ANNE ARUNDEL COUNTY
Department of Public Works
Bureau of Watershed Protection & Restoration

BEAVER ACTIVITY MANAGEMENT MANUAL

Assessment, Management, and Coexistence Procedures



Protecting County Infrastructure
Supporting Sustainable Management
Promoting Practical Coexistence

Version 1.1

October 2026

INTRODUCTION

Beaver activity can provide important ecological benefits, including the creation and enhancement of wetlands, increased habitat diversity, improved groundwater recharge, water quality improvements, and expanded habitat for fish, amphibians, birds, and other wildlife. These ecological functions can contribute to healthier and more resilient natural systems throughout the watershed.

At the same time, beaver activity may create challenges when flooding, dam construction, burrowing, or tree damage affects County infrastructure, public safety, or property. As beaver populations continue to expand throughout Anne Arundel County, the Department of Public Works increasingly encounters situations requiring consistent evaluation and management.

This manual establishes a standardized framework to support assessment, decision-making, documentation, and implementation of appropriate management strategies while balancing infrastructure protection and opportunities for coexistence where feasible.

PURPOSE & SCOPE

Purpose

This manual establishes internal standards and procedures for the evaluation and management of beaver-related activity encountered by Anne Arundel County Department of Public Works (DPW) staff.

The purpose of this manual is to:

- Provide a consistent framework for decision-making
- Protect County infrastructure and public safety
- Promote effective and sustainable management practices
- Improve coordination, documentation, and tracking of beaver-related issues

This manual is intended for use by DPW personnel and supporting contractors when beaver activity is encountered or involved in assessment, maintenance, inspection, or management activities associated with beaver impacts.

Scope

This manual applies to:

- Beaver-related impacts to County infrastructure
- Beaver activity occurring on County property or easements
- Beaver activity on private property when impacts to County infrastructure exist or are likely

Examples include:

- Flooded or blocked culverts
- Roadway flooding
- Stormwater facility impacts
- Drainage system impacts
- Sanitary system impacts
- Tree damage affecting infrastructure or facility function

Exclusions

This manual does not establish procedures for:

- General nuisance wildlife complaints with no infrastructure impact
- Wildlife rehabilitation or relocation
- Regulatory enforcement activities outside DPW authority

For private property issues that do not affect County infrastructure, the property owner or HOA may be referred to the Maryland DNR, approved non-profit organization, or to approved wildlife control operators, as appropriate.

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SECTION 1: GUIDING PRINCIPLES

1.0 Guiding Principles

The following principles shall guide all beaver-related management decisions:

1.1 Infrastructure Protection

Protection of County infrastructure and public safety shall remain the primary operational priority.

Management actions shall seek to minimize:

- Flooding risks to public and private infrastructure
- Damage to public infrastructure
- Water intrusion and inundation to utilities
- Disruption to stormwater or drainage systems

1.2 Early Intervention

Early identification and response are preferred over reactive emergency response.

Minor issues identified early are generally more manageable and cost-effective to resolve than advanced or recurring impacts.

1.3 Sustainable Management

Where feasible, management strategies should seek to reduce recurring issues through long-term solutions.

Coexistence strategies are preferred when:

- Infrastructure impacts can be controlled
- Long-term maintenance is feasible
- Public safety is not compromised

1.4 Use of Lethal Control

Trapping and lethal control are recognized as management tools, but should not be considered the default response.

Lethal control may be necessary when:

- Immediate infrastructure threats exist
- Coexistence methods are not feasible
- Previous mitigation efforts have failed

1.5 Consistency & Documentation

All beaver-related assessments and management actions shall be documented and evaluated using standardized procedures.

Consistent documentation supports:

- Defensible decision-making
- Program evaluation
- Long-term tracking of recurring issues

SECTION 2: DEFINITIONS

2.0 Definitions

Active Beaver Activity - Evidence indicating ongoing beaver presence or recent activity, including fresh mud, newly cut vegetation, active dam repair, or rising water levels.

Inactive Beaver Activity - Old or abandoned activity showing no recent evidence of maintenance or occupancy.

Beaver Activity Coordinator – The designated County representative responsible for coordinating the evaluation and management of reported beaver activity affecting County infrastructure, property, or operations.

Beaver Dam - A structure composed of woody material, mud, vegetation, or debris constructed by beavers to impound water.

Beaver Lodge - A den or shelter structure used by beavers for habitation.

Coexistence Device - A structural management tool designed to reduce infrastructure impacts while allowing beavers to remain at a site.

Examples include:

- Pond levelers
- Culvert protection devices
- Dam notch exclusion fencing
- Tree protection systems

Critical Infrastructure - County-owned or maintained infrastructure where failure or flooding presents operational, environmental, or public safety concerns.

Examples include:

- Roadways
- Culverts
- Stormwater facilities
- Sanitary systems

Minor Impact - A low-level impact with no immediate threat to infrastructure or public safety.

Moderate Impact - An active condition where infrastructure impacts are developing or increasing but are not yet critical.

Severe Impact - A condition posing an immediate risk to infrastructure, public safety, or system functionality.

Monitoring - Routine observation or inspection of a site without implementation of major management actions.

SECTION 3: JURISDICTION & RESPONSIBILITY

3.0 Overview

Beaver-related issues may occur on County-owned property, within County easements, or on adjacent private property.

DPW involvement is determined by:

- Ownership or maintenance responsibility
- Potential impact to County infrastructure
- Public safety concerns

3.1 County Property or Easement

DPW may evaluate and implement management actions when:

- Beaver activity occurs on County property
- Activity occurs within a County easement
- County-maintained infrastructure is impacted

3.2 Private Property

DPW involvement on private property is generally limited to situations where:

- County infrastructure is impacted or threatened
- Flooding extends onto County-maintained systems
- Access is necessary to address infrastructure impacts

3.3 No Infrastructure Impact

When beaver activity does not impact County infrastructure:

- No DPW action may be required
- Guidance or referrals may be provided as appropriate

3.4 Property Access

Access to private property requires appropriate authorization or Right of Entry (ROE) documentation prior to conducting work outside County property or easements.

3.5 Beaver Activity Coordination

The Beaver Activity Coordinator shall serve as the primary point of coordination for reported beaver activity involving County infrastructure, property, or operations.

- The Coordinator shall facilitate communication with the County Bureau or Department responsible for the affected infrastructure or property and coordinate additional stakeholders as appropriate.
- Management decisions affecting County infrastructure or operations shall be made in coordination with the responsible Bureau or Department. The Beaver Activity Coordinator does not supersede the authority or operational responsibilities of the affected Bureau or Department.

SECTION 4: SITE ASSESSMENT PROCEDURES

4.0 Overview

All reported or observed beaver-related issues shall receive a site assessment appropriate to the severity and potential impact of the activity.

Site assessments shall be documented using the approved GIS-based data collection system upon implementation.

The Beaver Activity Coordinator shall coordinate the initial evaluation of reported beaver activity and involve affected County Bureaus, Departments, or other stakeholders as necessary based on site conditions and potential infrastructure impacts.

4.1 Assessment Objectives

Site assessments are intended to:

- Determine extent of activity
- Identify infrastructure impacts or risks
- Evaluate management feasibility
- Support consistent decision-making

4.2 Required Assessment Information

At minimum, assessments shall document:

- Site location
- Watershed
- Type of activity observed
- Activity status (active/inactive)
- Presence of ponding or flooding
- Infrastructure impacts
- Severity classification
- Existing coexistence devices
- Photos (when practicable)

4.3 Infrastructure Evaluation

Assessment shall identify whether:

- Activity impacts County infrastructure or operations
    - Culverts are restricted or blocked
    - Stormwater systems are affected
    - Sanitary collection systems are affected
    - Wastewater Reclamation Facilities (WRFs) are affected
    - County maintained Rights-of-Way (ROWs) are affected
    - Roadways or facilities are threatened
- Water levels are increasing
- Public safety concerns exist
- Private infrastructure may be at risk

4.4 Severity Classification

Sites shall be classified as:

- Minor
- Moderate
- Severe

Severity classification shall consider:

- Extent of flooding
- Rate of change
- Infrastructure vulnerability
- Public safety risk

4.5 Initial Response Actions

Based on assessment findings, the Beaver Activity Coordinator shall facilitate appropriate follow-up actions:

- Monitor conditions
- Coordinate with affected County Bureaus, Departments, property owners, contractors, or other stakeholders as necessary
- Schedule follow-up inspections
- Recommend coexistence evaluation
- Initiate emergency mitigation
- Recommend trapping or contractor involvement

SECTION 5: DECISION FRAMEWORK

5.0 Decision Framework Overview

The purpose of this framework is to provide a consistent, defensible process for evaluating and responding to beaver-related activity encountered by DPW staff.

This framework is intended to:

- Standardize response actions
- Prioritize protection of County infrastructure
- Promote efficient and sustainable management strategies
- Reduce recurrence of issues through appropriate intervention

All beaver-related incidents shall be evaluated using the following step-by-step process.

The Beaver Activity Coordinator shall initially coordinate the Decision Framework process. Once the affected infrastructure or property is identified, the responsible Bureau or Department shall assume the lead role, with Coordinator support as needed.

5.1 Step 1: Infrastructure Impact Determination

Question:
Does the beaver activity impact, or have the potential to impact, County infrastructure?

Examples of Impact:

- Flooding or overtopping of roadways
- Culvert blockage or restriction
- Stormwater facility performance issues
- Sanitary collection system impacts

Action:

- If NO impact:
  - No DPW action required
  - Provide guidance if requested
  - Document findings and close, or monitor as needed
- If YES impact or risk exists:
  - Proceed to Step 2

5.2 Step 2: Activity Status

Question:
Is the beaver activity active and ongoing?

