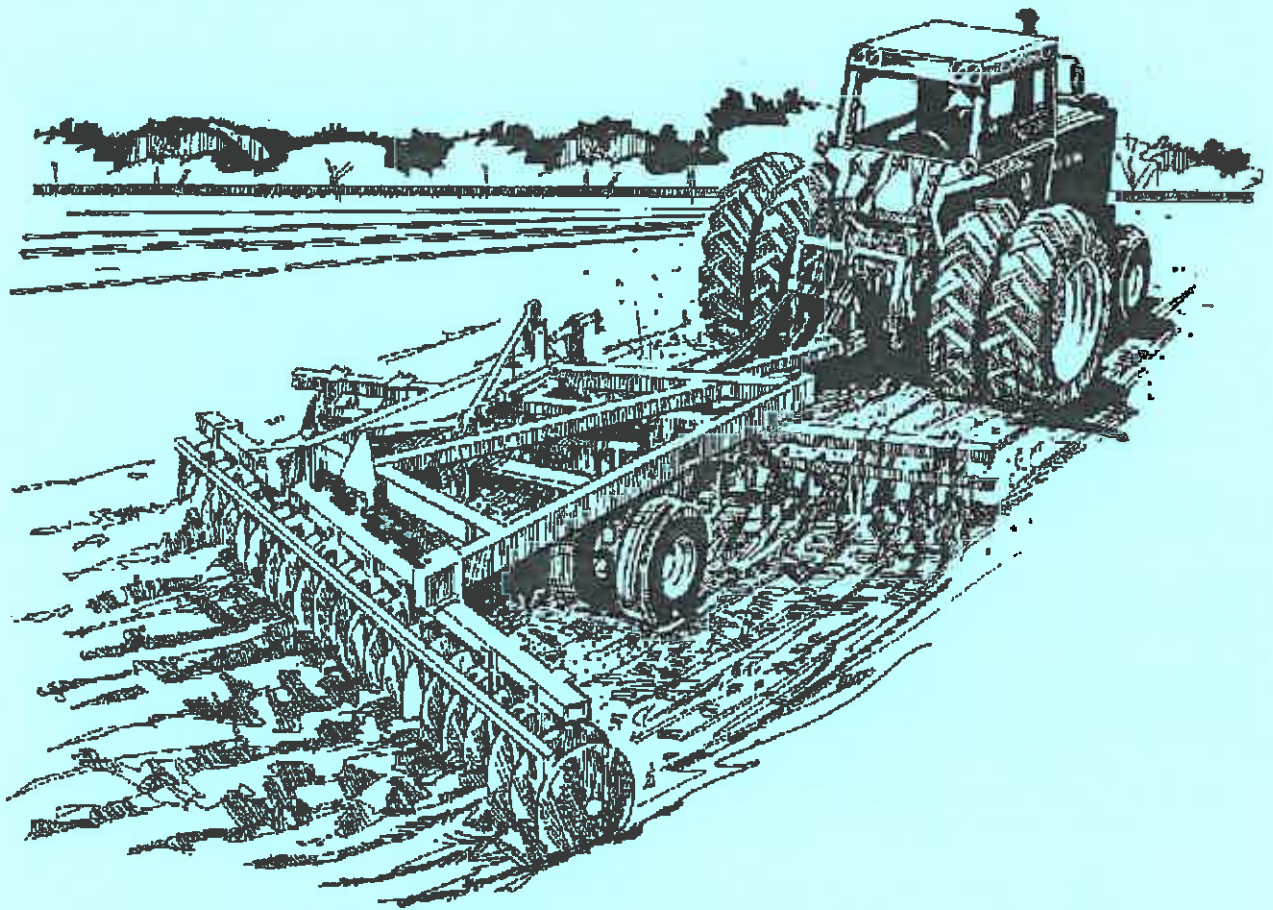


Protect Our Groundwater!



