SAN JUAN RIVER BASIN RECOVERY IMPLEMENTATION PROGRAM

NAPI FISH REARING PONDS STANDARDS OPERATING PROCEDURES

Prepared for:
Bureau of Indian Affairs
Navajo Indian Irrigation Project

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INTRODUCTION

The Bureau of Indian Affairs (BIA), Navajo Indian Irrigation Project (NIIP), has been involved in the San Juan River Basin Recovery Implementation Program (SJRIP) for the endangered Colorado pikeminnow and razorback sucker in the San Juan River since 1991. As a part of that commitment, BIA, with the support of the Navajo Nation, has provided sites, management and partial funding for the rearing of razorback sucker larvae for later stocking in the San Juan River. Three sites, Avocet, Hidden, and 6-Pack, have been established for this purpose. Avocet contains two ponds, Hidden one pond, and 6-Pack has 6 ponds.

Water is furnished to the ponds through the canal network of NIIP. Navajo Agriculture Products Industry – Operation & Maintenance (NAPI O&M) operates these canals. Water delivered to the ponds is accounted for and charged to the San Juan River Implementation and Recovery Program. Water is only available for delivery during the irrigation season.

Operation of these ponds is being transferred to the SJRIP, with the Navajo Nation as Contractor. This document is to provide the information necessary for the operation of the ponds. Pond management guidelines are being developed under separate contract, following completion of a management study to determine the best management strategy for the ponds.

NAPI O&M

NAPI O&M is a department of Navajo Agriculture Products Industry (NAPI), a Navajo Nation entity. NAPI O&M is presently funded by BIA through the 638 contracting process. The purpose of NAPI O&M is to deliver water from Navajo Dam to NAPI and other water users located on NIIP such as the Fish Rearing Ponds.

Organization

NAPI O&M consists of several departments headed by a director. The Operations Department has the overall responsibility for managing water deliver. Water ordering and emergency contacts are routed through the Dispatch Center (DISPATCH), a division of the operations department. The radio call number for DISPATCH is 800. They may also be reached by calling 566-2628.

Contacts

The following personnel are designated by NAPI O&M for contacting.

Director:	Wilton Charley	566-2600 ext. 1032
Operations:	Davis Henry	566-2628

The address for NAPI O&M is:

NAPI Main Office
10086 NM 371
Farmington, NM 87401

Water Ordering Procedures

DISPATCH hosts a mandatory water meeting periodically for all water users. The purpose of the meeting is to discuss water ordering procedures, the beginning of the season, the ending of the season, and other issues involving water delivery. Meeting schedules will be announced by DISPATCH. All meetings are held at the NAPI main office.

Since all of the valves at the ponds are automated, no formal water order is required for the Block 3 Fish Rearing Ponds. However, coordination with NAPI O&M is required at the beginning of the season, at the end of the season, and for any special operations. Information regarding water delivery is obtained by contacting DISPATCH. Emergencies should be reported to DISPATCH as soon as possible. Service requests can also be coordinated through DISPATCH.

Schedule

Usually, water deliveries begin during the middle of March. Contact DISPATCH to determine when water is available. Plan to prepare the valves to receive water a week prior to start up.

The irrigation season ends at the beginning of November. Contact DISPATCH to find when shutdown is planned so that the ponds can be filled for the winter season prior to shutdown. Once the main pipelines have been drained by NAPI O&M, valve winterization of the valves can proceed.

PIPELINE OPERATION & MAINTENANCE.

Each site receives water through a pipeline lateral tapped off of the main pipeline network of NIIP. The piped lateral to the ponds begins at a delivery unit consisting of an isolation valve, a control valve and a flow meter. All of the delivery units are operated and maintained by NAPI O&M. Maintenance downstream of the delivery unit is part of fishpond maintenance.

Water surface levels for each pond are maintained automatically using a float valve. This valve is designed to open when the water surface level reaches a predetermined low point and to shut when the water level reaches a predetermined high point. Each valve is equipped with a pressure sustaining feature designed to maintain a minimum upstream pressure in order to not interfere with ongoing irrigation. Each valve is isolated from the pond and the pipeline for maintenance purposes.

Pipeline Operation

ONLY NAPI O&M personnel are authorized to operate the delivery unit isolation valve. Coordination with NAPI O&M for operating the isolation valve to the fishponds is completed at the water meetings discussed in Section II. Once the pipeline is filled and pressurized, operation is limited to the float valves and their associated isolation valves..

Filling A Pipeline Lateral

1. Inspect and prepare all the float valves to receive water.

2. Close all of the isolation valves upstream of the float valve.

3. Close all of the drain valves located on the pipeline.

4. Inspect all air vents on the pipeline to ensure proper function. When filling, the air vent will blow out air until it shuts.

5. The pipeline is ready for filling. Call DISPATCH to arrange turning water to the lateral.

6. Once the lateral is pressurized, turn each float valve on individually.

Season Operation

1. Inspect pipeline lateral and air vents once a week for leaks. Report any problems to NAPI O&M.

2. Read and record the flow meter totalizer once a month.

Emergency Shutdown

Shutdown to work on float valves. Each float valve is isolated from the lateral pipeline by a valve installed directly upstream of the float valve. This valve can be isolated as required without coordinating with NAPI O&M. Simply close the valve SLOWLY.

Shutdown Procedures. Call DISPATCH to request shutting down the lateral. To drain the lateral, open one of the float valves by holding down the float and backing off the pressure sustaining control (loosen the pilot adjusting bolt). The float may be propped in the lowered position to facilitate operation during shutdown. See valve instructions contained in Appendix 2.

Winterizing

1. Coordinate with NAPI O&M to determine when the main pipeline will be drained.

2. Arrange to be on site during the main pipeline draining.

3. Turn on the farthest downstream float valve by holding down the float (may be propped) and backing off the pressure sustaining control.

4. Inspect all air vents for proper operation.

5. When the pipeline pressure is low enough, the air vent will open and begin to suck in air.

6. When the air vent stops drawing air, have NAPI O&M close the lateral isolation valve.

7. Once the lateral isolation valve is closed, close both isolation valves upstream and downstream of the float valve.

8. Proceed to winterizing the float valves.

Valve Operation

Instructions for operating and maintaining the float valve and plumbing schematics detailing float valve configuration are both located in Appendix 2. These valves, manufactured by Cla-Val, are hydraulically operated and controlled by two pilot lines. The supply pilot line taps off of the large blue valve just downstream of the flush out valve. The line then exits the valve enclosure and extends to the float switch located on the enclosure installed in the embankment of the pond. The return line begins at the float switch and returns to the float valve, terminating on the top of the small brass diaphragm valve.

When the pond is full, the float is raised up, opening the float switch. The switch allows water to flow from the supply pilot line to the return pilot line thereby pressurizing the top of the small brass diaphragm valve. With the small brass diaphragm valve pressurized, flow is diverted to the bonnet of the large blue valve pushing the interior diaphragm assembly down and shutting water off to the pond. When the pond level falls, the float is lowered, thereby shutting off the supply line and depressurizing the return line. With the small brass diaphragm valve open, water can exit out of the bonnet of the large blue valve and the upstream pipe pressure pushes the interior diaphragm assembly open, allowing flow to the pond.

Each float valve is provided with a pressure-sustaining valve designed to maintain upstream pressure in order to prevent interference with irrigation. The pressure-sustaining valve allows the large blue valve to open only when the upstream pressure exceeds a minimum value set by the operator. The pressure setting of the valve can be adjusted by turning the adjustment bolt located on the top of the valve (in to increase pressure, out to decrease pressure). Adjust the pressure-sustaining valve to a pressure setting of around 60 psi. A temporary pressure gauge can be easily mounted onto the flush out valve when setting the pressure sustaining valve. Adjustment may be necessary if this pressure setting is too high, as the valves will not open.

Valve Maintenance

In order for the float valve to operate correctly, all parts must be in good operating condition. Each spring, inspect and clean all of the fittings. Replace parts as required. The copper tubing and various brass fittings can be found in any hardware store. Valve and float parts are purchased from a Cla-Val dealer. The nearest dealers are:

New Mexico	Arizona
James, Cooke & Hobson, Inc	Engineered Sales Co.
(505) 344-7100	(602) 264-7946

When ordering Cla-Val parts, use the valve manual located in Appendix 2 to identify the name of the part.

During in-season operation, open the flush valve on the y-strainer every two weeks for a few seconds in order to clean out the filter. If the filter is not cleaned, the float valve will not shut.

Once a month, test each pond for proper valve operation. Open the valve by pushing down the float and then close the valve by releasing the float. Troubleshoot and correct the float valve as

required. Be aware that the pressure-sustaining feature on the valve will not allow the valve to open if another valve at the site is already opened.

The greatest threat to the float valves is freezing temperatures. At the end of the season:

1. Close both the upstream and downstream isolation valve.
2. Loosen all of the fittings and drain the water out of the tubing.
3. Remove the plugs from the bonnet of the large blue valve and allow the water to drain out. Use a suction bulb or pump to lower the water level in the bonnet to prevent freeze damage.
4. Remove the plugs from the bottom sides of the valve and allow the water to drain.
5. Loosen the fittings at the float apparatus and allow the water to drain. Pump the float switch several times until no water is discharged.
6. Keep the valve enclosure lids on. The black enclosures capture heat from the sun resulting in warmer temperature inside the enclosure.

AVOCET PONDS

Avocet east and west ponds are located northwest of the intersection of N4062 and N4087. The two ponds are adjacent to each other, sharing a common center dike. Drawing L101 shows the layout of the ponds while Drawing D101 shows the details.

Pond Specifications

These ponds were created by partitioning the existing basin with a dike using earth borrowed from the bottom of the existing basin. The sides of each pond were steepened and two more dikes were constructed to bulk up the bank. The ground surface of the pond was compacted to reduce the soil permeability. Both ponds are 6 ft. deep when filled. Drawing L101 shows the layout of these two ponds.

West Pond		East Pond	
Pond Area	3.34 acres	Pond Area	3.52 acres
Volume	18.0 af	Volume	19.6 af
Dike Side Slopes	3:1	Dike Side Slopes	3:1
Min. Side Slope	3:1	Min. Side Slope	3:1
Max. Side Slope	5:1	Max. Side Slope	5:1

Pipeline Operation and Maintenance

A 6-inch pipeline was constructed to convey water from delivery unit 3-33 to the ponds. Drawing D101 shows the details of this pipeline. The pipeline begins with an 8-inch steel tee just downstream of the delivery unit box containing a control valve. This tee has an 8-inch isolation valve on the downstream run to isolate the remaining side roll lateral pipeline. The out leg of this tee reduces to 6 inches followed by a 6-inch isolation valve, a 2-inch air vent with an enclosure, a 35 degree elbow, and than approximately 2,720 ft of 6-inch IPS CL 160 PVC pipe to another 6-inch steel tee, near the ponds.

After the 6-inch tee, the pipeline divides into two laterals, one for each pond. A butterfly valve is installed at the beginning of each lateral to isolate the lateral from the pipeline. Both of the isolation valves are enclosed in the same enclosure. The isolation valves are operated using a square nut. A valve key is required to operate these isolation valves. Always open or close these isolation valves SLOWLY.

Each lateral downstream of the isolation valve has a float valve installed followed by approximately 100 ft of 6-inch PVC extending to the pond. Each float valve has a pilot line extending to the float switch enclosure located on the south end of the middle dike. The float valve controlling the east pond supplies water for both float switches.

Generally, the maximum water surface should be maintained at 3 ft below the top of the dike. To ensure proper functioning of the float valve at Avocet Ponds, periodically clean the vegetation in front of the float switch enclosure so the float can measure the water surface elevation of the pond.

Dike Maintenance

Wind erosion has been the primary problem at Avocet Ponds. Most susceptible are the west facing banks of both ponds. Aquatic vegetation growth such as cattails along the water-mark of the bank is the best defense against wind erosion. If the problem continues to where the middle dike is jeopardized, more material may have to be added. This will require heavy equipment.

HIDDEN POND

Hidden Pond is located south east of the intersection of N4087 and N4095. Drawings L103, L104, and L106 shows the layout of the pond and plumbing details, the layout of the toe-drain, and the layout of the salamander fence respectively. Drawing D106 also shows the details of the drain siphon.

Pond Specifications

Hidden Pond was originally constructed as a stock water watering pond, but was rebuilt to serve as a fish rearing pond. The primary function of the pond will be to serve as a nursery pond. Larval and young-of-year fish will be stocked to the pond in the spring of the year and then harvested in the fall or early spring, depending on growth. The harvested fish will be stocked in either the Avocet or Six-Pack Ponds where they will be held until of sufficient size to be stocked to the river. The water surface area for Hidden Pond is 2.83 acres with water depths ranging from 6 ft to 9 ft. Hidden Pond is constructed with a seining kettle in the bottom for corralling fish

during draining. Draining Hidden Pond can be accomplished using a siphon (see instructions below). A salamander fence constructed around the perimeter of Hidden pond protects the pond from salamander infestation. A toe drain was installed on the main dike to protect the dike.

Pipeline Operation and Maintenance

The 6-inch lateral pipeline to Hidden Pond begins at a tee on the sideroll lateral of field 3-18A just downstream of the delivery unit. Downstream of the tee approximately 100 ft is the flow meter and the float control valve. Downstream of the float control valve is approximately 1,400 ft of 6-inch PVC pipe extending to Hidden Pond. Alongside this lateral are two 1-inch PVC pilot lines connecting the float switch with the float valve.

Filling the lateral pipeline requires coordination with NAPI O&M. Make sure the isolation valve upstream of the float control valve is open. Loosen the fitting on the pilot line connected to the top of the brass diaphragm valve to bleed air out of the pilot line when filling. Because the length of the pilot line, it may take up to 15 minutes to fill the pilot line. Tighten the fitting when water discharges out.

When testing the valve, allow 5 minutes for the valve to respond once the float switch is engaged. This is due to the length of the pilot line.

Winterizing the lateral pipeline again requires coordination with NAPI O&M. Close the isolation valve upstream of the float valve prior to NAPI O&M's shut-down of the delivery unit. *Failure to close this valve will result in flooding out the delivery unit since the delivery unit is lower than the pond*. Once isolated, loosen the fittings of the pilot line and drain. This procedure is different than the procedure for the other ponds because the pond is higher in elevation than the DU.

Siphon Drain Operation and Maintenance

A 12-inch siphon drain is used to drain Hidden Pond. The inlet to the siphon is the lowest part of Hidden Pond and is designed to drain the pond completely. The inlet to the siphon has a stainless steel mesh screen. The high point of the siphon is in the dike, from which the pipe extends approximately 1,000 ft to an open drain. At the dike, the siphon has an air vent used to make or break the siphon. At the end of the pipeline, a butterfly valve is used to control the flow rate and prevent flow.

A siphon works by creating a vacuum. To be successful all the air in the pipe has to be vacated. If air is introduced to the siphon, the flow will stop. Since the air vent located on the dike is crucial to the successful operation and safety of the siphon, a lock is provided to control this valve.

When water is desired in the pond, close the butterfly valve located at the end of the siphon and open the air vent. The top of the siphon located in the dike is designed to be below the bottom of the normal water surface. With the butterfly valve closed and the air vent opened, the siphon should fill completely with water. Lock the air vent in the open position to prevent accidental loss of water from the pond.