Indicators of Active Activity:

- Fresh mud or sticks on the dam
- Recently cut vegetation
- Rising or fluctuating water levels
- Visible beaver presence

Action:

- If INACTIVE:
  - Monitor site conditions
  - No immediate intervention required
- If ACTIVE:
  - Proceed to Step 3

5.3 Step 3: Severity Classification

All sites shall be classified based on the severity of impact:

Minor Impact

- No immediate infrastructure risk
- Stable water levels
- Minimal or localized effects

Action:

- Monitor
- Consider preventative measures

Moderate Impact

- Noticeable water level increase
- Partial culvert restriction
- Early-stage infrastructure risk

Action:

- Evaluate for coexistence strategies, Step 4
- Schedule follow-up inspection

Severe Impact

- Active flooding of infrastructure
- Complete culvert blockage
- Rapidly rising water levels
- Immediate safety concern

Action:

- Immediate response required
- Implement short-term mitigation (e.g., notching, debris removal)
- Proceed to Step 4

5.4 Step 4: Coexistence Feasibility Evaluation

Question:
Can the site be effectively managed using a coexistence strategy?

Evaluation Criteria:

- Ability to control water elevation
- Adequate installation location
- Site access (legal and physical)
- Long-term maintenance feasibility
- Stability of the surrounding infrastructure

If YES (Feasible):

- Implement an appropriate coexistence device:
    - Flow device
    - Culvert protection
    - Dam notch with exclusion fencing
    - Tree protection (if applicable)
- Establish a maintenance plan
- Document installation

If NO (Not Feasible):

- Proceed to Step 5

5.5 Step 5: Lethal Control (Trapping) Determination

Trapping shall be considered under the following conditions:

Use Trapping When:

- Immediate or recurring threat to infrastructure exists
- Coexistence methods are not feasible
- Previous coexistence efforts have failed
- Site conditions prevent effective long-term management

Requirements:

- Coordination with approved wildlife control personnel
- Compliance with applicable regulations
- Documentation of justification

BEAVER RELOCATION:
Live capture and relocation of beavers is generally not recommended and is a restricted management practice in Maryland; therefore, it is not included as a management option within this framework.

IMPORTANT:
Trapping alone is not considered a long-term solution.
Post-removal evaluation is required to:

- Determine if site conditions will attract new beavers
- Identify need for follow-up mitigation (e.g., devices, monitoring)

5.6 Step 6: Post-Action Monitoring

All sites shall be monitored following any intervention.

Monitoring Includes:

- Verification of water level control
- Inspection of installed devices
- Identification of renewed activity

Follow-Up Actions:

- Adjust or repair devices as needed
- Escalate response if conditions worsen
- Continue monitoring schedule

DECISION TABLE

Condition	Action
No infrastructure impact	No action / monitor
Inactive activity	Monitor
Minor impact	Monitor / preventative
Moderate impact	Evaluate coexistence
Severe impact	Immediate mitigation
Coexistence feasible	Install device
Coexistence NOT feasible	Consider trapping
Post-trapping	Evaluate for recurring conditions

SECTION 6: MANAGEMENT OPTIONS

6.0 Overview

This section outlines the approved management strategies for addressing beaver-related impacts to County infrastructure.

Management actions shall be selected based on the Decision Framework (Section 5) and site-specific conditions.

The Beaver Activity Coordinator shall facilitate evaluation and implementation of the selected management strategy in coordination with the Bureau, Department, or other entity responsible for the affected infrastructure or property.

Primary Objectives:

- Protect infrastructure
- Reduce the recurrence of issues
- Utilize the most effective and sustainable method available

Management strategies fall into three categories:

1. No Action / Monitoring
2. Coexistence Methods
3. Lethal Control (Trapping)

6.1 No Action / Monitoring

Use When:

- No impact to County infrastructure
- Beaver activity is inactive
- Water levels are stable and within acceptable limits
- Site does not present a foreseeable risk

Do NOT Use When:

- Water levels are increasing
- Infrastructure is at risk
- Activity is active and progressing

Required Actions:

- Document site conditions
- Schedule periodic monitoring (as needed)
- Provide guidance to property owners if applicable

6.2 Coexistence Methods

Coexistence methods are the preferred long-term management approach when feasible and when infrastructure impacts can be adequately controlled.

Coexistence devices are not maintenance-free and require periodic inspection, adjustment, debris removal, repair, or replacement. Device performance may be influenced by sediment accumulation, debris loading, extreme flow events, changing site conditions, or adaptive beaver behavior. As site conditions and beaver activity evolve, management strategies may require modification to remain effective.

These methods aim to:

- Control water levels
- Prevent infrastructure damage
- Allow beavers to remain in place

6.2.1 Flow Devices (Pond Levelers)

Purpose:

Regulate water levels by allowing controlled flow through or around a dam.

Use When:

- Water level needs to be reduced or stabilized
- A permanent pond condition is acceptable
- Adequate depth (generally ≥ 2–3 feet) can be maintained
- Site allows for proper installation and anchoring

Do NOT Use When:

- No stable pond depth can be maintained
- High sediment or debris load will clog the device
- Site access is limited for installation or maintenance
- Rapid, emergency drawdown is required

Key Considerations:

- Must be properly sized and installed
- Requires periodic inspection and debris removal (see Section 7.2, Inspection Frequency)
- Often used in conjunction with fencing
- Access to infrastructure, including manholes must be maintained

6.2.2 Culvert Protection Devices

Purpose:

Prevent beavers from blocking culverts while maintaining flow capacity.

Use When:

- Repeated culvert blockage occurs
- Culvert is critical to roadway drainage
- Sufficient space exists for installation

Do NOT Use When:

- Culvert is undersized or already failing
- Flow conditions exceed device capacity
- Site constraints prevent proper installation

Key Considerations:

- Reduces maintenance frequency
- Must be securely anchored
- Requires periodic inspection (see Section 7.2, Inspection Frequency)

6.2.3 Dam Notch with Exclusion Fencing

Purpose:

Maintain a controlled water elevation by notching the dam and preventing rebuilding at that location.

Use When:

- Specific water level needs to be maintained
- Flow can be directed through a controlled point
- Channel alignment is stable

Do NOT Use When:

- High flow events will wash out fencing
- Site is unstable or highly dynamic
- Long-term maintenance is not feasible

Key Considerations:

- Must extend upstream and downstream
- Requires regular inspection (see Section 7.2, Inspection Frequency)
- Often used as a lower-cost alternative to full devices

6.2.4 Tree Protection (Wrapping / Caging)

Purpose:

Prevent beaver damage to high-value trees.

Use When:

- Tree loss is the primary concern
- Flooding is not the primary issue
- Individual or limited number of trees require protection

Do NOT Use When:

- Large-scale tree clearing is occurring
- Flooding or infrastructure impacts are present

Key Considerations:

- Must allow for tree growth
- Requires periodic adjustment and expansion to accommodate tree growth
- Does not address water-related impacts

6.3 Lethal Control (Trapping)

Purpose:

Trapping is a targeted management tool used when other methods are not feasible or have failed.

Use When:

- Immediate threat to infrastructure exists
- Severe flooding or safety hazard is present
- Coexistence methods are not feasible
- Previous coexistence efforts have failed
- Site conditions prevent long-term management

Do NOT Use As:

- A standalone long-term solution
- A response to minor or non-impacting activity
- A substitute for proper site evaluation

Key Considerations:

- Coordination with approved wildlife control personnel
- Compliance with State and Federal regulations
- Proper documentation of justification

6.3.1 Post-Trapping Actions:

After removal, the site shall be reassessed to determine:

- Will conditions attract new beavers?
- Is additional mitigation required?

Follow-Up May Include:

- Installation of coexistence devices
- Continued monitoring
- Site modifications (if applicable)

6.4 Infrastructure Resiliency Measures

In some situations, reducing conflicts may involve improving the resilience of vulnerable infrastructure rather than implementing beaver-specific management measures.

Where sanitary sewer infrastructure is present within flood-prone areas, resiliency measures should be evaluated in coordination with the Bureau of Utility Operations. Potential measures may include raising sanitary manhole frames and covers, installing watertight gaskets or riser ring sealing systems, or implementing other improvements intended to reduce susceptibility to flooding and elevated groundwater conditions.

These measures may provide benefits in floodplain environments regardless of whether elevated water levels result from natural flooding events, beaver activity, or a combination of both. However, infrastructure improvements must be evaluated based on site-specific conditions, existing structure type and condition, accessibility for inspection and maintenance, and long-term maintenance requirements.

Raising a structure or sealing a frame may not fully resolve access, infiltration, or maintenance concerns if the structure remains located within an inundated or inaccessible area. Watertight gaskets and sealing systems may also be limited by manhole construction type, structural condition, joints, cracks, missing mortar, or other deficiencies.

Resiliency measures should be assessed as part of an integrated management approach and may be appropriate where infrastructure protection can be achieved more effectively through design modifications than through direct beaver management actions.

REFERENCE TABLE

Method	Use When	Avoid When
No Action	No impact	Risk increasing
Flow Device	Need water control	No stable pond
Culvert Protection	Repeated blockage	Undersized culvert
Notch + Fence	Controlled level needed	Unstable flow
Tree Protection	Tree damage only	Flooding present
Trapping	Severe / no alternatives	Minor issues

IMPORTANT:

Prior to implementation of a coexistence device, responsibilities for installation, funding, inspection, maintenance, and long-term monitoring shall be established among the appropriate parties. The Beaver Activity Coordinator shall facilitate this coordination but does not assume maintenance or operational responsibility for infrastructure or property managed by another Bureau, Department, or entity.

SECTION 7: MAINTENANCE & MONITORING

7.0 Overview

All beaver management actions require ongoing monitoring and maintenance to ensure continued effectiveness and to prevent recurrence of issues.

