How to Complete the Notification of Drain Maintenance or Repair Form

Introduction

The joint Notification of Drain Maintenance or Repair form may be used to apply for permissions from Conservation Authorities (CAs) under Section 28 of the *Conservation Authorities Act*, and Fisheries and Oceans Canada (DFO) under the *Fisheries Act* and *Species at Risk Act*. This form should be used for streamlined permissions following the *Drainage Act* and *Conservation Authorities Act* Protocol – Protocol for Municipalities and Conservation Authorities in Drain Maintenance and Repair Activities.

DFO has created a list of maintenance and repair activities that can be conducted in a municipal drain (Class A – E, Unrated, and Class F drains) without a review by DFO. To determine whether the Notification of Drain Maintenance or Repair form must be submitted to DFO for the proposed maintenance and repair activities, consult the following documents:

- Municipal Drain (Class A-E and Unrated) Maintenance and Repair Activities Not Requiring DFO Review; and
- Maintenance and Repair of F Drains.

As outlined in these documents, the following requirements must be met:

- The proposed activity is listed and meets the definition listed in the table;
- The key considerations associated with the activity and the Standard Measures to Avoid Causing Serious Harm to Fish can be incorporated; and
- Aquatic Species at Risk (SAR) are not present in the work zone or impact zone.

Note: Note: the impact zone extends 1 km downstream from the bottom end of the work zone. To confirm there are no aquatic SAR present, refer to the following website at: http://www.dfo-mpo.gc.ca/species-especes/fpp-ppp/index-eng.htm.

If the above requirements are met, a Notification of Drain Maintenance or Repair form does not need to be submitted to DFO. The form must still be submitted to the appropriate CA and all municipal, provincial, or federal legislation that applies to the work being proposed must be followed. If you cannot meet the requirements, then a Notification of Drain Maintenance or Repair form must be submitted to DFO.

Pictures (<500 kb per image) and detailed information about the proposed work should be submitted together with the Notification of Drain Maintenance or Repair form.

Section 1: Contact Information, Location, and Dates for Proposed Works

- Complete the contact information, location of the work, and start/finish dates. Either latitude/longitude or UTM coordinates may be used.
- Please attach a location map with the drain classification and highlight the area for the proposed work, including distinguishing between spot and continuous cleanout locations, staging, etc. (Figure 1).

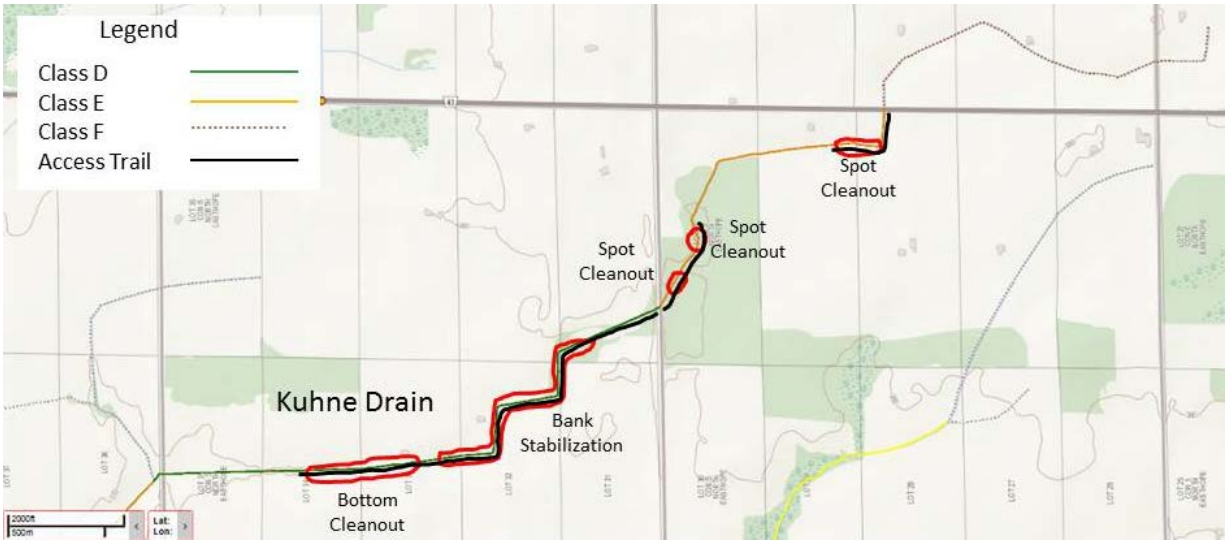

Figure 1. Kuhne Drain Example.

Section 2: Drain Classification

Indicate the drain class and length of the work zone and impact zone.

- Select the drain class for the work zone (area where the work is being completed) and record the length. Note: Some municipal drains may have more than one class. For example, one section of the drain may be a Class D and another section may be a Class E. If work was expected to occur in both sections, the length of each work zone should be recorded.
- Indicate the drain class of the impact zone or select natural watercourse where required. Note: the impact zone extends 1 km downstream from the bottom end of the work zone.
- Indicate whether federal aquatic SAR are present in the work zone or impact zone. SAR maps can be found at: http://www.dfo-mpo.gc.ca/species-especes/fpp-ppp/index-eng.htm.
- A site specific review will be required for Class D drains and for any drains in which aquatic SAR are present in the impact zone or work zone. Note: If a drain has not been classified (Unrated) and there is insufficient data on fish species and flow in the drain, DFO will complete a site specific review of the proposed works.