Handbook for the Voluntary Retrofit of Open, Uncased Agricultural Wells

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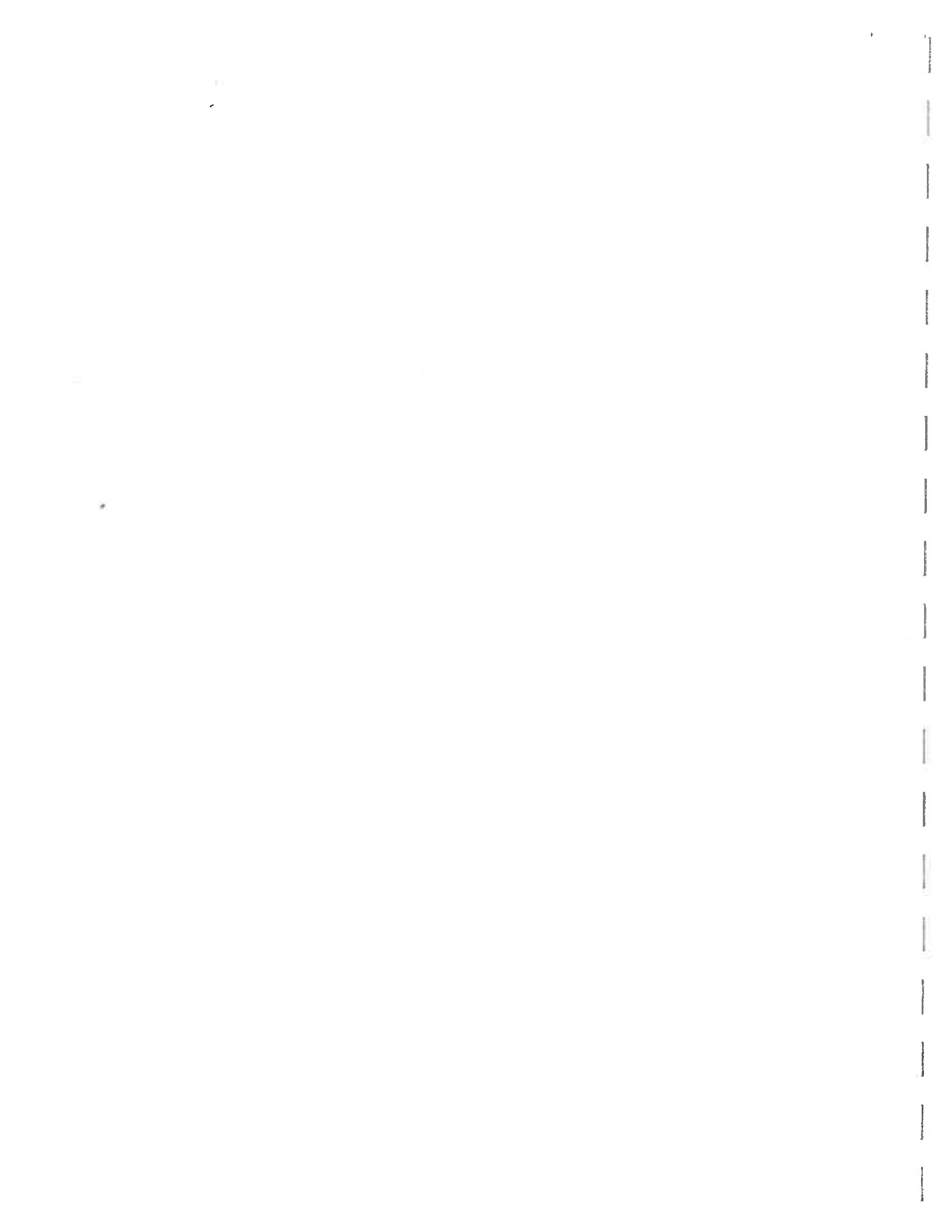
South Dade Soil and
Water Conservation District

Dade County
Agricultural Practices Study Advisory Board

Protect Our Groundwater!