Failure to maintain installed devices or monitor site conditions may result in:

- Loss of functionality
- Reestablishment of beaver activity
- Renewed risk to County infrastructure

Maintenance and monitoring responsibilities shall be defined at the time of implementation.

7.1 General Monitoring Requirements

All sites where beaver activity has been identified shall be subject to monitoring based on severity and management approach.

Monitoring Triggers:

- Initial report of beaver activity
- Post-installation of any coexistence device
- Post-trapping activities
- Following major storm events
- Observed changes in water level or flow

Monitoring Includes:

- Visual inspection of the dam condition
- Water level observation
- Evidence of active beaver activity
- Condition of infrastructure (culverts, roadways, facilities)
- Functionality of installed devices

7.2 Inspection Frequency

Inspection frequency shall be determined based on site conditions and management method:

Condition	Inspection Frequency
Active issue (moderate/severe)	Weekly to bi-weekly
Newly installed device	Within 2–4 weeks of installation
Stable coexistence site	Quarterly or as needed
Post-storm event	As soon as practicable
Post-trapping	Within 2–4 weeks

7.3 Maintenance Responsibilities

Responsibility for maintenance shall be clearly established prior to implementation.

The Beaver Activity Coordinator shall facilitate establishment of monitoring and maintenance responsibilities during project planning and document the responsible parties as appropriate.

DPW Responsibilities:

- Oversight of sites impacting County infrastructure
- Installation or coordination of coexistence devices, as determined during project planning
- Emergency response actions
- Documentation and tracking

HOA / Property Owner Responsibilities (When Applicable):

- Routine observation and reporting
- Minor maintenance (if agreed upon)
- Providing access for inspections and repairs

Contractor Responsibilities:

- Installation of devices (if contracted)
- Scheduled maintenance (if included in scope)
- Reporting deficiencies to DPW

7.4 Coexistence Device Maintenance

All coexistence devices require routine inspection and maintenance to remain effective.

7.4.1 Flow Devices (Pond Levelers)

Inspect For:

- Blockage from debris or sediment
- Pipe displacement or damage
- Changes in water level

Maintenance Actions:

- Remove debris and sediment buildup
- Re-secure anchoring if necessary
- Adjust pipe elevation if needed

7.4.2 Culvert Protection Devices

Inspect For:

- Debris accumulation is restricting flow
- Structural damage or shifting
- Beaver attempts to bypass the device

Maintenance Actions:

- Clear debris
- Reinforce structure
- Repair or replace damaged sections

7.4.3 Dam Notch & Exclusion Fencing

Inspect For:

- Rebuilding activity at the notch location
- Fence integrity and anchoring
- Water bypassing the intended control point

Maintenance Actions:

- Re-establish notch elevation
- Repair or extend fencing
- Remove accumulated materials

7.4.4 Tree Protection

Inspect For:

- Damage to protective material
- Tree growth constriction
- Beaver activity around protected trees

Maintenance Actions:

- Adjust or expand cages
- Repair damaged wrapping
- Replace materials as needed

7.5 Indicators of Failure

Immediate action shall be taken if any of the following conditions are observed:

- Rising water levels beyond the target elevation
- Repeated clogging or blockage
- Beaver activity bypassing installed devices
- Structural failure of device components
- Renewed infrastructure impact

7.6 Post-Trapping Monitoring

Sites where trapping has occurred shall be monitored to prevent recurrence.

Key Considerations:

- Unmodified site conditions may attract new beavers
- Dam rebuilding may resume within weeks

Required Actions:

- Reassess site conditions
- Determine the need for coexistence measures
- Schedule follow-up inspections

7.7 Documentation Requirements

All monitoring and maintenance activities shall be documented.

Documentation Includes:

- Date of inspection
- Observed conditions
- Actions taken
- Photos (recommended)
- Follow-up requirements

7.8 Escalation Protocol

If monitoring identifies worsening conditions or failure of the management strategy:

- Reassess site using Decision Framework (Section 5)
- Upgrade response level as needed
- Notify the Beaver Activity Coordinator and coordinate with appropriate County personnel, property owners, or contractors.

SECTION 8: COMMUNICATION & COORDINATION

8.0 Overview

Effective communication and coordination are critical to successful beaver management.

Many beaver-related issues occur on or adjacent to private property, requiring coordination between DPW, property owners, HOAs, and external partners.

This section establishes standard procedures for:

- Internal coordination
- External communication
- Property access
- Stakeholder engagement

8.1 Beaver Activity Coordinator

The Beaver Activity Coordinator shall serve as the initial point of coordination for beaver-related issues involving County infrastructure, property, or operations and provide continued coordination and technical support as needed.

Responsibilities Include:

- Coordinating initial site evaluations and documentation
- Facilitating application of the Beaver Activity Decision Framework
- Coordinating with affected County Bureaus and Departments
- Facilitating communication with property owners, HOAs, contractors, regulatory agencies, and external partners as appropriate
- Supporting development and implementation of management strategies in coordination with the responsible Bureau or Department
- Assisting with identification of installation, monitoring, and maintenance responsibilities
- Coordinating technical support or contractor involvement when necessary
- Supporting long-term documentation, tracking, and program evaluation

8.2 Internal DPW Coordination

All beaver-related issues impacting County infrastructure shall be communicated to appropriate DPW personnel.

Coordinate With (as applicable):

- Bureau of Watershed Protection & Restoration (BWPR)
- Road Operations / Highway Maintenance
- Bureau of Utility Operations
- Department of Recreation and Parks

Coordination Required When:

- Infrastructure is impacted or at risk
- A management action is proposed or implemented
- Access or easement questions arise
- Work may impact other DPW operations

Key Objective:

Ensure all relevant divisions are aware of:

- Site conditions
- Planned actions
- Potential impacts

8.3 External Communication (HOAs & Property Owners)

Clear and early communication with property owners and HOAs is essential.

When to Initiate Contact:

- Beaver activity is identified on private property
- Access is required for assessment or work
- Management actions are being proposed
- Follow-up maintenance or monitoring is needed

Communication Should Include:

- Description of the issue
- Potential risks (if applicable)
- Proposed actions
- Benefits of early intervention
- Contact information for DPW

Key Messaging Principles:

- Be clear and direct
- Avoid technical jargon when possible
- Emphasize infrastructure protection and prevention of impacts to public infrastructure, private property, and public safety
- Set realistic expectations

Important:

DPW shall not assume property owner awareness of the issue.

8.4 Right of Entry (ROE) / Property Access

Access to private property must be obtained prior to conducting work.

ROE Required When:

- Work is outside County-owned property or easement
- Installation of devices, removal of dam(s), or trapping is needed on private land
- Monitoring or maintenance requires ongoing access

ROE Process:

- Contact property owner or HOA representative
- Provide explanation of scope and purpose
- Provide formal Right of Entry documentation to landowner for review (see Appendix for example)
- Obtain signed agreement prior to work

Key Considerations:

- Clearly define scope of access
- Include duration (one-time vs ongoing access)
- Maintain documentation on file

If Access is Denied:

- Document denial
- Evaluate risk to County infrastructure
- Coordinate internally for next steps

8.5 Public Interaction & Complaint Response

DPW staff may receive inquiries or complaints from residents regarding beaver activity.

Common Concerns:

- Flooding or standing water
- Tree damage
- Perceived safety risks
- Desire for immediate removal

Response Approach:

- Acknowledge concern
- Explain site conditions
- Provide overview of management options
- Avoid committing to specific actions before assessment

Key Message:

"Each situation is evaluated based on impact to infrastructure and site conditions."

8.6 Coordination with External Agencies & Organizations

In some cases, coordination with external entities may be required.

Examples:

- Animal and Plant Health Inspection Service (APHIS)
- Maryland Department of Natural Resources (DNR)
- Approved wildlife control operators
- Environmental or nonprofit organizations
- Adjacent jurisdictions

Coordinate When:

- Trapping or wildlife control is required
- Regulatory compliance is necessary
- Additional resources or expertise are beneficial

8.7 Documentation of Communication

All significant communication shall be documented.

Documentation Includes:

- Date of contact
- Parties involved
- Summary of discussion
- Agreements made
- Copies of ROE or written correspondence

8.8 Escalation Protocol

Escalation may be required when:

- Access is denied, and infrastructure is at risk
- Stakeholder conflict arises
- Conditions worsen despite communication

Escalation Actions:

- Notify supervisory staff
- Coordinate with appropriate DPW divisions
- Determine next steps based on risk and authority

SECTION 9: CASE STUDIES

The following case studies demonstrate real-world application of the procedures, decision framework, and management practices described within this manual.

The selected examples represent a range of management approaches, including water level control devices, exclusion fencing, and direct management actions where critical infrastructure was at risk. These case studies are intended to provide practical examples of how site conditions, stakeholder objectives, infrastructure concerns, and ecological considerations influence management decisions.

Case studies are presented for informational purposes and should not replace site-specific evaluation and professional judgment.

Severity Classification	Case Study	Primary Management Approach
Minor	Arlington Echo Education Center	Notch Exclusion Fencing
Moderate	Old Jumpers Hole Road	Pond Leveler Installation
Severe	Bay Green Drive	Infrastructure Protection Through Lethal Control

CASE STUDY

Arlington Echo Education Center – NOTCH EXCLUSION FENCING

Millersville, Maryland

SITE OVERVIEW

Item	Description
Severity Classification	Minor
Practice Used	Notch Exclusion Fencing
Infrastructure / Resource Protected	Atlantic White Cedar floodplain habitat
Location Type	Floodplain wetland / forested habitat
Primary Concern	Prolonged inundation impacting Atlantic White Cedar stand
Managing Agency	Anne Arundel County Bureau of Watershed Protection and Restoration (BWPR)
Property Ownership	Anne Arundel County
Partner Organization	Arlington Echo Outdoor Education Center, Anne Arundel County Board of Education

EXISTING CONDITIONS

On March 12, 2025, BWPR became aware of beaver activity impacting property owned by Anne Arundel County Board of Education and managed by the Arlington Echo Outdoor Education Center located along Indian Landing Road in Millersville, Maryland.