Indicate the drain type:

- Channel
- Tile
- Channel & Tile Combination

Note: Any open ditch or drain is considered a channel.

Select the *Drainage Act* Section:

- *Section 74 – Maintenance/Repair*

  This option should be selected when drain repair/maintenance work is proposed by a municipal drainage superintendent, without a new report, under the authority of an older engineer's report adopted by by-law. Section 74 requires a municipality to keep municipal drainage systems maintained and repaired. The Drainage Act defines "maintenance" as the preservation of a drainage system (e.g. brushing, spraying, etc.) and "repair" as the restoration of a drainage system to its original condition (e.g. sediment removal, blockage removal, replacement of a crossing).

- *Section 77 - Deepen/Widen/Extend (Not applicable under DART protocol – regular permit process for CAs applies for this type of activity)*

  This option should be selected when minor improvements to the drain are proposed by the drainage superintendent without a new engineer's report. Section 77 of the Drainage Act allows a municipality to make minor improvements to a drain by deepening, widening or extending the drain to an outlet, but the value of the work is limited to $4,500. This section is infrequently used to perform activities such as removing an obstruction downstream from the end of a drain or stabilizing a bank that goes beyond the definition of repair.

- *Section 78 – Maintenance/Repair Only*

  This option should be selected only when drain repair/maintenance work (as defined earlier) is proposed under the authority of a new report and by-law passed under Section 78 of the Drainage Act. Section 78 allows a municipality to perform projects to improve a drainage system. The Act defines "improvement" as any modification/addition to a drainage system intended to increase the effectiveness of the system. Most Section 78 projects involve modifications or additions to an existing drainage system and in those situations, the Notification of Drain Maintenance or Repair form should not be used. However, occasionally Section 78 is used to update the assessment schedules and/or profiles and other drawings, and the physical work being performed falls within the definitions of "maintenance" or "repair". The notification form can be used for those situations.

- *Other*

  Provide specific details on the proposed activities.

Specify disposal of material, if applicable (e.g. location, method):

- Note the proposed location of the disposed material, method of relocation and any access considerations, if not already specified in the Engineer's Report.

Section 3: Maintenance and Repair Activities

Select all of the Maintenance and Repair Activities that apply in the drop down list in the form. Confirm the proposed activity meets the description in the form. Under "Additional Information", provide any important details of the activity. For example:

- Number of beaver dams to remove
- Number and size of spot cleanouts
- Indicate if there are any differences between the proposed activity and the description in the form

Section 4: Other Considerations for Review Agencies (Please specify):

- Provide any other relevant information that could affect the project (e.g. access considerations, buried utilities, date of last cleanout, drain condition) to assist with the review by the agencies.
- It may be helpful to attach photos (<500 kb per image) of the work site and/or for identifying any particular issues at the site.

Section 5: Avoidance, Mitigation, and Offsetting Measures

The avoidance, mitigation, and offsetting measures identified in the notification form and in the supporting information provided by the proponent will become part of a Class Authorization or *Fisheries Act* Authorization. Mitigation measures may be substituted as necessary based on the current conditions at the work site but effective sediment and erosion controls must be in place prior to starting work and maintained throughout the drain maintenance and repair activity(ies). However, it is important that the avoidance and offsetting measures that are selected are carried out as described. Failure to comply with any condition of an Authorization constitutes an offence under paragraph 40(3)(a) of the *Fisheries Act* and may result in charges being laid under the *Fisheries Act*.

Section 5a: Avoidance Measures

Avoidance measures are measures taken to completely prevent *serious harm to fish*. Avoidance measures should be used whenever possible. **Select all of the avoidance measures that will be used during the proposed drain maintenance and repair activities.**

Maintain Meanders

Meanders in a municipal drain can provide important fish habitat including: cover from undercut banks, rearing habitat (e.g. slower and shallower vegetated section of a drain), spawning habitat (e.g. riffles), and resting and overwintering areas (e.g. pools). **Indicate whether it is possible to keep any meanders in the municipal drain and identify these areas on a map.**

Maintain Natural Features/Coarse Substrates

Cobble and gravels often provide spawning habitat for a variety of fish species. Removal of these substrates should be avoided. **Indicate whether it is possible to maintain any sections of the municipal drain that contains good areas of cobble or gravel substrates. Identify these sections on a map.**

Maintain Pools and Riffles

Pools provide cover, help regulate water temperature, aid in fish passage, and are refuges for fish during low flow periods. Riffles provide protection from predators, shelter, and sources of food and some species use riffle habitat for spawning. **Indicate whether it is possible to keep any pools and riffles in the municipal drain and identify these areas on a map.**

Spot cleanout

Spot cleanouts are removals of isolated sediment build-up that is significant enough to cause erosion or flow blockage/flooding concerns in the channel. They are not continuous along the drain. **Indicate the number and size (m^2) of the spot cleanouts in the municipal drain.**

Staged cleanout

A staged cleanout is a drain cleanout conducted in stages by dividing it into sections along its length, with maintenance occurring one section at a time. Refuge areas may be left in between sections and are subsequently cleaned out at a later date. Depending on the length or sensitivity of habitat or species maintenance could be staged over a period of years. Staging could also be looked at geographically, whereby maintenance activities would alternate between reaches to provide intermediate refugia around the activity. **Indicate whether it is possible to conduct a staged cleanout of the municipal drain. Identify the stages on a map and explain the timing of the staged cleanout (e.g. Sections 1 & 3 (August 2017), Sections 2 & 5 (August 2018).**

