MEMORANDUM

DEPARTMENT OF NATURAL RESOURCES

To: Gregg Tichacek
From: Jim Mick

Date: July 3, 1997
Subject: Bigger's Farm - Attorney General's Request for Assistance
Pollution Control Board Case No. 97-178

As per your request, I have coordinated a review and field inspection of the subject property concerning a pollution case noted above.

Attached is a report of the field inspection (6-19-97) and subsequent series of recommendations for watershed stabilization and enhancement of fish and wildlife resources. This information was prepared by Region 1 field managers from the Divisions of Wildlife (Norm Emerick), Forestry (Barrie McVey), Natural Heritage (Anne Mankowski), and Fisheries (Jim Mick).

If you have any questions, please let me know.

cc: Norm Emerick
Barrie McVey
Anne Mankowski

JUN-20-97 FRI 09:50 IEPA PEORIA FAX NO. 3099833491 P.02

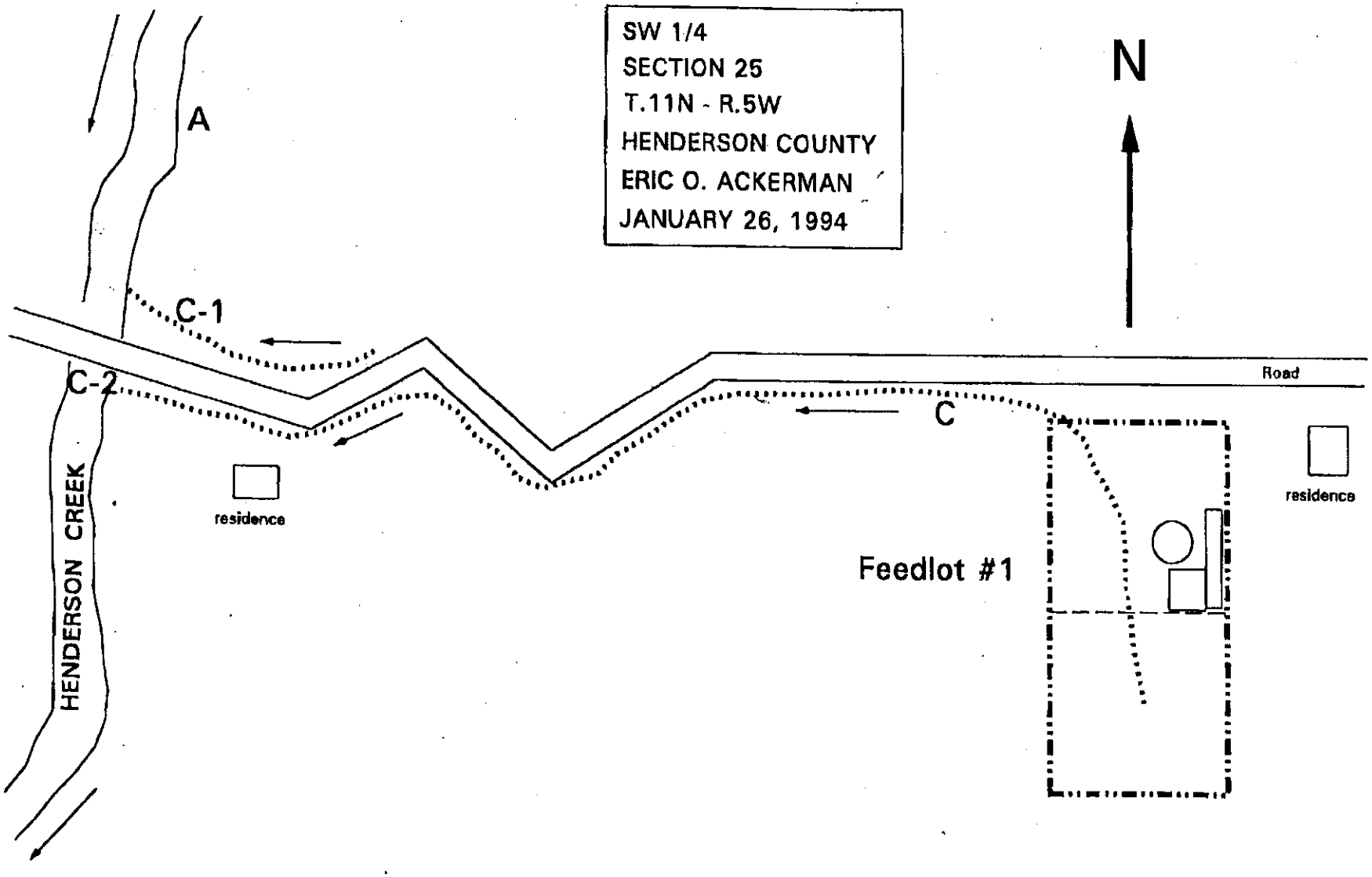

Figure 1. Plan View of Feedlot #1 at Bigger Farms & Feedlot Near Oquawka in Henderson County.