Handbook for the Voluntary Retrofit of Open, Uncased Agricultural Wells

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Introduction

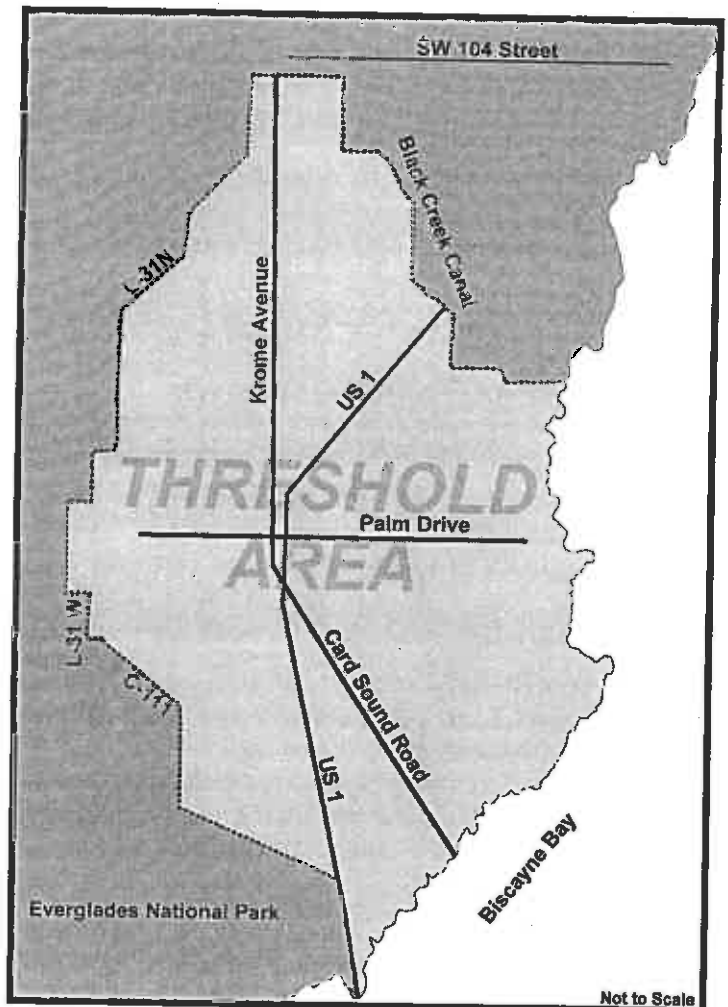
The high water table and highly porous lime rock in South Dade have enabled farmers to historically use open, uncased boreholes as a water source for irrigation and the mix-loading of pesticides and fertilizers. These open, uncased agricultural supply wells are a concern due to their potential to contaminate the groundwater. The open wells are direct conduits between the ground surface and groundwater. Surface run-off, which can contain pollutants, has been documented to discharge directly to groundwater via open, uncased wells in South Dade.

The South Florida Water Management District (SFWMD) has determined that the construction and maintenance of agricultural supply wells in accordance with State standards creates an undue hardship for the agricultural community. As a result, agricultural supply wells which do not exceed 25 feet in depth and are located within the **South Dade Threshold Area** (see lower right) are exempt from many of the construction and permitting standards enforced by SFWMD as stated in Rule 40E-30.302, Thresholds for South Dade County, F.A.C. However, SFWMD requires that a General Permit Application (no fee required) be submitted to DERM prior to the initial drilling or abandonment of agricultural wells in the South Dade Threshold Area. Additionally, the exemptions do not relieve the applicant from obtaining a Water Use Permit from SFWMD. For further information, please contact Jose Angueira of DERM's Water Supply Section at (305) 372-6522 and Rick Bower of SFWMD's Water Use Division at (800) 432-2045 ext. 6930 respectively.

In August and December of 1993, the U. S. Geological Survey (USGS) in conjunction with the Florida Department of Environmental Protection (FDEP) tested the water quality from open wells in South Dade. These open wells were used for pesticide and fertilizer mix-loading and/or irrigation in both row crop areas and groves. Based upon the results of the study, it was determined that **voluntary guidelines** specific to Dade County should be developed to protect the groundwater. A voluntary, rather than a regulatory approach, was chosen in an attempt to increase the number of

individuals implementing the guidelines and to avoid the regulatory process.

To achieve this goal, a series of Open Well Workshops was held from 1994 through 1996. The workshops were attended by farmers, well drillers, irrigation specialists and government agency representatives. Discussions focused on various retrofitting designs to eliminate direct discharges into open, uncased wells resulting from spills and overflows from mix-loading pesticides and fertilizers. Backflow prevention was also discussed. As a result of these discussions, the three open well retrofit designs on the following pages were developed as options to protect the groundwater.



South Dade Threshold Area

Open Well Retrofit Design # 1

Open Well Retrofit Design #1 was developed as a direct result of participation from those attending the Open Well Workshops. The design is practical and economically feasible for Dade County growers and was conceptually endorsed by FDEP, SFWMD and DERM.

Best Use: Prevents open, uncased irrigation wells from filling with surface debris and solids. Offers some protection to the groundwater from surface run-off into the well resulting from overflows or spillage during pesticide and fertilizer mix-loading.