To drain the pond, the initial water surface of the pond prior to any draining has to be at the normal operating level. If the initial water surface elevation is not at the normal operating level, the siphon will not work. In this case, either fill the pond to the normal operating level, use a vacuum pump to evacuate the air through the air vent or use a pump to drain the pond. If the water level is sufficient, first close the air vent located at the dike followed by SLOWLY opening the butterfly valve at the end of the siphon. Observe the discharge of the siphon to the open drain. Throttle the discharge as required by adjusting the butterfly valve (close for lowering the discharge, open for increasing the discharge). Be aware that the discharge may change over time so monitor the discharge periodically. When the water is sufficiently drained, the flow is stopped by closing the butterfly valve. Only open the air vent to break the siphon in an emergency. Normally the air vent valve will remain closed until the reservoir is re-filled. If the airvent is opened, the siphon cannot be restarted until the water level returns to near the normal operating level.

Dike Maintenance

Monitor the seepage around the toe of the dike. Seepage is the greatest threat to the dike. If standing water is seen at the toe of the dike, inspect the toe-drain. If the toe-drain is functional, lower the level of the pond and call for technical assistance.

Toe-Drain Maintenance

The toe drain runs parallel to the dike along the length of the dike. The toe drain consists of a 6-inch perforated HDPE pipe enveloped in a gravel blanket. The toe drain begins on both ends of the dike where the pipe emerges from the ground. Both branches then extend to a tee located near the middle of the dike. The drain then extends away from the dike to a small outlet approximately 400 ft from the dike.

Monitor the water level periodically on the outlet of the toe drain. If the outlet is submerged in water, clean the vegetation surrounding the outlet area in order to drain the outlet area.

Salamander Fence Maintenance

A salamander fence consisting of 24-inch flashing has been installed around the perimeter of Hidden Pond. To be successful, the salamander fence has to be continuous with no burrowing holes under the flashing, breaks in the flashing or bent areas where the top of the flashing is near the ground. Inspect the fence monthly to ensure the integrity of the fence.

6-PACK PONDS

The 6-Pack Ponds are located directly east on the intersection of N3005 and N4104. Access to the site is by way of a gravel road connected to N4111. Drawings L107 and L108 show the layout of these ponds. Drawing D108 shows the pipeline details of these ponds.

Pond Specifications

The 6-Pack Ponds consist of six rectangular cells configured in a 2 by 3 array as shown on Drawing L108. Each cell has a water surface area of 2.8 acres in size for a cumulative area of 16.8 acres. Minimum water depth of the cells is 6 ft with a maximum of 9 ft at normal operating

water surface elevation. Each cell has a deep basin to allow for the corralling of fish during netting operations. The pond water surface elevation for each pond is maintained by float-actuated valves.

Pipeline Operation and Maintenance

The lateral delivering water to the 6-Pack Ponds is located at a blow-off of the main pipeline just north of Field 3-60. The lateral begins at a 6-inch tap off of the 8-inch riser protruding from a manhole on the main lateral pipeline. Downstream of the tap is a 6-inch gate valve followed by a flow meter. Approximately 1,527 ft of 6-inch PVC pipe extends from the flow meter to a 6-inch tee located close to the southeast fence corner. At this 6-inch tee, the lateral branches into two laterals running parallel to the north-south perimeter dikes. At each pond delivery location, a 4-inch line taps off of the 6-inch lateral consisting of a 4-inch float actuated valve with a 4-inch butterfly isolation valve on either side. The 4-inch pipeline downstream of the float actuated valve extends through the dike to the pond. Parallel to this 4-inch pipeline are two 1-inch HDPE pilot lines connecting the float valve with the float switch.

During the spring, coordinate with NAPI O&M on when the main pipeline is pressurized. Close all of the isolation valves to each pond and close all of the drain valves shown on Drawing L108. SLOWLY open the 6-inch gate valve and fill the pipeline at a maximum flow rate of 200 gpm. Use the flow meter near the 6-inch gate valve as a guide. Check to make sure the air vent is functioning properly. The air vent will close and flow to the lateral will cease once the lateral is full. Once pressurized, begin filling the two northern ponds by SLOWLY opening both isolation valves to the ponds. Limit the filling rate for each pond to 400 gpm. Only two ponds, one on each side, can fill at any given time. Stagger the pressure setting of the valves so that only one pond on each side will fill at any given time.

During the season, open the flush-out valves on the “Y” strainers on the float actuated valves every two weeks. Failure to flush the valves regularly will prevent the valves from functioning properly due to the high particle concentration of the supply water. Test the valves on a monthly basis to ensure proper function.

During storm events, the valve enclosures are susceptible to filling from storm water. Constant inspection and maintenance is required to prevent flooding of the valve enclosures. Once filled, the valve enclosure requires pumping or bailing.

At the end of the season, coordinate with NAPI O&M to schedule when draining will take place. Drain the 6-inch lateral through the two northern ponds by forcing the floats down and backing off the pressure setting of the pressure-sustaining valve. Inspect the air vent to ensure proper functioning. When the air vent opens, the lateral is drained. Close the 6-inch gate valve at the head of the lateral and proceed with winterizing the float actuated valves. When winterizing the valves, CLOSE both isolation valves to prevent flooding the valve enclosure.

Care must be taken when servicing the float switch located in the enclosure in the pond embankment. When servicing, waders or rubber boots are required in order to reach the switch. Do not enter the float switch enclosure alone, always have an assistant on the outside of the enclosure for safety reasons.

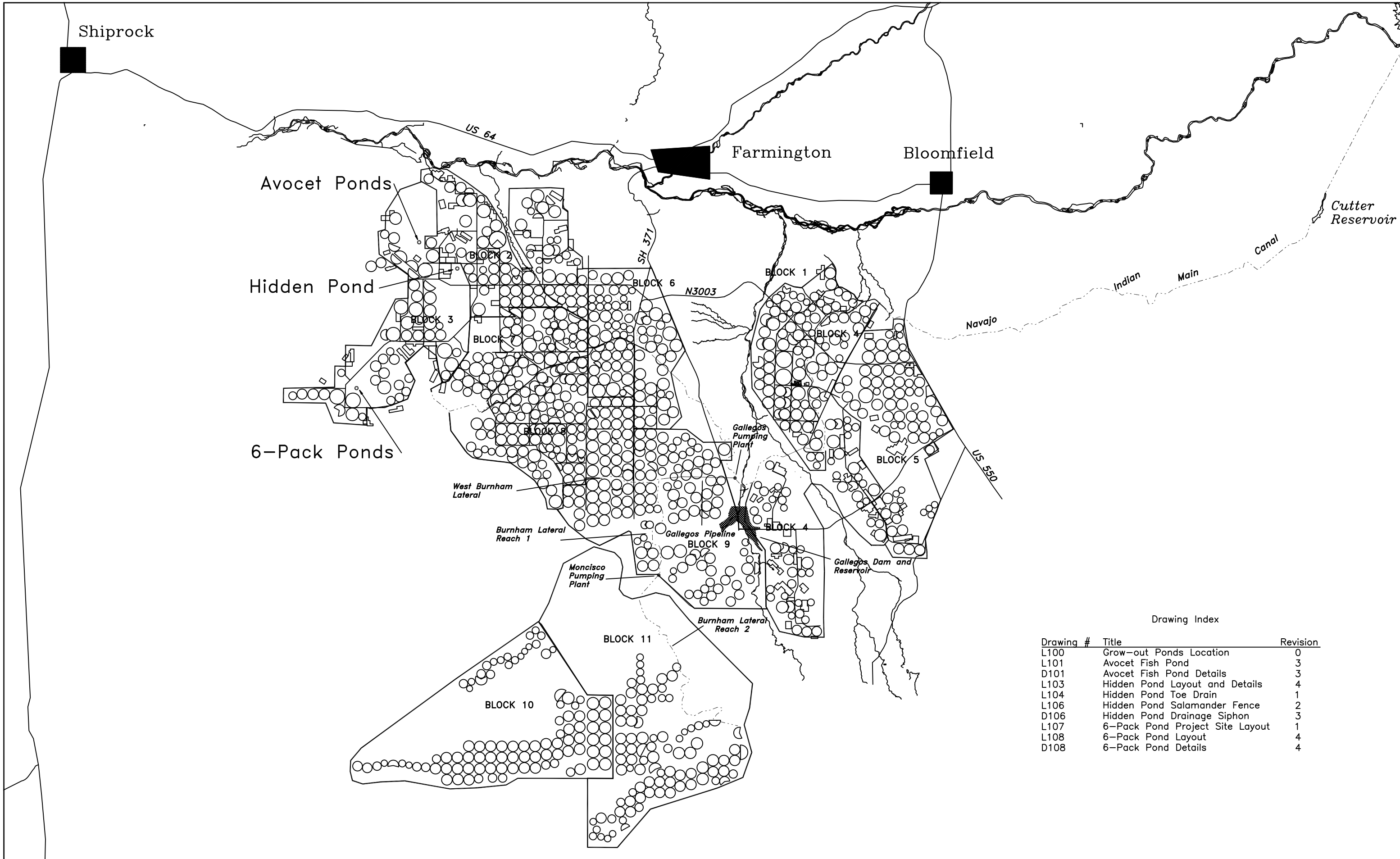
Road Maintenance

After storm events, stay on the gravel plated road. When wet, the soil type at 6-Pack Ponds is slick making vehicle travel highly risky.

Fence Maintenance

Clean the inside of the perimeter fence of tumbleweeds by tossing the weeds over the fence twice a year. Usually, cleaning is required in the spring during start-up and in the fall during winterizing.

APPENDIX 1 - AS-BUILTS DRAWINGS



Drawing Index

Drawing #	Title	Revision
L100	Grow–out Ponds Location	0
L101	Avocet Fish Pond	3
D101	Avocet Fish Pond Details	3
L103	Hidden Pond Layout and Details	4
L104	Hidden Pond Toe Drain	1
L106	Hidden Pond Salamander Fence	2
D106	Hidden Pond Drainage Siphon	3
L107	6–Pack Pond Project Site Layout	1
L108	6–Pack Pond Layout	4
D108	6–Pack Pond Details	4

REV	Revisions	Date	Design	Draw	Check

REV	Revisions	Date	Design	Draw	Check

Status: As–Built
Designed: MI
Drawn: MI
Checked: RDB
Approved:
File Name: SJL100.dwg

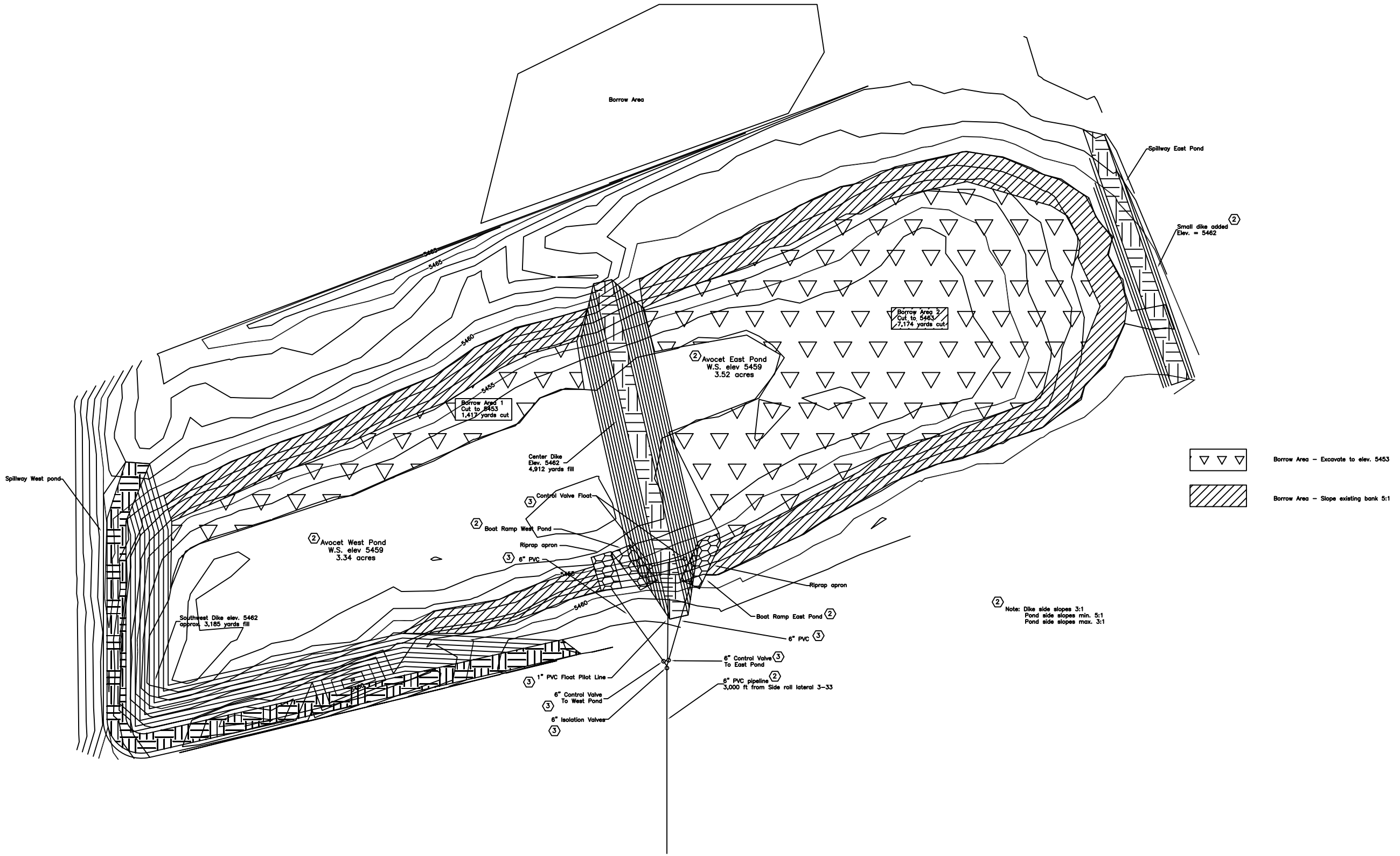
Not to Scale

Coordinate System: local
Datum: n/a
Survey Data Source: n/a

Keller–Bliesner Engineering
Irrigation & Water Resources
70 E. Center
Logan, Utah 84321

Bureau of Indian Affairs
Navajo Indian Irrigation Project
San Juan Recovery Implementation Program
Grow–Out Ponds Locations

Job No. 208–02
Date: 3/14/04
Sheet 1 of 10
DRAWING NO. L100
REV 0



REV	Revisions	Date	Design	Draw	Check
3	Added float valve configuration	1/26/04	MI	MI	RDB
2	As built	3/23/98	MI	MI	RDB
1	For construction	3/5/98	RDB	MI	RDB

Status: As built
Designed RDB/MI
Drawn MI
Checked RDB
Approved RDB
File Name: SJL101.DWG

50 0 50 100 150
SCALE 1" = 50'

Coordinate System: Local
Datum: Local
Survey Data Source: B.I.A. and Keller–Bliesner

Keller–Bliesner Engineering
Irrigation & Water Resources
70 E. Center
Logan, Utah 84321

Bureau of Indian Affairs
Navajo Indian Irrigation Project
San Juan Recovery Implementation Program
Avocet Fish Pond

Job No. 208–100
Date: 3/2/98
Sheet 2 of 10
DRAWING NO. L101
REV 3

REV	Revisions	Date	Design	Draw	Check
1	As-built	2/6/06	MI	MI	RDB

This drawing and the ideas and designs incorporated herein are specific to this project and, as an instrument of professional service, are the property of Keller–Bliesner Engineering. They may not be used, in whole or in part, for any purpose without the written authorization of Keller–Bliesner Engineering and the project owner.

