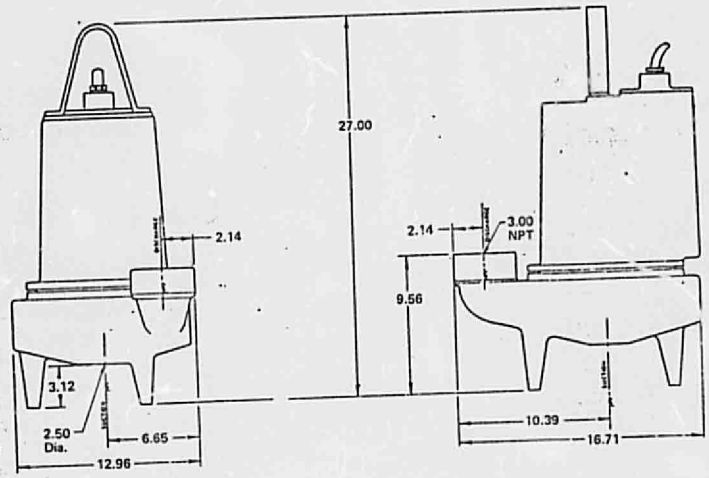
Model 3SE151 - 1½ HP, 230 Volt, Single Phase
Model 3SE153 - 1½ HP, 200-230 Volt, Three Phase
Model 3SE154 - 1½ HP, 460 Volt, Three Phase
Model 3SE201 - 2 HP, 230 Volt, Single Phase
Model 3SE203 - 2 HP, 200-230 Volt, Three Phase
Model 3SE204 - 2 HP, 460 Volt, Three Phase

Single Phase: PSC (Permanent Split Capacitor) Completely Oil-Filled and Overload Protection in Motor — 1625 RPM
Three Phase: Completely Oil-Filled, Overload Protection Required in Control Box 1750 RPM
Shaft: 416 Stainless Steel
Thrust Bearing: Ball
Radial Bearing: Sleeve-Permanent Lubrication

Models

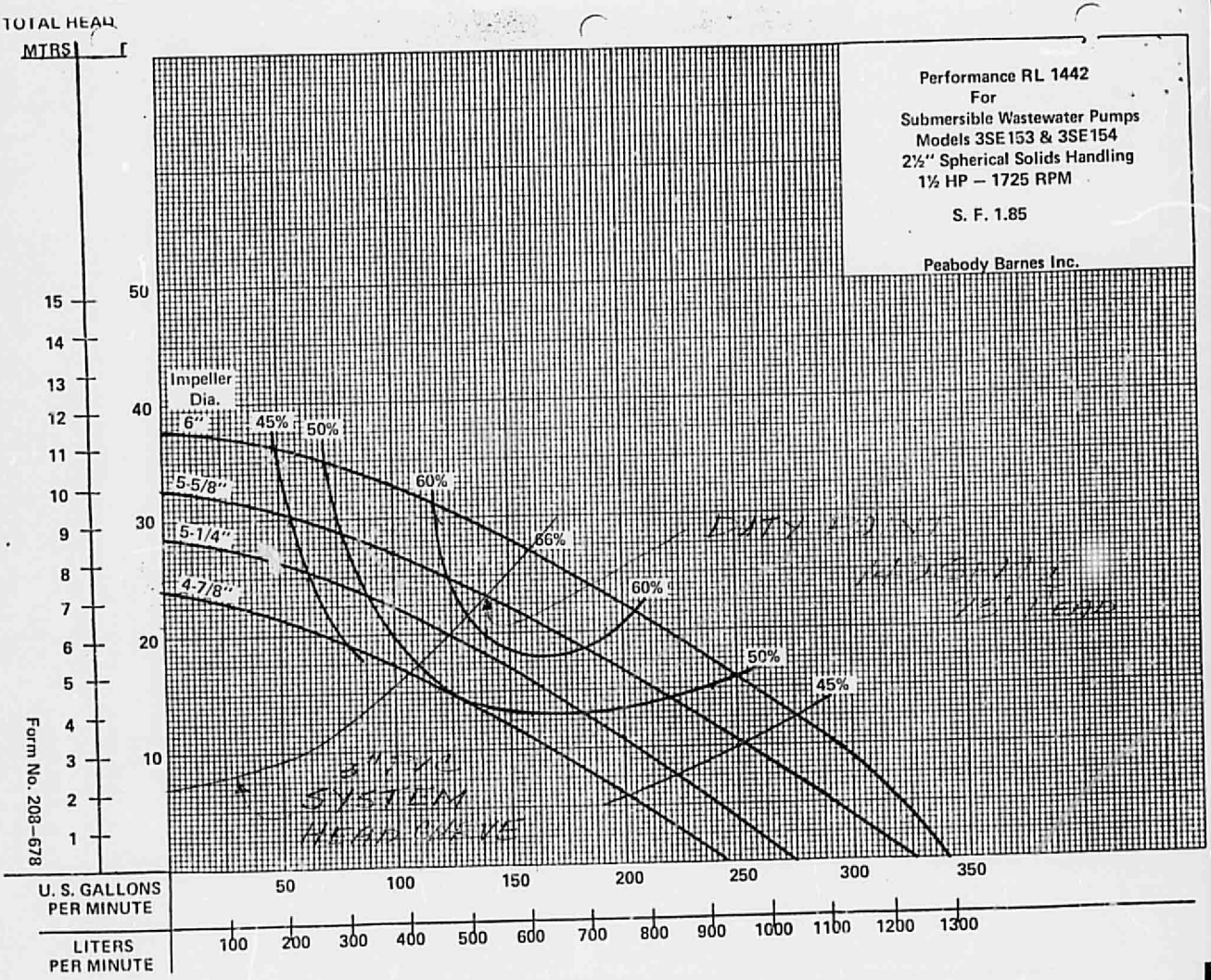
3SE151
3SE153
3SE154
3SE201
3SE203
3SE204

AMPERAGE		
MODEL NO.	MAX. RUN AMPS	LOCKED ROTOR AMPS
3SE151	12.6	23.0
3SE153	8.0	35.0
3SE154	4.0	17.5
3SE201	14.5	29.0
3SE203	14.0	50.8
3SE204	7.0	25.4



Peabody Barnes

Form No. 206 - 1080


Performance RL 1442
For
Submersible Wastewater Pumps
Models 3SE153 & 3SE154
2½" Spherical Solids Handling
1½ HP – 1725 RPM
S. F. 1.85
Peabody Barnes Inc.
TOTAL HEAD
MTRS
Impeller Dia.
6"
5-5/8"
5-1/4"
4-7/8"
45%
50%
60%
66%
60%
50%
45%
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
50
40
30
20
10
U. S. GALLONS PER MINUTE
50
100
150
200
250
300
350
LITERS PER MINUTE
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
Form No. 208–678

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE March 30, 1981 REF. NO._____

TO: Tony Reynolds, Supervisor, Plans Review Section, Code Administration Div.

FROM: Fred J. Aguirre, Civil Engineer FJA

SUBJECT: Mr. Finholt's Letter dated March 20, 1981 to Mayor Rusk

The drainage report provided for the subject site was not mandatory, since the acreage of the site was not greater than one acre. However, when the plans were initially submitted, the site plan reflected a site greater than one acre, subsequently, a drainage report was required and the reason for the report was also noted on the building plans underneath my reject dated October 16, 1980.

Why Mr. Finholt was not aware of the required drainage report until mid January is beyond me, since my reject is dated October 16, 1980.

FJA/cc

ROGER FINHOLT ENTERPRISES
Post Office Box 340047
Dallas, Texas 75234

RESTRICTED DELIVERY

CERTIFIED
P23 0399160
MAIL

Mayor David Rusk
Mayor of City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

CERTIFIED MAIL, RETURN RECEIPT REQUESTED

ROGER FINHOLT ENTERPRISES
Post Office Box 340047 Dallas, Texas 75234
Phone: Area Code 214 - 256-1421 or 252-6841

MAR 24 1981
MAYOR'S OFFICE

CERTIFIED MAIL, RETURN RECEIPT REQUESTED

March 20, 1981

Mayor David Rusk
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: Building Department, City of Albuquerque, Albuquerque, NM

Dear Mayor Rusk:

I have just been through an unbelievable ordeal with your City Building Department. Attached is a copy of a building permit I was recently issued for construction of a fast food restaurant at 4517 Central, NW, Albuquerque. I originally applied for this building permit approximately October 1, 1980 and it was just issued on Febraury 25, 1981. Following is a list of costs that I have incurred in order to obtain this building permit:

(1)	Building permit itself	$ 330.00
(2)	Drainage Report	2,843.83
(3)	Soil Report	1,144.00
(4)	Two trips to Albuquerque for my Architect to consult with your building department	685.00
(5)	Numerous changes made in our drawings changed by my architectural firm	3,300.00
(6)	Three trips by myself to Albuquerque to help secure building permit	790.60
	Total	$9,092.83

Mayor Rusk, this is unreasonable. Nobody should, regardless of where they build in the United States, have to spend $9,092.83 just to secure a building permit.

The building department will most likely say we should have used a local architectural firm and it would not have cost so much, but my architectural firm specializes in fast food restaurants and I would have had to incur more expenses by using a local firm if they are not familiar with fast food restaurants.

Mayor David Rusk
March 20, 1981

Mayor Rusk, I am an old pro at the game. I have built in 38 states and I have never run into this type of problem before and I have built in California and Nevada to name a few. The problem at your building department is they need a coordinator to help us poor souls in obtaining a building permit. **For instance, it was not until mid-January that I found out I had to have a drainage report at the cost of $2,843.83.** Another problem that I encountered was that when these people found out I was from Texas the project seems to have been put on the back burner. I may be from Texas, but I employ 90 people in the State of New Mexico. Also, I am a general contractor who has a New Mexico license. I may be from Texas but every person used on the construction project works for local subs in Albuquerque. The only person I send in from Texas is my General Superintendent who supervises the job.

My personal feelings are that obtaining a building permit in Albuquerque is so tough that you are scaring a lot of people off and they are refusing to build in Albuquerque. In driving around Albuquerque, it does not look to me like your economic situation is so good that you can afford to scare people out of town. It is allright for the building department to be tough but they need a couple of coordinators who know what happens in all departments and when somebody from in-town or out-of-town applies for a building permit the coordinator could say look we may be tough but here is what you need to do in order to get a building permit in three weeks or no longer than a month.