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no scale

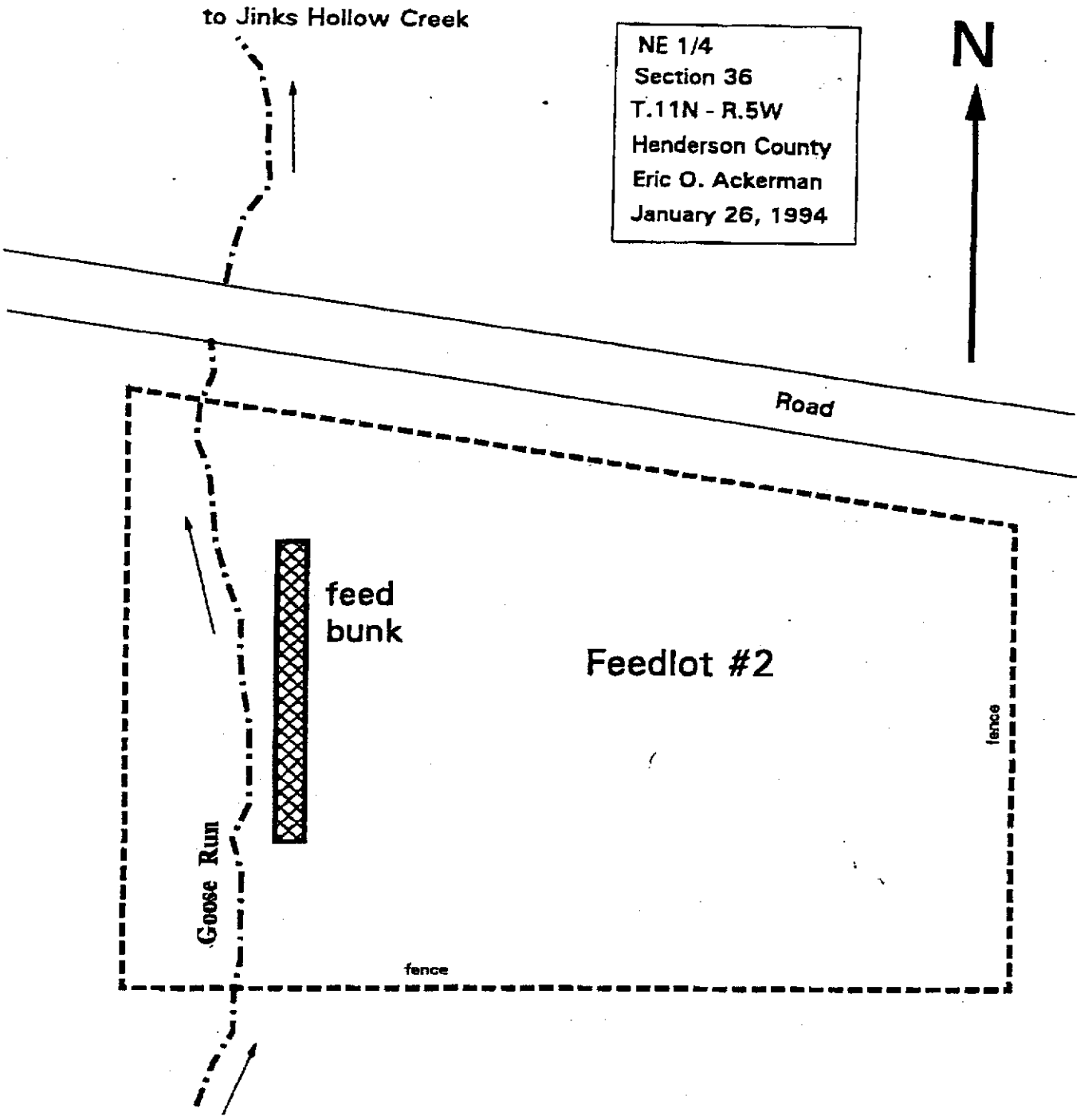

Figure 2. Plan View of Feedlot #2 at Bigger Farms & Feedlot Near Oquawka.

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no scale

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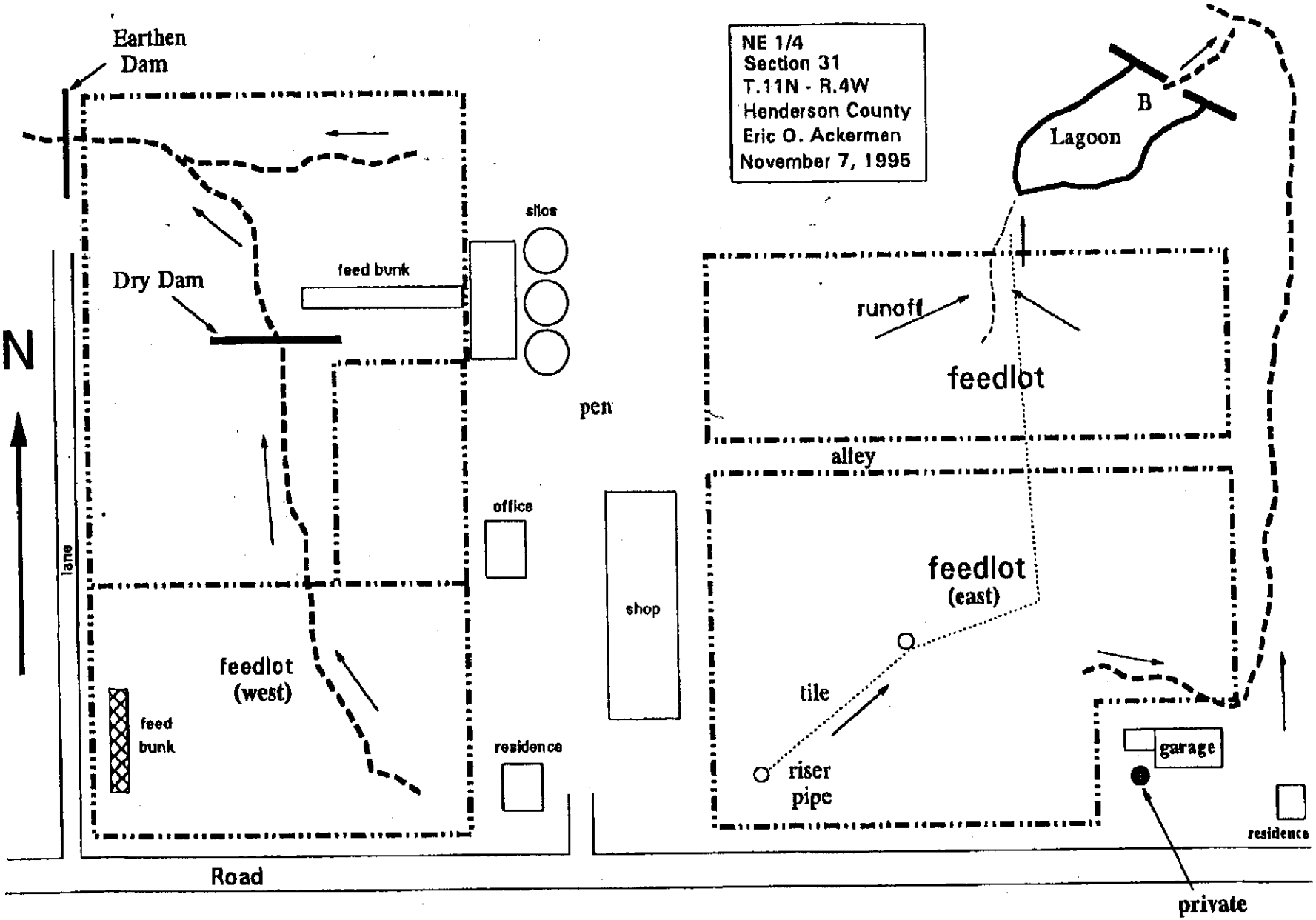

Figure 1. Plan View of Feedlot #3 at Bigger Farms & Feedlot Near Oquawka on November 7, 1995.

FILTER STRIP (acre)

Definition

A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater.

Scope

This standard establishes the minimum acceptable requirements for design and operation and maintenance of filter strips for removing sediment, organic matter, and other pollutants from runoff or wastewater. It does not apply to FIELD BORDERS (386).

Purpose

To remove sediment and other pollutants from runoff or wastewater by filtration, deposition, infiltration, absorption, decomposition and volatilization, thereby reducing pollution and protecting the environment.

Conditions Where Practice Applies

This practice applies:

A. On cropland at the lower edge of fields or on fields adjacent to streams, ponds, and lakes or above conservation practices such as TERRACES or DIVERSIONS.

B. In areas requiring filter strips as part of the WASTE MANAGEMENT SYSTEM to treat polluted runoff or wastewater.

C. Where filter area is required for renovation of supernatants from settling basins, lagoons, or other waste holding facilities.

Planning Considerations

Evaluate type and quantity of pollutant, slopes and soils, adapted vegetative species, time of year for proper establishment of vegetation, necessity for irrigation, visual aspects, fire hazards, and other special needs.

Prevent erosion where filters outlet into streams or channels.

If filter strips are to be used in treating wastewater or polluted runoff from concentrated livestock areas, the following must be considered:

A. Adequate soil drainage to insure satisfactory performance.

B. Provisions for preventing continuous or daily discharge of liquid waste unless the area is adequate for infiltrating all daily applied effluent. Temporary storage should be considered to prevent discharge to the filter strip more frequently than once every 3 days.

C. Enough rest periods to maintain an aerobic soil

profile. Storage or alternating filter strips may be desirable.

D. Reduced effectiveness of filter strips under snow or frozen conditions.

E. Filter strip will reduce nutrients and pesticides in runoff water thus improving water quality.

F. An adequate filter area and length of flow to provide the desired reduction of pollutants. A serpentine or switchback channel can be used to provide greater length of flow.

G. Provisions for excluding roof water and unpolluted surface runoff.

H. Slopes less than 5 percent are more effective; steeper slopes require a greater area and length of flow.

I. Provisions for mowing and removing vegetation to maintain the effectiveness of the filter area. While not generally recommended, controlled grazing may be satisfactory when the filter area is dry and firm.