Status: As-built
Designed RDB
Drawn MI
Checked RDB
Approved
File Name: NFWFL1001.dwg

150 0 150 300 450
Scale – ft

Coordinate System: Local
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

Keller–Bliesner Engineering
Irrigation & Water Resources
70 E. Center
Logan, Utah 84321

National Fish and Wildlife Foundation
San Juan River Fish Recovery Program
Razorback Sucker Rearing Pond Improvements
Avocet Pond Layout

Job No. 68100–01
Date: 6/8/05
Sheet 2 of 6
DRAWING NO. L1001
REV 1

REV	Revisions	Date	Design	Draw	Check
2	As–built	2/6/06	MI	MI	RDB
1	Revise perimeter fence	9/19/05	MI	MI	MI

Status: As–built
Designed: RDB
Drawn: MI
Checked: RDB
Approved:
File Name: NFWFL1001.dwg

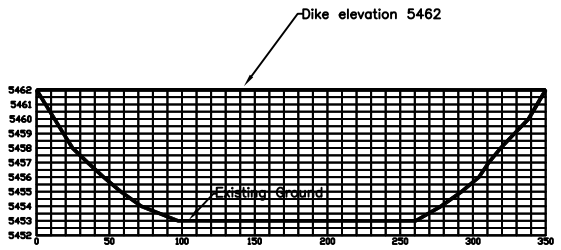
150 0 150 300 450
Scale – ft

Coordinate System: Local
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

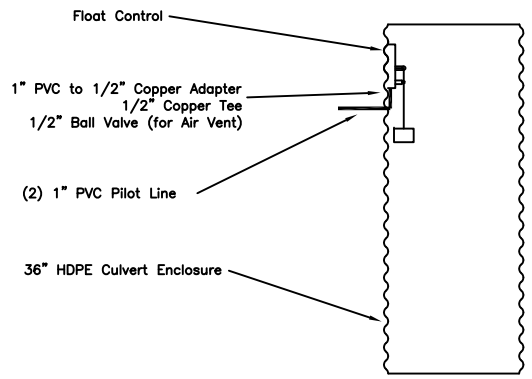
Keller–Bliesner Engineering
Irrigation & Water Resources
78 E. Center
Logan, Utah 84321

National Fish and Wildlife Foundation
San Juan River Fish Recovery Program
Razorback Sucker Rearing Pond Improvements
Avocet Pond Fence Installation

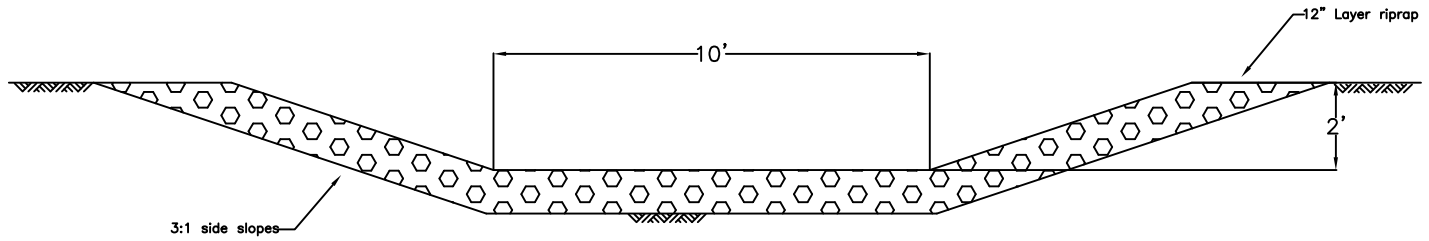
Job No. 68100–01
Date: 7/18/05
Sheet 3 of 6
DRAWING NO. L1001a
REV ②



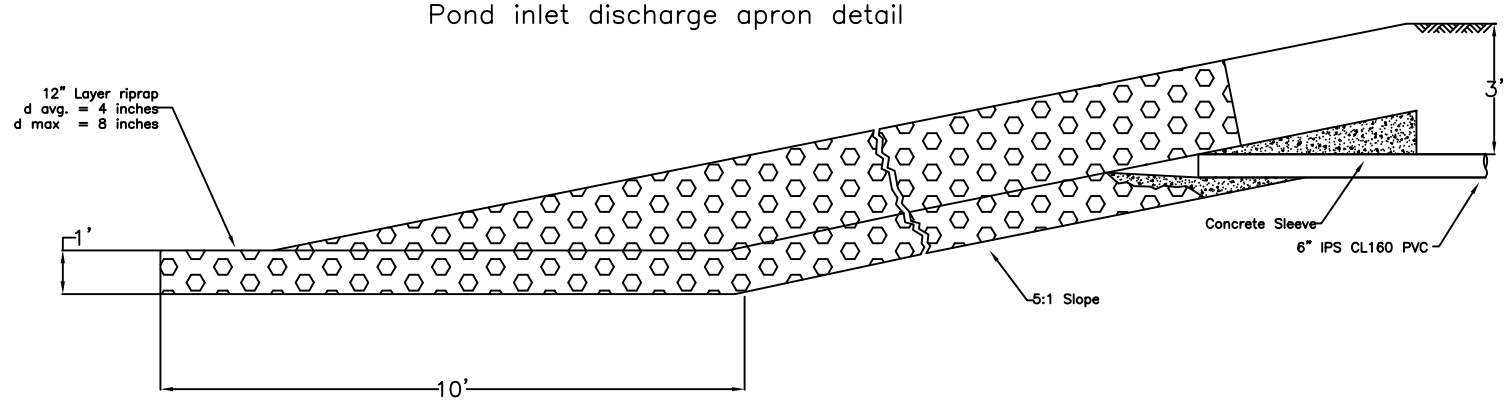
Middle Dike Profile
Hz. Scale 1"= 30'
Vert. Scale 1"= 3'



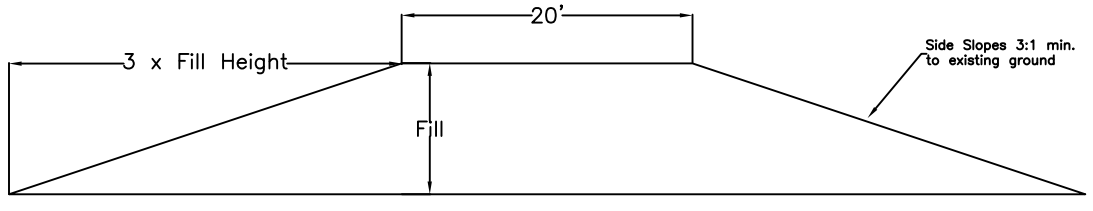
③ Float Valve Installation Detail



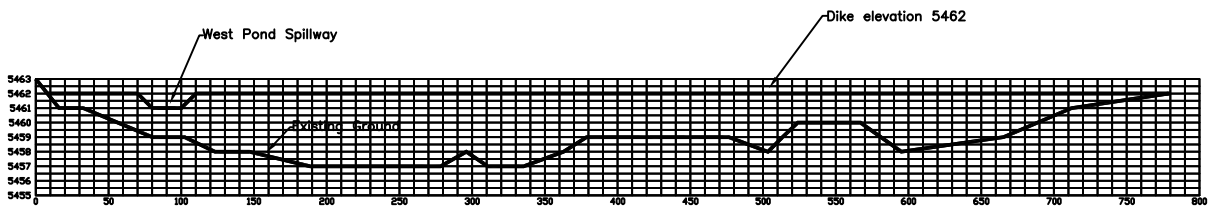
Pond inlet discharge apron detail



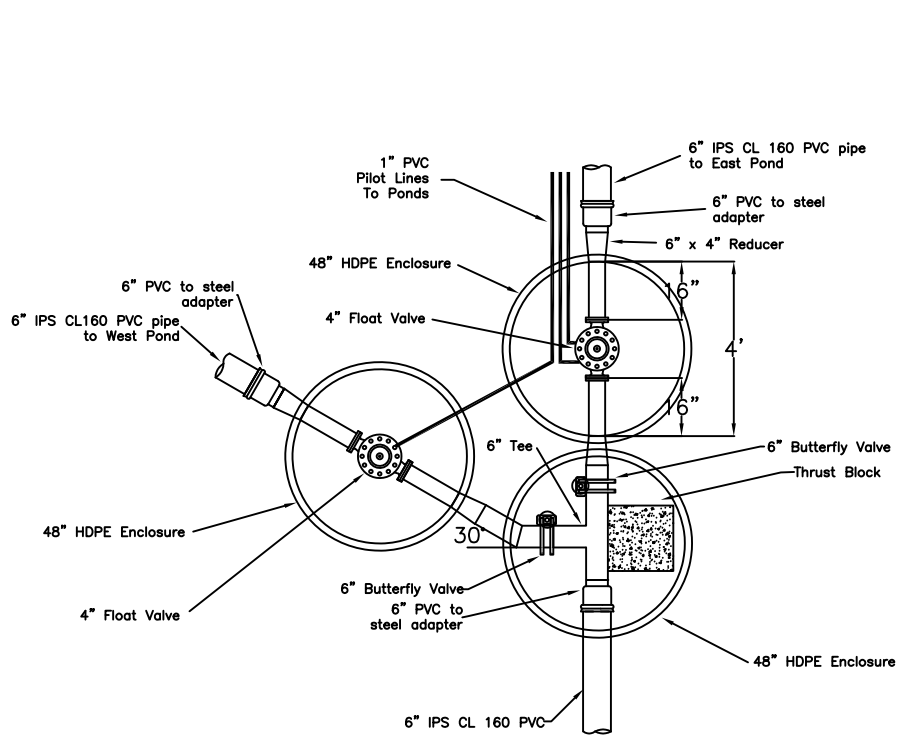
② Pond inlet detail



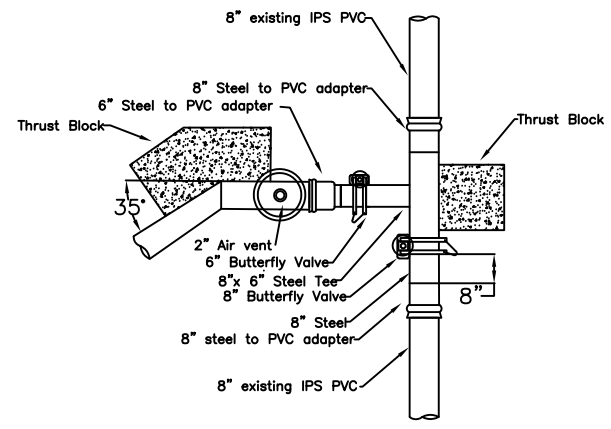
Dike Detail
Scale 1"= 3'



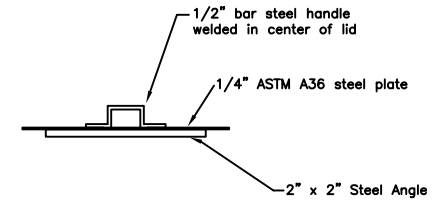
② Southwest Dike Profile
Hz. Scale 1"= 30'
Vert. Scale 1"= 3'



③ Pond Tee Detail



Turnout Detail



③ ENCLOSURE LID DETAIL
SCALE 1" = 1'

REV	Revisions	Date	Design	Draw	Check
③	Float Valve Detail Added	3/13/04	MI	MI	RDB
②	As built	3/24/98	MI	MI	RDB
①	For Construction	3/5/98	RDB	MI	RDB

Status: As built
Designed MI
Drawn MI
Checked RDB
Approved RDB
File Name: SJD101
SCALE 2 0 2 4 6
Coordinate System: N/A
Datum: N/A
Survey Data Source: N/A

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Irrigation & Water Resources
70 E. Center
Logan, Utah 84321

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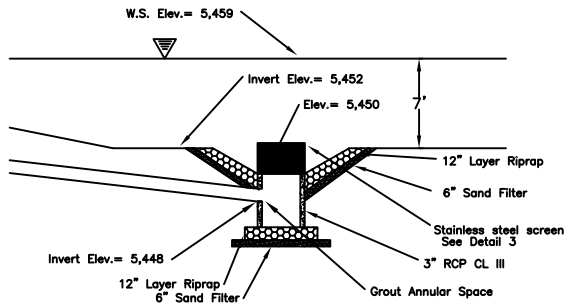
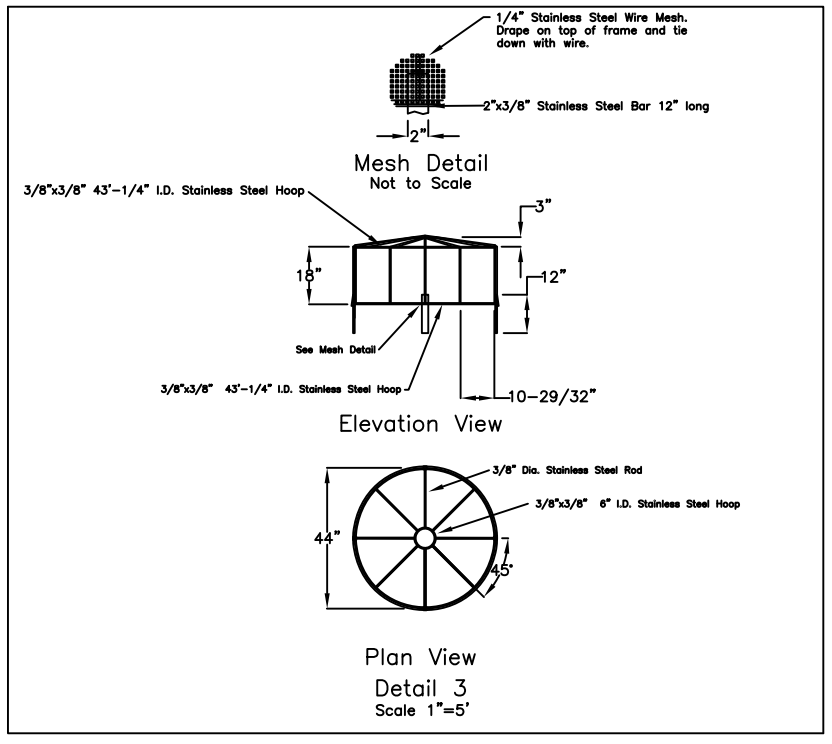
Navajo Indian Irrigation Project
San Juan Recovery Implementation Program

Avocet Fish Pond Details

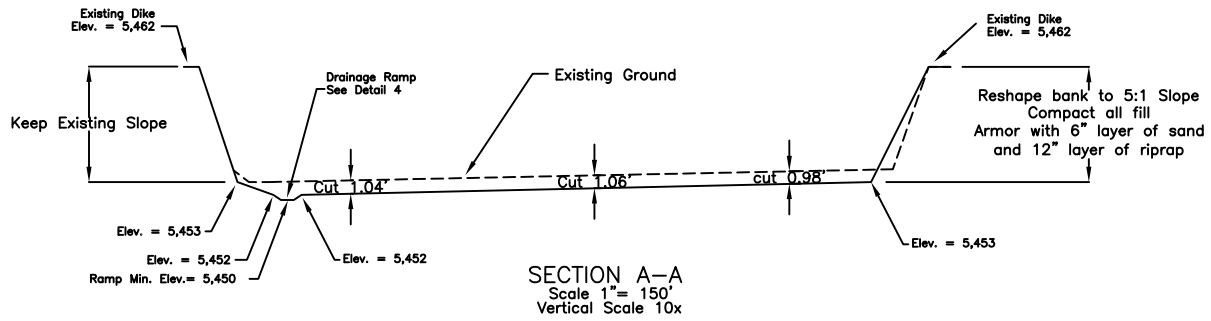
Job No. 208–100
Date: 3/3/98
Sheet 3 of 10
DRAWING NO. D101
REV ③