I feel I have been unfairly treated by the City of Albuquerque and would appreciate it if you would check into this further and advise me.

Sincerely,

Roger C. Finholt

Roger C. Finholt

RCF:csg

Atch.

CITY OF A

FOR ADMINISTRATIVE USE ONLY

This permit valid only for
Issue the permit on or below

VIT FOR:
OTHER
REPAIR

3. ADDITION
4. REMOVE

Treasury Division Validation

Treasury
Corporation

02-26-81
$ 0.00
02-26-81
01 * *329.00
*329.00
*329.00
*330.00
* 1.00

STREET NO. DIRZ ZIP CODE

ZIP CODE

	FEES
A APPLICATION—PLAN CHECK FEE	
B BUILDING	
C RETAINING WALLS	
D WALLS	
E FENCES	
F DEMOLITION	
G SWIMMING POOL	
H SIGNBILLBOARDS	
J FOUNDATIONS	
K UNIFORM BUILDING CODE BOOK	
L ALBUQ. AMENDMENTS TO UBC	
M UNIFORM SIGN CODE	
N DWELLING CODE BOOK	
P CODE SUPPLEMENT	
Q SPECIAL TYPE INSPECTION	
R REINSPECTION	
S PARK DEDICATION FEE	
T ELEV. TOP	
U DUPLICATE	
V RENEWAL	
W PRELIMINARY PLAN CHECK	
X CHANGE TO PLANS	
Y OTHER - SPECIFY	
Z CREDIT	
TOTAL FEES	

NAME
ADDRESS
CITY AND STATE — ZIP CODE
PHONE

NAME
ADDRESS
CITY AND STATE — ZIP
STATE LICENSE NO. — PHONE

NO. OF STORIES | LAND DIMENSIONS | GROSS FLOOR AREA

APARTMENT BLDG. NO. OF UNITS | NO. OF UNITS

BLDGS. | UNITS

REFERENCES

1 PUBLIC | 2 PRIVATE | 3 PUBLIC

TYPE OF BUILDING | COMMERCIAL | INDUSTRIAL & PUBLIC | RESIDENTIAL | NEW CONSTRUCTION

1 GAS | 2 ELECT | 3 OIL | 4 COAL | 5 OCAR | OTHER

NOTICE: SEPARATE PERMITS ARE REQUIRED FOR ELECTRICAL, PLUMBING, HEATING, VENTILATING OR AIR CONDITIONING. THIS PERMIT BECOMES NULL AND VOID IF WORK OR CONSTRUCTION IS NOT COMMENCED WITHIN 180 DAYS OR IF CONSTRUCTION OF WORK IS SUSPENDED OR ABANDONED FOR A PERIOD OF 180 DAYS AT ANY TIME AFTER WORK IS COMMENCED.

I hereby acknowledge that I have read this application and state above is correct and agree to comply with all city ordinanc and state laws regulating building construction or the performance of work [illegible] and indicated above. The Pl Check Date Fee (applicant est). [illegible] the Code Administration Divisio [illegible] the erection, alteration or [illegible]

SIGNATU

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 26, 1981

Bovay Engineers, Inc.
P. O. Box 30068
3125 Carlisle Blvd. N.E.
Albuquerque, New Mexico 87190

Attention: Stephen F. Fritz, P.E.

Re: Proposed Grandy's Restaurant
4517 Central Avenue N.W.

Dear Mr. Fritz:

The above-referenced drainage report is approved.

If you have any questions, please contact me at 766-7644.

Sincerely,

Fred Aguirre
Civil Engineer

FA/fs

DRAINAGE REPORT

FOR THE

GRANDY'S RESTAURANT
ALBUQUERQUE, NEW MEXICO

PREPARED FOR:

ROGER FINHOLT
ALBUQUERQUE, NEW MEXICO

FEBRUARY 1981
BEI 6014-159

BOVAY ENGINEERS, INC.

BOVAY

Bovay Engineers, Inc.

5615 Fannin Street
P.O. Box 8098
Houston, Texas 77004
713/529-4921
TWX 910 881 2530

10305 Airline Highway
P.O. Box 15728
Baton Rouge, Louisiana 70895
504/293-3861
TWX 510 993 3410

East 808 Sprague Avenue
Spokane, Washington 99202
509/838-4111
TWX 510 773 1829

7600 Chevy Chase Two, Suite 401
Austin, Texas 78752
512/453-7322
TWX 910 874 1350

Washington Building, Suite 601
15th Street and New York, N.W.
Washington, D.C. 20005
202/638-0010

1747 Pennsylvania Avenue, N.W. Suite 702
Washington, D.C. 20006
202/223-1155

3125 Carlisle Blvd., N.E.
P.O. Box 30068
Albuquerque, New Mexico 87110
505/344-3577
TWX 910 989 1183

AFFILIATE FIRM

Dunbar & Dickson, Inc.
120 S. Parking Place
P.O. Box 849
Lake Jackson, Texas 77566
713/297-3028

BOVAY ENGINEERS, INC.

HOUSTON • SPOKANE • BATON ROUGE
AUSTIN • ALBUQUERQUE • WASHINGTON, D. C.

February 12, 1981

Mr. Richard S. Heller, P.E.
City Engineer
City of Albuquerque
P. O. Box 1293
Albuqeurque, New Mexico 87103

Re: Proposed Grandy's Restaurant
4517 Central Avenue, N.W.
BEI No. 6014-159

Dear Mr. Heller:

Please find enclosed three copies of the Drainage Report for the project referenced above.

We have incorporated all of the criteria outlined in the City Engineer's Interim Drainage Guidelines, November 1979, regarding valley area developments and we request that you review and approve this report.

If you should have any questions, please do not hesitate to call.

Sincerely,

BOVAY ENGINEERS, INC.

Stephen F. Fritz

Stephen F. Fritz, P.E.
NM P.E. No. 6804

SFF:DMG:cw
Enclosure

RECEIVED

FEB 13 1981

CITY ENGINEER

PROFESSIONAL ENGINEERS AND PLANNERS TEL. 505/884-0700
P. O. BOX 30068 • 3125 CARLISLE BOULEVARD, N.E. • ALBUQUERQUE, NEW MEXICO 87190 • [redacted] • CABLE BOVENG

DRAINAGE REPORT

FOR THE

GRANDY'S RESTAURANT
ALBUQUERQUE, NEW MEXICO

PREPARED FOR

ROGER FINHOLT
ALBUQUERQUE, NEW MEXICO

FEBRUARY 1981
BEI 6014-159

BOVAY ENGINEERS, INC.

Contents

	Page No.
EXECUTIVE SUMMARY	1
PURPOSE	2
PROJECT LOCATION AND DESCRIPTION	2
DRAWING 1 - LOCATION MAP	
EXISTING DRAINAGE CONDITIONS	3
PHOTOGRAPHS	
DRAWING 2 - TOPOGRAPHIC MAP	
DEVELOPED DRAINAGE CONDITIONS	5
RECOMMENDATIONS AND CONCLUSIONS	7
TAB 1	
CITY ENGINEER'S INTERIM DRAINAGE GUIDELINES, NOVEMBER 1979	
TAB 2	
DESIGN COMPUTATIONS	
MAP POCKET	
DRAWING 3 - GRADING AND DRAINAGE PLAN	

EXECUTIVE SUMMARY

This report sets forth the storm water drainage plan for the proposed development of an approximately 30,000 square foot area bounded by West Central Ave. NW on the south and private lands on the north, east, and west in the City of Albuquerque, New Mexico.

The proposed improvements to be constructed on a partially developed lot consist of a one-story restaurant building surrounded by a landscaped parking area.

The drainage plan covered by this report has been prepared consistent with DRAINAGE RESOLUTION 1972-2, ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY. Additional storm water runoff resulting from the proposed development will be controlled by a combination of parking lot ponding and controlled pumping rate discharge. This will ensure that the undeveloped 1-year discharge rate from the development will not be exceeded and that the November 1979 City Engineer's Interim Drainage Guidelines concerning valley area developments are met.

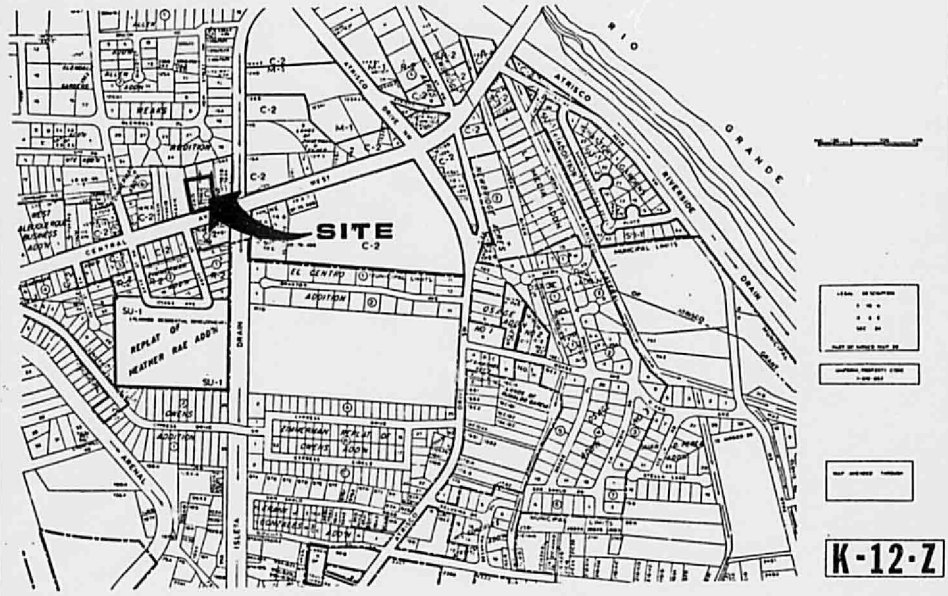
PURPOSE

The purpose of this report is to present the supporting engineering data for the most feasible solution for the proposed drainage plan consistent with DRAINAGE RESOLUTION 1972-2, ALBUQUERQUE METROPOLITAN FLOOD CONTROL AUTHORITY. This report follows the criteria outlined by the City Engineers' Interim Drainage Guidelines of November, 1979, a copy of which is located in TAB 1.