Arlington Echo staff expressed concerns regarding prolonged ponding within the floodplain and potential impacts to a native Atlantic White Cedar stand located near the beaver impoundment area. The cedar stand is considered environmentally significant and reportedly represents one of the last naturally occurring Atlantic White Cedar stands remaining on Maryland's Western Shore.

SITE ASSESSMENT

BWPR conducted a joint site assessment with Arlington Echo staff to evaluate beaver activity locations, hydrologic conditions, and potential impacts to the cedar stand.

Two active dams were identified within the area of concern. The downstream dam posed limited direct impacts because water elevations naturally decreased downstream. However, the upstream dam was actively impounding water within the floodplain and contributing to sustained inundation around the cedar stand.

The impounded pool was determined to be relatively shallow, and BWPR concluded that

installation of a traditional pond leveler would not provide reliable or practical long-term water level management at this location.

MANAGEMENT APPROACH

Arlington Echo staff indicated a preference for coexistence-based management rather than direct removal of the beavers.

After evaluating site conditions, BWPR determined that notch exclusion fencing represented the most appropriate management strategy. The proposed approach would allow partial lowering of the impounded water surface while discouraging beavers from rebuilding within the notched section of the dam.

Although the selected approach could not guarantee permanent water retention within the ponded area, it was expected to reduce prolonged inundation impacts to the Atlantic White Cedar stand while allowing continued beaver occupancy within the watershed.

IMPLEMENTATION

On May 15, 2025, BWPR partially notched the dam to reduce floodplain water elevations impacting the cedar stand.

A notch exclusion fence was then installed and secured within the dam to maintain conveyance through the notched section and discourage dam reconstruction at the targeted location.

OUTCOME

Following installation, Arlington Echo staff reported improved water conditions within the cedar stand area.

To date, BWPR has not received reports indicating renewed flooding impacts to the Atlantic White Cedar stand associated with beaver activity at this location.

This case study demonstrates the application of coexistence-based management strategies to balance habitat preservation, ecological function, and protection of sensitive natural resources.

PHOTO DOCUMENTATION




Beaver impoundment and floodplain conditions impacting Atlantic White Cedar habitat.



Notch exclusion fence installation within beaver dam.



Post-installation conditions within the cedar stand area.

CASE STUDY

OLD JUMPERS HOLE ROAD – POND LEVELER INSTALLATION

Millersville, Maryland

SITE OVERVIEW

Item	Description
Severity Classification	Moderate
Practice Used	Pond Leveler Flow Device
Infrastructure / Area Protected	Adjacent private property and floodplain
Location Type	Floodplain wetland adjacent to B&A Trail
Installation Date	May 14, 2026
Primary Concern	Water encroachment onto nearby private property
Managing Agency	Anne Arundel County Bureau of Watershed Protection and Restoration (BWPR)
Property Ownership	Anne Arundel County Recreation & Parks / County ROW

EXISTING CONDITIONS

On March 7, 2024, BWPR was notified of beaver activity along the B&A Trail corridor. Site investigations identified two active beaver dams located on Recreation & Parks property.

The first dam was located immediately upstream of a culvert crossing beneath the trail. While this dam created wetland habitat, it posed no significant risk to trail infrastructure and was left in place.

A second, larger dam located upstream near a pedestrian bridge was impounding water within the adjacent floodplain. The elevated water surface created concerns regarding water encroachment onto nearby private property.

Initial evaluations determined that a pond leveler may provide a viable long-term coexistence solution by lowering and stabilizing the pond elevation while maintaining wetland habitat.

SITE MONITORING AND REASSESSMENT

Following initial investigations, BWPR monitored the site for approximately seven months. By October 1, 2024, the area no longer showed signs of active beaver activity, and coexistence plans were temporarily placed on hold.

On October 27, 2025, residents notified BWPR of renewed beaver activity and continued

concerns regarding flooding impacts to adjacent property.

BWPR returned to the site on December 23, 2025, to evaluate current conditions and discuss potential coexistence options with nearby residents.

MANAGEMENT APPROACH

On March 17, 2026, BWPR partially notched the dam approximately 6 inches to confirm ongoing beaver activity, evaluate dam repair behavior, and temporarily reduce pond elevation.

A follow-up inspection on March 18, 2026, confirmed active beaver maintenance and repair of the notched section.

On April 24, 2026, BWPR again partially notched the dam at the planned pond leveler location, lowering the structure approximately 12 inches. A follow-up inspection conducted on April 27, 2026, showed the notch had been fully repaired and the dam further reinforced by beaver activity.

Based on observed repair behavior and continued ponding impacts, BWPR determined that installation of a pond leveler represented the most appropriate long-term management strategy.

Approval was requested from Recreation & Parks on April 22, 2026, to install the device within County right-of-way and Recreation & Parks property. Authorization was granted on May 1, 2026.

INSTALLATION

On May 14, 2026, BWPR staff installed a pond leveler consisting of a fabricated intake cage, 60 feet of 15-inch single-wall HDPE pipe, and a controlled notch through the dam.

The device was configured to lower the pond elevation approximately 12 inches while maintaining an estimated 3-foot deep pool within the deepest portion of the pond.

OUTCOME

Post-installation monitoring documented measurable reductions in pond elevation:

- Approximately 7 inches of water reduction within 24 hours.
- Approximately 9 inches of total reduction within four days.

The installation successfully reduced upstream ponding while maintaining wetland habitat and minimizing impacts to adjacent private property.

BWPR continues to monitor the site periodically for device performance, maintenance needs, and ongoing beaver activity.

PHOTO DOCUMENTATION

Before Photos:



3/7/2024 - Existing dam and ponded conditions prior to installation.



7/24/2024 – Existing dam with no signs of beaver maintenance or new activity.



4/24/2026 – Notching the dam 12” in the location of proposed pond leveler.



4/27/2026 – Repair of the notch done 3 day prior.








5/14/2026 – Pond leveler installation and intake cage placement.



5/18/2026 – Reduced pond elevation following installation.

CASE STUDY

BAY GREEN DRIVE – CRITICAL INFRASTRUCTURE RESPONSE

Arnold, Maryland

SITE OVERVIEW

Item	Description
Severity Classification	Severe
Practice Used	Targeted Beaver Removal (Trapping)
Infrastructure / Area Protected	Anne Arundel County sanitary sewer pumping station
Location Type	Utility infrastructure / floodplain area
Primary Concern	Water encroachment threatening operation of pumping station
Managing Agency	Anne Arundel County Bureau of Watershed Protection and Restoration (BWPR)
Partner Agency	Anne Arundel County Bureau of Utility Operations (BUO)
Property Ownership	Anne Arundel County
Wildlife Management Partner	USDA APHIS Wildlife Services

EXISTING CONDITIONS

On October 13, 2025, BWPR was notified by the Bureau of Utility Operations (BUO) of beaver activity potentially impacting an Anne Arundel County sanitary sewer pumping station located near Bay Green Drive in Arnold, Maryland.

Site conditions indicated that water impounded by an active beaver dam was approaching elevations capable of interfering with pumping station operations and associated infrastructure.

SITE ASSESSMENT

On October 15, 2025, BWPR conducted a site assessment and determined that the elevated water surface created by the beaver dam represented an immediate operational threat to the pumping station.

BWPR staff partially notched the dam to relieve ponding around the facility and reduce immediate risk to infrastructure. Follow-up inspections were planned to evaluate repair activity and determine whether the dam remained actively maintained by beavers.

FOLLOW-UP INSPECTION AND MANAGEMENT DECISION

On October 16, 2025, BWPR returned to the site and observed that the dam had been fully repaired. Water levels had again risen to elevations approaching the operational limits of the pumping station.

Based on the immediate threat posed to critical public utility infrastructure, and continued active maintenance of the dam, BWPR determined that coexistence measures were not appropriate at this location.

A management decision was made to remove the beavers through the County's cooperative agreement with USDA APHIS Wildlife Services.

IMPLEMENTATION

During the week of October 26, 2025, USDA APHIS Wildlife Services removed two beavers from the site.

Subsequent follow-up inspections identified no additional repair activity at the dam location following removal efforts.

OUTCOME

A follow-up site inspection conducted on May 18, 2026, documented no renewed beaver activity at the location.

The response successfully reduced immediate flood risk to the sanitary sewer pumping station and restored operational security to the facility.

This case study demonstrates that while coexistence strategies are preferred where feasible, direct management actions may be necessary when active beaver activity presents an immediate threat to critical public infrastructure.

The site also highlighted broader infrastructure vulnerability concerns unrelated to beaver activity alone. Anne Arundel County continues to explore opportunities to improve flood resiliency at sanitary pumping stations located within low-lying and flood-prone areas, recognizing that these facilities may remain susceptible to flooding impacts during major storm events even in the absence of beaver activity.

PHOTO DOCUMENTATION




Beaver dam and elevated water conditions adjacent to pumping station infrastructure.




Dam notching and emergency water level reduction activities.