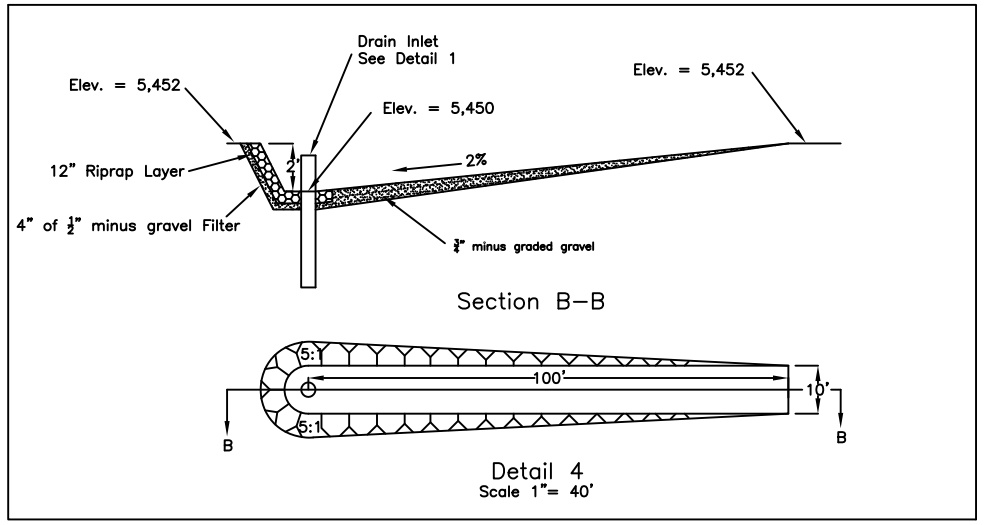
Detail 1
Scale 1"=15'

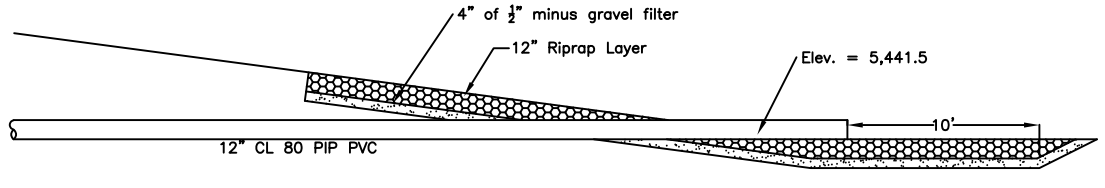


Detail 3
Scale 1"=5'

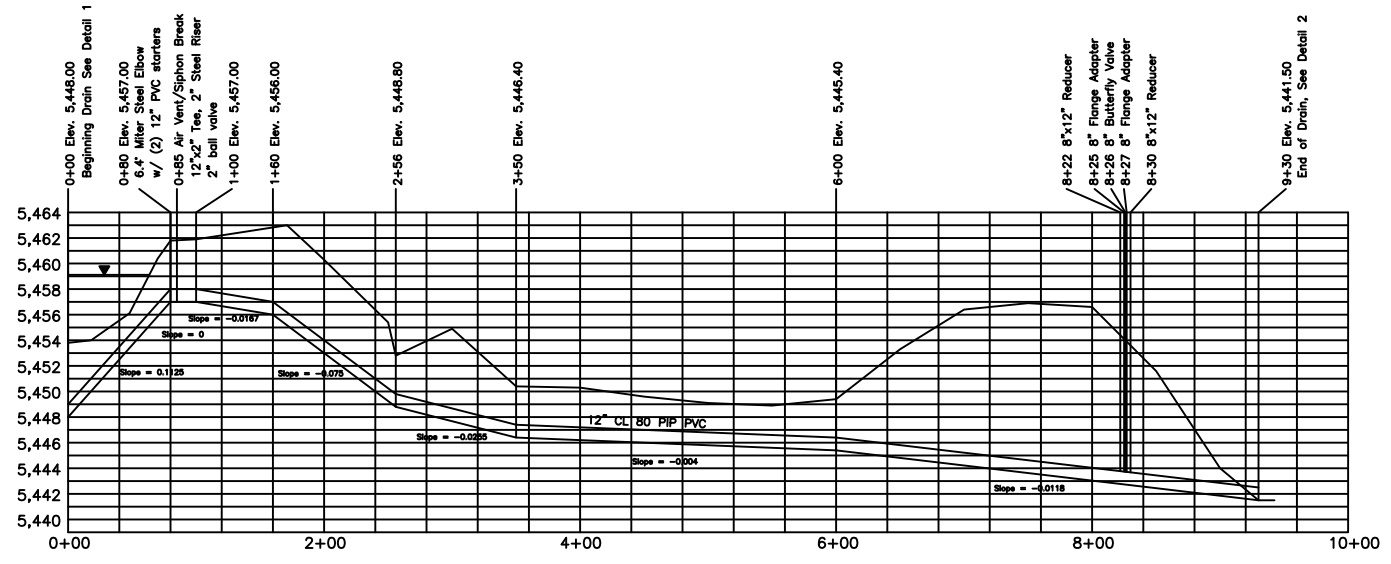


SECTION A–A
Scale 1"= 150'
Vertical Scale 10x





Detail 2
Scale 1"=10'



Drain Profile

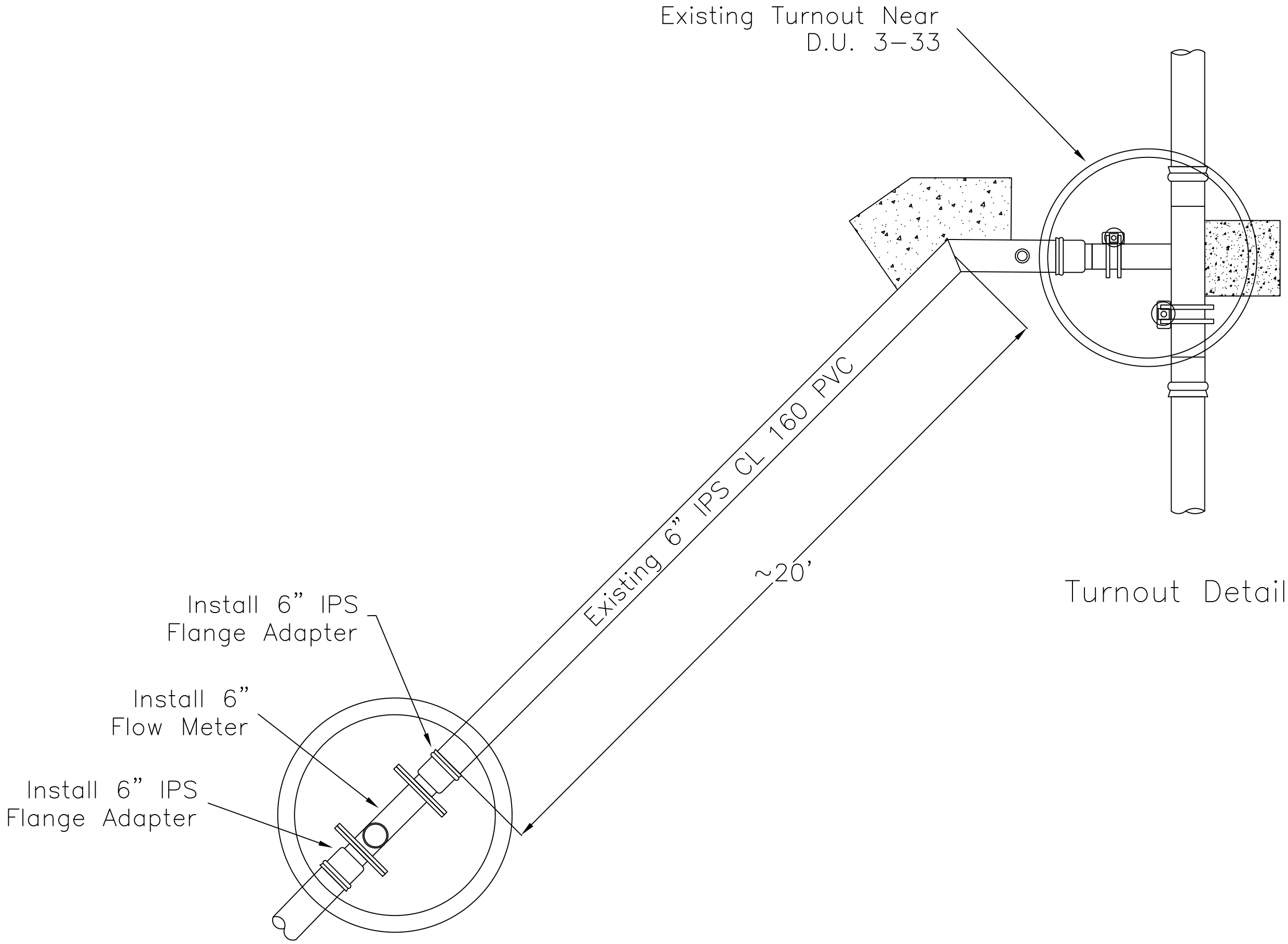
REV	Revisions	Date	Design	Draw	Check
1	As–built	2/10/06	MI	MI	RDB

Status: As–built
Designed RDB
Drawn MI
Checked RDB
Approved
File Name: NFWFL1001.dwg
Coordinate System: Local
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

Keller–Bliesner Engineering
Irrigation & Water Resources
78 E. Center
Logan, Utah 84321

National Fish and Wildlife Foundation
San Juan River Fish Recovery Program
Razorback Sucker Rearing Pond Improvements
Avocet Pond Details

Job No. 68100–01
Date: 6/8/05
Sheet 5 of 6
DRAWING NO. L1001
REV 1



Turnout Detail

REV	Revisions	Date	Design	Draw	Check
1	As–built	2/6/06	MI	MI	RDB

Status: As–built
Designed: MI
Drawn: MI
Checked: MI
Approved:
File Name: NFWFD1002.dwg

Not to Scale

Coordinate System:
Datum:
Survey Data Source: Keller–Bliesner

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78 E. Center
Logan, Utah 84321

National Fish and Wildlife Foundation
San Juan River Fish Recovery Program
Razorback Sucker Rearing Pond Improvements
Avocet Pond Flow Meter Installation

Job No. 68100–01
Date: 12/5/05
Sheet 6 of 6
DRAWING NO. D1002
REV 1

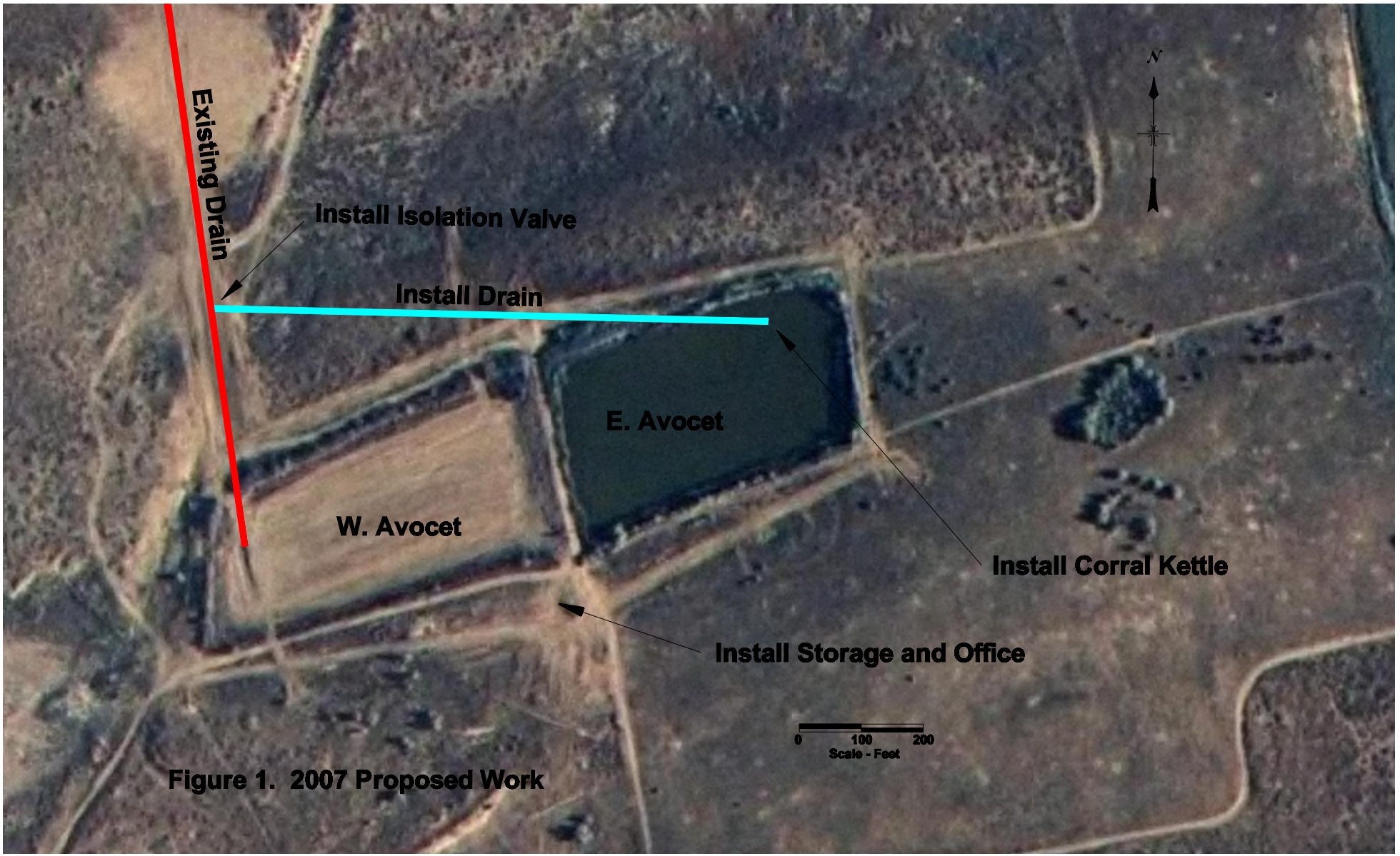
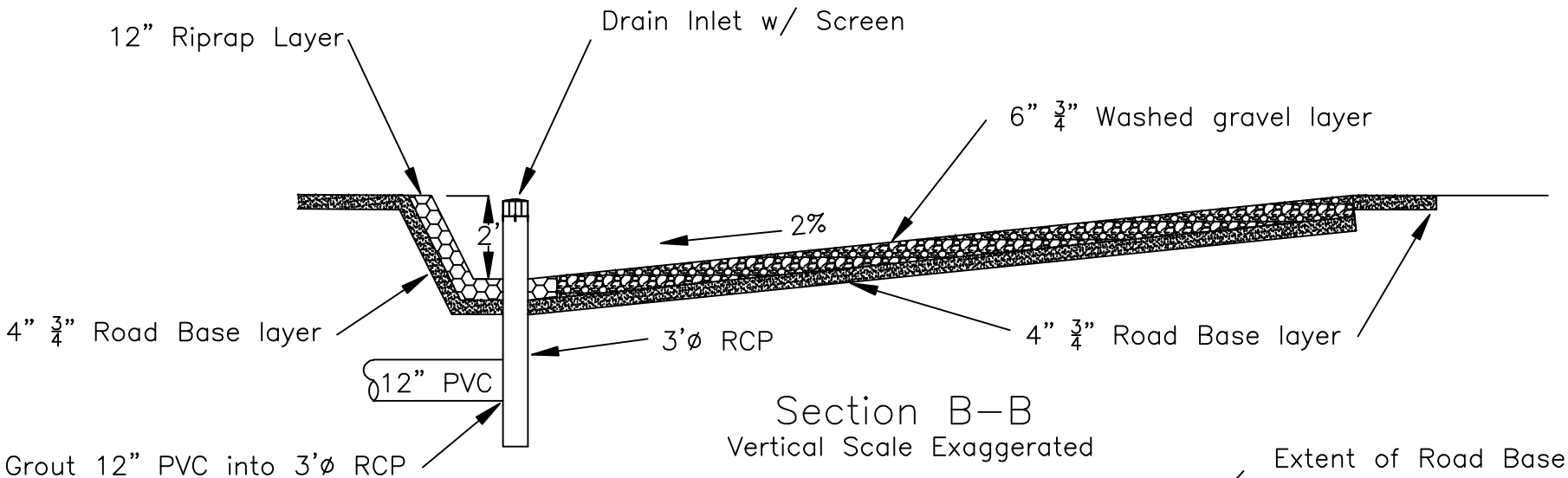
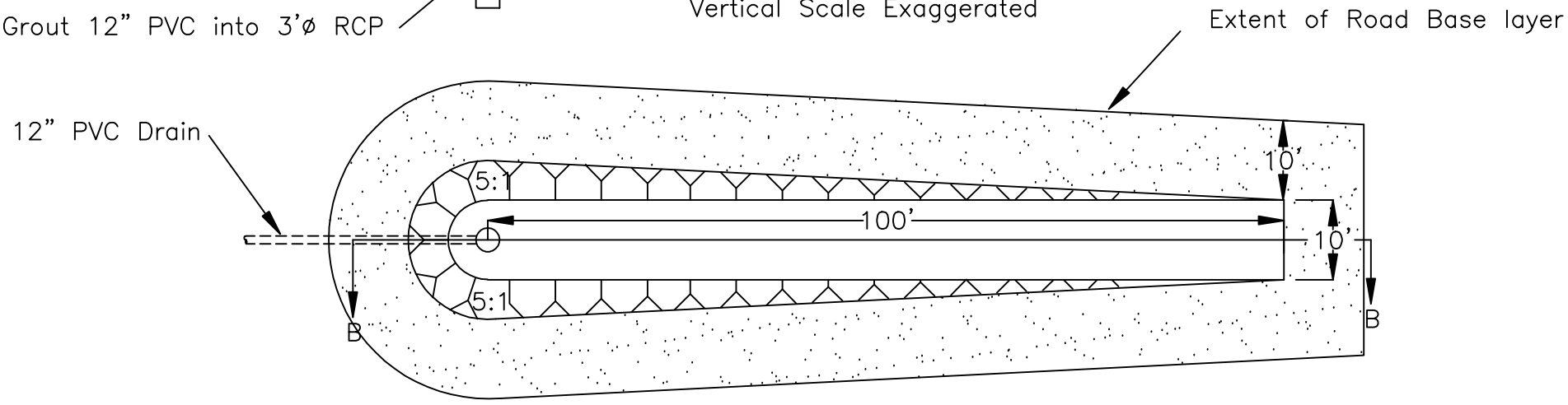