PROJECT LOCATION AND DESCRIPTION

The proposed Grandy's Restaurant, a one-story building, is planned for an approximately 30,000 square foot lot located at 4517 Central Ave. NW. Presently two small commercial buildings occupy this lot and an adjoining lot owned by the same developer. Both structures will be demolished. The remainder of the lot is undeveloped. The area is shown in the City of Albuquerque's Zone Atlas, Map K-12. A location map is shown on Drawing 1.

The proposed project site contains approximately 0.687 acres of land. The slope of the project site is generally from south to north. The difference in elevation from the south property line to the north property line is 1.58 feet. The lowest elevation on the site is approximately 4949.30 feet above mean sea level.



LEGAL DESCRIPTION

TRACT A: FORMERLY MRGCD TRACTS 114-AID, 115-CI, AND 115-DI MRGCD MAP NUMBER 39 AS THE SAME ARE SHOWN AND DESIGNATED ON THE SUMMARY PLAT FILED IN THE OFFICE OF THE COUNTY CLERK OF BERNALILLO COUNTY, NEW MEXICO ON SEPTEMBER 24, 1980.

NORTH

LOCATION MAP

DRAWING 1

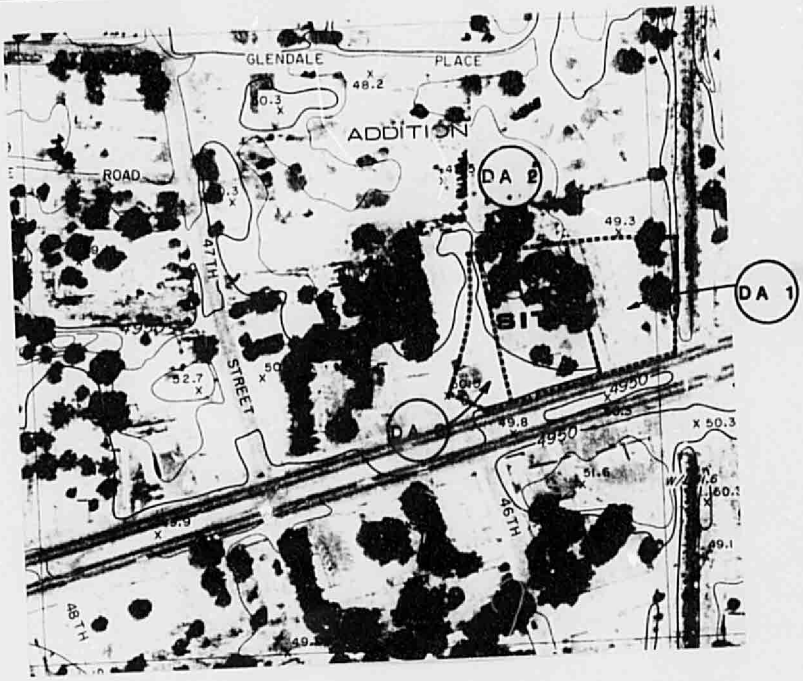
Bovay Engineers, Inc.

EXISTING DRAINAGE CONDITIONS

The project site is bounded by a paved, curbed, and guttered street on the south and by undeveloped properties on the north and east. A commercial building occupies part of the lot to the west. For the photography of the site, see the following page. Off-site storm water runoff enters the site from the east and west and these flows will be accommodated by this drainage plan. The present on-site drainage is characterized by overland sheet flow basically from south to north. Both the off-site flows and the on-site flow collect at the rear of the site of the proposed development in a minor depression where they remain until evaporation and infiltration finally remove them. The drainage areas contributing runoff to the site are outlined on Drawing 2. The combined existing undeveloped 1-year discharge rate for all three drainage areas is 1.11 cfs.

Photo 1: Looking north at the proposed site from across Central Avenue.

Photo 2: Looking east across the proposed site.



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LEGEND

DA DRAINAGE AREA

EXIST. DRAINAGE DIVIDE

NORTH

TOPOGRAPHIC MAP

1"-200'

DRAWING 2

Bovay Engineers, Inc.

DEVELOPED DRAINAGE CONDITIONS

The proposed one-story building will comprise approximately 13 percent of the entire site, sidewalks, and paved parking 80 percent, and landscaped areas 7 percent.

As shown on Drawing 3 (located in the map pocket), the proposed site has been graded so that all of the storm water runoff drains to the north parking lot detention area.

A two foot wide sod-lined swale will be constructed between the western property line and the proposed curb line to intercept the off-site sheet flow and to convey this runoff to the north parking area through a curb cut. The 50-year runoff rate from the western off-site area has been computed to be 0.71 cfs.

The off-site flows from the drainage area to the east of the proposed development will be allowed to enter the site by means of a series of curb cuts. The 50-year runoff rate from this area will be 1.17 cfs.

Situated within the north parking lot detention area will be a standard pre-cast manhole with a grated cover. This manhole will contain an electric submersible dewatering pump. The discharge into Central Avenue will be 0.30 cfs. This pump rate is well below the combined unde-

veloped 1-year discharge rate of 1.11 cfs, thus meeting the criteria set forth in the City Engineers' Interim Guidelines of November, 1979 for valley area developments. The storm water runoff will be pumped through a 3-inch, PVC, schedule 40 outlet pipe that will be buried beneath the parking lot and discharge through the curb face at Central Avenue. The submersible pump will be equipped with level controls for automatic start/stop operations. A typical pump meeting these requirements is shown in the attached catalog cut-sheet located in TAB 2 with the design computations.

Based upon the Inflow-Outflow mass balance computation included in this report, the maximum storage volume required for the 50-year storm will have to be 1858 cubic feet. This storage volume has been provided entirely within the north parking lot area. The maximum ponded depth will be less than 10 inches.

RECOMMENDATIONS AND CONCLUSIONS

The following recommendations are proposed:

1. Intercept and convey the off-site storm water runoff from the drainage area to the west of the proposed development by means of a two foot wide sod-lined swale. Allow this runoff to enter the site through a curb cut north of the proposed building.

2. Allow the off-site storm water runoff from the drainage area to the east of the proposed site to enter the parking lot through a series of curb cuts.

3. Grade the parking areas to provide positive drainage swales to carry the storm runoff to the inlet structure of the submersible pump.

4. Provide an electric submersible dewatering pump with a 140 gpm capacity, 24.5 foot head, 1½ HP, three phase 60 Hertz motor.

5. Provide a 3-inch, schedule 40 PVC storm drain line from the submersible pump to the face of curb along Central Avenue.

6. Grade the southern and northern periphery landscaping areas to hold and retain all direct rainfall falling on them.

7. Provide 1858 cubic feet of storage volume in the north parking lot area.

In accordance with the above recommendations, the project site will discharge runoff at no greater rate than the combined undeveloped 1-year discharge rate of 1.11 cfs. The required ponding volume will equal 1858 cubic feet and will be contained in the north parking lot area. An electric, submersible pump will be provided to discharge the runoff to Central Avenue.

It is concluded that the proposed development will not have an adverse effect on areas downstream from the site.

1

INTERIM DRAINAGE GUIDELINES
November 1979

Due to the time necessary in the publication of the Storm Drainage Manual, and at the request of various developers and the engineering community, the following are guidelines to be considered as aids in the preparation and approval of drainage reports and plans and their review:

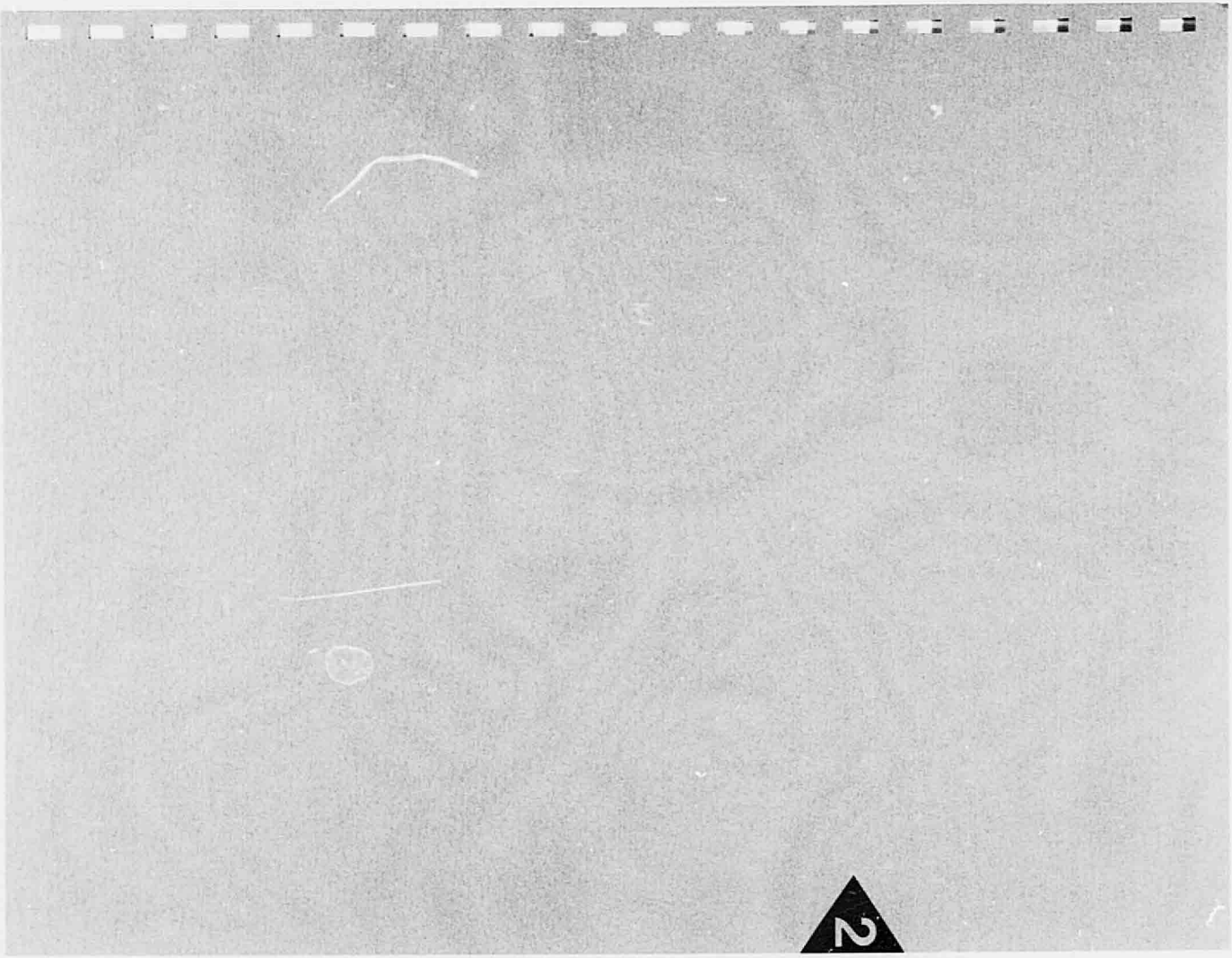
(A) Flow in Streets:

1) All flow in streets will be confined within the street R/W (Q_{100}).
2) The maximum flows (Q_{10}) in streets is established from the calculation of velocity times depth which may not exceed 4.8. When this parameter is exceeded, a storm drain is required. If downstream facilities are adequate, no interim ponding will be required; if downstream facilities are inadequate, a common pond meeting the criteria of Paragraph B5 will be required.
3) Special consideration must be given for all flows at T-intersections. Both the Q_{10} and Q_{100} must be analyzed to prove no encroachment at the R/W line on the downhill portion of the T-intersection and that the momentum will not carry the flow over the curb across from the intersecting street.