J. The need to distribute flow uniformly across the top of the filter strip and maintain sheet flow through the strip.

K. Soils in the filter area have infiltration rates in the range of 1.0 to 6.0 inches per hour. Infiltration rates outside this range require special design.

- Filter strips by themselves will not meet the "no-discharge" requirement applicable to livestock operations requiring permits under the National Pollutant Discharge Elimination System. More stringent pollution abatement measures may be necessary where receiving waters must be highly protected.

The Illinois Environmental Protection Agency has criteria for filter strips. These criteria are identified as "Design and Maintenance Criteria Regarding Runoff Field Application Systems" and are a component of the agency's rules and regulations as promulgated under Title 35: Environmental Protection; Subtitle E: Agriculture Related Water Pollution; Chapter II: Environmental Protection Agency; Part 570.

Design Criteria

I. FILTER STRIPS FOR SEDIMENT AND RELATED POLLUTANTS

These criteria apply to filter strips on cropland at the lower edge of fields, pastures, or manure spreading areas adjacent to streams, ponds, and lakes, and above conservation practices such as terraces or diversions.

The length of flow through vigorous vegetation shall

be at least 10 ft (3 m) for slopes of less than 1 percent proportionately up to at least 25 ft (8 m) for 30 percent slopes.

II. FILTER STRIPS FOR RUNOFF FROM CONCENTRATED LIVESTOCK AREAS

These criteria apply to filter strips for feedlot and barnyard runoff, where facility confines less than or equal to 300 animal units.

A. Settling Facilities. A settling basin shall be provided between the waste source and filter strip to store 1,100 cu. ft. per acre inch of runoff from a 2-year, 24-hour rainfall. Any basin outflow shall be disregarded in computing minimum storage. Additional storage capacity, based on frequency of cleaning, shall be provided for manure and other solids settled within the basin. When the basin will be cleaned after every significant runoff event, additional storage equivalent to at least 0.5 in. from the concentrated waste area shall be provided. If only annual cleaning of the basin is planned, additional storage equivalent to at least 6 in. from the concentrated waste area shall be provided.

B. Effluent Transport System. The transport system between the settling basin and the filter strip shall be designed to keep as uniform of flow as possible to prevent solids depositions. Design velocity should be 2 feet per second or greater. Distribution system should uniformly spread effluent across the top of the filter strip.

C. Filter Strip. The filter strip shall be located on gently sloping soils of moderate permeability with adequate fertility to grow a heavy stand of vegetation. The filter strip shall:

1. Be shaped to provide uniform flow.

2. Have adequate length to provide a minimum contact time of 2 hours. Table 1 gives minimum flow lengths needed to provide a contact time of 2 hours.

3. Have a minimum width of 20 feet and a maximum width of 100 feet.

4) Provide adequate filter area to infiltrate the runoff from the 1- year, 2-hour rainfall event. The following equation shall be used to obtain the minimum filter strip area:

$$\text{Filter strip area} = \frac{\text{volume of runoff (cu ft)} \times 12}{[2 \text{ hrs} \times \text{soil infiltration (in/hr)}] - [1\text{yr, } 2\text{hr rainfall}]}$$

Table 1. Minimum Flow Lengths for Vegetative Filters Utilizing Overland Flow and Having Various Slopes a/

Slope (percent)	Velocity (Fps)	Flow length (ft.)
0.5	0.04	290
0.75	0.05	360
1.0	0.06	435
1.5	0.07	505
2.0	0.08	575
3.0	0.10	720
4.0	0.12	860

a/ Design flow depth is 0.5 inch. The assumed Manning's roughness coefficient is 0.3.

III. FILTER AREAS FOR TREATING SUPERNATANTS FROM SETTING BASINS, LAGOONS, AND OTHER HOLDING FACILITIES.

A. Nutrients Loading. The area to which wastes are to be applied shall have nutrient uptake capability (N) equal to, or in excess of, the rate of nutrient(N) loading. Concentrations of N in supernatants used for design shall be the average of 3 or more analysis from the facility from which supernatant will be removed.

B. Filter Area. The filter area shall be located on sloping soils with adequate fertility to grow the vegetation/crop assumed in design. The filter area shall: 1) Be shaped to provide uniform flow. 2) Have adequate length to provide a minimum contact time of 30 minutes. 3) Flow through time and filter area width shall be adequate to infiltrate the design rate of flow, where:

Q = design rate of flow (application)(cfs)
DD = design depth of flow (inches)
V = flow velocity (fps)
Ftt = flow through time (hrs)
L = filter area length (ft)
W = filter area width (ft)\
IR = infiltration rate of soil = (in/hr)
FTT = L/V/3600

DD = FTT * IR
Q = (DD*V*W)/12

Filter Strip Specifications

Engineering Specifications
All trees, stumps, brush, rocks, and similar materials that can interfere with installing the filter strip shall be removed.
The materials shall be disposed of in a manner that is consistent with standards for maintaining and improving the quality of the environment and with proper functioning of the filter strip.

The filter strip shall be shaped to grade and dimensions shown on the plan or as staked in the field. If necessary, topsoil shall be stockpiled and spread to the required grade and thickness.
Excess spoil shall be disposed of in areas where it does not interfere with the require flow characteristics of the filter strip.

Vegetative Specifications

A. All areas disturbed during construction shall be vegetated.

B. To aid in the establishment of vegetation, surface water runoff shall be prevented from entering the filter strip through the use of temporary diversions until after vegetation is established to a minimum height of 4 inches and 90 percent ground cover.

C. Immediately prior to seedbed preparation, apply the following minimum amounts of fertilizer per acre:

Nitrogen(N) - 120 pounds of actual nitrogen.

Phosphorus(P) -120 pounds of P205

Potassium(K) - 120 pounds K20

D. Apply limestone, if necessary, for the species to be grown.

E. Incorporate the required lime and fertilizer and prepare a firm seedbed to a depth of 3 inches. The seedbed shall be free from clods, stones, or other debris that might hamper proper seeding.

F. For filter strips planned in conjunction with waste management systems select one of the following mixtures and seed according to the rate shown:

a) Reed canary grass-25 lbs./acre

b) Mixture reed canary grass and tall fescue--15 lbs./acre of each species.

G. For filter strips for erosion and sediment control select seeding mixtures from conservation cover or field border planting specifications. If trees or shrubs are to be planted, do not plant closer than 10 feet from the cropland edge (side away from water) of the filter strip.

H. Filter areas shall be vegetated as per past or desired use.

Operation and Maintenance

A. Protect the filter from damage by farm equipment, traffic and livestock. 1) Do nót use as a roadway. 2) Avoid operations that leave tillage marks or wheel marks. 3) Avoid damaging filter area with herbicides.

B. Fertilize the filter as necessary to maintain vigorous growth.

C. Harvest when the forage is at the proper state of maturity for maximum quality fee. Refer to Pasture and Hayland Management specifications for management of forage crops.

D. Repair damage caused by erosion or equipment immediately so it will continue to perform properly.

E. Reshape and reseed areas where concentrated flow occurs or vegetation fails. See Section A, Establishment of Vegetation.

F. To prevent excess organic solids from entering the filter:
a) Do not scrape waste into settling basin, but place in separate storage area away from settling basin.
b) Remove solids from the settling basin when 2 to 4 inches accumulate.

G. If organic wastes accumulate in the filter strip and are damaging vegetation, redistribute wastes.

CRITICAL AREA PLANTING
(acre)

Definition

Planting vegetation, such as trees, shrubs, vines, grasses, or legumes, on highly erodible or critically eroding areas (does not include tree planting mainly for wood products).