Two-stage/low-flow channel

Over time, a two-stage/low-flow channel may form in some wider municipal drains (Figure 2). During periods of low flow, the water is concentrated into the narrower deeper portion of the channel. During periods of high flow, the low-level vegetated benches on either side of the drain allow large volumes of water to be transported through the full width of the channel. This is helpful in systems that see a large variation in water flow, particularly after rain events. It reduces erosion and provides improved fish passage. When conducting a bottom cleanout, the narrower, deeper part of the channel may be cleaned out and the vegetated benches on either side of the drain should not be touched. **Indicate whether it is possible to maintain a two-stage/low-flow channel. If the entire low-flow channel cannot be maintained, identify the section(s) that can be maintained on a map.**

Work in low or no flow

A municipal drain is easier to clean out when there is as little flow as possible. For Class F drains, the work should be conducted when the drain is dry, frozen, or there is standing water with *no observable flow* (no movement of water between two points). For all other drain types, this means working in the drain during periods of the lowest water levels, typically in the summer when spring freshet is over and

warm dry weather conditions mean less surface run-off and lower flow rates. Avoiding high spring flows also means that work is not occurring when many fish species are spawning. **Indicate on the form whether the work can be carried out during low flows in Class A, B, C, D, and E drains and no flows in Class F drains.**

Section 5b: Mitigation Measures

When avoidance is not possible, then efforts should be made to minimize (mitigate) impacts caused by the proposed municipal drain maintenance or repair activity. Appropriate sediment and erosion control measures are a requirement under Section 28 of the *Conservation Authorities* Act and the *Fisheries Act*. Note: In addition to the sediment and erosion control measures listed below, the Standard Measures to Avoid Serious Harm to Fish must also be followed.

The mitigation measures in the form represent various strategies that have been effective in avoiding serious harm to fish and fish habitat. Ontario Provincial Standard Drawings (OPSD) have been included when available. These are intended to be examples; the mitigation measures used should be designed to site conditions. Not all of the strategies presented are suitable in every case. Every municipal drain is different; the mitigation measures appropriate for one site may not be appropriate for another. Selection of the appropriate strategy or set of strategies should be based on conditions at the site. Note: Class D drains and municipal drains with aquatic SAR may require specific mitigation measures. For these drains, a biologist will work with the proponent during the site specific review process.

Indicate all of the measures that will be used to minimize sediment and erosion. Details (e.g. type of product, number, and approximate dimensions) on the selected mitigation measures should be provided on the Notification of Drain Maintenance or Repair form. Additional details and explanation should be provided along with the form in a cover email. Sketches, drawings, and site photographs are helpful for the reviewing biologist when alternative measures are proposed.

Erosion Control Mats (Temporary)

Erosion control mats and blankets can be used to stabilize banks and disturbed areas where revegetation or seeding is not appropriate, or cannot be implemented at the right time of year to become established. Temporary erosion control mats and blankets are made from natural fibers such as jute, straw, or coir mats that will break down over time as vegetation takes hold. Mats are typically used in combination with reseeding and some mats are available that contain seed. **Indicate the type of mats and the extent of the area that temporary erosion control mats are to be used (i.e. in a specific location or along the entire length of the drain).**

Erosion Control Mats (Permanent)

Similar to the temporary mats discussed above, permanent erosion control mats can be used where seeding and revegetation is not appropriate or immediate stabilization is required. Permanent erosion control mats and blankets are made from synthetic fibers that will not break down. In addition to stabilizing banks, these mats can be used instream in place of riprap for outfall protection below culverts and tile outlets. **Indicate the type of mats and the extent of the area that permanent erosion control mats are to be used (i.e. in a specific location or along the entire length of the drain).**

Silt Curtain

Silt curtains may be a helpful mitigation measure for maintenance/repair work in larger drains with little or no flow. Water levels in some drains are heavily influenced by the water levels of the receiving waterbody downstream. This is often seen with drains that flow into lakes or large canal systems. In these situations, a silt curtain may be installed just upstream of the outlet to prevent sediment movement downstream. Silt curtains may also be used to isolate a drain from the receiving waterbody, preventing fish from moving up into the drain during the construction. Upon completion of work, silt curtains need to be removed with care to prevent release of any sediment that has been trapped by the curtain. **Indicate where the silt curtain(s) will be used.**

Silt Fence Barrier (light-duty)

This mitigation measure refers to the installation of a geotextile fabric above the waterline, parallel to water flow (Figure 3; OPSD 219.110). Placement of silt fencing across (perpendicular to) the channel is a type of flow check dam and is discussed below. Silt fence barriers prevent sediment from entering the drain from work areas along the bank slope or the top of the banks. Silt fencing needs to be installed correctly, with the fabric extending into a trench and back filled in order to work effectively. This fencing should be staked with no more than 2.3 m between the stakes. **Indicate where the silt fence barrier will be used.**

Silt Fence Barrier (heavy-duty)

Similar to light duty fencing discussed above, heavy duty silt fencing is installed parallel to water flow (Figure 4; OPSD 219.130). Heavy duty fencing is trenched, backfilled and staked further into the ground to withstand heavier sediment loads. Stakes should also be no more than 2 m apart. **Indicate where the silt fence barrier will be used.**