(B) Ponding:

1) No ponding will be required on any lot or development of less than one acre, unless said lot or development is part of a previously approved Master Drainage report or plan.
2) No ponding will be required for any development of less than five acres where the composite C-factor, including streets, is less than C=.50.
3) No ponding will be required on any individual lots within a subdivision. Common ponding areas are a preferred solution with the approval of the City Engineer.
4) As much as practicable, all flows for a development shall be routed through required pond(s).
5) Required ponds shall have the following general characteristics:
   a) Volume = Developed 100 year volume - Undeveloped 100 - year volume.
   b) Positive discharge = Q_5 undeveloped to street or storm drain.
   c) Overflow spillway = Q_{100} developed.
6) Developments within the valley area shall have ponding regardless of size. The pond(s) shall have a volume equivalent to the 50-year developed runoff volumes with Q_1 positive discharge. An overflow must be provided.

Approved:
Richard S. Heller
Richard S. Heller
City Engineer



DETERMINE OFF-SITE FLOWS :

WEST OFF-SITE AREA : D.A. No. 3

AREAS PLANIMETERED twice and averaged :

Building Area :

0.070
0.072

$$0.071 \times \frac{(200\ ft)^2}{in} \times \frac{1}{43{,}560} = 0.065\ Ac.$$

TOTAL DRAINAGE AREA :

0.33
0.33

$$0.33 \times (200)^2 \times \frac{1}{43{,}560} = 0.303\ Ac.$$

WEIGHTED RUNOFF COEFFICIENT - WEST OFF SITE AREA

DESCRIPTION	AREA A ACRES	C	AC
PAVED	.065	0.95	.062
UNDEVELOPED	.238	0.35	.083
TOTAL	.303		.145

$$\text{WEIGHTED "C"} = \frac{\Sigma\ AC}{\Sigma\ A} = \frac{.145}{.303} = 0.48$$

FOR Grando's - W. Central DESCRIPTION OFF-SITE Q
DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2/10/81 FILE NO. 6014-159 SHEET 1 OF 23

BOVAY ENGINEERS, INC.

EAST OFF-SITE AREA: D.A. NO. 1

0.75
0.75

$0.75 \times (200)^2 \times \frac{1}{43,560} = 0.689$.

EAST Area is undeveloped → C = 0.35.

DETERMINE t_c For 50-Yr. Storm:

Time of Concentration - East Area:

Using FIG. 3-1, 'URBAN HYDROLOGY FOR SMALL WATERSHEDS' S.C.S. technical release no. 55:

ELEV. DIFF. = 49.8 - 48 = 1.8'
Slope = 0.95% L = 190'

From FIG. 3-1 for S = .95%, nearly bare ground → Velocity = .97 fps

$t_c = \frac{L}{60 \frac{sec}{min} V} = \frac{250}{60(0.97)} = 3.26$ min

Use 10 min. as minimum t_c

FOR Grandy's - W. Central DESCRIPTION OFF-SITE Q
DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2-10-81 FILE NO. 5014-159 SHEET 2 OF 23

BOVAY ENGINEERS, INC.

t_c West Area

ELEV. DIFF. = 50.5 - 49.5 = 1.0'

S = .74% length = 135'

Vel. = 0.85 fps

$$t_c = \frac{135}{60(0.85)} = 2.65 \text{ min.} \quad \text{Use } t_c = 10 \text{ min.}$$

Determine Storm water runoff for off-site Areas:

$Q_{50} = C I_{50} A$

I_{50} → intensity equation from Herkenoff

$$I(\text{west}) = \frac{146}{t_c + 20} = \frac{146}{10 + 20} = 4.87 \text{ in/hr.}$$

$$I(\text{east}) = I(\text{west}) = 4.87 \text{ in/hr.}$$

D.A. 1 EAST $Q_{50} = 0.35(4.87)(.689) = 1.17$ CFS

DA.3 WEST $Q_{50} = 0.48(4.87)(.303) = 0.71$ CFS

FOR Grandy's - W. Central DESCRIPTION OFF-SITE Q

DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2-10-81 FILE NO. 6014-159 SHEET 3 OF 23

BOVAY ENGINEERS, INC.

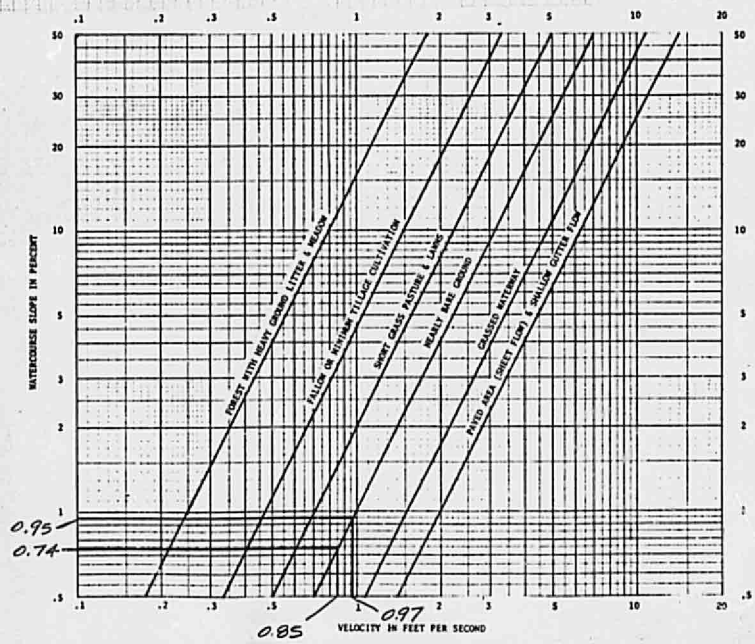


Figure 3-1.--Average velocities for estimating travel time for overland flow.

FOR GRANDY'S DESCRIPTION Travel time for tc calculations

DESIGNED MAG DATE 2/11/81 CHECKED SFS DATE 2-10-81 FILE NO. 4414-159 SHEET 4 OF 23

BOVAY ENGINEERS, INC.

ONSITE RUNOFF DETERMINATIONS : D.A. NO. 2

TOTAL AREA = 29,933 SQ. FT.

Portion LANDSCAPED (100% retention) = 2028 SQ. FT.

Area contributing runoff = 29,933 - 2028 = 27,905 SQ. FT.
= 0.641 AC.

Area contributing runoff is all paved
→ C = 0.95

Determine required Q_{50} developed ponding volume:

C = 0.95
A = 0.641 AC.
D = 2.05 in. From NOAA Atlas 50 yr. - 6 Hr. Storm

Volume = CDA = $.95(2.05)(.641)(43,560)\left(\frac{1}{12}\right)$
= 4531.5 ft.³ USE 4532 ft.³

Determine Q_1 developed discharge rate:

C = 0.95
A = 0.641 AC.

Rainfall intensity I_1 for the 1-year storm as shown on the following page = 1.62 in/hr.

FOR Grandy's DESCRIPTION ONSITE Runoff rates
DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2-10-81 FILE NO. 1-CM-159 SHEET 5 OF 23

BOVAY ENGINEERS, INC.

1-yr. storm Discharge Rate = $Q_1 = CI_1A$

$Q_1 = (0.95)(1.62)(.641) = 0.986$ CFS USE $Q_1 = 1.0$ CFS

Determine Q_1 undeveloped discharge rate:

$A = 0.687$ Ac.

$C = 0.35$ undeveloped $C = 0.95$ developed

$I_1 = 1.62$ in/hr.

On a portion of existing lot are buildings - need to determine a weighted "c"

building area = 0.091 Ac

undeveloped = 0.687 - 0.091 = 0.596 Ac

	A	C	AC
Paved	.091	0.95	.086
undeveloped	.596	0.35	.209
TOTAL	.687		.295

WEIGHTED "C" = $\frac{\Sigma AC}{\Sigma A} = \frac{.295}{.687} = 0.43$.

$Q = CI_1A = 0.43(1.62)(.687) = 0.48$ CFS.

plus the Q_1 from offsite areas:

East $Q_1 = .35(1.62)(.689) = 0.39$ CFS

West $Q_1 = 0.48(1.62)(.303) = 0.24$

TOTAL $Q_1 = 1.11$ CFS

FOR Grandy's DESCRIPTION ONSITE Runoff rates

DESIGNED MG DATE 2/4/91 CHECKED SFF DATE 2-10-91 FILE NO. 1014-159 SHEET 6 OF 23

BOVAY ENGINEERS, INC.

Station: ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO (CITY).
Latitude, 35° 05' N.; Longitude, 106° 39' W.; Elevation 4960 ft.