Purpose

To stabilize the soil, reduce damage from sediment and runoff to downstream areas, and improve wildlife habitat and visual resources.

Conditions Where Practice Applies

On highly erodible or critically eroding areas. These areas usually cannot be stabilized by ordinary conservation treatment and management, and if left untreated, can cause severe erosion or sediment damage. Examples of applicable areas are dams, dikes, mine spoil, levee, cuts, fills, surface-mined areas, and denuded or gullied areas where vegetation is difficult to establish by usual planting methods.

Specifications

I. FOR PLANTING TREES AND SHRUBS

See TREE PLANTING Standards and Specifications in Section IV of the Field Office Technical Guide.

II. FOR SEEDING GRASSES AND LEGUMES

A. Site preparation

1. Top dress fine textured soils (high in clay content) such as Nappanee, Clarence, Chatsworth, McGary, Markland, Okaw, Atlas, and Hurst; and coarse textured soils, with minimum of 6 inches of topsoil (with at least one additional foot of soil material favorable to plant root development underneath) after construction is completed.

2. For mined land, when the pH of the surface material (top 24 inches) is 4.5 or below, topdress with a minimum of 24 inches of soil material suitable for plant growth, or as required by state or federal regulations.

3. For ditches being constructed with a dragline where seeding will be done as construction progresses during seeding periods apply any required fertilizer and seed within 24 hours after final shaping of the ditch side slope is completed.

4. For temporary seedings on construction sites:

a. If seeded within 24 hours after final grading, no seedbed preparation is required, but would be desirable.

b. If seeded after 24 hours:

(1) For short term (less than one year) seedings, prepare a rough (disked) seedbed incorporating any required lime and fertilizer. See Table 2.

(2) For long term seedings, prepare a conventional seedbed.

5. Conventional seedbed

Incorporate any required lime and fertilizer and prepare a firm seedbed to a depth of 3 inches that is free of large clods, stones and debris larger than 6 inches in diameter.

B. Seed Quality

Seed shall meet all requirements of state seed laws. Bags will be labeled with a germination and purity test completed within the past nine months. Certified seed is preferred. See varieties of Adapted Grasses and Legumes Species in Section II-D-1 of the field office Technical Guide.

Seed that has become wet, moldy, or otherwise damaged in transit or storage is not acceptable. Seed, except warm season grasses, with less than 80 percent pure live seed (PLS) is not acceptable. Warm season grasses should be at least 50 percent pls. Use of certified seed will insure variety and genetic characteristics.

Percent hard seed will be added to percent germination to determine total percent germination for legumes.

% pure live seed (PLS) =

$$\frac{\% \text{ germination} \times \text{purity}}{100}$$

C. Inoculant

1. The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed.

2. When hydroseeding, three times the recommended amount will be used.

3. All legumes not preinoculated will be inoculated within 12 hours of seeding with inoculant specific to the species being seeded. If seed was preinoculated more than 60 days prior to seeding, reinoculate.

D. Fertilizer will be applied according to soil test or per Table 2.

E. Lime will be applied to adjust the pH to levels appropriate for the species selected per Table 1. Rates will be adjusted for purity and effectiveness.

F. Seed mixtures, rates, and planting dates. All seeding rates for permanent

seedings are pure live seed (PLS).

1. For permanent seedings (including dormant seedings) see Table 1 and Table 2. Plant Suitability Zones are outlined in Section I-B of the Field Office Technical Guide.

2. For temporary seedings see Table 1.

G. Seeding Methods

1. Conventional Method

Apply seed uniformly at a depth of 1/4 to 1/2 inch with a drill (band seed) or cultipacker type seeder or broadcast seed uniformly and cover to 1/4 to 1/2 inch depth with a cultipacker, harrow, or similar tool.

2. Dormant Seeding

a. Prepare a seedbed as outlined for a conventional seedbed when soil conditions are conducive to tillage.

b. Mulch with appropriate materials and anchor mulch, according to the mulching specification.

c. Broadcast seed or hydroseed over the top of the mulch during dormant seeding periods.

3. Hydroseeding

a. Seed, fertilizer, and lime may be applied together (hydroseeding).

b. Do not use hydrated lime in a slurry mix.

c. Use no more than 125 pounds of solids per 100 gallons of water.

d. If legume seed is hydroseeded, triple the recommended rate of inoculant.

e. If inoculant is in a fertilizer or lime mixture, apply within 30 minutes. Reinoculate if not seeded within one hour.

f. The soil surface should be moist.

4. Temporary seedings may be broadcast, drilled, or hydroseeded without covering the seed, however, covering is more desirable.

H. Mulching

All critical area plantings will be mulched except where dormant seedings are made into a cover crop. See MULCHING standards in Section IV of Field Office Technical Guide.

III. SODDING CRITICAL AREAS

A. Grade to a slope of 2:1 or flatter, and smooth to remove all rills and gullies. Remove all debris that would prevent contact of the sod with the soil.

B. Use a good dense sod of suitable grass. (Usually bluegrass). Only moist, fresh sod shall be used.

C. Sod critical areas no later than October 1.

D. Sod shall be cut uniformly about 1/2 to 1 inch thick.

E. Area to be sodded shall be properly shaped and compacted.

F. Apply the following minimum amounts of fertilizer per acre:

Nitrogen (N) - 120 pounds actual Nitrogen

Phosphorus (P) - 120 pounds of P205

Potassium (K) - 120 pounds of K20

G. Apply lime to attain a minimum soil pH of 5.5 and incorporate required lime and fertilizer to a depth of 2 inches and smooth.

H. Moisten the soil to a depth of 2 inches.

I. Start laying sod from the lower end of slopes. On steep slopes use of ladders will speed up the laying and prevent damage to the sod.

J. Sod strips shall be laid at right angles to the flow of water; stagger joints. Fill any open joints with loose soil and compact.

K. Tamp or roll all laid sod to insure a solid contact of rootmat to soil surface.

L. On severe sites 3:1 or steeper, sod shall be held in place by woven wire, wooden pegs, or similar material. Pegs or staples should be 10 inches long.

M. Sodded areas shall be watered until moisture penetrates the soil layer beneath the sod.

IV. LAND USED OR HELD FOR FUTURE DEVELOPMENT, WHICH NEEDS VEGETATIVE PROTECTION FOR AN UNDETERMINED PERIOD OF TIME INCLUDES FORMER CROPLAND BEING CONVERTED TO OTHER LAND USES SUCH AS IDLE, URBAN, OR INDUSTRIAL PURPOSES. FOLLOW SPECIFICATIONS FOR PASTURE AND HAYLAND PLANTING OR CONSERVATION COVER WHERE VEGETATIVE COVER IS THE MAIN REQUIREMENT. FOLLOW RECREATION AREA IMPROVEMENT SPECIFICATIONS WHERE THE URBAN LAWN TYPE OR WOODY COVER IS DESIRABLE.

V. ESTABLISHMENT AND MAINTENANCE

A. Protect the area from grazing by livestock and vehicular traffic for the length of time necessary for the vegetation to become well established, and in no case less than 18 months after seeding. Moderate grazing may be permitted after the 18 month period on sites where grazing will not result in damage to the vegetative cover, cause excessive runoff, or cause erosion in the opinion of the technician.

B. To improve the establishment of vegetative grass cover on critical areas, todress late summer seedings the spring following seeding and spring seeding in late August or early September with 100 to 150 pounds per acre of actual nitrogen.