Straw Bale Barrier (light duty)

Straw bales may be used, similar to silt fencing, as a light duty option to prevent sediment from entering a drain when work is being completed along the banks (Figure 5; OPSD 219.100). This measure is also installed parallel to water flow. Straw bales need to be trenched 75 mm and staked well into the ground (600 mm), with the trench backfilled and compacted to prevent sediment from washing under the bales. The bales need to be butted tightly against adjoining bales to prevent sediment flowing between the bales and each bale should have two stakes to prevent shifting. **Indicate where the straw bale barrier will be used.**

Flow Check Dams (Temporary)

Temporary flow check dams are commonly used sediment control measures in municipal drains. Constructed downstream of the maintenance site, flow check dams are used to reduce flow velocity in a watercourse and dissipate flow energy allowing sediment to settle out of the water. Water is allowed to flow slowly through or over the check dam with the sediment remaining behind.

In-water sediment control measures can be effective for short periods on small drainage areas. However, it is important that they are only used when flow in the drain is low. Otherwise, the sediment will not settle out behind the check dam. Flow check dams are not effective sediment controls in large

watercourses or during high flow events (e.g. major rain events). As with all sediment and erosion control measures, prior to removing the barriers any sediment accumulated behind in-water sediment barriers must be removed carefully to avoid re-suspension.

Straw Bale Flow Check Dam

Straw bale flow check dams require staking straw bales, tightly fitted together across a channel (Figure 6; OPSD 219.180). The bales must be installed tight enough together to prevent sediment laden water from flowing between them. This method can be used in flat bottom and V-shaped ditches. The most common error when installing straw bales is placing bales in the channel only. The straw bales must extend well up the bank on either side of the channel. Without bales on the slopes, flows will work around the dam releasing sediment and causing additional bank erosion.

For this mitigation measure, the flow check dam should consist of two rows of straw bales which are offset to prevent flow through the dam. The bales need to be trenched, backfilled, and evenly staked. Bale ties must not be touching the ground to ensure that they are oriented properly and to prevent the ties from degrading allowing the bale to break apart. **Indicate where the straw bale flow check dam will be used.**

Silt Fence Flow Check Dam

Silt fence flow check dams are frequently indicated on the Notification of Drain Maintenance or Repair forms as the chosen mitigation measure, however, they only work in small drains with very low flow and are only effective when they are properly installed and maintained (Figure 7 & Figure 8; OPSD 219.190). As with straw bales, the silt fence slows the flow allowing sediment to settle out of the water column and also filters sediment from water as it passes through the material. More than one set of curtains may be required and the number of check dams proposed for a drain maintenance project should be indicated on the notification form.

Silt fences are commonly placed where flows are too high, or can be inadequate during a rain event. When installing the silt fence, it should be constructed so that the top of the fence will give way releasing some of the water, but continuing to hold back the sediment that has settled out. Without proper trenching and backfilling the bottom of the silt fence will kick out and the sediment will be washed downstream.

Care also needs to be taken when removing these controls. Excess sediment should be removed from the entrapment before taking down a sediment control structure; this will prevent the sediment from being released back into the stream. These structures should not be confused with the use of silt fencing along the banks. **Indicate the number of silt fence flow check dams and where the silt fence flow check dam(s) will be used.**

Rock Flow Check Dam, V-Ditch

Rock flow check dams can be designed as temporary or permanent structures. (Note: The gradient of the municipal drain may influence the design of the rock flow check dam, V-ditch.) Rock is usually installed in combination with geotextile to create a dam which forms a pool behind it (Figure 9; OPSD 219.210). These structures are also used in combination with sediment traps (Figure 10 & Figure 11; OPSD 219.220). Water velocity is reduced and heavier sediments are allowed to settle. While rock flow

check dams are able to withstand somewhat higher flows than the straw bale or silt fence versions, it is still not a good option for large drainage areas with high flows.

The design should include a long spillway on the downstream slope creating a riffle. This pool-riffle feature can be left permanently, or modified to a lower height after maintenance works have been completed to add habitat diversity to the drain.

The rock flow check dam, V-ditch version is used in narrow, deep v-shaped drains. Rock is placed in the channel to form the flow check dam. Geotextile fabric is placed over the rock, taking care to trench and backfill the geotextile fabric at the upstream end to anchor and prevent water from lifting it. A layer of rock is placed over the geotextile to secure it. The geotextile acts as an additional sediment filter. These structures can fail if water is able to undermine or skirt the structure along the banks. **The number and size of the proposed rock flow check dams should be indicated on the Notification of Drain Maintenance or Repair form.**

Rock Flow Check Dam, Flat-Bottom Ditch

Rock flow check dams, flat bottom ditch is similar to the V-ditch design above but is meant for use in wide, flat-bottom drains (Figure 12; OPSD 219.211). **The number and size of the proposed rock flow check dams should be indicated on the Notification of Drain Maintenance or Repair form.**

Other Temporary Measures

Drainage superintendents, drainage engineers, and Conservation Authority staff and contractors often come up with mitigation ideas that are more suitable to the limitations or challenges of a drain maintenance site. These other mitigation measures can be indicated on the Notification of Drain Maintenance or Repair form when submitting for review.

Section 5c: Offsetting Measures (Permanent) – Applicable for DFO Submissions

After applying avoidance and mitigation measures, any residual impacts would normally require authorization and should then be addressed by offsetting.