DURATION	RETURN PERIOD (YEARS) 1	2	5	10	25	50	100	I,
5 min.	0.18	0.23	0.30	0.35	0.44	0.49	0.55	2.17
10 min.	0.27	0.35	0.47	0.55	0.68	0.77	0.86	1.62
15 min.	0.35	0.44	0.59	0.70	0.86	0.97	1.08	1.40
30 min.	0.48	0.62	0.82	0.96	1.19	1.34	1.50	0.96
1 hr.	0.61	0.78	1.04	1.22	1.50	1.70	1.90	
2 hr.	0.63	0.81	1.09	1.28	1.57	1.78	1.97	
3 hr.	0.64	0.83	1.13	1.33	1.63	1.86	2.08	
6 hr.	0.68	0.90	1.25	1.47	1.80	2.05	2.30	
12 hr.	0.71	0.96	1.35	1.59	1.95	2.22	2.50	
24 hr.	0.75	1.02	1.46	1.72	2.10	2.40	2.70	

RAINFALL INTENSITY VALUES

FOR Grandi's DESCRIPTION Rainfall intensity
DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2-10-81 FILE NO. 6014-157 SHEET 1 OF 23

BOVAY ENGINEERS, INC.

RAINFALL DISTRIBUTION

Assume the distribution has the form $y = Kx^{\alpha}$

where $y = \frac{\text{Precipitation at any time}}{\text{Total precipitation}}$

x = Time (hr)

From six hour storm distribution graph ES-1003 in SCS NEH-4 ~~SEE~~ SHEET 10 OF 19

@ $t = 2.5$ $y = 0.60$

@ $t = 2.0$ $y = 0.23$

$\Delta t = 0.5$ $\Delta y = 0.37$

Boundary conditions

@ $x_1 = 0.5hr$; $y_1 = 0.37$

@ $x_2 = 6hr$; $y_2 = 1.00$

$y = Kx^{\alpha}$

$y_1 = Kx_1^{\alpha}$ $K = \frac{y_1}{x_1^{\alpha}}$

$y_2 = Kx_2^{\alpha}$ $x_2^{\alpha} = y_2/K$

or $x_2^{\alpha} = \frac{y_2}{y_1} x_1^{\alpha}$

substituting

$(6)^{\alpha} = \frac{1}{0.37}(0.5)^{\alpha} = 2.702703\,(0.5)^{\alpha}$

Let $c^{\alpha} = 2.702703$

Therefore

$(6)^{\alpha} = (c)^{\alpha}(0.5)^{\alpha} = [(c)(0.5)]^{\alpha}$

By inspection

$c = 12$

Therefore

$c^{\alpha} = 12^{\alpha} = 2.702703$

$\alpha \log 12 = \log 2.702703$

$\alpha = \frac{\log 2.702703}{\log 12} = 0.400117$

FOR Grandes DESCRIPTION RAINFALL DISTRIBUTION

DESIGNED SFF DATE 2/9/81 CHECKED MG DATE 2/9/81 FILE NO. 4014-159 SHEET 8 OF 23

BOVAY ENGINEERS, INC.

$$K = \frac{y_1}{x_1^{\alpha}} = \frac{0.37}{(0.5)^{0.400117}} = 0.48826$$

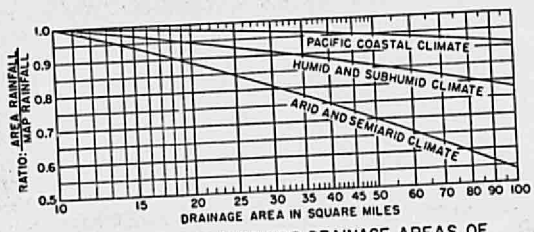
$$y = Kx^{\alpha}$$
$$= 0.48826\, x^{0.400117}$$

FOR Grandys DESCRIPTION RAINFALL DIST.

DESIGNED SFF DATE 2/9/81 CHECKED MG DATE 2/9/81 FILE NO. 6014-159 SHEET 7/9 OF 16/23

BOVAY ENGINEERS, INC.

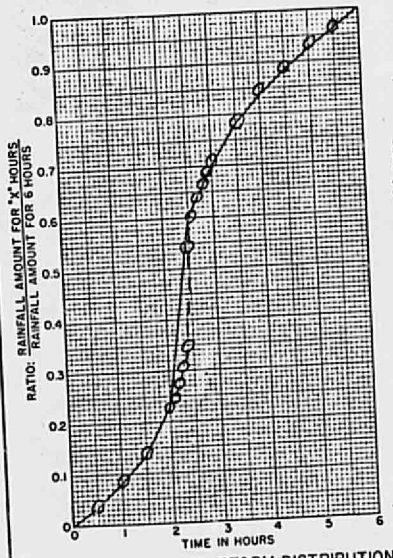
HYDROLOGY: CRITERIA FOR DESIGN STORMS USED IN DEVELOPING EMERGENCY SPILLWAY DESIGN AND FREEBOARD HYDROGRAPHS



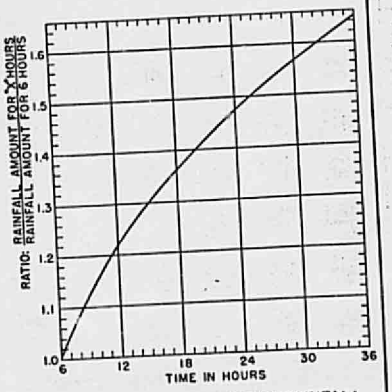
(a) RAINFALL RATIOS FOR DRAINAGE AREAS OF 10 TO 100 SQUARE MILES

$y = .48826\,x^{.400117}$

∴ Max @ 2.5 hrs



(b) SIX HOUR DESIGN STORM DISTRIBUTION



(c) RELATIVE INCREASE IN RAINFALL AMOUNT FOR STORM DURATIONS OVER SIX HOURS

FIGURE 21.2

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - CENTRAL TECHNICAL UNIT	STANDARD DWG. NO. ES-1003 SHEET 1 OF 1 DATE 7-2-56

FOR Grandy's DESCRIPTION RAINFALL DIST.

DESIGNED SFF DATE 2/9/01 CHECKED MG DATE 2/9/01 FILE NO. 5014-159 SHEET ~~7~~ 10 OF ~~16~~ 23

BOVAY ENGINEERS, INC.

N	TIME X (HRS)	Y	ΔY	REARRANGE N	ΔY	ACCUM DIST.
	0	0				0
1	.083	.180	.180	23	.013	.013
2	.167	.239	.059	21	.013	.026
3	.333	.314	.075	19	.021	.047
4	.500	.370	.056	17	.023	.070
5	.750	.435	.065	15	.024	.094
6	1.00	.488	.053	13	.028	.122
7	1.25	.534	.046	11	.031	.153
8	1.50	.574	.040	9	.037	.190
9	1.75	.611	.037	7	.046	.236
10	2.00	.644	.033	5	.065	.301
11	2.25	.675	.031	3	.075	.376
12	2.50	.704	.029	1	.180	.556
13	2.75	.732	.028	2	.059	.615
14	3.0	.758	.026	4	.056	.671
15	3.25	.782	.024	6	.053	.724
16	3.50	.806	.024	8	.040	.764
17	3.75	.829	.023	10	.033	.797
18	4.00	.850	.021	12	.029	.826
19	4.25	.871	.021	14	.026	.852
20	4.50	.891	.020	16	.024	.876
21	4.667	.904	.013	18	.021	.897
22			.013	20	.020	

FOR Grandy's DESCRIPTION RAINFALL Dist. Determination

DESIGNED MG DATE 2/9/81 CHECKED JFF DATE 2-11-81 FILE NO. 694-159 SHEET 11 OF 23

BOVAY ENGINEERS, INC.

N	TIME X (HRS)	Y	ΔY	REARRANGE N	ΔY	ACCUM DIST.
	4.833	.917				.917
23			.013	22	.013	
	5.00	.930				.930
24			.036	24	.036	
	5.50	.966				.966
25			.034	25	.034	
	6.00	1.00				1.00

FOR Grundy's DESCRIPTION Dist. Determination

DESIGNED MG DATE 2/9/81 CHECKED SFF DATE 2-11-81 FILE NO. 6-14-169 SHEET 12 OF 23

BOVAY ENGINEERS, INC.

DETERMINE COMBINED RUNOFF FROM ALL DRAINAGE AREAS : DEVELOPED CONDITION

D.A. No. 1 :

C = 0.35

A = 0.689 Ac. CA = .24

D.A. No. 2 :

C = 0.95

A = .641 Ac. CA = .61

D.A. No. 3

C = 0.48

A = .303 CA = .15

COMBINED CA = 1.00

INFLOW = DCA values shown in table on next page.

FOR Grandy's DESCRIPTION Inflow Determination

DESIGNED MG DATE 2/11/81 CHECKED SFF DATE 2/11/81 FILE NO. 4014-159 SHEET 13 OF 23

BOVAY ENGINEERS, INC.

TIME (MIN)	ACCUM DIST. %	ACCUM. RAINFALL (IN)	Δ RAINFALL (IN)	INFLOW (FT.³)
0	0	0	0	0
5	.013	.027	.027	0
10	.026	.053	.026	94
15	.047	.096	.043	156
30	.070	.144	.048	174
45	.094	.193	.049	178
60	.122	.250	.057	207
75	.153	.314	.064	232
90	.190	.390	.076	276
105	.236	.484	.094	341
120	.301	.617	.133	483
135	.376	.771	.154	559
150	.556	1.140	.369	1339
165	.615	1.261	.121	439
180	.671	1.376	.115	417
195	.724	1.484	.108	392
210	.764	1.566	.082	298
225	.797	1.634	.068	247
240	.826	1.693	.059	214
255	.852	1.747	.054	196
270	.876	1.796	.049	178
300	.930	1.907	.111	403
330	.966	1.980	.073	265
360	1.00	2.05	.070	254
				7342 FT³

FOR GRANDY'S DESCRIPTION INFLOW Determination

DESIGNED MG DATE 2/10/81 CHECKED SEF DATE 2-11-81 FILE NO. 6014-159 SHEET 14 OF 23

BOVAY ENGINEERS, INC.

Discharge line is to have a 1/4"ϕ hole drilled into it within the inlet structure for drain purposes back into the inlet. Need to determine nominal discharge rate due to loss:

Use the orifice equation:

$Q = 0.60A\sqrt{2gH}$

Head, $H = 24.5$

A of 1/4"ϕ hole = 0.000341

$Q = 0.60\,(.000341)\sqrt{64.4(24.5)} = 0.00813\,CFS$

$= 3.65\,GPM$

$\Rightarrow$ Nominal discharge = 140 − 4 = 136 GPM

FOR Grandi's DESCRIPTION Nominal discharge

DESIGNED SWB DATE 2/12/81 CHECKED MG DATE 2/12/81 FILE NO. 4014-159 SHEET 15 OF 23

BOVAY ENGINEERS, INC.