C. Weeds will be controlled by mowing or herbicides. Only those herbicides which are labeled for the specific use will be recommended. Refer to University of Illinois publication "Illinois Agronomy Handbook" and to specific label instructions for guidance on herbicide selection and use.

References

Erosion and Sediment Control, Surface Mining in the Eastern U.S. 1976, E.P.A. Technology Transfer Seminar Publication (EPA-625/3-76-006), Vols. 1 & 2.

A Guide to: Conservation Plantings on Critical Erosion Areas, Soil Conservation Service, Syracuse, NY 1980.

Illinois Agronomy Handbook, University of Illinois (current year)

Procedures and standards for Urban Soil Erosion and Sedimentation Control in Illinois, SCS, October 1981.

TABLE 1 - CRITICAL AREA PLANTING

All seeding rates are pure live seed

Seeding Mixture	Rate Lbs. PLS/ Ac.	Rate lb. PLS/ 1000 Sqft.	Suitable pH	Site Suitability Drought-ty	Well Drained	Wet	Plant Suitability Zone	Seeding Period Spring 1/	Summer	Dormant
1. Smooth bromegrass							I	Early spring-June 1	Aug. 1-Sept. 1	Nov. 1-March 15
or tall fescue	24	.55		X	X		II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Alfalfa or birds-foot trefoil	8	.20	6.0-7.5				III	Early Spring-May 15	Aug. 1-Sept. 20	Nov. 15-March 1
2. Smooth bromegrass							I	Early spring-June 1	Aug. 1-Sept. 1	Nov. 1-March 15
or tall fescue	24	.55		X	X		II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Crownvetch	16	.40	6.0-8.0				III	Early spring-May 15	Aug. 1-Sept. 15	Nov. 15-March 1
3. Tall fescue	12	.30					I	Early spring-June 1	Aug. 1-Sept 1	Nov. 1-March 15
Timothy or redtop	2.5	.06			X	X	II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Birdsfoot trefoil	12	.30	5.5-7.5				III	Early spring-May 15	Aug. 1-Sept. 15	Nov. 15-March 1
4. Reed canarygrass	12	.30					I	Early spring-June 1	Aug. 1-Sept 1	Nov. 1-March 15
Smooth bromegrass or					X	X	II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Tall fescue	12	.30					III	Early spring-May 15	Aug. 1-Sept. 20	Nov. 15-March 1
Ladino (optional)	2.5	.06	5.5-7.5							
5. Tall fescue	12	.30	4.5-6.0				I	Early spring-June 1	Aug. 1-Sept 1	Nov. 1-March 15
Redtop	2.5	.06		X	X	X	II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Sericea lespedeza 2/	16	.40					III	Early spring-May 15	Aug. 1-Sept. 20	Nov. 15-March 1
or alsike clover	8	.20								
6. Sweet clover	8	.20	6.0-8.0				I	Early spring-June 1	Aug. 1-Sept. 1	Nov. 1-March 15
Tall fescue	12	.30		X	X		II	Early spring-May 15	Aug. 1-Sept. 10	Nov. 15-March 1
Redtop or	2.5	.06					III	Early spring-May 15	Aug. 1-Sept. 20	Nov. 15-March 1
Smooth bromegrass	12	.30								

TABLE I - CRITICAL AREA PLANTING

All seeding rates are pure live seed

Seeding Mixture	Rate Lbs. PLS/ Ac.	Rate lb. PLS/ 1000 Sqft.	Suitable pH	Site Suitability Drought-ty	Well Drained	Wet	Plant Suitability Zone	Seeding Period Spring 1/	Summer	Dormant
7. Switchgrass	8	.10	5.5-7.0	X	X	X	I	Early spring-June 10		Nov. 1-March 15
							II	Early spring-June 1		Nov. 1-March 1
							III	Early spring-June 1		Nov. 1-March 1
8. Switchgrass	2	.04		X	X	X	I	Early spring-June 10		
Big Bluestem	6	.14					II	Early spring-June 1		
Indiangrass	6	.14					III	Early spring-June 1		
9. Temporary Seedings										
A. 45 to 365 days										
Cereal Rye or Wheat	90	2.5		X	X	X	I	Early spring-Sept. 30		
							II	Early spring-Oct. 5		
							III	Early spring-Oct. 10		
Oats	90	2.5			I, II, III			Early spring-July 1		
Perennial Ryegrass	24	.55	5.0-7.5	X	X	X	I	Early spring-Sept. 30		
							II	Early spring-Oct. 5		
							III	Early spring-Oct. 10		
B. More than 365 days										
Perennial Ryegrass	12	30		X	X	X	I	Early spring-Sept. 30		
							II	Early spring-Oct. 5		
Timothy	2.5	.06					III	Early spring-Oct. 10		
Tall Fescue	16	.40		X	X	X	II	Early spring-Oct. 5		
							III	Early spring-Oct. 10		
Perennial Ryegrass or Timothy	2.5	.06								

1/ On non-topsoiled stripmine spoil - set date up 10 days.

7 Use sericea only in So. 1/2 of Illinois.

Where a seeding mixture is needed or desired but not listed in the above table, submit proposed seeding mixture through channels for approval by the State Resource Conservationist.

Where a choice of grasses is indicated, both grasses may be used in proportionate amounts.

TABLE 2 - CRITICAL AREA PLANTING

ite	Fertilizer (lbs./acre) 1/ N	P205	K20	Seed Mixtures	Companion Crop (per acre) Oats2/	Rye or Wheat	Mulch3/	Lime4/	Remarks
ams, dikes, borrow reas, road cuts and ther construction ites	120	120	120	1-2-3-4	1 bu.	16 lbs/PLS	Yes	If needed	
teep eroding land .e. land formerly ropped or damaged, dle	120	120	120	1-2-3-4-7	1 bu. Ac.	16 lbs/PLS	Yes-If no companion crop	If needed	Apply strawy manure and incorporate if available.
lowouts in sandy oils	120	120	120	1-2-3-4	1 bu.	16 lbs/PLS	Yes-if no manure is used after seeding	If needed	Apply strawy manure and incorporate if available. Apply an additional 2 tons after seeding, if available and/or use companion crop.
itch bank side slopes	120	120	120	1-2-3-4	1 bu.	16 lbs/PLS	Yes		
itch berms and spoil anks	60	60	60	1-2-3-4-7	1 bu.	16 lbs/PLS	Yes-if no companion crop is used.	If needed	

TABLE 2 - CRITICAL AREA PLANTING

	Fertilizer (lbs./acre) 1/			Companion Crop (per acre)					
Site	N	P2O5	K2O	Seed Mixtures	Oats2/	Rye or Wheat	Mulch3/	Lime4/	Remarks
Surface mined area	120	120	120	(pH 4.5-5.5) 5-7 (pH 5.5-7.5) 1-2-3-4-7 (pH 7.5) 2-6	1 bu.	16 lbs/PLS	Yes	If needed	
Temporary seedings	60	60	60	8			If needed	5/	
(Construction) (Sites)		5/							

1/ Soil test is preferred.
2/ Spring only.
3/ See MULCHING
4/ If needed per soil test for species seeded.
5/

Protection Period	Lime	Fertilizer
45 to 90 days	No	No
45 to 365 days	If needed	Yes
More than 365 days	If needed	Yes

SCS-IL, June, 1992

POND (No.)

Definition

A water impoundment made by constructing a dam or an embankment or by excavating a pit or dugout. In this standard, ponds constructed by the first method are referred to as embankment ponds, and those constructed by the second method are referred to as excavated ponds. Ponds constructed by both the excavation and embankment methods are classified as embankment ponds if the depth of water impounded against the embankment at spillway elevation is 3 ft or more.