Construction Guidelines

1. Hand drive a 3 foot length of 8 inch diameter PVC piping into a 9 inch diameter borehole, allowing at least 3 inches of the piping to extend above the ground surface.
2. Excavate a 30 inch diameter circle, a few inches in depth, around the PVC piping in preparation for a concrete pad.
3. Form a 30 inch diameter concrete pad around the PVC casing, placing the concrete near the top of the PVC casing and sloping it down away from the casing. Use a circular piece of road mesh to reinforce the concrete.
4. Place a 26 inch diameter steel disk on the wet concrete pad to form a ½ inch groove along the outer edge of the disk to hold it in place.
5. Pry off the steel disk when the concrete is dry and return the disk over the concrete pad to help protect the well from damage by agricultural equipment.
6. The hole in the steel disk can be sealed by welding a piece of steel over the opening.

If mix-loading pesticides & fertilizer:

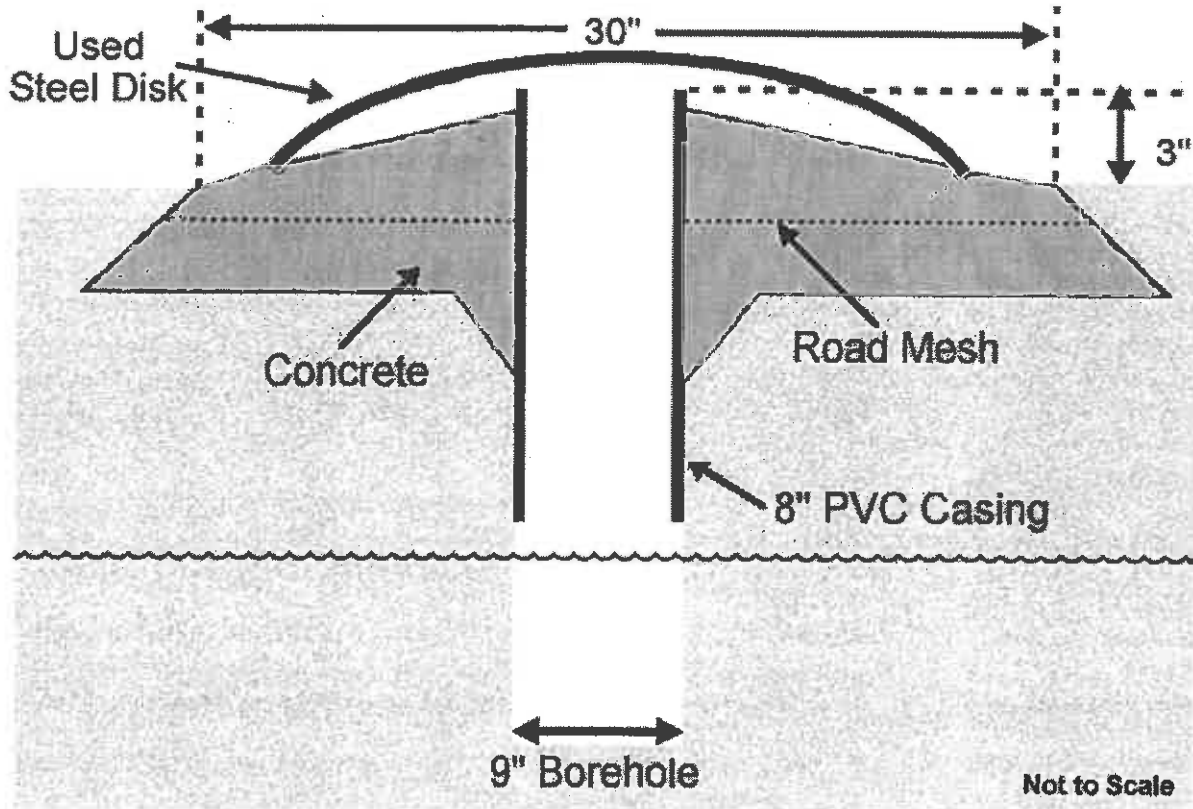
Operational Recommendations

- Maintain a 10 foot setback of mix-loading activities from the supply well.
- Provide a water supply for rinsing pesticide containers and hands.
- Install a shut off valve for the water supply at the point of entry to the mix tank to avoid overflowing the mix tank.