TIME (MIN)	ACCUM. INFLOW (FT.³)	ACCUM. OUTFLOW @ 136 GPM (FT.³)	ACCUM. REQ'D. STORAGE (FT.³)
0	0	0	0
5	0	0	0
10	94	91	
15	250	182	
30	424	454	
45	602	726	
60	809	1000	
75	1041	1273	
90	1317	1545	
105	1656	1818	
120	2141	2091	50
135	2700	2363	337
150	4037	2636	1403
165	4478	2909	1569
180	4895	3181	1714
195	5287	3454	1833
210	5585	3727	1858 ← Peak Storage REQ'D.
225	5832	3999	1833
240	6046	4272	1774
255	6242	4545	1697
270	6420	4818	1602
300	6823	5363	1460
330	7066	5909	1179
360	7342	6454	888

MASS BALANCE INDICATES A REQUIRED STORAGE VOLUME OF 1858 FT.³ FOR A PUMP DISCHARGE OF 136 GPM.

136 GPM = 0.30 CFS < 1.11 CFS (Q, undeveloped)

FOR GRANDY'S DESCRIPTION INFLOW - OUTFLOW BALANCE

DESIGNED MG DATE 2/11/81 CHECKED SFD DATE 2-12-81 FILE NO. 4-014-159 SHEET 16 OF 23

BOVAY ENGINEERS, INC.

DETERMINE STORAGE CAPACITY OF NORTH PARKING LOT AREA:

ELEV. (Ft.)	ELEV. DIFF. (Ft.)	SURFACE AREA (SF)	AVE. AREA (S.F.)	VOLUME (Ft.^{3})	CUM. VOL. (Ft.^{3})
48.55		0			0
	0.25		514	129.	
48.80		1028			129
	0.10		1353	135.	
48.90		1678			264
	0.10		2129	213.	
49.00		2580			477
	0.10		2942	294.	
49.10		3304			771
	0.10		3728	373.	
49.20		4152			1144
	0.10		4676	468.	
49.30		5200			1612
	0.10		5642	564.	
49.40		6084			2176.

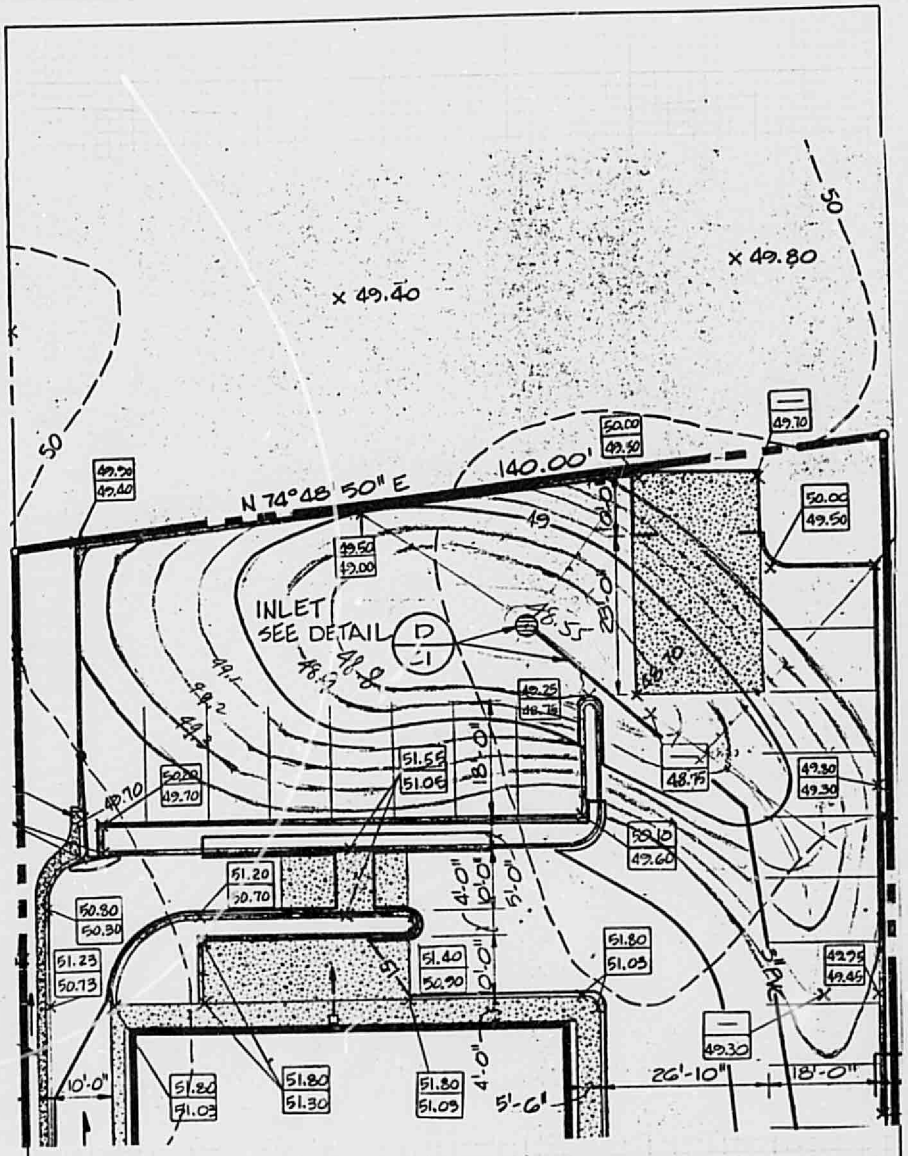
Volume needed for storage = 1858 Ft.^{3}

Volume available = 2176 Ft.^{3}

FOR GRANDY'S DESCRIPTION Storage Capacity

DESIGNED MG DATE 2/11/81 CHECKED SFF DATE 2/12/81 FILE NO. 6012-159 SHEET 17 OF 23

BOVAY ENGINEERS, INC.



FOR Grandy's DESCRIPTION Storage determination

DESIGNED MG DATE 2/12/81 CHECKED GFF DATE 2/12/81 FILE NO. 4014-159 SHEET 18 OF 23

BOVAY ENGINEERS, INC.

2-INCH PIPE OR HOSE.

(Actual diameter, 2.00 ins.)

Discharge in Gallons.		Velocity in Feet per Second.	Velocity Head, Feet.	Loss of Head in Feet per 1000 feet of length.						
Per Minute.	Per 24 Hours.			Very Smooth and Straight Brass, Tin, etc. c=140	Ordinary Straight Brass, Tin, etc. c=130	Smooth New Iron. c=120	Ordinary Iron. c=100	Old Iron. c=80	Very Rough. c=60	Badly Tuberculated. c=40
6	8,640	0.61	0.01	1.0	1.2	1.4	2.0	2.9	5.0	10.7
8	11,520	0.82	0.01	1.8	2.0	2.4	3.3	5.0	8.6	18.2
10	14,400	1.02	0.02	2.7	3.1	3.6	5.0	7.6	12.9	27.4
12	17,280	1.23	0.02	3.8	4.3	5.0	7.0	10.7	18.1	38.5
14	20,160	1.43	0.03	5.0	5.8	6.7	9.4	14.2	24.1	51
16	23,040	1.63	0.04	6.4	7.4	8.6	12.0	18.2	30.9	66
18	25,920	1.84	0.05	8.0	9.2	10.7	14.9	22.7	38.6	82
20	28,800	2.04	0.03	9.8	11.2	12.5	18.2	27.5	46.8	99
25	36,000	2.55	0.10	14.8	16.9	19.6	27.3	41.6	71	150
30	43,200	3.03	0.15	20.7	23.8	27.3	38.4	58	99	210
35	50,400	3.57	0.20	27.5	31.5	36.6	51	78	132	280
40	57,600	4.08	0.26	35.1	40.2	46.8	66	99	168	359
45	64,8[illegible]	4.60	0.33	43.8	50	58	82	123	210	446
50	72,000	5.11	0.40	53	61	71	99	150	257	540
55	79,200	5.62	0.49	64	73	84	118	179	305	640
60	86,400	6.13	0.58	74	83	99	139	210	359	760
65	93,600	6.64	0.68	85	99	115	161	244	416	880
70	100,800	7.15	0.79	99	114	132	184	280	477	1010
75	108,000	7.66	0.91	113	129	149	209	318	540	1150
80	115,200	8.17	1.04	127	146	169	237	358	610	1280
90	129,600	9.19	1.31	158	182	210	294	447	760	1610
100	144 000	10.21	1.62	192	220	256	358	540	920	1960
110	158,400	11.23	1.95	230	262	306	429	650	1110	2330
120	172,800	12.25	2.33	271	310	360	500	760	1300	2760
130	187,200	13.28	2.73	312	360	418	580	880	1510	3190
140	201,600	14.30	3.17	360	413	479	670	1020	1730	3670
150	216,000	15.32	3.64	407	465	540	760	1140	1950	4180
160	230,400	16.34	4.14	460	530	610	860	1290	2210	4690
170	244,800	17.35	4.67	520	590	690	960	1460	2480	5300
180	259,200	18.38	5.23	570	650	760	1070	1620	2730	5800
190	273,600	19.40	5.84	630	720	840	1180	1780	3030	6400
200	288,000	20.42	6.46	690	800	920	1290	1960	3330	7100
220	316,800	22.47	7.82	830	950	1110	1540	2340	3990	8400
240	345,600	24.51	9.31	980	1120	1300	1820	2760	4700	9900
260	374,400	26.55	10.90	1130	1290	1510	2110	3190	5400	11500

20

C=130

FOR GRANDY'S DESCRIPTION Friction Loss - P.V.C. Pipe

DESIGNED MG DATE 2/11/81 CHECKED SFF DATE 2-11-81 FILE NO. 1014-159 SHEET 19 OF 23

BOVAY ENGINEERS, INC.

3-INCH PIPE.

(Actual diameter, 3.00 ins.)