APPENDICES

APPENDIX A Beaver Activity Decision Framework

APPENDIX B Example Right of Entry (ROE) Agreement

APPENDIX C Detail – Pond Leveler Flow Device

APPENDIX D Detail – Keystone Culvert Fence

APPENDIX E Detail – Notch Exclusion Fencing

APPENDIX F Detail – Tree Protection (Wrapping / Caging)

Beaver Management / Coexistence Decision Framework

Beaver Issue Identified

Is the issue on County-owned property / maintenance easement OR is beaver activity impacting County infrastructure?
(e.g., sanitary facilities, culverts, roads, drainage systems, trails)

Yes → **Is there an opportunity to utilize a beaver coexistence device?**

Yes → **Can the coexistence device be installed internally by AACO staff?**

Yes → **Request material approval and construct / install internally.**

No → **Refer property owner to qualified non-profit / technical resource AND direct them to the list of Maryland licensed trappers.**

No → **Contact APHIS for beaver management services.**

No → **Contact Ecotone or APHIS for installation support.**

NOTES

- This decision tree applies to issues reported on or impacting County property, infrastructure, or maintenance easements.
- Record all reported beaver activity within the County tracking system to support long-term management and coexistence efforts.

LEGEND

- Decision Point
- External Action / Coordination
- Internal Action

EXAMPLES OF COEXISTENCE DEVICES

Beaver Dam Management
- Pond Leveler Flow Device
- Notch Exclusion Fencing

Beaver Infrastructure Protection
- Culvert Protection Fence (Keystone)
- Remote Intake Culvert Protection System

Beaver Vegetation Protection
- Tree Protection Wrap

BEAVER MANAGEMENT / COEXISTENCE

DECISION FRAMEWORK

PROCESS FLOWCHART

COUNTY PROPERTY / INFRASTRUCTURE / EASEMENTS

SCALE	DATE	DRAWN	SHEET
NTS	JUN 2026	—	—

Department of Public Works
Right-of-Way Division
2662 Riva Road
Annapolis, MD 21401

RIGHT OF ENTRY PERMIT

THIS RIGHT OF ENTRY PERMIT ("Right of Entry") made this _____ **day of** **,** _____**,** by and between_____ (the "Grantor") and **ANNE ARUNDEL COUNTY, MARYLAND**, a body corporate and politic of the State of Maryland, (Grantee).

WHEREAS, Grantors are the owners of certain parcel of land identified as _____, identified as _____on the Plat entitled_____, recorded in Plat Book _____, Page _____, and further described in a deed recorded among the land records of Anne Arundel County, Maryland in Book _____, Page _____; and

WHEREAS, beaver activity and associated dam construction on or near the Property have impacted, or may continue to impact, public infrastructure, including but not limited to drainage facilities, culverts, roadways, and related public improvements; and

WHEREAS, the Grantee is responsible for the inspection, maintenance, protection, and repair of public infrastructure affected by such conditions; and

WHEREAS, the Grantee desires to enter upon the Property for the limited purposes of assessing site conditions, monitoring beaver activity, removing beaver dams as necessary, and undertaking related actions reasonably required to protect public infrastructure (**the Work**); and

WHEREAS, the Grantor is willing to grant the Grantee, its employees, agents, contractors, and authorized representatives, the right to enter upon the Property for such limited purposes and under the terms set forth herein.

WITNESSETH: Grantor does hereby grant, permit, license and give to the Grantee, its employees, agents, and contractors the authorization, right and power to enter upon Grantor's Property for the purpose of completing the Work and for other purposes as set forth in this Right of Entry; and

IT IS UNDERSTOOD AND AGREED that (1) Entry onto the Property shall be limited to activities associated with: (a) Site inspection and assessment, (b) Monitoring beaver activity and site conditions, (c) Removal of beaver dams or other related obstructions, (d) Restoration of drainage flow affecting public infrastructure, and (e) Other work reasonably incidental to the protection, maintenance, or repair of public infrastructure, (2) This Agreement shall remain in effect until revoked in writing by the Grantor, provided that any such revocation shall not affect the Grantee's ability to complete work already initiated or reasonably necessary to address an active threat to public infrastructure, (3) The Agency shall make reasonable efforts to provide advance notice to the Grantor prior to entry, except in the event of an emergency or where immediate access is reasonably necessary to prevent damage to public infrastructure, protect public safety, or address active flooding or drainage obstruction, (4) Upon completion of its activities, the Grantee shall make reasonable efforts to restore the Property as nearly as practicable to its prior condition, excluding changes necessarily resulting from the authorized work, normal wear and

tear, or conditions beyond the Grantee's control (5) This Agreement grants only a temporary right of entry and does not create an easement, leasehold, or any other permanent property interest in favor of the Grantee, (6) Grantee shall cause any and all contractors and/or subcontractors performing any or part of the Work to carry general commercial liability insurance written by a reputable insurance carrier, licensed to do business in Maryland, insuring against bodily injury, death, and damage occurring in, on, or about the Property resulting from the acts, omissions, negligence or misconduct of such contractor, its subcontractors, employees, agents. Such insurance coverage shall be maintained during all times that any such contractor, agent, employees or subcontractors are performing any activities on the Property, (7) to the extent permitted by law and subject to appropriation, Grantee agrees to save, indemnify, protect and hold harmless the Grantor and its agents, invitees, licensee, employees, contractors, and officials from any and all liability, obligations, loses, claims, damages, actions, suits, proceedings, costs, and expenses including but not limited to reasonable attorney fees arising and/or resulting directly from the acts, omissions, negligence or misconduct of such party, its contractors, employees, and agents in connection with the Work or the performance of the Work.

IN WITNESS WHEREOF, this Right of Entry Permit is executed on the date and year first above written.

WITNESS:

_____ BY:_____
(Insert: "the Grantor(s)" Name)

ATTEST: ANNE ARUNDEL COUNTY, MARYLAND

_____ BY:_____ (SEAL)
Christine Anderson, Chief Administrative
Officer for Steuart Pittman, County Executive

APPROVED AS TO TERMS:

_____
Department of Public Works

APPROVED AS TO FORM AND LEGAL SUFFICIENCY
ANNE ARUNDEL COUNTY, MARYLAND
GREGORY J. SWAIN, COUNTY ATTORNEY

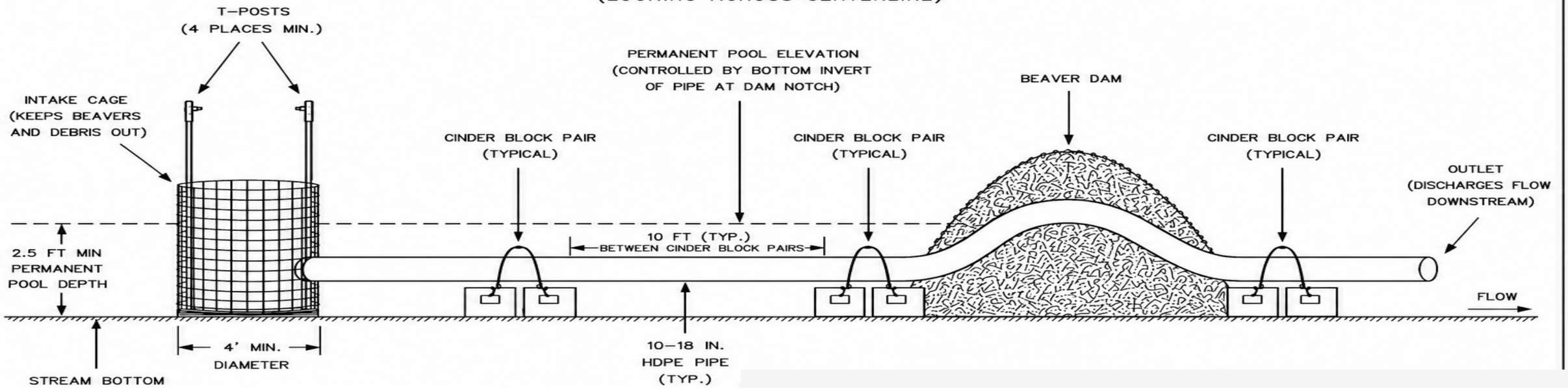
By: _____
Christine Neiderer
Senior Assistant County Attorney

POND LEVELER FLOW DEVICE

BEAVER DAM MANAGEMENT

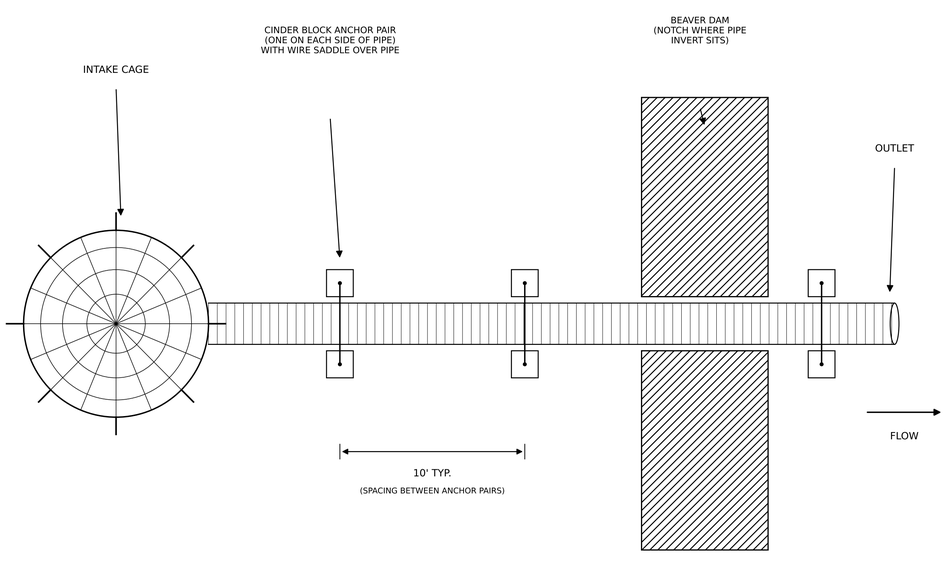
PROFILE VIEW

(LOOKING ACROSS CENTERLINE)