Backflow Prevention Recommendations

1. **A stationary air gap** (a fixed space between the water fill pipe and the top of the mix tank which should be at least twice the diameter of the fill pipe opening) or
2. If there is no stationary air gap:
 - A. **A vacuum breaker** (cost ~\$66.00) located on the discharge side of the pump, 6 inches above the highest point of downstream piping or 6 inches above the rim of the mix tank (whichever is higher) and
 - B. **One spring-loaded check valve** (cost ~\$25.00) on the suction side of the pump is sufficient provided that there is either:
 - 1) a spring-loaded foot valve used in the well or
 - 2) a check valve (spring-loaded or flapper) in the pump

Open Well Retrofit Design # 1



RETROFITTING MATERIALS	COSTS
3 foot x 8 inch diameter PVC casing PR125	\$15.00
concrete mix - (2) 80 lb. bags	\$8.00
Approximate Total Cost	\$23.00

Open Well Retrofit Design # 2

Open Well Retrofit Design #2 was presented by a grower in Dade County. This design is currently being used successfully by growers in Dade County for pesticide and fertilizer mix-loading wells. Design #2 offers more protection to the groundwater from discharges resulting from pesticide and fertilizer mix-loading than Design #1. Additional benefits from using Design #2 include:

1. a clean water supply which does not clog spray rig nozzles,
2. a permanent foot valve on the drop pipe which helps maintain the prime of the pump, and
3. greater efficiency for workers since the permanent drop pipe eliminates the need to drop a hose into the well for each mix-loading event.

Best Use: Pesticide & fertilizer mix-loading sites in row crop areas.

Construction Guidelines

1. Place a 6 foot length of 6 inch diameter PVC piping into a 9 inch diameter borehole as a casing, with 3 feet below the ground and 3 feet extending above the ground surface.
2. Pack newspaper into the space between the PVC casing and the wall of the borehole a few inches below ground surface to hold the casing and concrete in place.
3. In preparation for a concrete pad, scrape away a 3 foot diameter circle of soil surrounding the borehole down to the limestone (make sure the newspaper is packed in the borehole at least 3 inches below the limestone).
4. Add the concrete mix to the newspaper, sealing the PVC casing in place. Form a 3 foot diameter concrete pad a few inches up around the PVC casing, sloping the concrete away from the casing. Use #10 steel mesh to reinforce the concrete.
5. A shale trap as indicated in Design #3, step 1, can also be used in this design to place the concrete deeper for greater durability and groundwater protection. (**optional**)
6. For a drop pipe, use a 2 inch diameter PVC pipe which has been adjusted to the length of the well (design #2 shows a 20 foot drop pipe for a 22 foot well).
7. Cut a 2½ inch hole in a 6 inch diameter PVC cap. Insert the top of the PVC drop pipe through the hole in the PVC cap.
8. Place the 20 foot length of 2 inch diameter drop pipe & cap (with attached spring-loaded foot valve with strainer) into the well, seating the PVC cap on the 6 inch diameter PVC casing.
9. Attach a PVC elbow to the top of the 2 inch diameter drop pipe, followed by a quick disconnect valve for the pump attachment.