Discharge in Gallons.		Velocity in Feet per Second.	Velocity Head, Feet.	Loss of Head in Feet per 1000 feet of length.						
Per Minute.	Per 24 Hours.			Very Smooth and Straight Brass, Tin, etc. c=140	Ordinary Straight Brass, Tin, etc. c=130	Smooth New Iron. c=120	Ordinary Iron. c=100	Old Iron. c=80	Very Rough. c=60	Badly Tuberculated. c=40
10	14,400	0.45	0.00	0.37	0.43	0.50	0.7	1.0	1.8	3.8
15	21,600	0.68	0.01	0.79	0.91	1.06	1.5	2.2	3.8	8.1
20	28,800	0.91	0.01	1.35	1.55	1.80	2.5	3.8	6.5	13.8
25	36,000	1.13	0.02	2.04	2.34	2.71	3.8	5.8	9.8	20.8
30	43,200	1.35	0.03	2.87	3.29	3.81	5.4	8.1	13.8	29.2
35	50,400	1.59	0.04	3.81	4.38	5.1	7.1	10.7	18.3	38.9
40	57,600	1.82	0.05	4.89	5.6	6.5	9.1	13.8	23.5	49.7
50	72,000	2.27	[illegible]	7.4	8.5	9.8	13.8	20.8	35.5	75
60	86,400	2.72	[illegible]	10.3	11.8	13.7	19.2	29.1	49.6	105
70	100,800	3.18	0.16	13.8	15.8	18.3	25.7	38.8	66	140
80	115,200	3.63	0.20	17.6	20.2	23.4	32.8	49.6	84	179
90	129,600	4.09	0.26	21.9	25.1	29.1	40.8	62	105	223
100	144,000	4.54	0.32	26.7	30.6	35.2	49.6	75	128	271
120	172,800	5.45	0.46	37.2	42.8	49.7	70	106	179	380
140	201,600	6.35	0.63	49.6	57	66	92	139	238	510
160	230,400	7.26	0.82	64	73	84	118	179	306	650
180	259,200	8.17	1.04	79	91	106	148	223	380	810
200	288,000	9.08	1.28	96	110	128	178	271	461	980
220	316,800	9.99	1.55	114	132	153	213	323	550	1170
240	345,600	10.89	1.84	134	154	179	251	380	650	1370
260	374,400	11.80	2.16	156	179	208	291	440	750	1590
280	403,200	12.71	2.51	179	206	238	334	510	860	1830
300	432,000	13.62	2.88	204	233	271	380	580	980	2080
320	460,800	14.52	3.28	229	263	306	428	650	1110	2330
340	489,600	15.43	3.71	257	294	342	479	720	1230	2610
360	518,400	16.34	4.15	286	328	380	530	800	1370	2910
380	547,200	17.25	4.62	317	361	420	590	890	1520	3210
400	576,000	18.16	5.11	348	399	461	650	980	1670	3520
420	604,800	19.06	5.64	380	436	510	710	1070	1830	3870
440	633,600	19.97	6.20	414	475	550	770	1170	1980	4220
460	662,400	20.88	6.78	449	520	600	840	1270	2160	4570
480	691,200	21.79	7.38	488	560	650	910	1370	2330	4980
500	720,000	22.70	8.00	530	600	700	980	1480	2520	5400
550	792,000	24.96	9.70	620	720	830	1170	1770	3010	6400
600	864,000	27.23	11.50	710	840	980	1370	2070	3520	7400

.31

C=130

FOR GRANDY'S DESCRIPTION Friction loss - PVC PIPE

DESIGNED MG DATE 2/11/81 CHECKED SFF DATE 2-11-81 FILE NO. 6416-159 SHEET 20 OF 23

BOVAY ENGINEERS, INC.

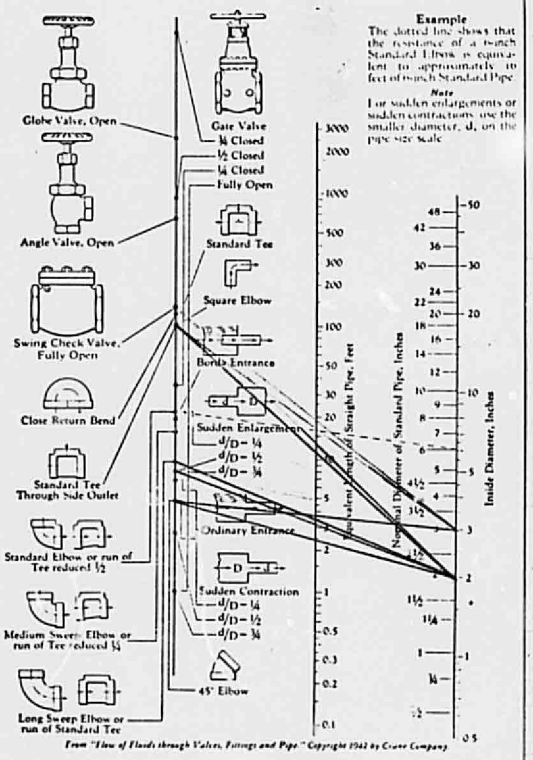


FIGURE 4
FLOW OF WATER THROUGH VALVES & FITTINGS

FOR GRANDY'S DESCRIPTION Friction Loss - Valves & Fittings

DESIGNED MA DATE 2/11/81 CHECKED SFP DATE 2-11-81 FILE NO. 1112-159 SHEET 21 OF 22

BOVAY ENGINEERS, INC.

LINE SIZE (IN)	PUMP CAPACITY (GPM)	FRICTION LOSS FOR 225' PIPE + 7' Static Head	EQUIVALENT LOSS FOR BENDS, ETC. (FT.)	TOTAL HEAD (FT.)
2"	0	7	0	7
	50	20.73	2.14	22.87
	100	56.50	7.70	64.20
	150	111.63	16.28	127.91
3"	0	7	0	7
	50	8.91	.44	9.35
	100	13.89	1.60	15.49
	160	23.43	3.82	27.25

PVC PIPE C=130

	EQUIV. LENGTHS OF STRAIGHT PIPE 2"ø	3"ø
CHECK VALVE	14	19
SUDDEN ENLARGEMENT d/D = 2/3 = .67 use 1/2		3.1
45° ELBOW	2.5	3.8
WYE—USE STD TEE	11.5	16
2-90° MEDIUM SWEEP	7.0	10.4
	35.0	52.3

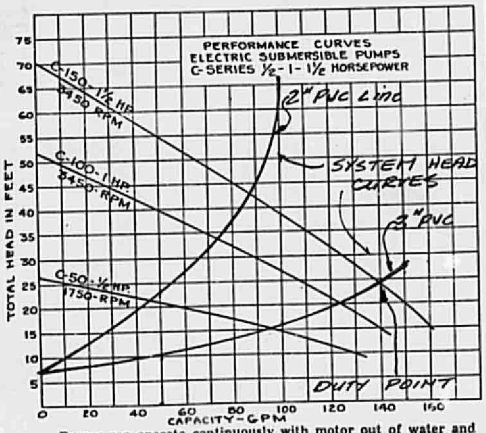
FOR GRANDY'S DESCRIPTION TOTAL HEAD LOSSES

DESIGNED MG DATE 2/11/81 CHECKED SFF DATE 2-11-81 FILE NO. 1014-159 SHEET 22 OF 23

BOVAY ENGINEERS, INC.

PUMP MODELS

CATALOG NO.	MOTOR SIZE & TYPE	CORD LENGTH	TYPE	WEIGHT
C-50	½ Horsepower 1 Phase 115 or 230V	50 Ft.	Manual	75 Lbs.
C-50A	½ Horsepower 1 Phase 115 or 230V	50 Ft.	Automatic	86 Lbs.
C-100	1 Horsepower 1 Phase 115 or 230V	75 Ft.	Manual	90 Lbs.
C-100A	1 Horsepower 1 Phase 115 or 230V	75 Ft.	Automatic	105 Lbs.
C-100-3	1 Horsepower 3 Phase 220 or 440V	75 Ft.	Manual	90 Lbs.
C-100A-3	1 Horsepower 3 Phase 220V	75 Ft.	Automatic	105 Lbs.
C-150	1½ Horsepower 1 Phase 115 or 230V	75 Ft.	Manual	95 Lbs.
C-150A	1½ Horsepower 1 Phase 115 or 230V	75 Ft.	Automatic	110 Lbs.
C-150-3	1½ Horsepower 3 Phase 220 or 440V	75 Ft.	Manual	95 Lbs.
C-150A-3	1½ Horsepower 3 Phase 220V	75 Ft.	Automatic	110 Lbs.



Pumps can operate continuously with motor out of water and pump gulping air and water.

Total head is vertical height in feet from water level to point of discharge plus friction in discharge hose or piping.

HYDR-O-MATIC PUMPS

Bulletin 151

* Start level to be set @ 40"
Stop level to be set @ 6"

FOR Grandy's DESCRIPTION Pump Rating Curves

DESIGNED MG DATE 2/11/91 CHECKED SFF DATE 2-11-91 FILE NO. 1014-168 SHEET 23 OF 23

BOVAY ENGINEERS, INC.