Purpose

To provide water for livestock, fish and wildlife, recreation, fire control, crop and orchard spraying, and other related uses, and to maintain or improve water quality.

Scope

This standard establishes the minimum acceptable quality for the design and construction of ponds if:

1. Failure of the dam will not result in loss of life; in damage to homes, commercial or industrial buildings, main highways or railroads; or in interruption of the use or service of public utilities.

2. The product of the storage times the effective height of the dam is less than 3,000. Storage is the volume, in acre-feet, in the reservoir below the elevation of the crest of the emergency spillway. The effective height of the dam is the difference in elevation, in feet, between the emergency spillway crest and the lowest point in the cross section taken along the centerline of the dam. If there is no emergency spillway, the top of the dam is the upper limit.

3. The effective height of the dam is 35 ft or less, and the dam is hazard class (a).

4. The dam does not exceed limits for class III, small or intermediate, as defined by Illinois Department of Transportation, Division of Water Resources. (ref. IDOT Rules & Regulations for construction and maintenance of dams.)

5. Landowner, or other responsible party, has secured necessary permits, if required, for design and construction from IDOT, DWR. Table 1 lists class III dams by dam height and storage and whether or not a permit is required.* Dam height is the difference, in feet, measured from the natural bed of the stream or watercourse at the downstream dam slope or toe of the barrier to the top of the embankment or barrier.

Dam Ht* (ft)	Storage to top of Dam (ac-ft)	Permit Required
0 - 6	All	No
6 - 25	< 50	No
6 - 25	> 50	Yes
> 25	< 15	No
> 25	> 15	Yes

TABLE 1 - REQUIREMENT FOR IDOT PERMIT CLASS III DAMS.

Conditions where practice applies

Site Conditions. Site conditions shall be such that runoff from the design storm can be safely passed through (1) a natural or constructed emergency spillway, (2) a combination of a principal spillway and an emergency spillway, or (3) a principal spillway.

Investigations. Sufficient investigations shall be made of the structure site and borrow areas to determine the suitability of site and materials for construction, water holding ability and structure stability. A complete analysis of foundation and earth fill materials shall be made when, in the opinion of the engineer, such analysis is needed.

Drainage area. The drainage area above the pond must be protected against erosion to the extent that expected sedimentation will not shorten the planned effective life of the structure. The drainage area shall be large enough so that surface runoff and groundwater flow will maintain an adequate supply of water in the pond. The quality shall be suitable for the water's intended use.

Reservoir area. The topography and soils of the site shall permit storage of water at a depth and volume that ensure a dependable supply, considering beneficial use, sedimentation, season of use, and evaporation and seepage losses. If surface runoff is the primary source of water for a pond, the soils shall be impervious enough to prevent excessive seepage losses, or shall be of a type that sealing is practicable.

Ponds for fish production. The minimum surface area shall be 0.5 acre. Ponds shall be at least 9' deep over an area of 1000 sq ft in Henderson, Iroquois, Knox, Livingston, Peoria, Warren and Woodford and all counties north thereof. The shoreline, excluding the embankment and waterway outlets into the pond, shall be steepened to a slope of 2:1 from the normal water surface to a depth of 3 ft; on ponds with a surface area of 6 acres or greater this requirement may be reduced to 75% of the shoreline. For ponds larger than 3 acres, provisions shall be

made to drain the pond in a 14 day period. An available pumping system of adequate size will meet the drawdown requirement.

Planning considerations

A. Water Quantity

1. Effects upon components of the water budget, especially effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

2. Variability of effects caused by seasonal or climatic changes.

3. Effects on the downstream flows or aquifers that could affect other water uses or users.

4. Potential for multiple use.

5. Effects on the volume of downstream flow to prohibit undesirable environmental, social or economic effects.

B. Water Quality

1. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment attached substances that are carried by runoff.

2. Effects on the visual quality of onsite and downstream water resources.

3. Short-term and construction-related effects of this practice on the quality of downstream water courses.

4. Effects of water level control on the temperatures of downstream water to prevent undesired effects on aquatic and wildlife communities.

5. Effects on wetlands and water-related wildlife habitats.

6. Effects of water levels on soil nutrient processes such as plant nitrogen use or denitrification.

7. Effects of soil water level control on the salinity of soils, soil water, or downstream water.

8. Potential for earth moving to uncover or redistribute toxic materials such as saline soils.

Design criteria for embankment ponds

Foundation cutoff. A cutoff of relatively impervious material shall be provided under the dam if necessary. The cutoff shall be located at or upstream from the centerline of the dam. It shall extend up the abutments as required and be deep enough to extend into a relatively impervious layer or provide for a stable dam when combined with seepage control. The cutoff trench shall have a bottom width adequate to accommodate the equipment used for excavation, backfill, and compaction operations.

Side slopes shall not be steeper than one horizontal to one vertical.

Seepage control. Seepage control is to be included if (1) previous layers are not intercepted by the cutoff, (2) seepage creates swamping downstream, (3) such control is needed to insure a stable embankment, or (4) special problems require drainage for a stable dam. Seepage may be controlled by (1) foundation, abutment, or embankment drains; (2) reservoir blanketing ; or (3) a combination of these measures. Seepage control shall be provided in all embankments over 25 feet high.

Earth embankment. The minimum top width for a dam is shown in table 2. If the embankment top is to be used as a public road, the minimum width shall be 16 ft for one-way traffic and 26 ft for two-way traffic. Guardrails or other safety measures shall be used where necessary and shall meet the requirements of the responsible road authority.

Table 2.-Minimum top width for dams

*Total height of embankment ft	Top Width ft
10 or less	6
10 - 15	8
15 - 20	10
20 - 25	12
25 - 35	14
35 or more	15

* Total height of embankment is the difference in feet from the low point along the centerline of dam to the constructed top of dam.

The combined upstream and downstream side slopes of the settled embankments shall not be less than five horizontal to one vertical, and neither slope shall be steeper than two horizontal to one vertical. All slopes must be designed to be stable, even if flatter side slopes are required.

If needed to protect the slopes of the dam, special measures, such as berms, rock riprap, sand-gravel soil cement, or special vegetation, shall be provided (Technical Releases 56 and 69).

The minimum elevation of the top of the settled embankment shall be 1 ft above the water surface in the reservoir with the emergency spillway flowing at design depth. The minimum difference in elevation between the crest of the emergency spillway and the settled top of the dam shall be 2 ft for all dams having more than a 20-acre drainage area or more than 20 ft in effective height.

The design height of the dam shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. This increase shall not be less than 5 percent, except

where detailed soil testing and laboratory analyses show that a lesser amount is adequate. The height shall be increased by 10% when fill material is pushed up and compacted by a bulldozer.

Principal spillway. A pipe conduit, with needed appurtenances, shall be placed under or through the dam, except where rock, concrete, or other types of mechanical spillways are used, or where the rate and duration of flow can be safely handled by a vegetated or earth spillway.

The crest elevation shall be no less than 0.5 ft below the crest of the emergency spillway for dams having a drainage area of 20 acres or less, and no less than 1 ft for those having a drainage area of more than 20 acres.

When design discharge of the principal spillway is considered in calculating peak outflow through the emergency spillway, the crest elevation of the inlet shall be such that the full flow will be generated in the conduit before there is discharge through the emergency spillway. The inlets and outlets shall be designed to function satisfactorily for the full range of flow and hydraulic head anticipated.