- This section must be completed if you are working in a Class A, B, C, D, or E Drain.
- This section does not need to be completed for Class F Drains.
- Select the appropriate offsetting options that can be successfully implemented.
- The number and size of the offsetting measures used should reflect the scale and extent of the disturbance. For example, one pool created per 2 km of drain cleanout would **not** be appropriate or sufficient.
- The notification form will be considered to be incomplete by DFO if offsetting measures are not identified and quantified.
- Class D and SAR Drains require a site specific review by DFO; a biologist can work with you to determine appropriate and offsetting.

When selecting the type and location of the offsetting measures, it is important that these measures do not have a negative impact on the municipal drain. In many cases, the offsetting measures used can

provide additional benefits to the drain. For example, in a section of a drain with a large gradient change, a Newbury Weir/Rock Flow Check Dam, V-Ditch or Rock Flow Check Dam, Flat-bottom Ditch can be used to slow down the movement of water and minimize the erosion in this section as well as provide important fish habitat.

Bank Stabilization

There are a number of ways that banks stabilization can be achieved from simple reseeding of exposed soils to more elaborate bioengineering techniques. Reseeding is discussed below. This section will focus on alternative methods.

Bioengineering or artificial (riprap or gabion baskets) methods can be used to stabilize banks that are eroding where natural revegetation is either not possible or not practical. Bioengineering techniques use plant material to stabilize banks and have greater habitat benefits than artificial methods.

Bioengineering methods include:

- Brush mattresses - A brush mattress is a protective mat of cuttings placed on the stream bank and staked sufficiently to hold it in place (See Kavanagh & Hoggarth, 2015). This mat provides 100% coverage in the area that it is placed.
- Live fascines – These are best described as a rope-shaped bundle of live cuttings, lashed together with twine. Fascines grow rapidly when constructed from live materials. The resulting root systems work well to secure soils and to hold the fascine in place. They are simple and effective, require little time to build, and can be installed with little site disturbance (See Kavanagh & Hoggarth, 2015).
- Root wads - Use of root wads (trunks butted into the bank leaving the root mass exposed) to protect banks (See Kavanagh & Hoggarth, 2015).
- Live cribwall - A three dimensional structure created from untreated timbers, fill, and live cuttings. This structure, once filled, acts as a retaining wall. The timbers provide immediate protection and stability for the structure, but their importance is gradually lessened as they decompose, and the live cuttings grow and proliferate. The resulting root mass binds the fill and the parent soils into a single coherent mass. Live cribwalls are also one of the more complex structures listed, as their construction can cause considerable site disturbance (See Kavanagh & Hoggarth, 2015).
- Live Rock Revetments – This is a combination of live dormant cuttings with field or armour stone (riprap). The live cuttings are placed in the openings between the rock, during or after rock placement. The rock holds the cuttings in place and as the cuttings grow the roots hold the rock in place and help to stabilize the site. This method has also been referred to as a joint planting, vegetated rip-rap, and rock fill with branch layering (See Kavanagh & Hoggarth, 2015).
- Riprap (Bank Armouring) - Placement of riprap along the banks. Geotextile fabric should be placed underneath riprap to prevent erosion behind the armouring. This is not a preferred method for long reaches.

Indicate which bank stabilization methods are to be used and provide all necessary details (e.g. number, size, location).

Creation of a Low Flow Channel

This design incorporates a deepening of the centre of the channel in wider drains, or through a floodplain with low-level vegetated benches on either side (Figure 2). During periods of high flow, the channel is able to transport large volumes of water through the full width of the channel. During periods of low flow, the water is concentrated into the narrower portion of the channel allowing for higher velocity to minimize sediment deposition with the added benefits of reduced erosion and improved fish passage. This is also helpful in systems that see a large variation in water flow, particularly after rain events. **Provide all of the details on the construction of the low flow channel (e.g. length, depth, width of centre channel, width of benches).**

Culvert Removal/Replacement

Removal or replacement of culverts is often under taken as part of the maintenance and repair of drains. Culvert replacements can be conducted without DFO review when the new culvert is the same size as the old culvert and is in the same location; this is referred to as a "like for like" replacement. Culvert replacements can also be done without DFO review when the requirements and conditions in the Culvert Replacement Best Management Practices can be met. The following documents should be reviewed when planning a culvert replacement in a municipal drain:

Municipal Drain (Class A – E and Unrated) Maintenance and Repair Activities Not Requiring DFO Review;
Maintenance and Repair of F Drains; and
Culvert Replacement Best Management Practices.

In some circumstances, the removal or replacement of perched culverts (not properly embedded into the bottom of the drain) or undersized culverts, which are barriers to fish passage, may be used as a measure to offset other maintenance works. When replacing a culvert, the diameter of the new culvert should be large enough to permit water to flow through at a normal velocity. Undersized culverts concentrate flows creating a "fire hose" effect where the water velocity is too fast for most fish species to swim against the flow.

A replaced culvert should also be embedded into the substrate at both the upstream end, to prevent erosion and undermining, and at the downstream end to prevent excessive scouring and erosion, and to ensure that fish can swim through the culvert even during low flow conditions. **Provide all of the details on the culvert replacement (e.g. size of area dewatered, diameter and length of the culvert, % of embedment).**

Newbury Weir/Rock Flow Check Dam, V-Ditch

Newbury weirs are similar to rock flow check dams with a few modifications (Figure 13). Newbury weirs are intended to be permanent structures. The shape of the rock flow check dam should be low enough to allow fish passage over the structure and shaped in a "V" to concentrate low flows. Newbury weirs can be used to enhance pools, recruit gravel, re-aerate flows, and assist fish passage. They are typically used in channelized stream reaches to help restore run-pool-riffle sequences but can also provide other benefits. For example they can:

- Aerate water;
- Control the gradient of a stream and creates fish habitat in the process; and
- Increase fish production by providing spawning substrate.