2" ELECTRIC

SUBMERSIBLE DEWATERING PUMPS - LIGHT-WEIGHT

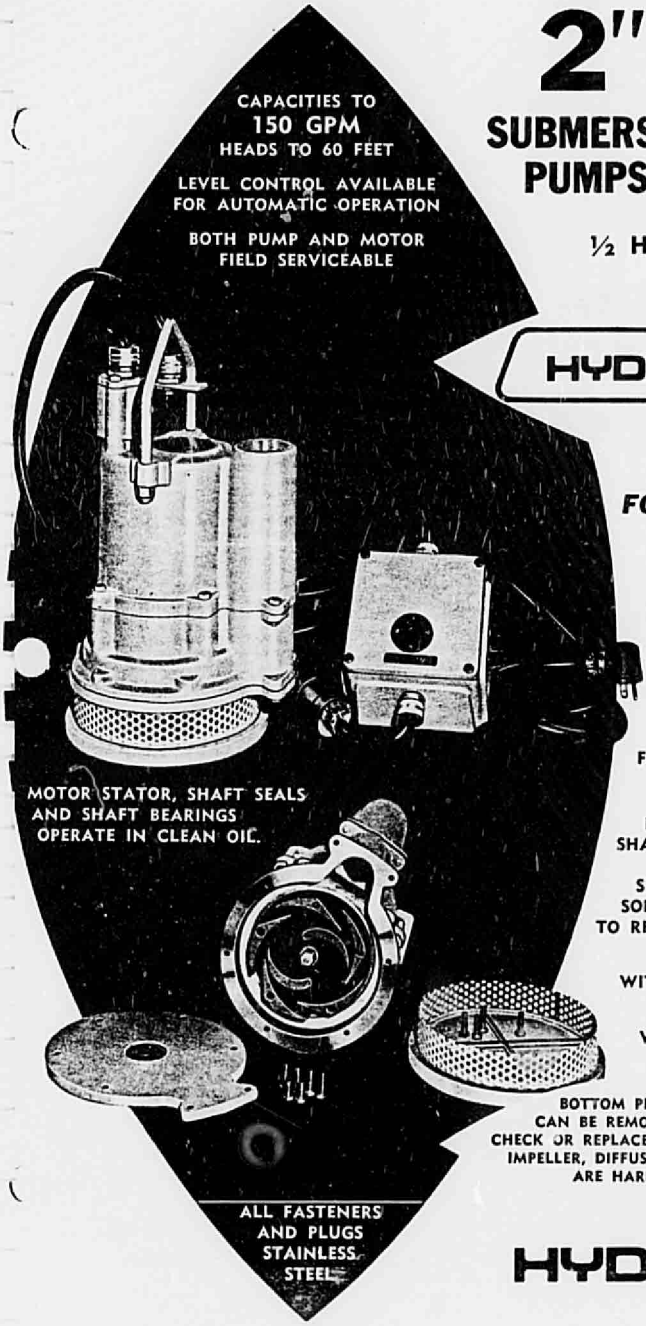
3 SIZES

½ HP - 1 HP - 1½ HP

CAPACITIES TO
150 GPM
HEADS TO 60 FEET

LEVEL CONTROL AVAILABLE FOR AUTOMATIC OPERATION

BOTH PUMP AND MOTOR FIELD SERVICEABLE



HYDR-O-MATIC

FOR ALL DEWATERING JOBS

CONSTRUCTION - MINES - UTILITIES
PITS - QUARRIES - TUNNELS

PUMPS DIRTY WATER LOADED WITH SAND, MUD, DIRT 24 HOURS A DAY WITHOUT ATTENTION

NO PRIMING - NO SUCTION HOSE
NO ENGINE FUMES

FOR SINGLE PHASE OR 3 PHASE POWER

DOUBLE TANDEM MOUNTED SHAFT SEALS WITH OIL CHAMBER FOR LUBRICATION
SEAL NEXT TO IMPELLER HAS SOLID TUNGSTEN CARBIDE FACES TO RESIST ABRASION AND CORROSION

HEAVY POWER CORD WITH PLUG FOR DISCONNECTING FROM CONTROL BOX.

WATER-PROOF CONTROL BOX WITH HANGER STRAP

MOTOR STATOR, SHAFT SEALS AND SHAFT BEARINGS OPERATE IN CLEAN OIL.

BOTTOM PLATE AND SCREEN CAN BE REMOVED IN MINUTES TO CHECK OR REPLACE IMPELLER AND DIFFUSER. IMPELLER, DIFFUSER AND SUCTION PLATE ARE HARD DUCTILE IRON

ALL FASTENERS AND PLUGS STAINLESS STEEL

HYDR-O-MATIC
PUMPS

CHECK VALVES

NO. 5301 CHECK VALVES

- For submersible and turbine pumps requiring air intake into drop pipe
- Tapped ⅛" IPS on intake side for air snifter valve. (Furnished less snifter valve)

Pipe Size Inches	List Price	Min. Well Size —Inches	Approx. Wt. Each Lbs.
1	6.82	3	1¼
1¼	8.44	3½	2
1½	10.98	4	2¾
2	16.48	5	4
2½	50.40	6	6
3	86.36	8	10½
4	115.16	8	30

NO. 5302 CHECK VALVES

- All-brass, for use with submersible pumps
- Installed as a discharge check valve between pump and column pipe

Pipe Size Inches Male Female	List Price	Min.Well Size —Inches	O.D. of Valve	Approx. Wt. Each, Lbs.
1¼ x 1	7.02	2	1 15/16"	1¼
1¼ x 1¼	9.22	2	1 15/16"	1½
1½ x 1¼	9.22	2½	2¼"	2
2 x 2	19.80	3	2 13/16"	3½
3 x 3	60.50	5	4⅛"	10½
4 x 4	92.40	6	5⅛"	19

Note: 2" and 3" available in Ductile Iron. Prices on request.

NO. 5303 CHECK VALVES

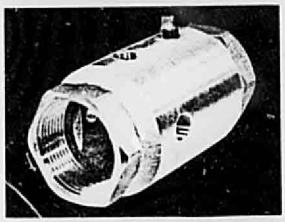
- Used with submersible and turbine pumps for air intake into pump column
- Tapped ⅛" IPS on intake side for air snifter valve and ¼" IPS for switch connection on outlet side. Furnished without snifter valve

Pipe Size Inches	List Price	Approx. Wt. Each, Lbs.
1	7.36	1¼
1¼	8.78	2
1½	10.22	2¾
2	17.50	4
2½	49.74	6
3	84.56	10½
4	113.30	30

NO. 5304 CONTROL CENTER CHECK VALVE

- For float type air separator pressure tanks when used with submersible pumps
- Recommended for heavy-duty, high-capacity service
- Comes with ¼" pipe tap for pressure switch and gauge; ⅛" tap for snifter valve and plug. ⅛" brass plug furnished

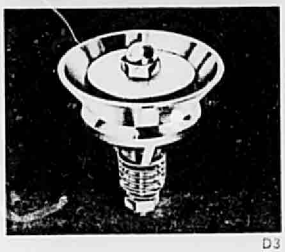
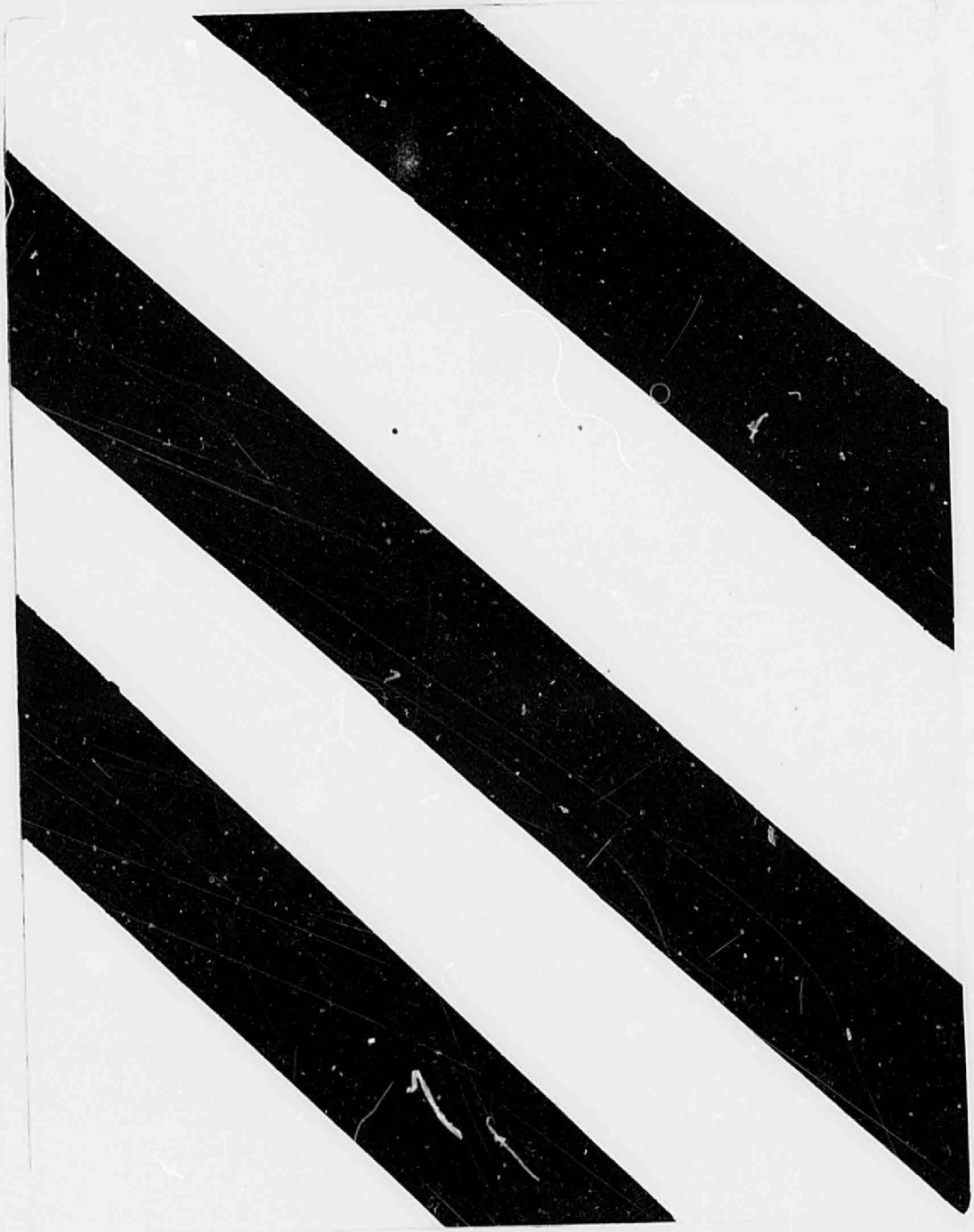
Size	List Price	Approx. Weight Each, Lbs.
1"	7.36	1¼
1¼"	8.78	2
1½"	11.46	2¾
2"	17.60	4



NO. 5305 CHECK VALVE INSERTS

- Brass valve insert with Monel metal spring
- Easily installed into most 150-lb. ground joint unions
- Used on lines where spaced is limited
- Can be furnished for fuel oil or gasoline if so specified

Pipe Size Inches	List Price	Wt. Per Ctn., Lbs.	Pcs. Per Ctn.
1	3.44	1	4
1¼	4.04	¾	2
1½	4.94	1	2
2	6.96	1	1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