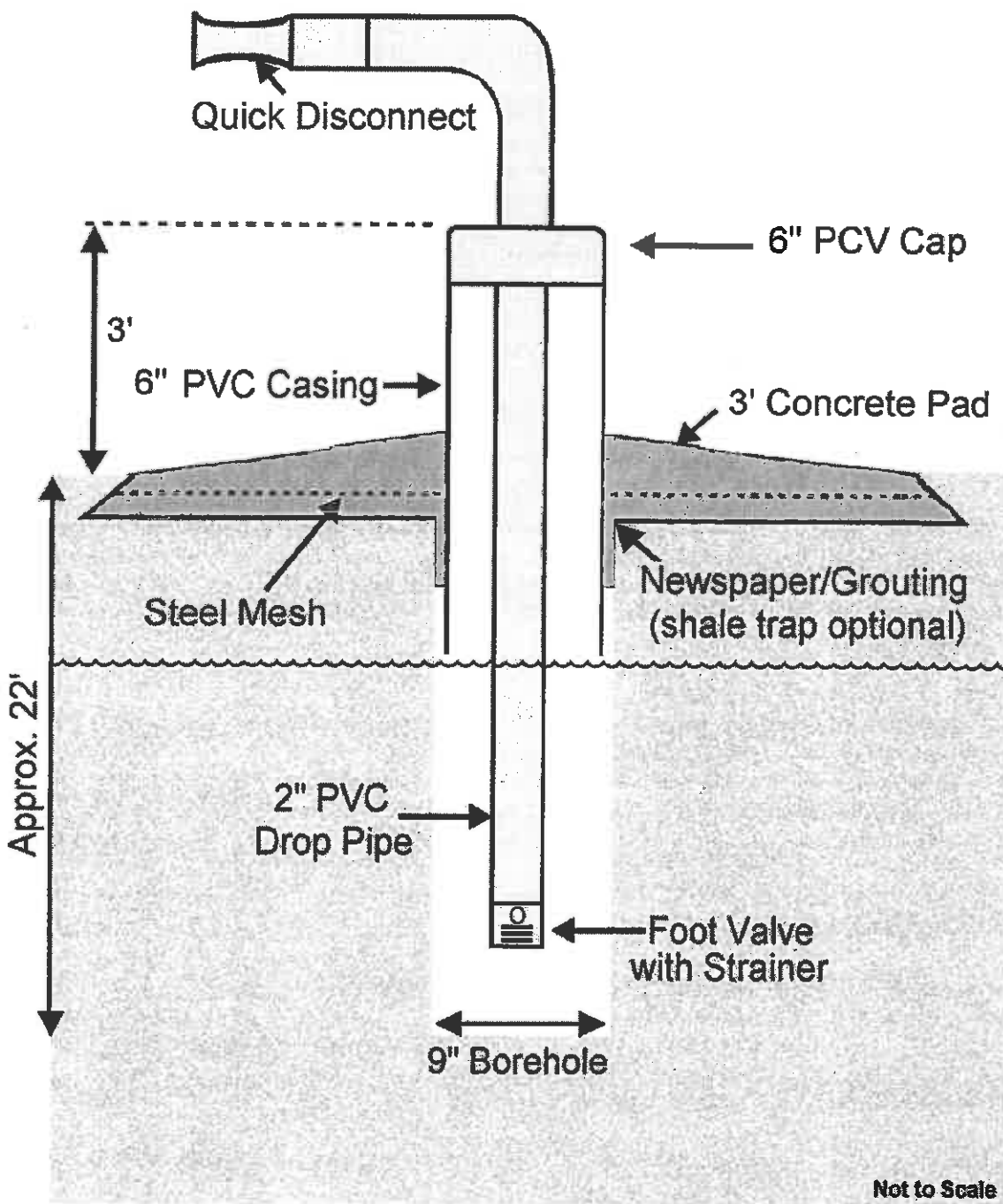
Operational Recommendations

- Provide a water supply for rinsing pesticide containers and hands.
- Install a shut off valve for the water supply at the point of entry to the mix tank to avoid overflowing the mix tank.

Backflow Prevention Recommendations

1. **A stationary air gap** (a fixed space between the water fill pipe and the top of the mix tank which should be at least twice the diameter of the fill pipe opening) or
2. If there is no stationary air gap:
 - A. **A vacuum breaker** (cost~\$66.00) located on the discharge side of the pump, 6 inches above the highest point of downstream piping or 6 inches above the rim of the mix tank (whichever is higher) **and**
 - B. **One spring-loaded check valve** (cost ~\$25.00) on the suction side of the pump and the spring-loaded foot valve as indicated above.

Open Well Retrofit Design #2



RETROFITTING MATERIALS	COSTS	RETROFITTING MATERIALS	COSTS
6 foot x 6 inch diameter PVC casing PR125	\$18.00	2 inch diameter 90° PVC elbow	\$2.00
6 inch diameter PVC cap	\$9.00	2 inch diameter quick disconnect	\$5.00
20 foot x 2 inch diameter PVC drop pipe, sch. 40	\$12.00	concrete mix - (4) 80 lb. bags	\$16.00
2 inch spring-loaded brass foot valve with strainer	\$34.00	Approximate Total Cost	\$96.00

Open Well Retrofit Design # 3

Open Well Retrofit Design #3 was developed through research with well and irrigation supply experts. This design would be appropriate for a permanent pesticide or fertilizer mix-loading site at a plant nursery, grove or row crop field with a dedicated chemigation system. All uses and benefits referenced under Retrofit Design #2 will also apply here. Additionally, Design #3 would provide the needed groundwater protection when an open, uncased well used for pesticide or fertilizer mix-loading is located within 200 feet of a private drinking water well.