Figure 1. 2007 Proposed Work

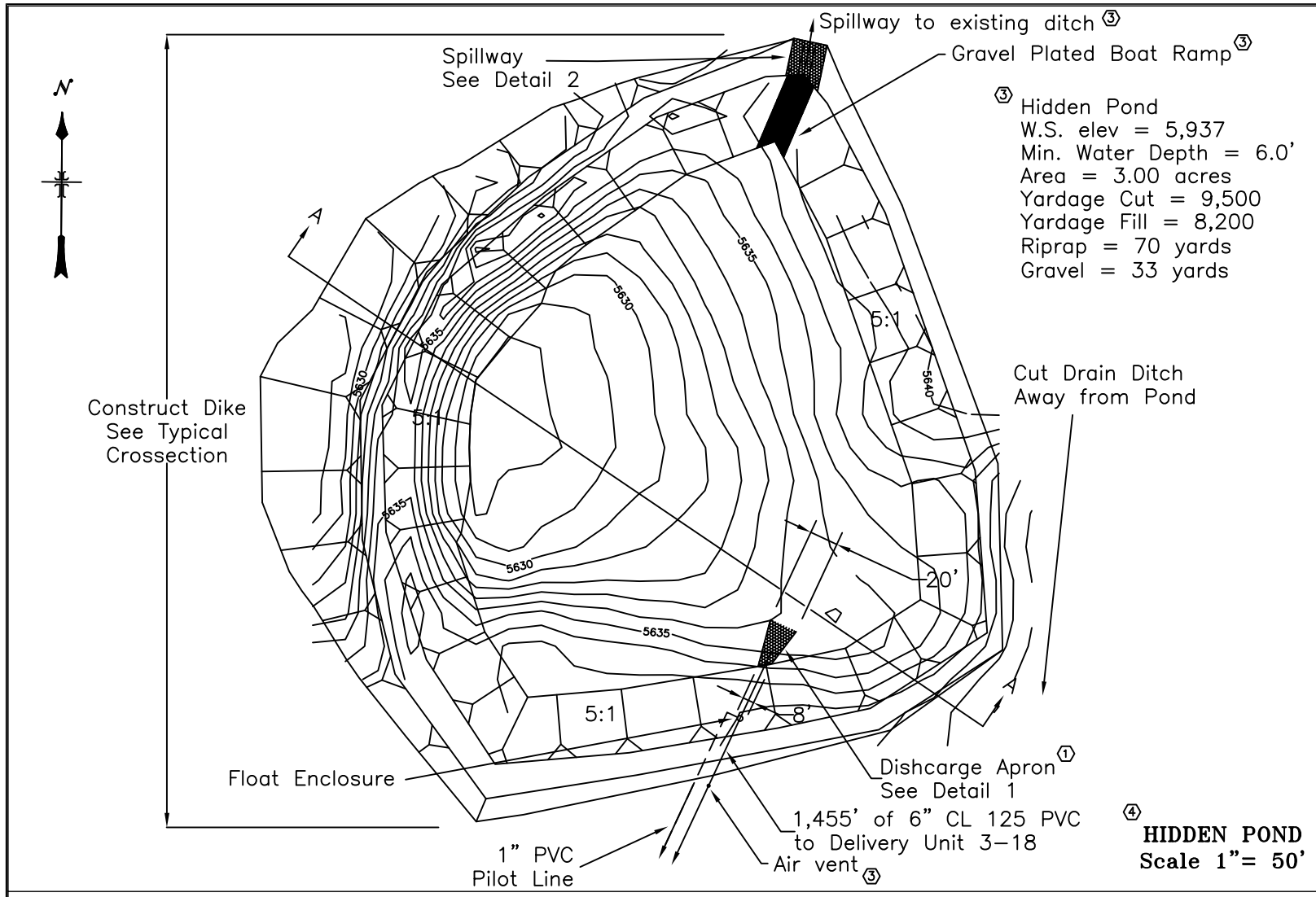


Section B–B
Vertical Scale Exaggerated

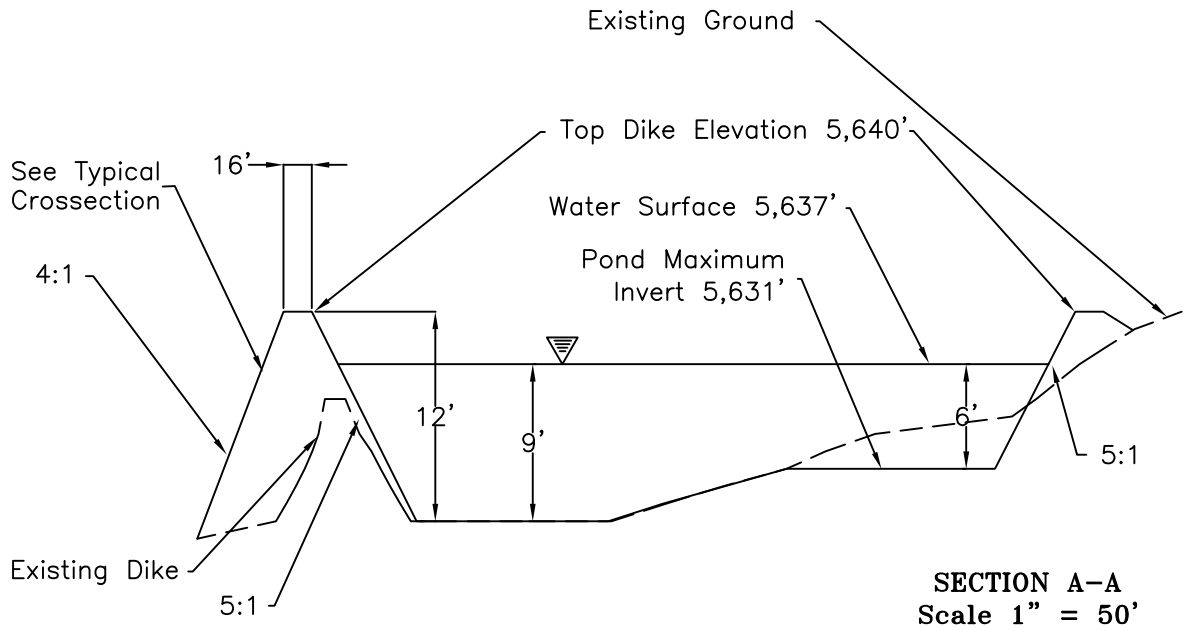


Kettle Detail

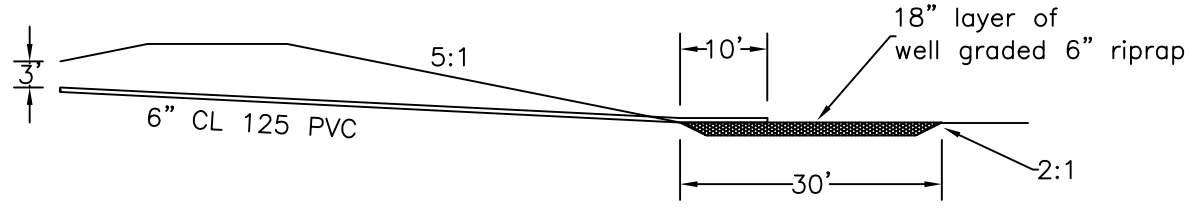
FIGURE 2



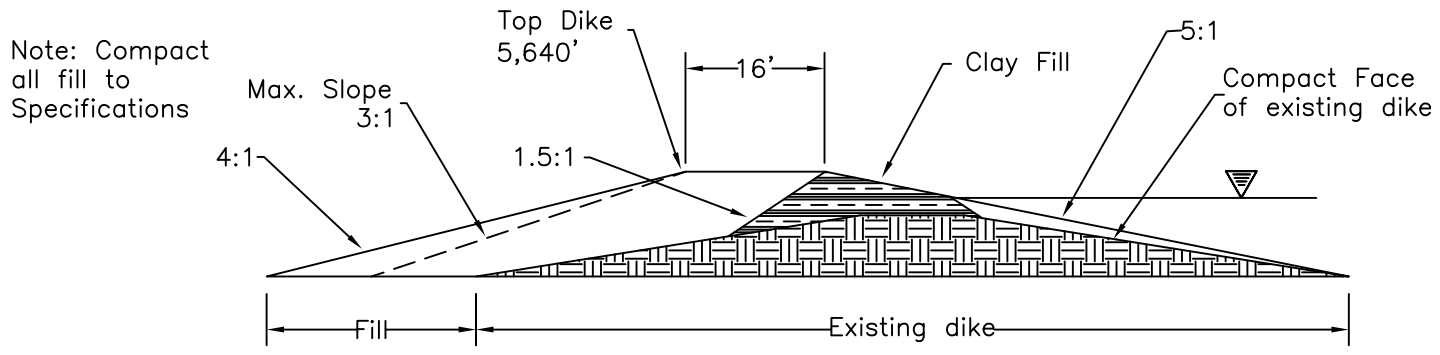
④ **HIDDEN POND**
Scale 1"= 50'



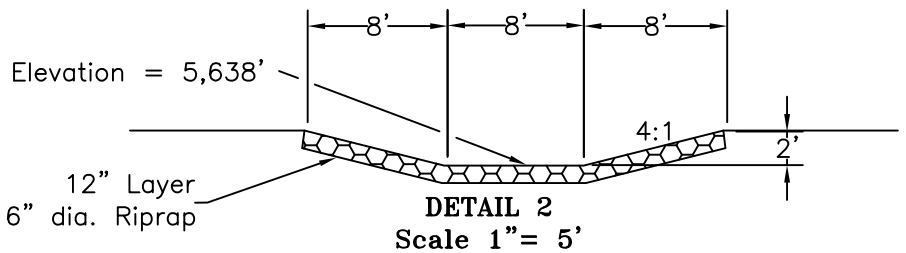
SECTION A–A
Scale 1" = 50'
Vert. Scale x 10



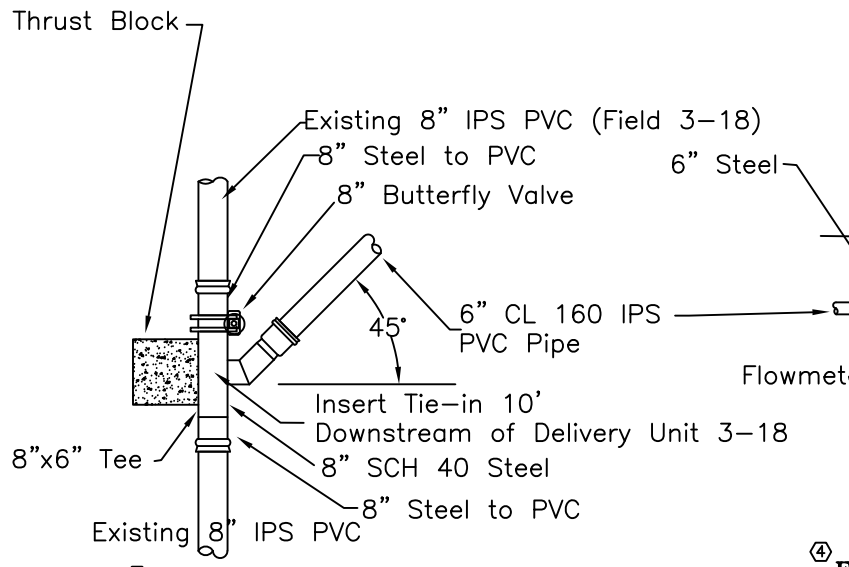
① **DETAIL 1**
Scale 1" = 10'



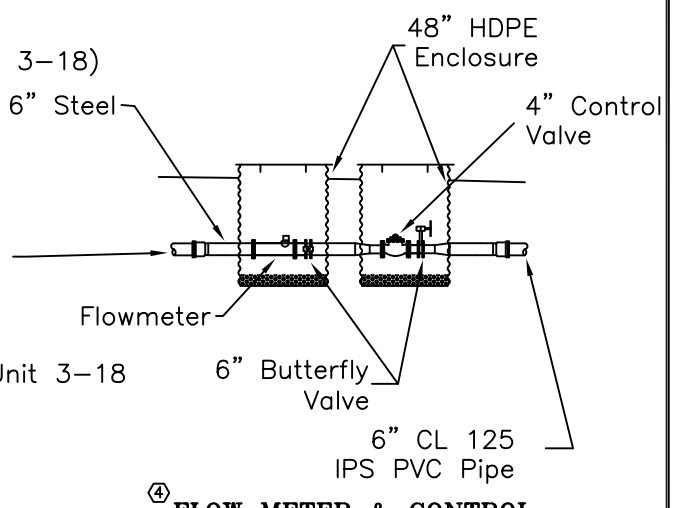
TYPICAL CROSS SECTION ①
Scale 1"=10'