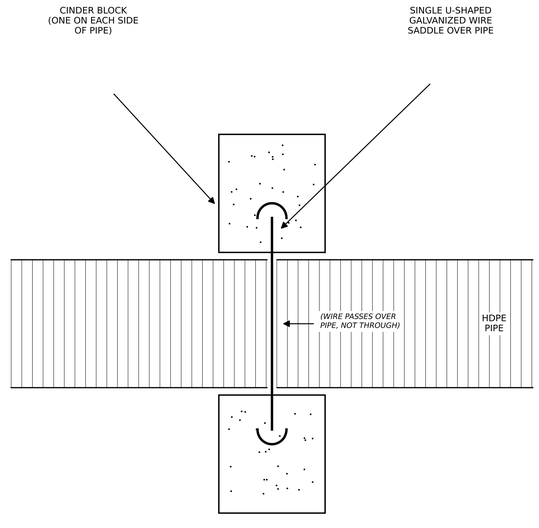
PLAN VIEW

(LOOKING DOWN)



ANCHOR DETAIL

(TYPICAL)



NOTES:

1. THE PERMANENT POOL ELEVATION IS CONTROLLED BY THE BOTTOM INVERT OF THE HDPE PIPE AT THE BEAVER DAM NOTCH.
2. CONSTRUCT INTAKE CAGE USING GALVANIZED WELDED WIRE MESH WITH 4 IN. x 4 IN. OR 6 IN. x 6 IN. OPENINGS. PROVIDE A MINIMUM CAGE DIAMETER OF 4 FT.
3. SECURE INTAKE CAGE WITH A MINIMUM OF FOUR (4) T-POSTS DRIVEN INTO THE STREAM BED.
4. CAP ALL T-POSTS TO PREVENT INJURY TO PERSONNEL, WILDLIFE, AND MAINTENANCE EQUIPMENT.
5. USE 10 IN. TO 18 IN. CORRUGATED SINGLE-WALL HDPE PIPE, OR AS REQUIRED FOR SITE CONDITIONS AND FLOW CAPACITY.
6. INSTALL CINDER BLOCK ANCHOR PAIRS AT 10 FT TYPICAL SPACING. SECURE EACH ANCHOR PAIR WITH A SINGLE GALVANIZED WIRE SADDLE EXTENDING FROM ONE CINDER BLOCK, OVER THE TOP OF THE PIPE, AND ATTACHED TO THE CINDER BLOCK ON THE OPPOSITE SIDE OF THE PIPE.
7. MAINTAIN A MINIMUM PERMANENT POOL DEPTH OF 2.5 FT.
8. ADJUST DIMENSIONS BASED ON SITE CONDITIONS, WATER DEPTH, FLOW REQUIREMENTS, AND BEAVER ACTIVITY.

POND LEVELER FLOW DEVICE

BEAVER DAM MANAGEMENT

CONSTRUCTION DETAIL

PROFILE / PLAN / ANCHOR DETAIL / NOTES

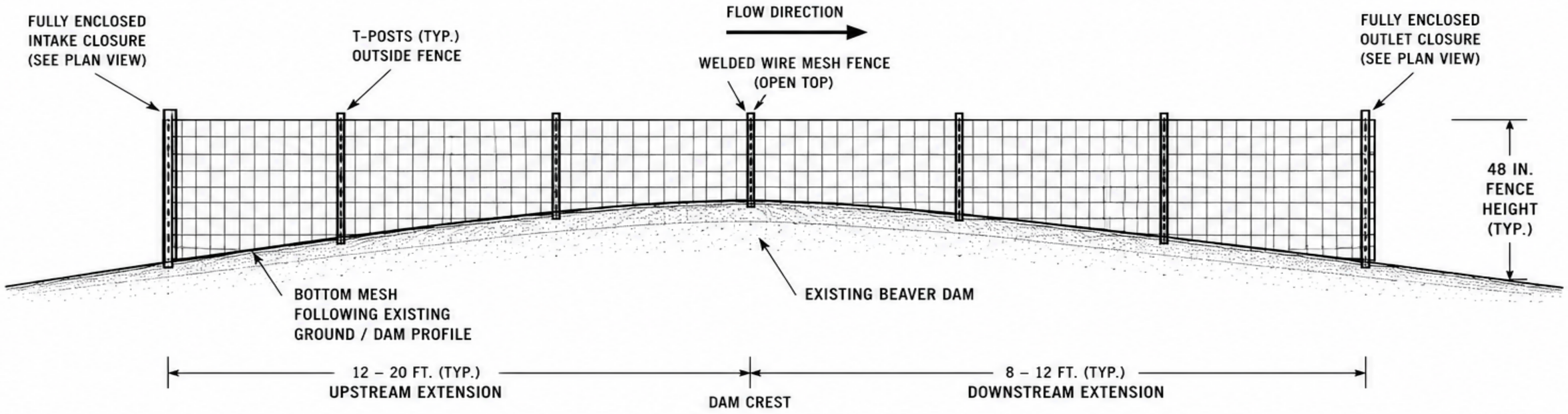
SCALE	DATE	DRAWN	SHEET
NTS	**JUN 2026**	—	—

NOTCH EXCLUSION FENCING

BEAVER DAM MANAGEMENT

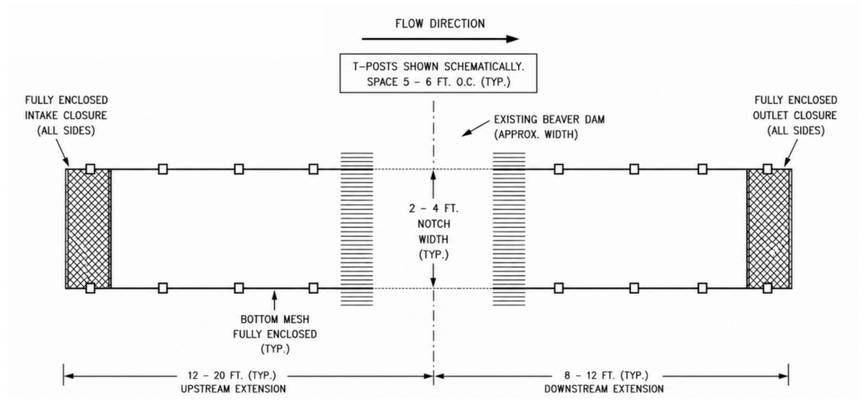
NOT TO SCALE

PROFILE VIEW (LOOKING UPSTREAM TO DOWNSTREAM)



PLAN VIEW

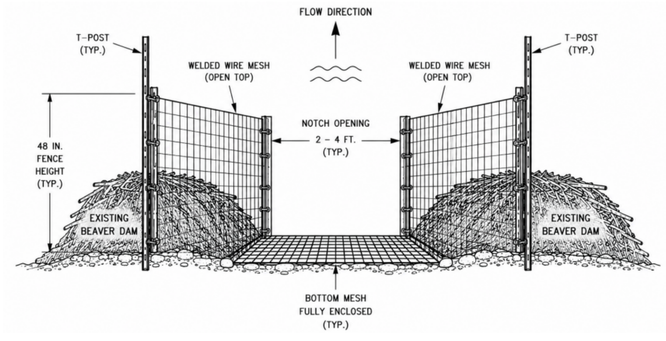
(LOOKING DOWN)



- T–POST (TYP.)
- WELDED WIRE MESH FENCE (OPEN TOP)
- FULLY ENCLOSED INTAKE / OUTLET CLOSURE (ALL SIDES)
- EXISTING BEAVER DAM CENTERLINE
- EXISTING BEAVER DAM (APPROX. WIDTH)

CROSS SECTION THROUGH NOTCH

(TYPICAL, LOOKING DOWNSTREAM)



DESIGN CRITERIA / CONSTRUCTION NOTES:

1. FENCE HEIGHT: 48 INCHES (TYP.).
2. NOTCH WIDTH: 2 - 4 FEET (TYP.).
3. FENCE MATERIAL: GALVANIZED WELDED WIRE MESH WITH 4 IN. x 4 IN. OR 6 IN. x 6 IN. OPENINGS.
4. BOTTOM MESH SHALL FULLY FOLLOW EXISTING GROUND / DAM PROFILE WITH NO GAPS.
5. INTAKE AND OUTLET CLOSURES SHALL BE FULLY ENCLOSED TO PREVENT BEAVER ACCESS AROUND ENDS (SEE PLAN VIEW).
6. T-POSTS SHALL BE STEEL, MIN. 5 FT. LONG, SPACED 5 - 6 FT. ON CENTER (TYP.), AND INSTALLED OUTSIDE FENCE.
7. ALL MATERIALS SHALL BE GALVANIZED OR OTHERWISE CORROSION RESISTANT.
8. ADJUST EXTENSION LENGTHS AS NEEDED BASED ON SITE CONDITIONS, FLOW REQUIREMENTS, AND BEAVER ACTIVITY.