Best Use: Permanent pesticide/fertilizer mix-loading sites at groves, nurseries, or row crop areas with chemigation systems. This design should also be used when open mix-loading wells are located within 200 feet of drinking water wells.

Construction Guidelines

1. Install a 6 inch x 10 inch shale trap on a 5 foot length of 6 inch diameter PVC casing so that the bottom of the shale trap is even with the bottom of the casing.
2. Place the 5 foot length of 6 inch diameter PVC casing with the shale trap into the 9 inch diameter borehole.
3. Use concrete mix to fill and seal the space between the PVC casing and the wall of the borehole. The shale trap will hold the concrete in place.
4. Pour a 4 foot x 4 foot x 6 inch concrete pad around the well opening, sloping the concrete away from the casing. Use #10 steel mesh to reinforce the concrete.
5. Install four 4 inch diameter steel pipes (filled with concrete) at the corners of the pad to protect the mix-load area from damage by agricultural equipment. **(optional)**
6. Install a 12 foot length of 2 inch diameter PVC drop pipe (with attached spring-loaded foot valve with strainer) into the 6 inch diameter well casing using a 2 inch x 6 inch well seal to hold the drop pipe in place.
7. Attach a PVC elbow to the top of the drop pipe followed by: a spring-loaded check valve, a break away nipple, and a quick disconnect valve with dust cap.