DETAIL 2
Scale 1"= 5'



③ **TIE–IN DETAILS**
Scale 1" = 2'



④ **FLOW METER & CONTROL VALVE DETAILS**
Scale 1" = 4'

REV	Revisions	Date	Design	Draw	Check
④	Added control valve configuration	1/26/04	MI	MI	RDB
③	As Built	1/17/00	MI	MI	RDB
②	Edit plumbing	12/1/99	MI	MI	RDB
①	Move dam core, add discharge apron	11/20/99	RDB	MI	RDB

Status: As Built
Designed: MI
Drawn: MI
Checked: RDB
Approved:
File Name: SJL103.dwg
Scale – ft: 50 0 50 100 150
Coordinate System: Local
Datum: Local
Survey Data Source: BIA – NIIP

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Logan, Utah 84321

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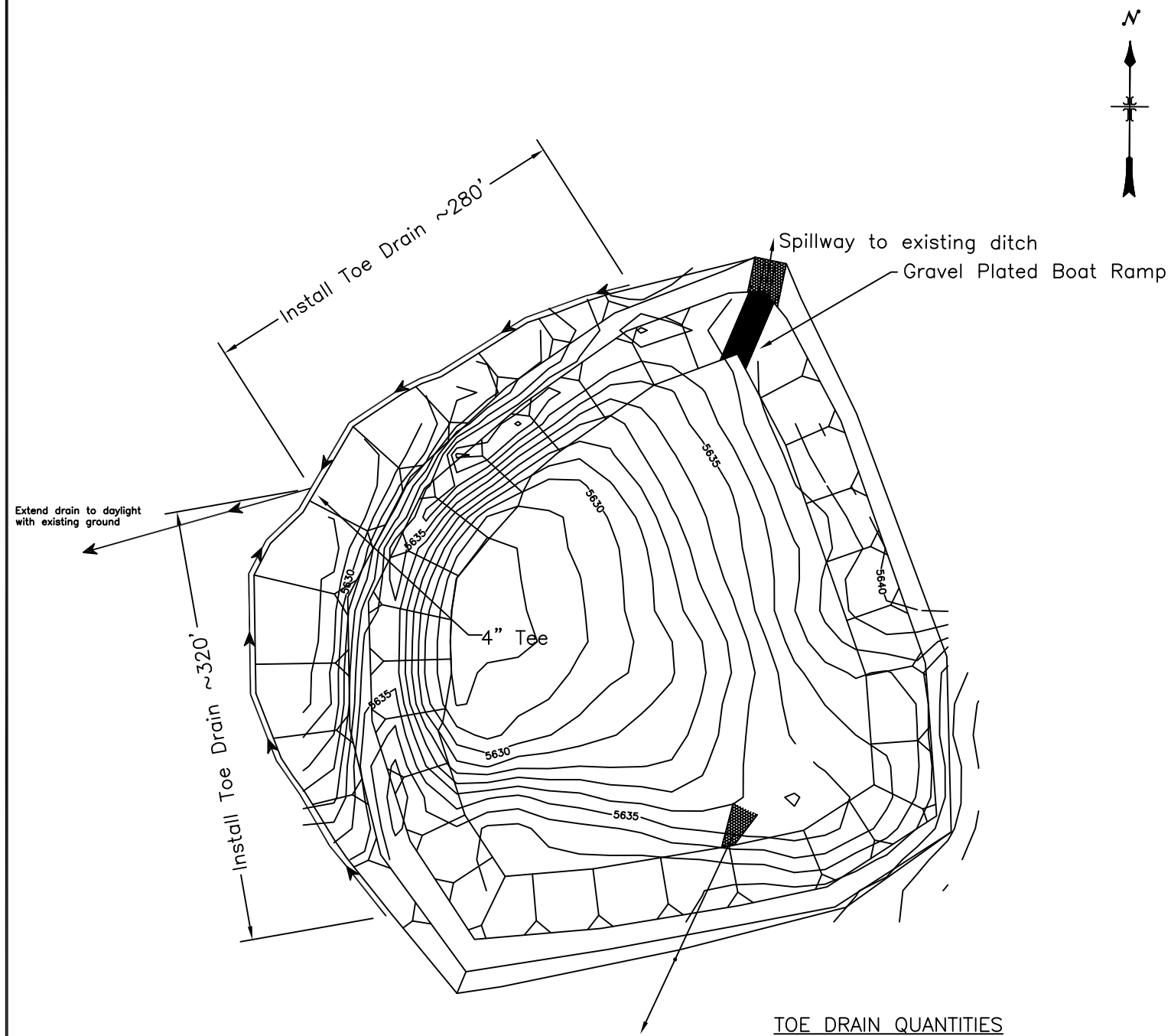
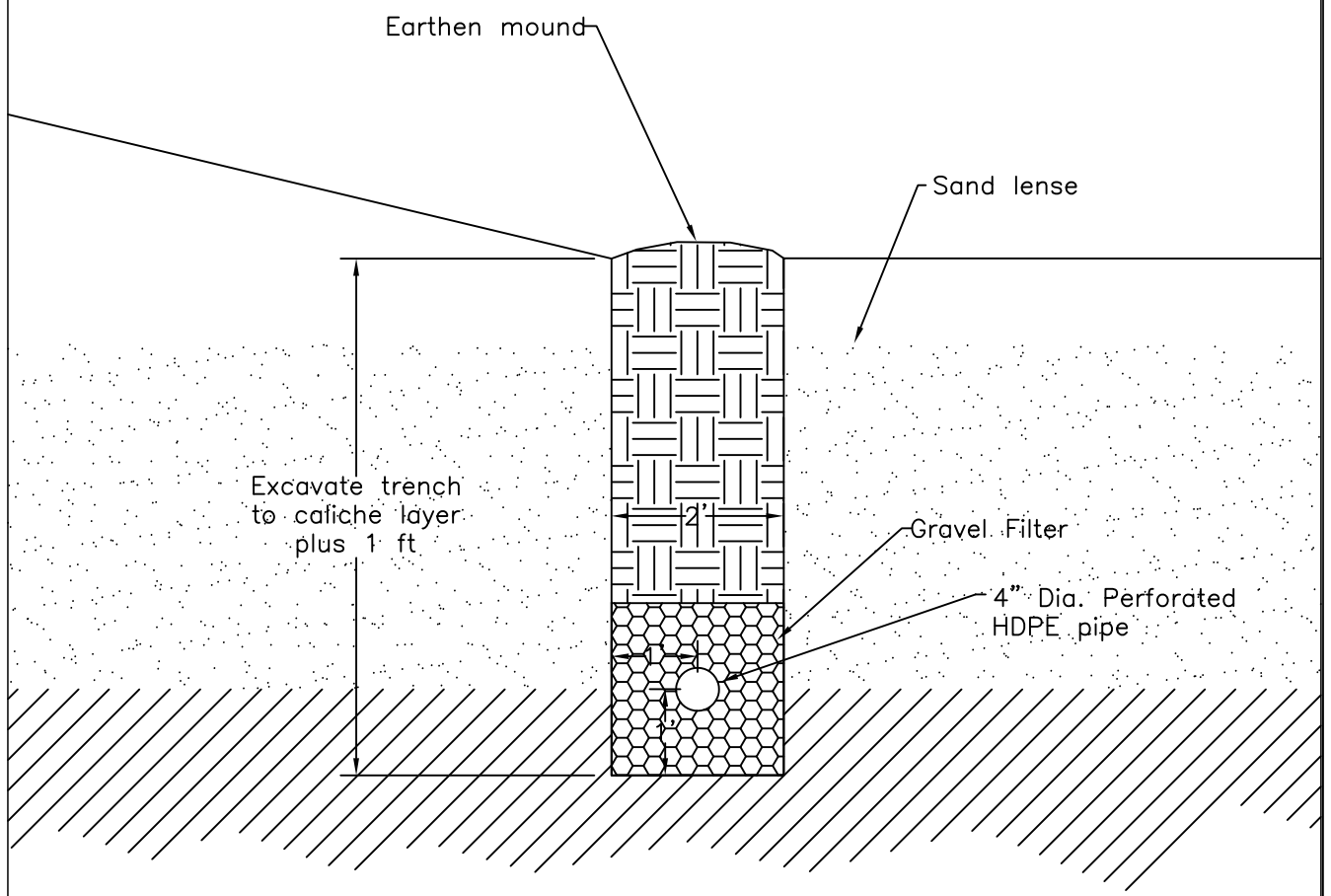
San Juan Section 7 Consultation
Hidden Pond Layout and Details

Job No. 208–100
Date: 10/20/99
Sheet 4 of 10
DRAWING NO. L103
REV ④



TOE DRAIN QUANTITIES
800 Ft Drain pipe
135 cu.yrd Gravel



DETAIL 1
Scale 1" = 1'

REV	Revisions	Date	Design	Draw	Check
1	Move dam core, add discharge apron	1/26/04	RDB	MI	RDB

Status: As built
Designed RDB
Drawn MI
Checked RDB
Approved
File Name: SJL104.dwg

50 0 50 100 150
Scale – ft

Coordinate System: Local
Datum: Local
Survey Data Source: BIA – NIIP

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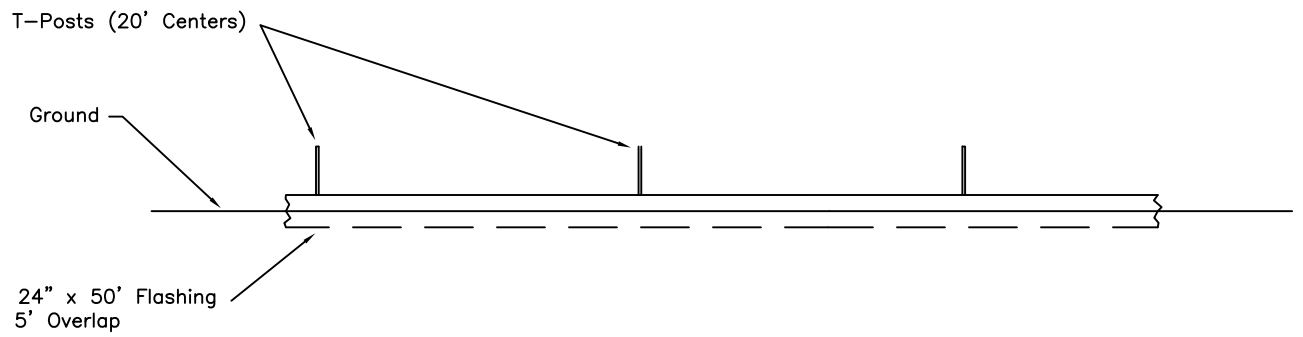
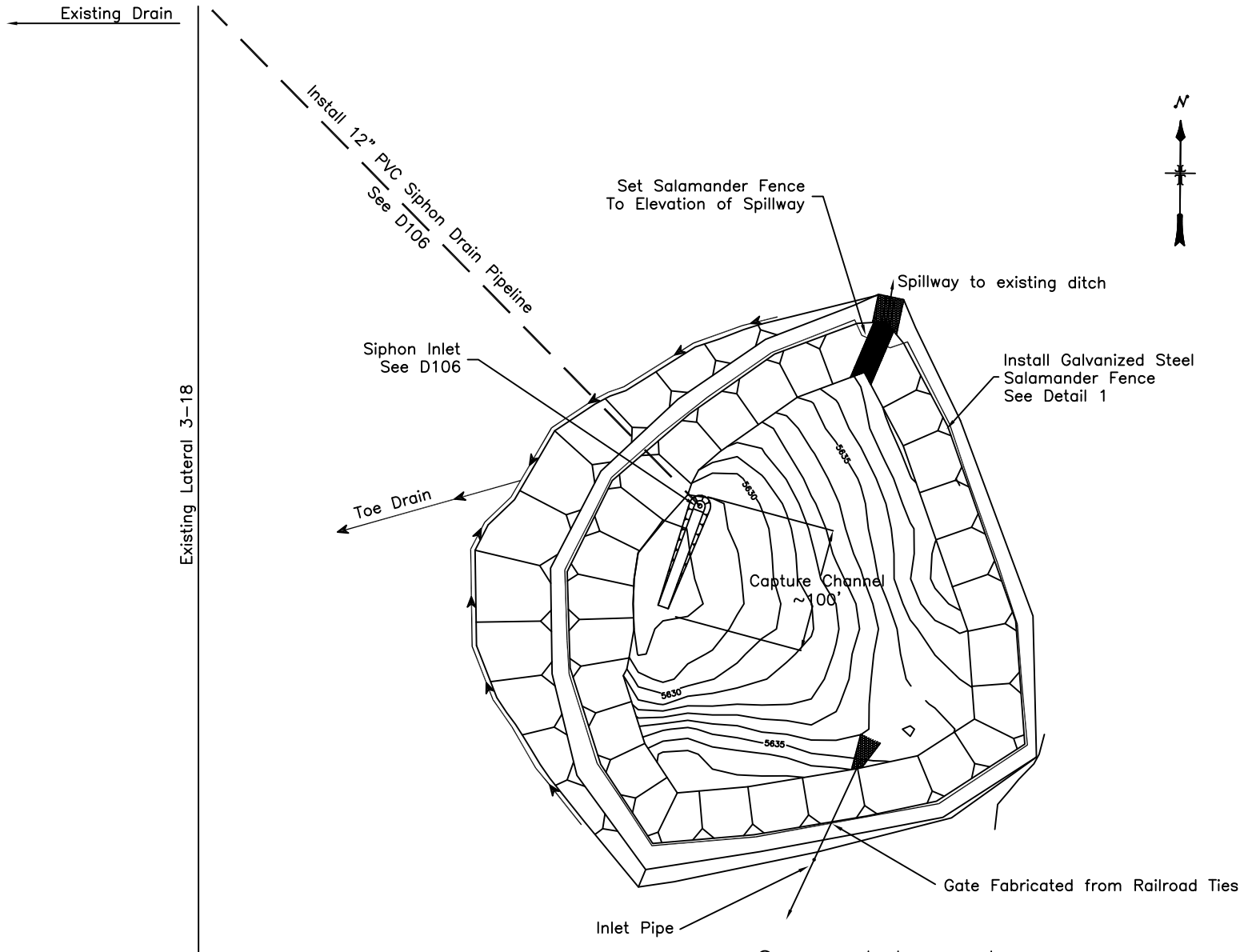
Navajo Indian Irrigation Project
San Juan Section 7 Consultation
Hidden Pond Toe Drain
Layout and Details

Job No. 208–100
Date: 10/03/00
Sheet 5 of 10
DRAWING NO. L104
REV 1



Detail 1



General Layout

REV	Revisions	Date	Design	Draw	Check
2	As–built	11/21/03	MI	MI	RDB
1	Added Capture Channel	11/7/03	MI	MI	RDB

Status: As–built
Designed: MI
Drawn: MI
Checked: RDB
Approved:
File Name: SJL106.dwg