NOTCH EXCLUSION FENCING

BEAVER DAM MANAGEMENT

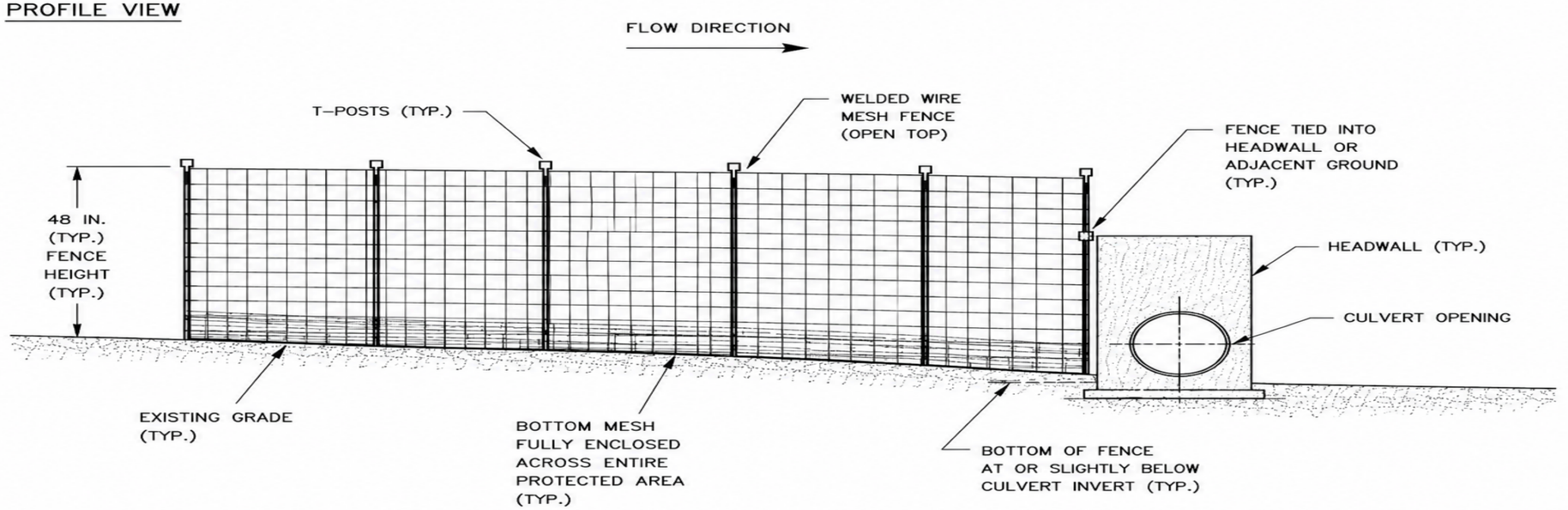
CONSTRUCTION DETAIL

PROFILE / PLAN / CROSS SECTION / NOTES

SCALE	DATE	DRAWN	SHEET
NTS	**JUN 2026**	**—**	**—**

CULVERT PROTECTION FENCE (KEYSTONE FENCE)

PROFILE VIEW

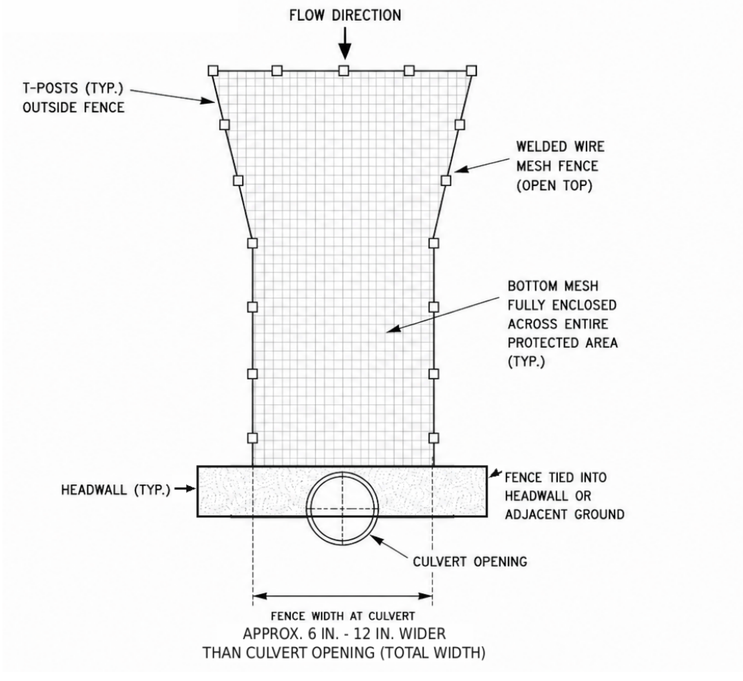


NOTE:

HEADWALL SHOWN FOR CLARITY.
DEVICE GEOMETRY MAY BE ADAPTED
FOR PIPE INLETS WITHOUT HEADWALLS.

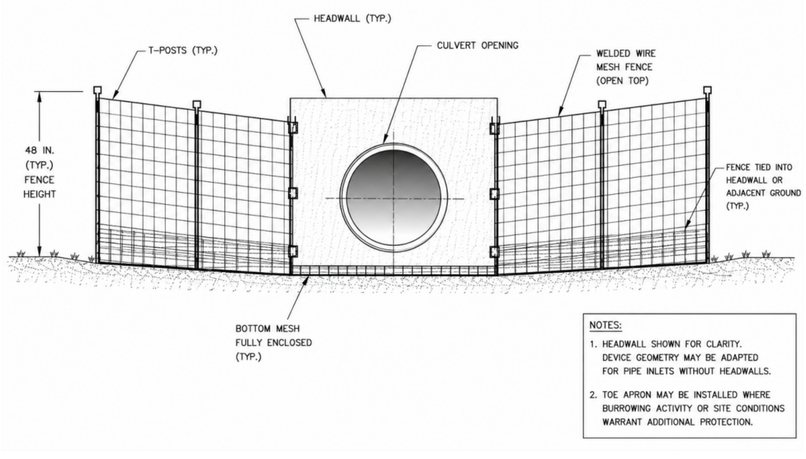
PLAN VIEW

(LOOKING DOWN)



FRONT VIEW

(LOOKING DIRECTLY AT CULVERT INLET)



DESIGN CRITERIA / CONSTRUCTION NOTES:

1. FENCE HEIGHT: 48 INCHES (TYP.).
2. FENCE MATERIAL: GALVANIZED WELDED WIRE MESH WITH 4 IN. x 4 IN. OR 6 IN. x 6 IN. OPENINGS.
3. INSTALL STEEL T-POSTS OUTSIDE FENCE AT 5 - 6 FT. ON CENTER (TYP.).
4. FENCE WIDTH AT CULVERT SHALL BE APPROXIMATELY 6 - 12 IN. WIDER THAN CULVERT OPENING (TOTAL WIDTH), UNLESS SITE CONDITIONS REQUIRE OTHERWISE.
5. CONSTRUCT DEVICE WITH A FULLY ENCLOSED BOTTOM MESH TO PREVENT BEAVER ENTRY BENEATH THE FENCE.
6. FENCE SHALL BE SECURELY TIED INTO THE HEADWALL OR ADJACENT GROUND TO ELIMINATE GAPS AROUND THE CULVERT OPENING.
7. EXTEND FENCE UPSTREAM AND FLARE OUTWARD TO DISTRIBUTE FLOW AND REDUCE THE LIKELIHOOD OF BLOCKAGE AT THE CULVERT INLET.
8. WHERE A HEADWALL IS NOT PRESENT, ADAPT FENCE GEOMETRY AS NECESSARY TO FULLY PROTECT THE CULVERT INLET.
9. ALL MATERIALS SHALL BE GALVANIZED OR OTHERWISE CORROSION RESISTANT.
10. ADJUST DIMENSIONS AND CONFIGURATION BASED ON SITE CONDITIONS, CULVERT SIZE, FLOW REQUIREMENTS, MAINTENANCE ACCESS, AND OBSERVED BEAVER ACTIVITY.

GENERAL NOTE:

HEADWALL SHOWN FOR CLARITY. CULVERT PROTECTION FENCES MAY BE INSTALLED AT PIPE INLETS WITHOUT HEADWALLS WHERE SITE CONDITIONS WARRANT.