The capacity of the pipe conduit shall be adequate to discharge long-duration, continuous, or frequent flows without flow through the emergency spillways. The diameter of the pipe shall not be less than 4 in. If the pipe conduit diameter is 10 in. or greater, its design discharge may be considered when calculating the peak outflow rate through the emergency spillway.

The minimum capacity for pipe conduits shall be adequate to discharge the runoff from the frequency storm in Table 3 for non-permit dams, or Table 4 for permit dams without emergency spillway flows.

Pipe conduits under or through the dam shall meet the following requirements. The pipe shall be capable of withstanding external loading without yielding, buckling or cracking. Flexible pipe strength shall not be less than than necessary to support the design load with a maximum of 5% deflection. The inlets and outlets shall be structurally sound and made of materials compatible with those of the pipe. All pipe joints shall be made watertight by the use of coupling, gaskets, caulking, or by welding.

For dams 20 ft or less in effective height, acceptable pipe materials are cast-iron, steel, corrugated steel or aluminum, asbestos-cement, concrete, plastic, vitrified clay with rubber gaskets and cast-in-place reinforced concrete. Asbestos-cememnt, concrete and vitrified clay pipe

shall be laid in a concrete bedding. Plastic pipe that will be exposed to direct sunlight shall be made of ultraviolet-resistant materials and protected by coating or shielding, or provisions for replacement should be made as necessary. Connections of plastic pipe to less flexible pipe or structures must be designed to avoid stress concentrations that could rupture the plastic.

For dams more than 20 ft in effective height conduit shall be plastic, reinforced concrete,cast-in-place reinforced concrete,corrugated steel or aluminum, or welded steel pipe. The maximum height of fill over any principal spillway steel or aluminum pipe must not exceed 25 ft. Pipe shall be watertight. The joints between sections of pipe shall be designed to remain watertight after joint elongation caused by foundation consolidation. Concrete pipe shall have concrete bedding or a concrete cradle, if required. Cantilever outlet sections, if used, shall be designed to withstand the cantilever load. Pipe supports shall be provided when needed. Other suitable devices such as a Saint Anthony Falls stilling basin or an impact basin may be used to provide a safe outlet. Protective coatings of asbestos-bonded, asphalt coated, or vinyl coating on galvanized corrugated metal pipe, or coal tar enamel on welded steel pipe should be provided in areas that have a history of pipe corrosion, or where the saturated soil resistivity is less than 4,000 ohms-cm, or where soil pH is lower than 5.

Specifications in tables 5 and 6 are to be followed for polyvinyl chloride (PVC), steel, and aluminum pipe.

Cathodic protection is to be provided for coated welded steel and galvanized corrugated metal pipe where soil and resistivity studies indicate that the pipe needs a protective coating, and where the need and importance of the structure warrant additional protection and longevity. If cathodic protection is not provided for in the original design and installation, electrical continuity in the form of joint-bridging straps should be considered on pipes that have protective coatings. Cathodic protection should be added later if monitoring indicates the need.

Practice standard 430-FF provides criteria for cathodic protection of welded steel pipe.

Seepage Control. Seepage control along a pipe conduit spillway shall be provided if any of the following conditions exist:

1. The effective height of dam is greater than 15 ft.

2. The conduit is of smooth pipe larger than 8" in diameter.

3. The conduit is of corrugated pipe larger than 12" in diameter.

Table 3. Spillway Requirements - Non Permit Dams - Storage < 50 AC. FT.

Drainage Area 1/ (Acres)	Effective Fill Height (Feet)	Minimum Design Frequency (24 hour Duration Storm) Principal Spillway (Yrs)	Emergency Spillway (Yrs)
0-20	0-20	-	10
0-20	21-35	2	25
21-100	0-20	2	25
21-100	21-35	2	50
101-200	0-20	2	25
101-200	21-35	5	50
201-400	0-20	5	25
201-400	21-35	10	50
>400	0-20	10	25
>400	21-35	10	50

1/ FOR DRAINAGE AREAS OF 250 ACRES OR LESS, ROUTINGS MAY BE MADE USING APPROXIMATE RESERVOIR ROUTING METHODS, IN CHAPTER 11 OF THE ENGINEERING FIELD MANUAL. FOR DRAINAGE AREAS OF 250 ACRES OR LARGER, USE ROUTING METHODS OUTLINED IN NEH-4, TR-33, TR-35, DAMS-2 COMPUTER PROGRAM, OR OTHER ACCEPTED METHODS.

Table 4. Spillway Requirements - Class III Permit Dams

Drainage Area (Acres)	Effective Fill Height (Feet)	Minimum Design Frequency (24 hour Duration Storm) Principal Spillway (Yrs)	Emergency Spillway (Yrs)
All	All	25	100

Table 5.-Acceptable PVC pipe for use in earth dams1

Nominal pipe size in.	Schedule for standard dimension ration (SDR)	Maximum depth of fill over pipe
4 or smaller	Schedule 40	15
	Schedule 80	20
	SDR 26	10
6, 8, 10, 12	Schedule 40	10
	Schedule 80	15
	SDR 26	10
6, 8, 10, 12	SDR 35	9

1/ Polyvinyl chloride pipe, PVC 1120 or PVC 1220, conforming to ATSM-D-1785 or ATSM-D-2241.

2/ PVC pipe shall not be subjected to wheel loads until 2.5' (30") of fill is placed above the conduit or other procedures are taken to protect the conduit from crushing.

Table 6.-Minimum gage for corrugated metal pipe [2-2/3-in x 1/2-in corrugations] 1/

	Minimum gauge for steel pipe with diameter (in) of-						Minimum thickness (in) of aluminum pipe2 with diameter (in) of--			
Fill height (ft)	21 and less	24	30	36	42	48	21 and less	24	30	36
1-15	16	16	16	14	12	10	0.06	0.06	0.075	0.075
15-20	16	16	16	14	12	10	.06	.075	.105	.105
20-25	16	16	14	12	10	10	.06	.105	.135	3

1 Pipe with 6-, 8-, and 10-in diameters has 1-1/2 in x 1/4-in corrugations.
2 Riveted or helical fabrication.
3 Not permitted.

Table 6A
Minimum Gages - Corrugated Steel Pipe - 3 inch x 1 inch Corrugations

Fill Height Above Pipe (feet)	Pipe Diameter in Inches									
	36-42	48	54	60	66	72	78	84	90	96
1-15	16	16	16	16	16	16	14	12	12	10
15-20	16	16	16	14	14	14	12	10	8	**
20-25	16	14	12	10	8	8	8	**	**	**

**Not permitted

When using welded steel pipe, Table 7. gives allowable fill heights above pipe for each wall thickness and diameter,

TABLE 7.

WELDED STEEL PIPE

Diameter Inches	Wall Thickness in Inches and Approximate Gauge Thickness								
	.141" 10 ga.	.172" 8 ga.	.188" 7 ga.	.219" 5 ga.	.250" 3 ga.	.312" 0 ga.	.375" 000 ga.	.438"	.5"
12	8'	14'	18'	27'	42'				
14	5'	9'	12'	18'	26'				
16	3'	6'	8'	12'	18'	36'			
18	3'	5'	6'	9'	13'	26'	44'		
20		3'	4'	6'	9'	19'	32'		
22		3'	3'	5'	7'	15'	25'	40'	
24			3'	4'	6'	12'	20'	33'	46'
30					3'	6'	9'	15'	24'
36						3'	6'	9'	14'
42						3'	4'	6'	9'

New reject or high quality used smooth steel pipe may be used for principal spillway conduits under the following conditions.
(1) Structure is Job Class III or less.
(2) Pipe is of high quality and free of excessive rust and pitting.
(3) The pipe wall thickness is 5/16" or greater.