Not to Scale

Coordinate System: n/a
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

Keller–Bliesner Engineering
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Logan, Utah 84321

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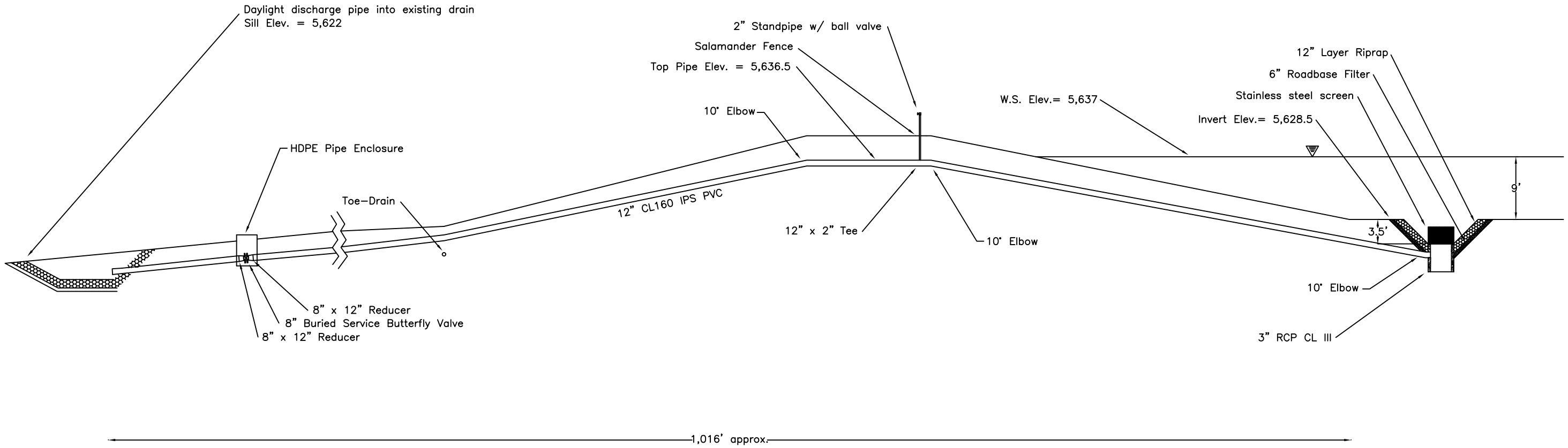
Navajo Indian Irrigation Project
San Juan Section 7 Consultation
Hidden Pond Salemander Fence Layout

Job No. 208–01
Date: 8/12/03
Sheet 6 of 10
DRAWING NO. L106
REV 2



REV	Revisions	Date	Design	Draw	Check
3	As–built	3/13/04	MI	MI	RDB
2	Changed File name; Sheet 2 of 2	11/7/03	MI	MI	RDB
1	For Construction	8/12/03	MI	MI	RDB

Status: As–built
Designed MI
Drawn MI
Checked RDB
Approved
File Name: SJL106.dwg

Not to Scale

Coordinate System: n/a
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

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Logan, Utah 84321

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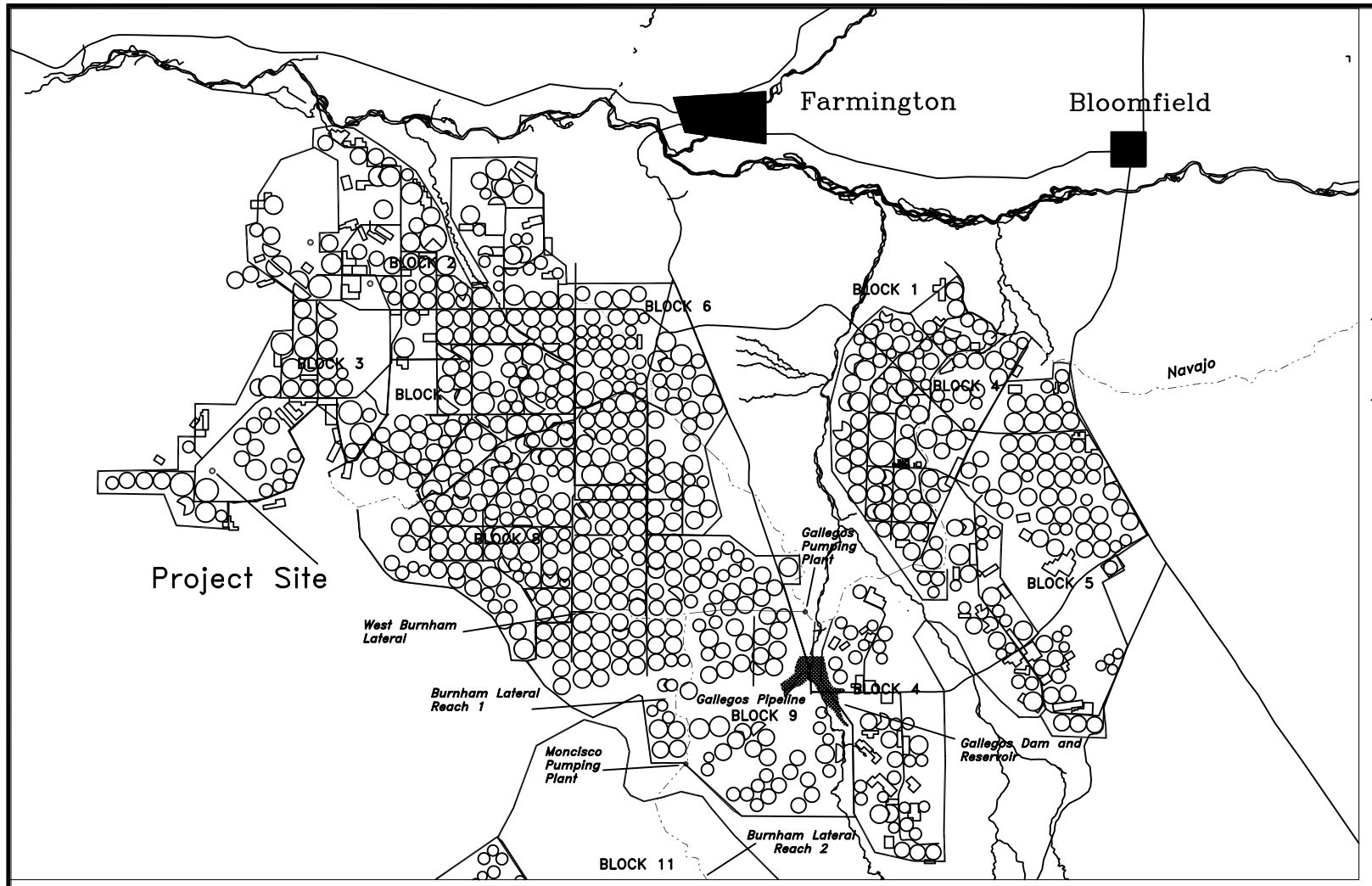
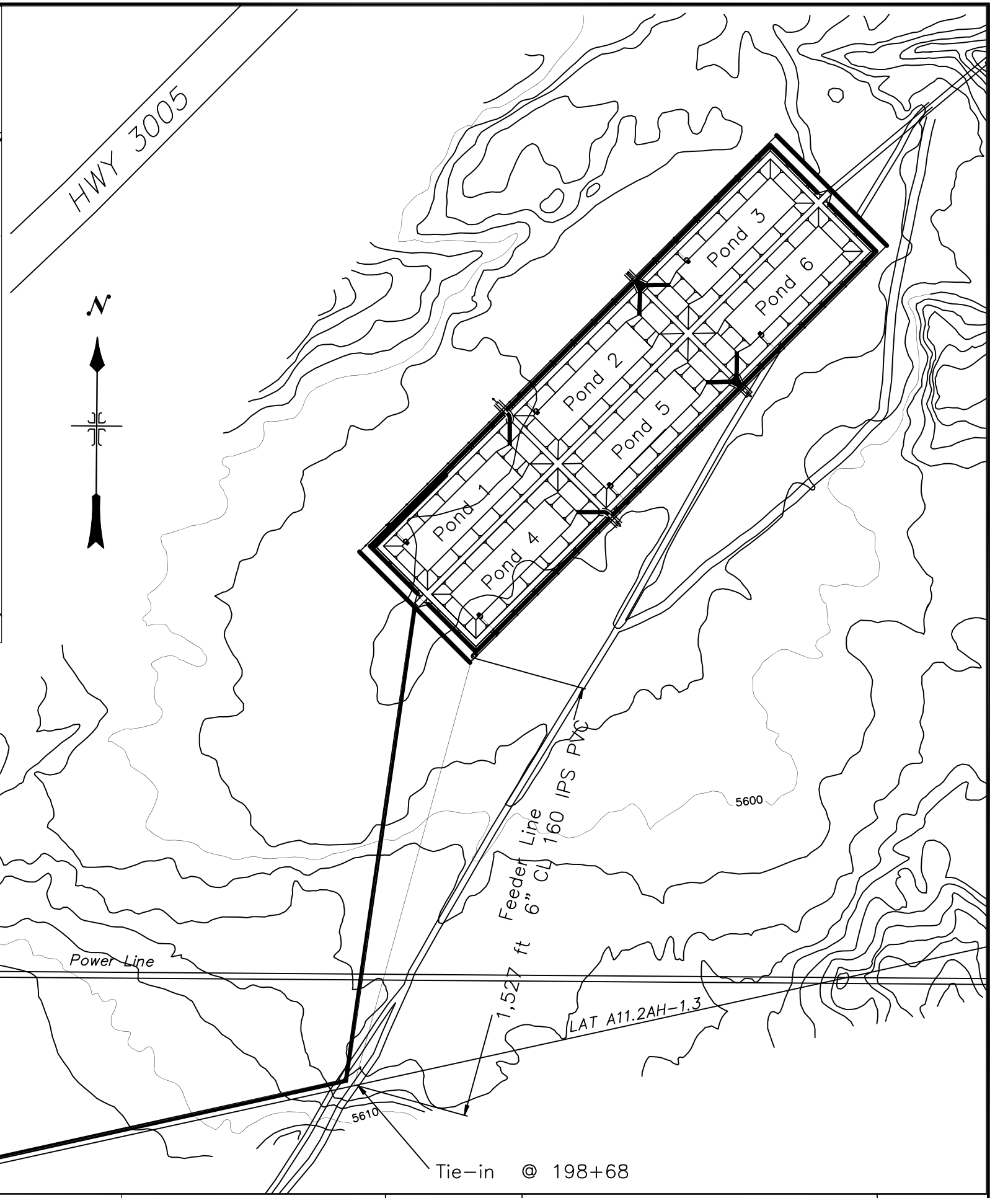
Navajo Indian Irrigation Project
San Juan Section 7 Consultation

Hidden Pond Drainage Siphon Details

Job No. 208–01
Date: 7/3/03
Sheet 7 **of** 10
DRAWING NO. D106
REV 3





REV	Revisions	Date	Design	Draw	Check
1	Added road lengths	12/19/01	MI	MI	RDB

Status: As–Built
Designed: MI
Drawn: MI
Checked: RDB
Approved:
File Name: SJL107.dwg

200 0 200 400 600
SCALE – Ft

Coordinate System: local
Datum: USGS MSL
Survey Data Source: Keller–Bliesner / BIA NIIP

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Logan, Utah 84321

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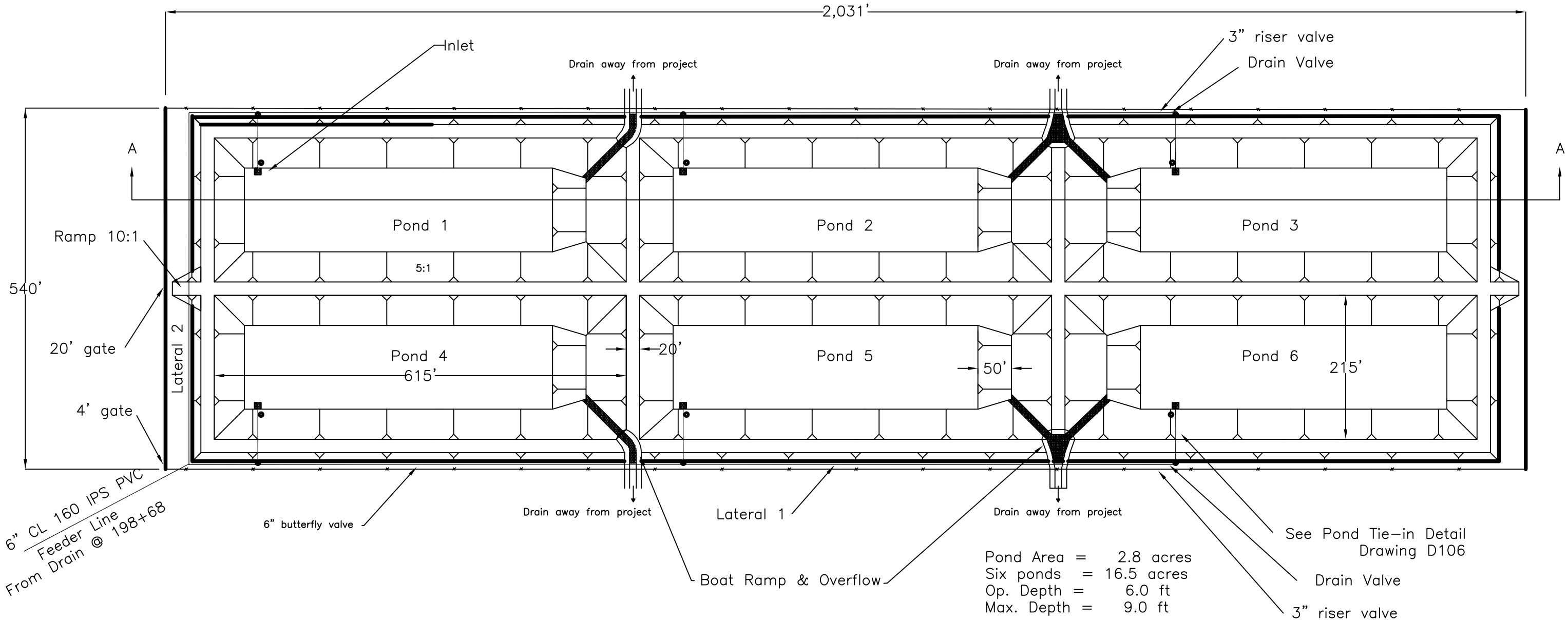
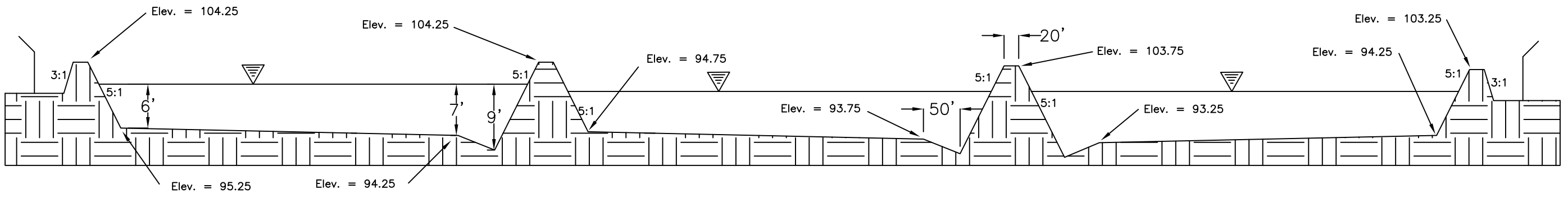
Navajo Indian Irrigation Project
San Juan Recovery Implementation Program

6–Pack Pond
Project Site Layout

Job No. 208–02
Date: 7/21/01
Sheet 8 of 10
DRAWING NO. L107
REV 1





Section A–A
Vertical Scale 10x

REV	Revisions	Date	Design	Draw	Check
4	Changed Drawing Number to L108	1/26/04	MI	MI	RDB
3	As–built	12/13/01	MI	MI	RDB
2	Submitted for Construction	8/17/01	MI	MI	RDB
1	Designed Pond Elevations	7/20/01	MI	MI	RDB

Status: As built
Designed RDB
Drawn MI
Checked RDB
Approved
File Name: SJL106.dwg
250 0 250 500 750 SCALE – feet
Coordinate System: n/a
Datum: n/a
Survey Data Source: n/a

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Logan, Utah 84321

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Navajo Indian Irrigation Project
San Juan Recovery Implementation Program
6–Pack Pond
Pond Layout

Job No. 208–02
Date: 4/11/01
Sheet 9 of 10
DRAWING NO. L106
REV 4

APPENDIX 2 - CLA-VAL USER MANUAL

MODEL 124-01
624-01

Float Valve

- **Accurate & Repeatable Level Control**
- **On-Off Non-Modulating Action**
- **Fully Adjustable High & Low Level Settings**
- **Simple Design, Proven Reliable**
- **Easy Installation and Maintenance**

The Cla-Val Model 124-01/624-01 Float Valve is a non-modulating valve which accurately controls the liquid level in tanks. This valve is designed to open fully when the liquid level reaches a preset low point and close drip tight when the level reaches a preset high point.