If not constructed properly, this type of structure can be a barrier to fish during low flows. Some maintenance will be required, particularly after high flow events. Considerable experience is required when designing these structures and, therefore, this rehabilitation project should not be carried out without the support of experts (e.g. aquatic biologists, engineers, and hydrologists). For design criteria and details, refer to the Rehabilitation and Enhancement of Aquatic Habitat Guide V. 1.0 by R.J. Kavanagh & C.T. Hoggarth Central and Arctic Region Fisheries and Oceans Canada.

Provide all of the important construction details (e.g. number of structures, size, design details) for the Newbury Weir/Rock Flow Check Dam, V-Ditch that is to be constructed.

Refugia Pools/Sediment Traps

Refugia Pools are created by strategically digging a spot that is wider and deeper in the open drain (Figure 10 & Figure 11; OPSD 219.220). Excessive widening of the channel should be avoided, however, the channel must be widened enough to stabilize the banks. Refugia pools can be created as an offsetting measure in A, C, and E drains. During low flow conditions, when even permanent watercourses can dry up for short periods of time, these larger deeper areas are important habitat for fish, providing cover and cooler temperatures.

The number of refugia pools created should reflect the length of drain being maintained. As a minimum, there should be one refugia pool per 1 km. **Indicate the number of pools and design details (e.g. dimensions) proposed on the Notification of Drain Maintenance or Repair form and attach a map with the proposed locations.**

Reseeding and/or Planting

As soon as the drain maintenance is completed, the spoils or excavated material created from the cleanout should be levelled and reseeded (when not in a cultivated agricultural field). This is typically undertaken as a mitigation measure to stabilize disturbed soils and prevent sediment from entering the drain.

When reseeding, the following should be considered:

- Disturbed soils should be seeded with native grass seed or a seed legume mix within 48 hours of the disturbance and ideally within 24 hours if possible. Grasses such as switchgrass, prairie cordgrass, and cylindric blazing star have very long roots and may provide more stabilization of soils compared to other grass species.
- Seeding should occur while the disturbed soil is still moist to facilitate germination.
- Sufficient time should be left in the growing season to ensure that germination can occur for revegetation to be successful.
- Where revegetation cannot be undertaken within a reasonable time after soils are disturbed or the work is conducted outside of the growing season, artificial cover such as mulch, straw, or fiber mats should be used to stabilize the banks until natural revegetation occurs.

When reseeding and/or planting is being undertaken as an offsetting approach, look for opportunities to improve poorly vegetated areas, riparian areas, or widen buffers strips. The benefits of reseeding and/or planting to both drainage and fish habitat include:

- Filtering of sediment from overland flow;
- Removal of nitrogen and phosphorus in water (preventing excessive in-stream vegetation growth);
- Increased shading and cooling of water;
- Improved cover from overhead predators;
- Increased nutrients and food for fish; and
- Improved bank stability with a vegetation root mass.

Seeding is often used in combination with other bank stabilization techniques. **Indicate the size of the area that is to be re-seeded or replanted and provide any additional details (e.g. seed mix to be used).**

Note: It is important that the grasses, shrubs, and/or trees that are to become established are compatible (e.g. doesn't host blights/fungi which could damage crops) with the adjacent land usage.

Riffle Habitat

Riffles are shallow areas with fast, turbulent water running over gravel, cobble, and/or small boulders. Riffles aerate water, provide important habitat for aquatic insects, and provide cover and spawning substrate for a variety of fish species. The placement of gravel, cobble, or riprap may protect a section of a municipal drain experiencing down cutting (e.g. tile outlet). **The number and size of the proposed riffle habitat(s) should be provided and the location of the riffle(s) should be indicated on a map.**

Rock Flow Check Dam, Flat-Bottom Ditch

Rock flow check dams can be designed as temporary or permanent structures. Rock is placed in the channel to form the flow check dam. Geotextile fabric is placed over the rock, taking care to trench and backfill the geotextile fabric at the upstream end to anchor to prevent water from lifting it. A layer of rock is placed over the geotextile to secure it. These structures can fail if water is able to undermine or skirt the structure along the banks. These structures are also used in combination with refugia pools. The rock flow check dams, flat bottom ditch (Figure 12; OPSD 219.211) is meant for use in wide, flat-bottom drains. It is important that fish are able to pass the check dam structure.

The number and size of the proposed rock flow check dams should be provided and the location of the dam(s) should be indicated on a map.