CULVERT PROTECTION FENCE

(KEYSTONE FENCE) — BEAVER INFRASTRUCTURE PROTECTION

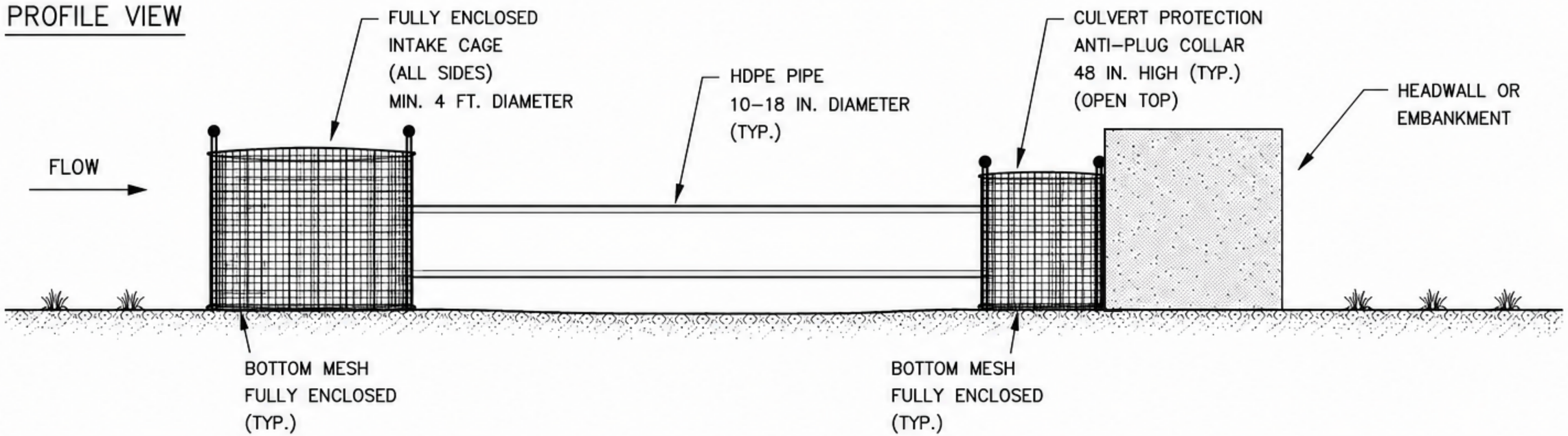
CONSTRUCTION DETAIL

PROFILE / PLAN / FRONT VIEW / NOTES

SCALE	DATE	DRAWN	SHEET
NTS	JUN 2026	—	—

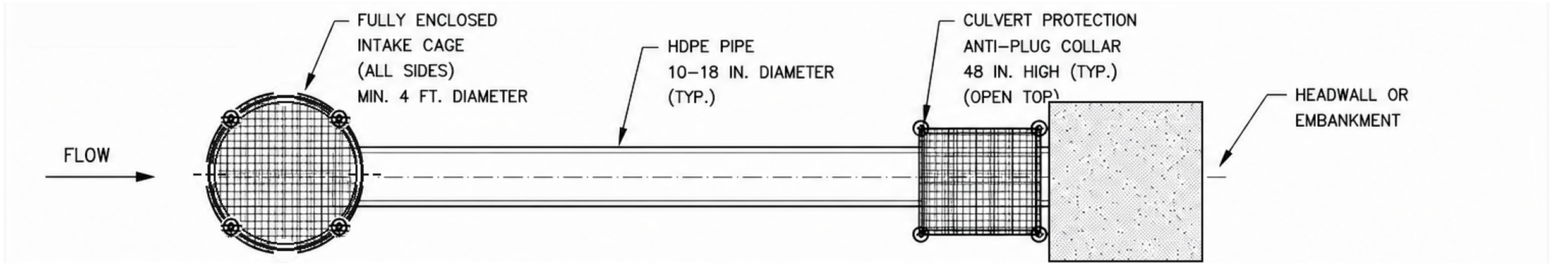
REMOTE INTAKE CULVERT PROTECTION SYSTEM

PROFILE VIEW



PLAN VIEW

(LOOKING DOWN)



NOTES:

1. INTAKE CAGE SHALL BE FULLY ENCLOSED ON ALL SIDES, INCLUDING BOTTOM.
2. CONSTRUCT CAGES USING GALVANIZED WELDED WIRE MESH WITH 4 IN. x 4 IN. OR 6 IN. x 6 IN. OPENINGS.
3. HDPE PIPE DIAMETER SHALL BE SIZED TO CONVEY ANTICIPATED FLOW. TYPICAL PIPE DIAMETERS RANGE FROM 10 - 18 INCHES.
4. INSTALL STEEL T-POSTS AS REQUIRED FOR SUPPORT. MINIMUM OF 4 EACH FOR INTAKE CAGE AND 4 EACH FOR ANTI-PLUG COLLAR.
5. ALL MATERIALS SHALL BE GALVANIZED OR OTHERWISE CORROSION RESISTANT.
6. ADJUST DIMENSIONS BASED ON SITE CONDITIONS, FLOW REQUIREMENTS, AND OBSERVED BEAVER ACTIVITY.

GENERAL NOTE:

HEADWALL SHOWN FOR CLARITY. SYSTEM MAY BE ADAPTED FOR PIPE INLETS WITHOUT HEADWALLS WHERE SITE CONDITIONS WARRANT.

REMOTE INTAKE CULVERT PROTECTION SYSTEM

BEAVER INFRASTRUCTURE PROTECTION

CONSTRUCTION DETAIL

PROFILE / PLAN / NOTES

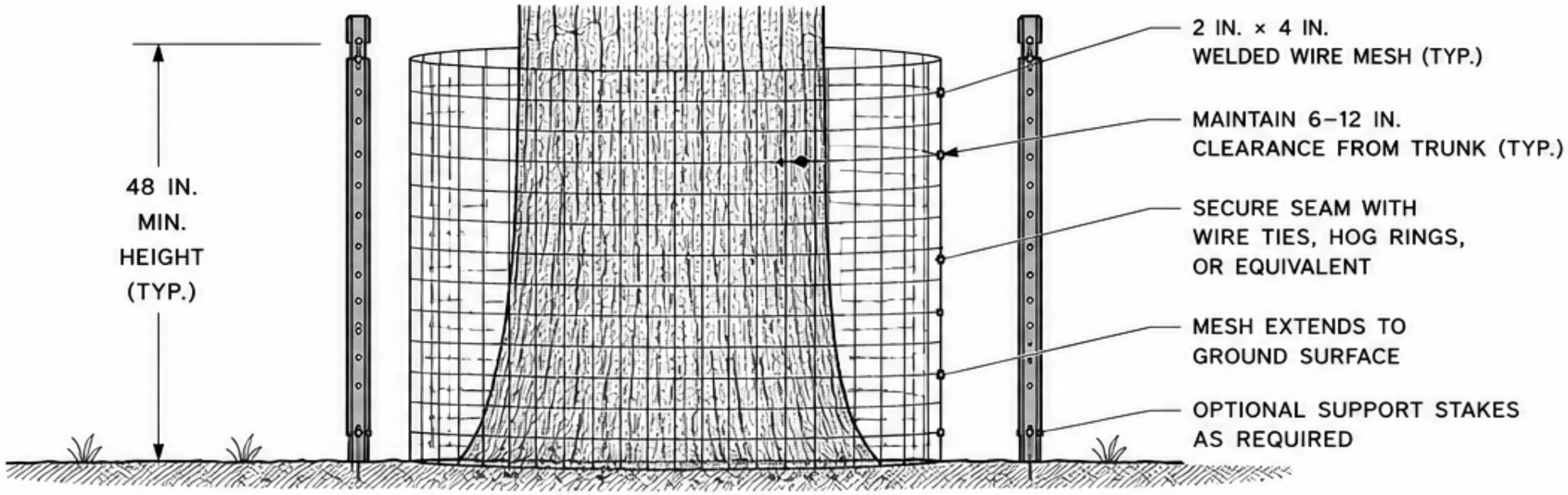
SCALE	DATE	DRAWN	SHEET
NTS	**JUN 2026**	**—**	**—**

TREE PROTECTION WRAP

BEAVER VEGETATION PROTECTION

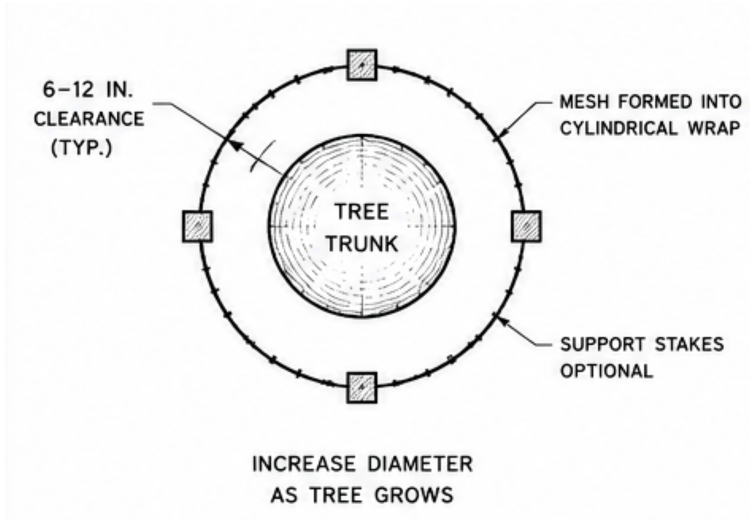
PROFILE VIEW

(LOOKING AT TREE FROM SIDE)



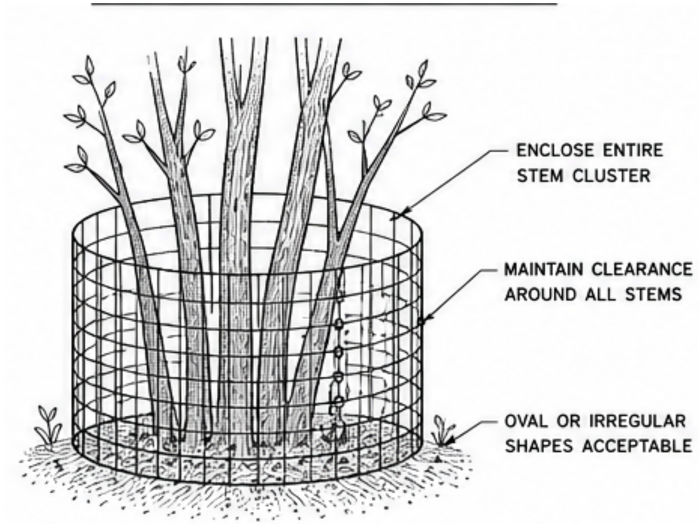
PLAN VIEW

(LOOKING DOWN)



MULTI-STEM TREE / SHRUB DETAIL

(TYPICAL)



DESIGN CRITERIA / CONSTRUCTION NOTES:

1. INSTALL 2 IN. x 4 IN. WELDED WIRE MESH AROUND TRUNK MAINTAINING 6 - 12 IN. CLEARANCE FROM BARK.
2. MESH SHALL EXTEND FROM GROUND SURFACE TO A MINIMUM HEIGHT OF 48 IN.
3. SECURE WRAP USING WIRE TIES, HOG RINGS, OR EQUIVALENT FASTENING METHOD.
4. DO NOT ATTACH MESH DIRECTLY TO TREE.
5. SUPPORT STAKES MAY BE INSTALLED AS REQUIRED TO MAINTAIN WRAP SHAPE AND STABILITY.
6. INCREASE WRAP DIAMETER AS TREE GROWS.
7. INSPECT PERIODICALLY AND REPAIR DAMAGED FENCING AS NEEDED.
8. CORROSION-RESISTANT MATERIALS ARE RECOMMENDED FOR LONG-TERM INSTALLATIONS.
9. ADJUST DIMENSIONS AS NECESSARY BASED ON TREE SIZE, SITE CONDITIONS, AND OBSERVED BEAVER ACTIVITY.

TREE PROTECTION WRAP

BEAVER VEGETATION PROTECTION

CONSTRUCTION DETAIL

PROFILE / PLAN / MULTI-STEM DETAIL / NOTES

SCALE	DATE	DRAWN	SHEET
NTS	**JUN 2026**	**—**	**—**