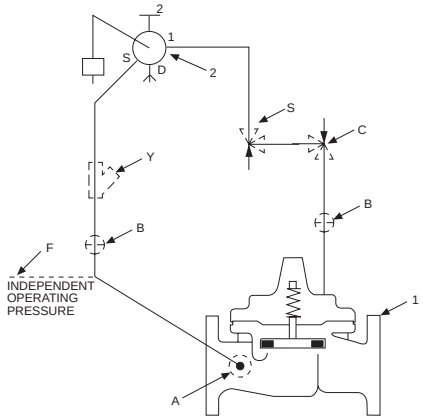
This is a hydraulically operated, diaphragm valve with the pilot control and float mechanism mounted on the cover of the main valve. The float positions the pilot control to close the valve when the float contacts the upper stop. The high and low liquid levels are adjusted by positioning the stop collars on the float rod. The difference between high and low levels can be adjusted to as little as one inch, or to as much as 18 inches by adding optional float rod extensions. Level settings can be as much as 11½ feet below the valve. The float mechanism may be located remotely from the main valve. See the technical data sheet on Model CF1-C1 Float Control for additional information.

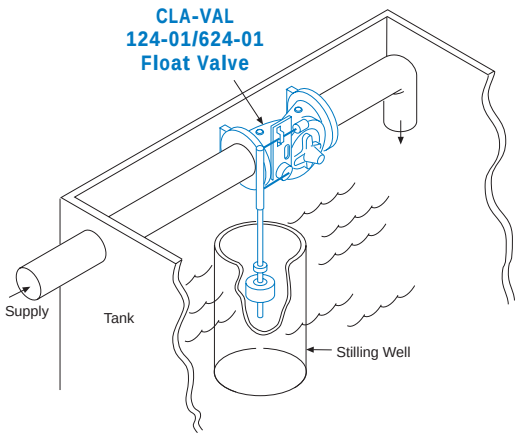
Schematic Diagram

Item	Description
1	Hytrol (Main Valve)
2	CF1-C1 Float Control

Optional Features

Item	Description
A	X46A Flow Clean Strainer
B	CK2 Cock (Isolation Valve)
C	CV Flow Control (Closing)
F	Independent Operating Pressure
S	CV Flow Control (Opening)
Y	X43 "Y" Strainer





Typical Applications

The Model 124-01/624-01 Float Valve is commonly mounted above the high water level in a tank. Globe pattern valves are supplied standard with the float control mounted on the cover as illustrated, with a horizontal discharge. Angle valves are configured to discharge downwards.

Installation

A stilling well (8" minimum diameter) must be provided around the float if the liquid surface is subject to turbulence, ripples or wind. When the valve is mounted on top of the tank roof a 2" clearance hole should be provided for side movement of the float rod where the rod goes through the top of the tank.

An independent source of air or water may be used to operate the valve. The pressure from this independent source must at all times be equal to or greater than pressure at the valve inlet.

If minimum flowing line pressure is less than 10 psi, consult Cla-Val for full details.

If the float control is remotely mounted from the main valve, the control may be installed at any elevation above the valve, provided the flowing line pressure in psi is equal to or greater than the vertical distance in feet between the valve and the float control. See the technical data sheet on Model CF1-C1 for additional information.

Model 124-01 (Uses Basic Valve Model 100-01)

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class			
		Flanged			Screwed
Grade	Material	ANSI Standards*	150 lb.	300 lb.	End** Details
ASTM A-536	Ductile Iron	B16.42	250	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400
ASTM B62	Bronze	B16.24	225	400	400
Type 304	Stainless Steel	B16.5	285	400	400
356-T6	Aluminum	B16.1	275	—	—

Note: *ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
** End Details machined to ANSI B2.1 specifications.

Cover Capacity

Liquid Volume Displaced from Diaphragm Chamber When Valve Opens			
Valve Size	Displacement	Valve Size	Displacement
½"	0.34 fl. oz.	2"	.032 gal
¾"	0.34 fl. oz.	2 - ½"	.043 gal
1"	0.7 fl. oz.	3"	.080 gal
1 - ¼"	.020 gal	4"	.169 gal
1 - ½"	.020 gal	6"	.531 gal

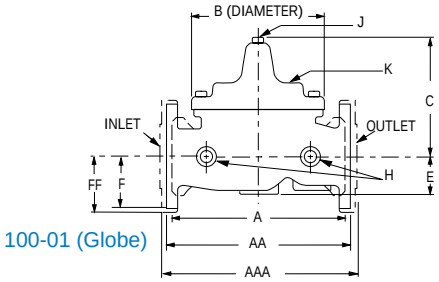
Materials

Component	Material Options				
Body & Cover	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Available Sizes	½" - 6"	½" - 6"	½" - 6"	½" - 6"	½" - 6"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Trim: Disc Guide, Seat & Cover Bearing	Bronze is standard. Stainless Steel is optional.			Stainless Steel is standard.	
Disc	Buna-N® Rubber				
Diaphragm	Nylon Reinforced Buna-N® Rubber				
Stem, Nut & Spring	Stainless Steel				

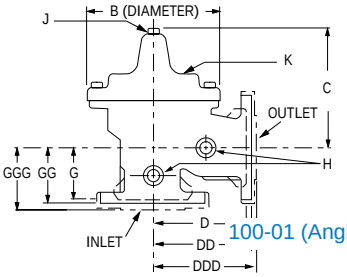
2" Globe, Screwed

4" Angle, Flanged

Dimensions
(In inches)



100-01 (Globe)



100-01 (Angle)

VALVE SIZE (Inches)	½ - ¾	1	1¼ -1½	2	2 ½	3	4	6
A Screwed	3.50	5.12	7.25	9.38	11.00	12.50	—	—
AA 150 ANSI	—	—	8.50*	9.38	11.00	12.00	15.00	20.00
AAA 300 ANSI	—	—	9.00	10.00	11.62	13.25	15.62	21.00
B DIA.	3.15	4.38	5.62	6.62	8.00	9.12	11.50	15.75
C MAX.	3.00	2.75	5.50	6.50	7.56	8.19	10.62	13.38
D Screwed	—	—	3.25	4.69	5.50	6.25	—	—
DD 150 ANSI	—	—	—	4.69	5.50	6.00	7.50	10.00
DDD 300 ANSI	—	—	—	5.00	5.81	6.63	7.81	10.50
E	0.75	1.25	1.12	1.50	1.69	2.06	3.19	4.31
F 150 ANSI	—	—	2.50	3.00	3.50	3.75	4.50	5.50
FF 300 ANSI	—	—	3.06	3.25	3.75	4.13	5.00	6.25
G Screwed	—	—	1.88	3.25	4.00	4.50	—	—
GG 150 ANSI	—	—	—	3.25	4.00	4.00	5.00	6.00
GGG 300 ANSI	—	—	—	3.50	4.31	4.38	5.31	6.50
H NPT Body Tapping	⅛	¼	⅜	⅜	½	½	¾	¾
J NPT Cover Center Plug	⅛	¼	¼	½	½	½	¾	¾
K NPT Cover Tapping	⅛	¼	⅜	⅜	½	½	¾	¾
Valve Stem Internal Thread UNF	—	—	10-32	10-32	10-32	¼-28	¼-28	⅜-24
Stem Travel	—	—	0.4	0.6	0.7	0.8	1.1	1.7
Approx.Ship Wt. Lbs.	3	8	15	35	50	70	140	285

Model 624-01 (Uses Basic Valve Model 100-20)

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 lb.	300 lb.
ASTM A-536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
ASTM B62	Bronze	B16.24	225	400
Type 304	Stainless Steel	B16.5	285	400
356-T6	Aluminum	B16.1	275	—

Note: *ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.

Cover Capacity

Liquid Volume Displaced from Diaphragm Chamber When Valve Opens			
Valve Size	Displacement	Valve Size	Displacement
3"	.032 gal	6"	.169 gal
4"	.080 gal	8"	.531 gal

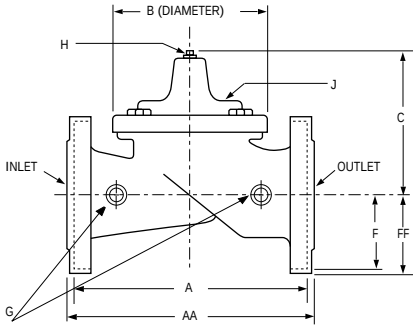
Materials

Component	Material Options				
Body & Cover	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Available Sizes	3" - 8"	3" - 8"	3" - 8"	3" - 8"	3" - 8"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Trim: Disc Guide, Seat & Cover Bearing	Bronze is standard. Stainless Steel is optional.			Stainless Steel is standard.	
Disc	Buna-N® Rubber				
Diaphragm	Nylon Reinforced Buna-N® Rubber				
Stem, Nut & Spring	Stainless Steel				

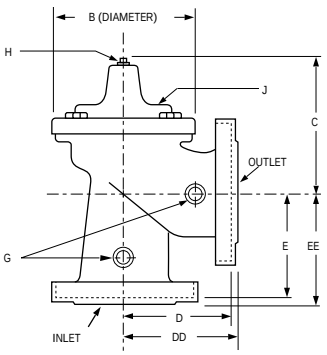
3" Globe, Flanged

6" Angle, Flanged

Dimensions
(In inches)



100-20 (Globe)



100-20 (Angle)

VALVE SIZE (Inches)	**3**	**4**	**6**	**8**
A 150 ANSI	10.25	13.88	17.75	21.38
AA 300 ANSI	11.00	14.50	18.62	22.38
B DIA.	6.62	9.12	11.50	15.75
C MAX.	7.00	8.62	11.62	15.00
D 150 ANSI	—	6.94	8.88	10.69
DD 300 ANSI	—	7.25	9.38	11.19
E 150 ANSI	—	5.50	6.75	7.25
EE 300 ANSI	—	5.81	7.25	7.75
F 150 ANSI	3.75	4.50	5.50	6.75
FF 300 ANSI	4.12	5.00	6.25	7.50
G NPT Body Tapping	⅜	½	¾	¾
H NPT Cover Center Plug	½	½	¾	¾
J NPT Cover Tapping	⅜	½	¾	¾
Valve Stem Internal Thread UNF	10-32	¼-28	¼-28	⅜-24
Stem Travel	0.6	0.8	1.1	1.7
Approximate Shipping Weight Lbs.	45	85	195	330

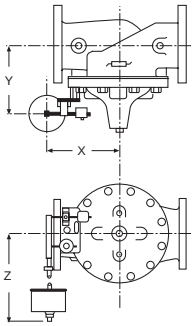
Valve Selection

			These Symbols and Indicate Available Sizes*										
		Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"
		End Details	Screwed				Screwed or Flanged				Flanged		
Model 124-01	Basic Valve 100-01	Globe	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		Angle						✓	✓	✓	✓	✓	
	Suggested Flow-GPM	Max. Continuous	19	33	55	93	125	208	300	460	800	1800	
		Max. Intermittent	24	42	68	120	160	260	370	580	990	2250	
Model 624-01	Basic Valve 100-20	Globe								✓**	✓	✓	✓
		Angle									✓	✓	✓
	Suggested Flow-GPM	Max. Continuous								260	580	1025	2300
		Max. Intermittent											

✖ **624-01 is the reduced internal port size version of the 124-01**
Refer to the 100-01 or the 100-20 Technical Data Sheet for basic valve options.
Max. Continuous Flow based on 20 fps (100-01), 25 fps (100-20)
Max. Intermittent Flow Based on 25 fps (100-01)

* See the 124-02/624-02 Technical Data Sheet for larger sizes.
**Flanged End Detail Only

Pilot System Dimensions

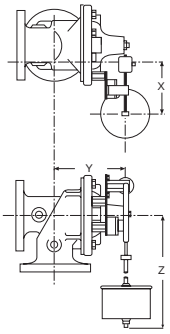


124-01 1/2" to 6"
624-01 3" to 8"
GLOBE

124-01/624-01 Float Valve (Globe)									
Size	½" & ¾"	1"	1¼" & 1½"	2"	2 ½"	3"	4"	6"	8"
X	2.50	5.50	6.00	6.25	6.75	7.25	8.00	10.25	12.25
Y	4.25	4.75	6.75	7.00	7.75	8.25	9.50	10.50	10.75
Z (MAX)	29.75	28.50	28.25	28.50	28.75	29.00	29.25	29.25	53.25

124-01/624-01 Float Valve (Angle)						
Size	2"	2 ½"	3"	4"	6"	8"
X	6.25	6.75	7.25	8.00	10.25	12.25
Y	7.00	7.75	8.25	9.50	10.50	10.75
Z(MAX)*	28.50	29.75	29.00	29.25	29.25	53.25

*C(Max.) is with standard float rod.



2" to 8"
ANGLE

Pilot System Specifications

Pressure Rating
300 psi Max.

Temperature Rating
Water: to 180°F. Max.

Materials
In contact with operating fluid : Brass, stainless steel monel, with Buna-N® seals
Float linkage and float rod: Brass and PVC
Base plate: enameled steel
Float: Polypropylene

Float
5 3/8" diameter. If maximum temperature exceeds 160°F. specify a stainless steel float. Available at extra cost.

Float Rod
Standard: Two 12" sections of PVC rod, with 12" extension increments at extra cost. A larger counterweight is required if float rod length exceeds 2'.
Optional: 24" stainless steel rod, with 24" extension increments at extra cost. A larger counterweight is required if float rod length exceeds 5'.

Adjustment Range
Level Differential: 1" min. to 18" max. with PVC rod.
1" min to 40" max. with stainless steel rod.

Operating Fluids
Clean liquids or gases compatible with specified materials.

When Ordering, Please Specify

1. Catalog No. 124-01 or No. 624-01
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Screwed or Flanged
6. Float Rod Material and Length
7. Float Ball Material
8. Desired Options
9. When Vertically Installed

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E-124-01/624-01 (R-5/97)

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