Mitigation and Offsetting Measures Drawings

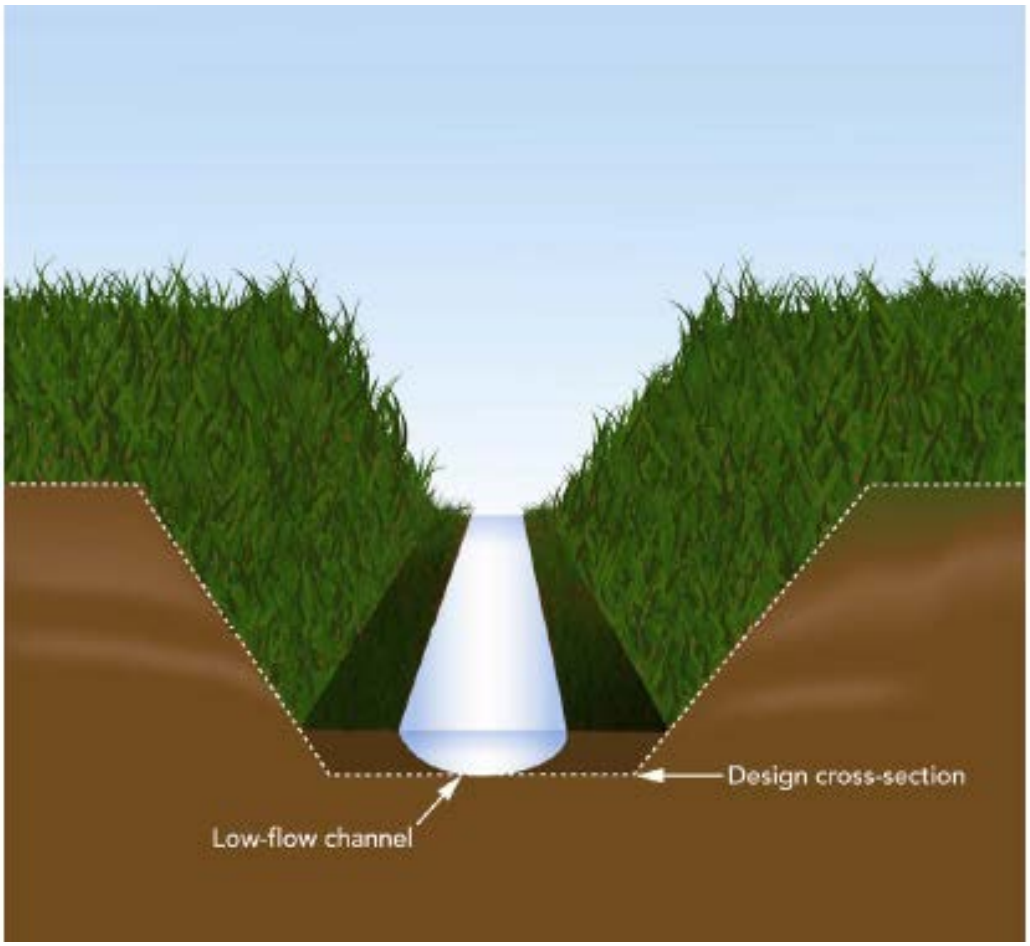

Figure 2. Two-stage/low-flow channel (MNRF & OMAFRA, 2012).
(Return to 8-6; 8-12)