Seepage along pipes extending through the embankment shall be controlled by use of a filter and drainage diaphragm, unless it is determined that antiseep collars will adequately serve the purpose.

Antiseep collars will be considered adequate for embankments with a relatively impermeable zone to permanent pool elevation and all dry dams.

The drain is to consist of sand, meeting fine concrete aggregate requirements (at least 15% passing the No. 40 sieve but no more than 10% passing the No. 100 sieve). IDOT FA-1 OR FA-2 FINE AGGREGATE WILL MEET THESE REQUIREMENTS. If unusual soil conditions exist, a special design analysis shall be made.

The drain shall be a minimum of 2 ft thick and extend vertically upward and horizontally at least three times the pipe diameter, and vertically downward at least 18 in beneath the conduit invert. The drain diaphragm shall be located immediately downstream of the cutoff trench, approximately parallel to the centerline of the dam.

The drain shall be outletted at the embankment downstream toe, preferably using a drain backfill envelope continuously along the pipe to where it exits the embankment. Protecting drain fill from surface erosion will be necessary.

When antiseep collars are used in lieu of a drainage diaphragm, they shall have a watertight connection to the pipe. Maximum spacing shall be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe. Collar material shall be compatible with pipe materials. The antiseep collar(s) shall increase by 15% the seepage path along the pipe.

Closed conduit spillways designed for pressure flow must have adequate antivortex devices.

To prevent clogging of the conduit, an appropriate trash guard shall be installed at the inlet or riser.

A pipe with a suitable valve shall be provided to drain the pool area if needed for proper pond management or if required by state law. The principal spillway conduit may be used as a pond drain if it is located where it can perform this function.

Supply pipes through the dam to watering troughs and other appurtenances shall have an inside diameter of not less than 1 1/4".

Emergency spillways. Emergency spillways convey large flood flows safely past earth embankments.

An emergency spillway must be provided for each dam, unless the principal spillway is large enough to

pass the peak discharge from the routed design hydrograph and the trash that comes to it without overtopping the dam. The following are minimum criteria for acceptable use of closed conduit principal spillway without an emergency spillway: a conduit with a cross-sectional area of 3 square feet or more, an inlet that will not clog, and an elbow designed to facilitate the passage of trash.

The minimum capacity of a natural or constructed emergency spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 3, less any reduction creditable to conduit discharge and detention storage.

The emergency spillway shall safely pass the peak flow, or the storm runoff shall be routed through the reservoir. The routing shall start either with the water surface at the elevation of the crest of the principal spillway or at the water surface after 10 days' drawdown, whichever is higher. The 10-day drawdown shall be computed from the crest of the emergency spillway or from the elevation that would be attained if the entire design storm were impounded, whichever is lower. Emergency spillways shall provide for passing the design flow at a safe velocity to a point downstream where the dam will not be endangered.

When the principal spillway is a closed conduit with diameter 10" or larger, and drainage areas less than 250 acres, the acquired capacity of the emergency spillway may be computed by subtracting the peak principal spillway design storm flow from the peak emergency spillway design storm inflow, in lieu of any routing procedure. The emergency spillway will be sized using procedures found in chapter 11 of the engineering field manual.

Constructed emergency spillways are open channels that usually consist of an inlet channel, a control section, and an exit channel. They shall be trapezoidal and shall be located in undisturbed or compacted earth. The side slopes shall be stable for the material in which the spillway is to be constructed. For dams having an effective height exceeding 20 ft, the emergency spillway shall have a bottom width of not less than 10 ft.

Upstream from the control section, the inlet channel shall be level for the distance needed to protect and maintain the crest elevation of the spillway. The inlet channel may be curved to fit existing topography. The grade of the exit channel of a constructed emergency spillway shall fall within the range established by discharge requirements and permissible velocities.

Spillway dikes or shaped exit channels shall be used as needed to insure that spillway flows do not damage the earth embankments. The back slope of the constructed spillway dike shall have a minimum side slope of 2:1, a minimum top width of 4 ft and a minimum height of 2 ft above the outlet channel grade.

Structural emergency spillways. If chutes or drops are used for principal spillways or emergency spillways, they shall be designed according to the principals set forth in the Engineering Field Manual for Conservation Practices and the National Engineering Handbook-Section 5, hydraulics; Section 11, drop spillways; and Section 14, chute spillways. The minimum capacity of a structural spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in table 3, less any reduction creditable to conduit discharge and detention storage.

Visual resource design. The visual design of ponds shall be carefully considered in areas of high public visibility and those associated with recreation. The underlying criterion for all visual design is appropriateness. The shape and form of ponds, excavated material, and plantings are to relate visually to their surroundings and to their function.

The embankment may be shaped to blend with the natural topography. The edge of the pond may be shaped so that it is generally curvilinear rather than rectangular. Excavated material can be shaped so that the final form is smooth, flowing, and fitting to the adjacent landscape rather than angular geometric mounds. If feasible, islands may be added for visual interest and to attract wildlife.

Design criteria for excavated ponds

Runoff. Provisions shall be made for a pipe and emergency spillway if necessary. Runoff flow patterns shall be considered when locating the pit and placing the spoil (see table 4).

Side slopes. Side slopes of excavated ponds shall be stable and shall not be steeper than one horizontal to one vertical. If livestock will water directly from the pond, a watering ramp of ample width shall be provided. The ramp shall extend to the anticipated low water elevation at a slope no steeper than three horizontal to one vertical.

Perimeter form. If the structures are to be used for recreation or are highly visible to the public, the perimeter or edge should be curvilinear.

Inlet protection. If

surface water enters the pond in a natural or excavated channel, the side slope of the pond shall be protected against erosion.

Excavated material. The material excavated from the pond shall be placed so that its weight will not endanger the stability of the pond side slopes and so that it will not be washed back into the pond by rainfall. It shall be disposed of in one of the following ways:

1. Uniformity spread to a height that does not exceed 3 ft, with the top graded to a continuous slope away from the pond.

2. Uniformly placed or shaped reasonably well with side slopes assuming a natural angle of repose. The excavated material will be placed at a distance equal to the depth of the pond but not less than 12 ft from the edge of the pond.

3. Shaped to a designed form that blends visually with the landscape.

4. Used for low embankment and leveling.

5. Hauled away.

Fencing. Where an adjacent area is used for grazing or is open to livestock, the pond area, earthfill and vegetative spillway shall be fenced to exclude livestock. Where watering ramps are constructed in an excavated pond, the fence shall permit livestock access to the ramp area only. Fencing shall be according to STANDARD & SPECIFICATION 472, LIVESTOCK EXCLUSION.

Near urban areas, fencing may be necessary to exclude traffic from embankment and spillway vegetation and to prevent the use of facilities for purposes other than intended.

SAFETY. Farm ponds are potential attractive nuisances and safety aspects must be considered in their design and layout. If the area is used or may be used, for recreation, it is recommended that warning signs be erected, that lifesaving equipment be available on site and that emergency instructions be posted in a conspicuous location

Vegetation. All exposed surfaces of the embankment, earth spillway, borrow areas, and other areas disturbed during constructin shall be seeded or sodded.

Seedbed preparation and treatment and the seeding mixtures and methods shall be according to STANDARD & SPECIFICATION 342, CRITICAL AREA PLANTING.

Plans and specifications. Plans and specifications for installing ponds shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.