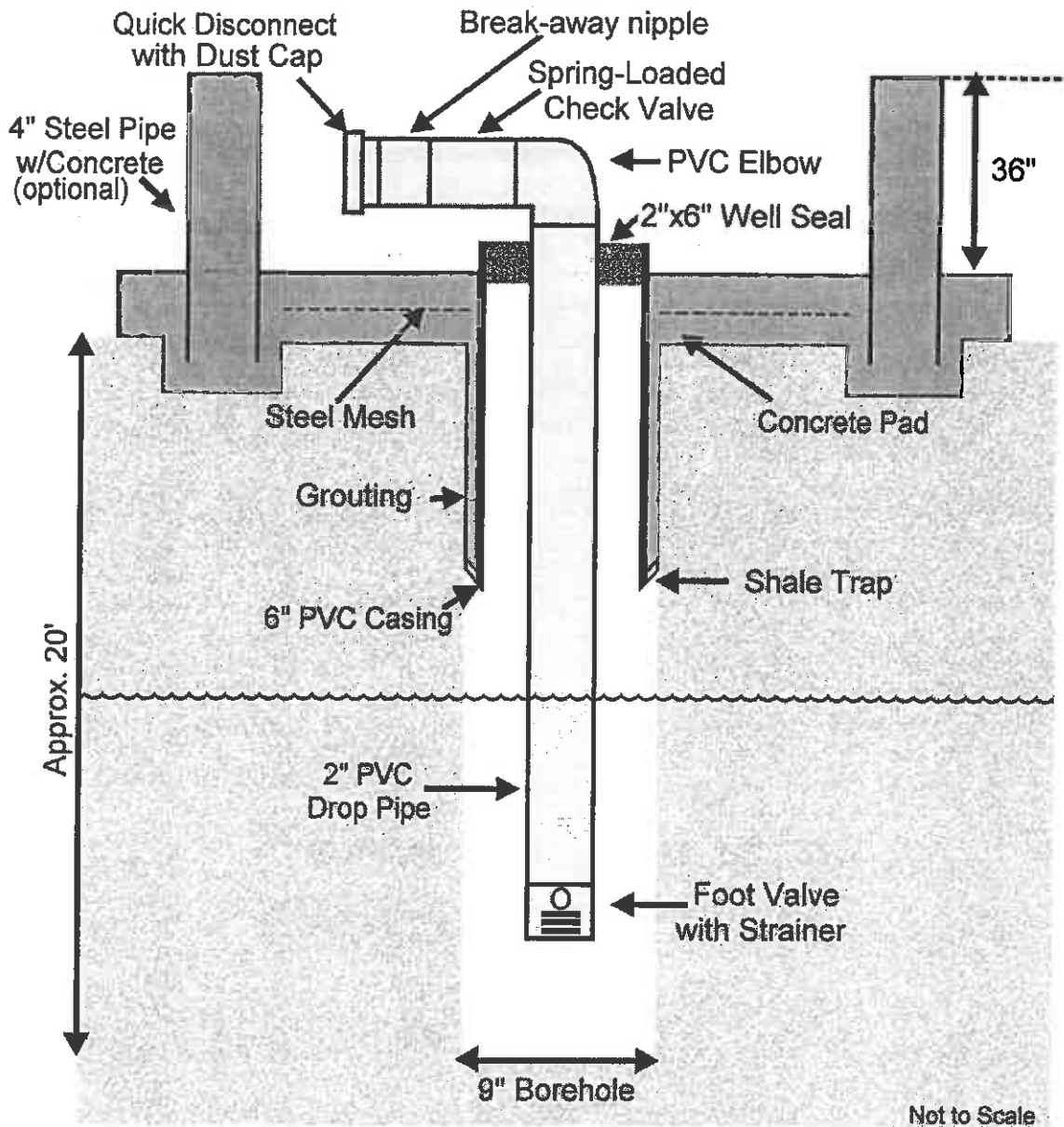
Operational Recommendations

- Provide a water supply for rinsing pesticide containers and hands.
- Install a shut off valve for the water supply at the point of entry to the mix tank to avoid overflowing the mix tank.

Recommended Backflow Prevention

1. **A stationary air gap** (a fixed space between the water fill pipe and the top of the mix tank which should be at least twice the diameter of the fill pipe opening) **or**
2. If there is no stationary air gap:
 - A. **A vacuum breaker** (cost ~\$66.00) located on the discharge side of the pump, 6 inches above the highest point of downstream piping or 6 inches above the rim of the mix tank (whichever is higher) **and**
 - B. **The spring-loaded foot valve and spring-loaded check valve** as indicated above.

Open Well Retrofit Design #3



RETROFITTING MATERIALS	COSTS	RETROFITTING MATERIALS	COSTS
5 foot x 6 inch diameter PVC casing PR125	\$15.00	2 inch diameter close threaded PVC nipple	\$1.00
12 foot x 2 inch diameter drop pipe sch. 40	\$9.00	2 inch diameter quick disconnect	\$5.00
well seal 6 inch x 2 inch	\$40.00	dust cap for quick disconnect	\$11.00
2 inch spring-loaded brass foot valve with strainer	\$34.00	shale trap 10 inch x 6 inch	\$16.00
2 inch diameter 90° PVC elbow	\$2.00	clamp for shale trap	\$3.00
2 inch PVC spring-loaded check valve	\$25.00	concrete mix (5) 80 lb. bags	\$20.00
break away nipple	\$13.00	Approximate Total Cost	\$194.00
		20 foot x 4 inch dia. black pipe (optional)	\$134.00

Other options for reducing discharges to ground and groundwater when mix-loading pesticides and fertilizers in addition to the three open well retrofitting designs were also discussed at the Workshops as follows:

A **Fourth Option** for the protection of ground and groundwater is FDEP's Minimum Construction and Operation Standards for Chemical Mixing Centers used for Pesticide Mixing and Loading. The guidance standards for a permanent mix-loading center would be practical in plant nurseries, groves, etc., where the same dedicated mix-loading area is used repeatedly on a daily basis. It would also offer the necessary protection needed in public wellfield protection areas. For more information on these guidance standards please contact Mike Thomas of FDEP's, Nonpoint Source Management Section at (904) 488-3601. Prior to construction of a permanent mix-loading center, contact DERM's Plan Review Section at (305) 375-3330 and the Permit Records Section of the Department of Planning Development and Regulation at (305) 375-2475 for plan submittal requirements and prior approval.

A **Fifth Option** for the protection of ground and groundwater is portable containment systems for mixing and loading pesticides. A variety of portable containment systems are available from agricultural product suppliers. They range from trailers with a drain and sump to catch spilled material to inflatable containment systems made of chemical-resistant vinyl materials. The Empty-Clean system is also available which extracts pesticides from their containers, fills spray tanks, rinses the pesticide containers and includes secondary containment. For more information on the above products, contact: Chemical Containers, Inc., at (800) 346-7867; Gempler's at (800) 382-8473; or Empty-Clean at (800) 833-0943. Please note that this information is provided for convenience only and does not represent an endorsement of these particular products. There may also be comparable products produced by other manufacturers.

For more information contact:

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