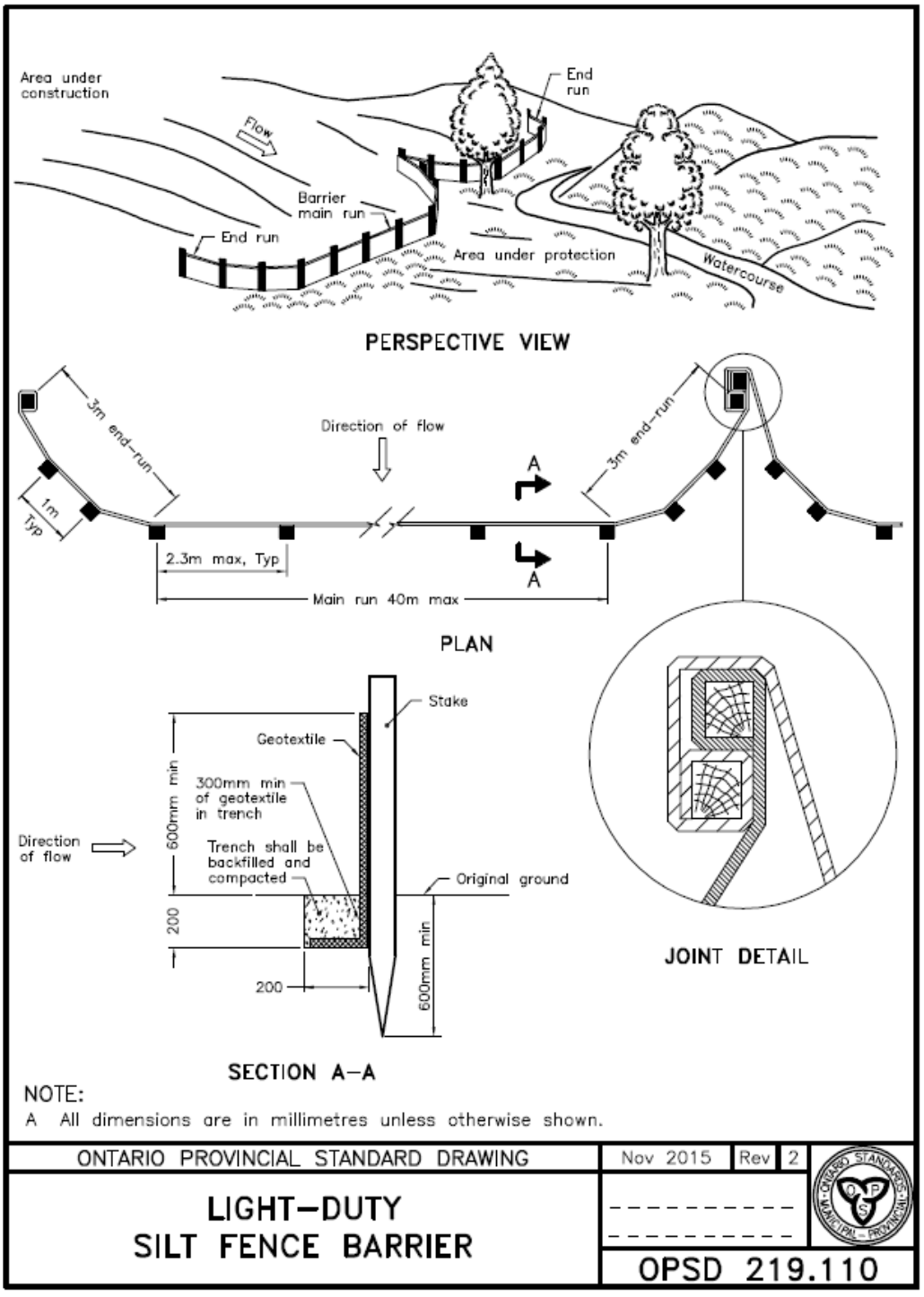

Figure 3. OPSD 219.110 Silt fence barrier (light duty).

[Return to 8-8]

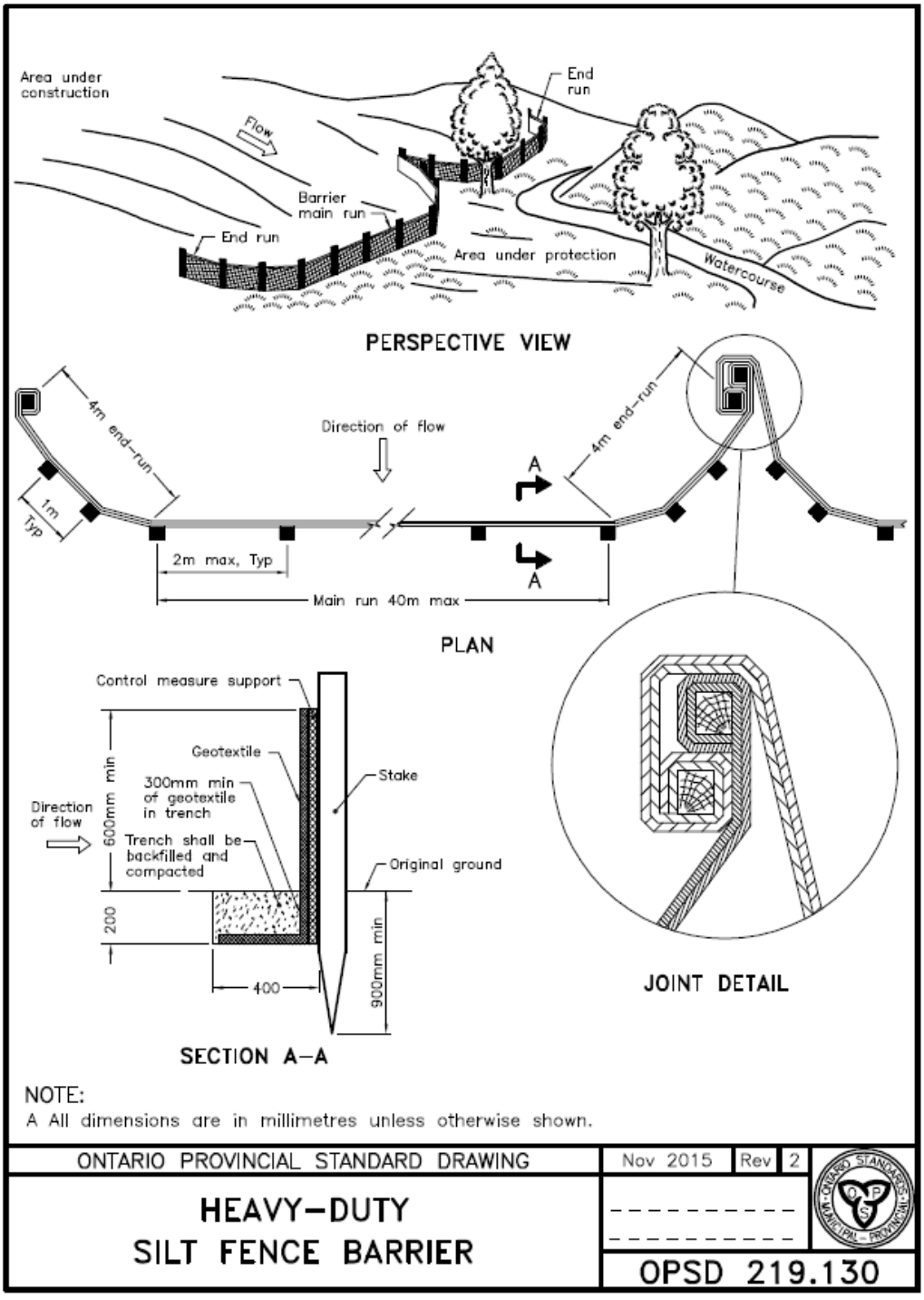

Figure 4. OPSD 219.130 Silt fence barrier (heavy duty).

[Return to 8-8]

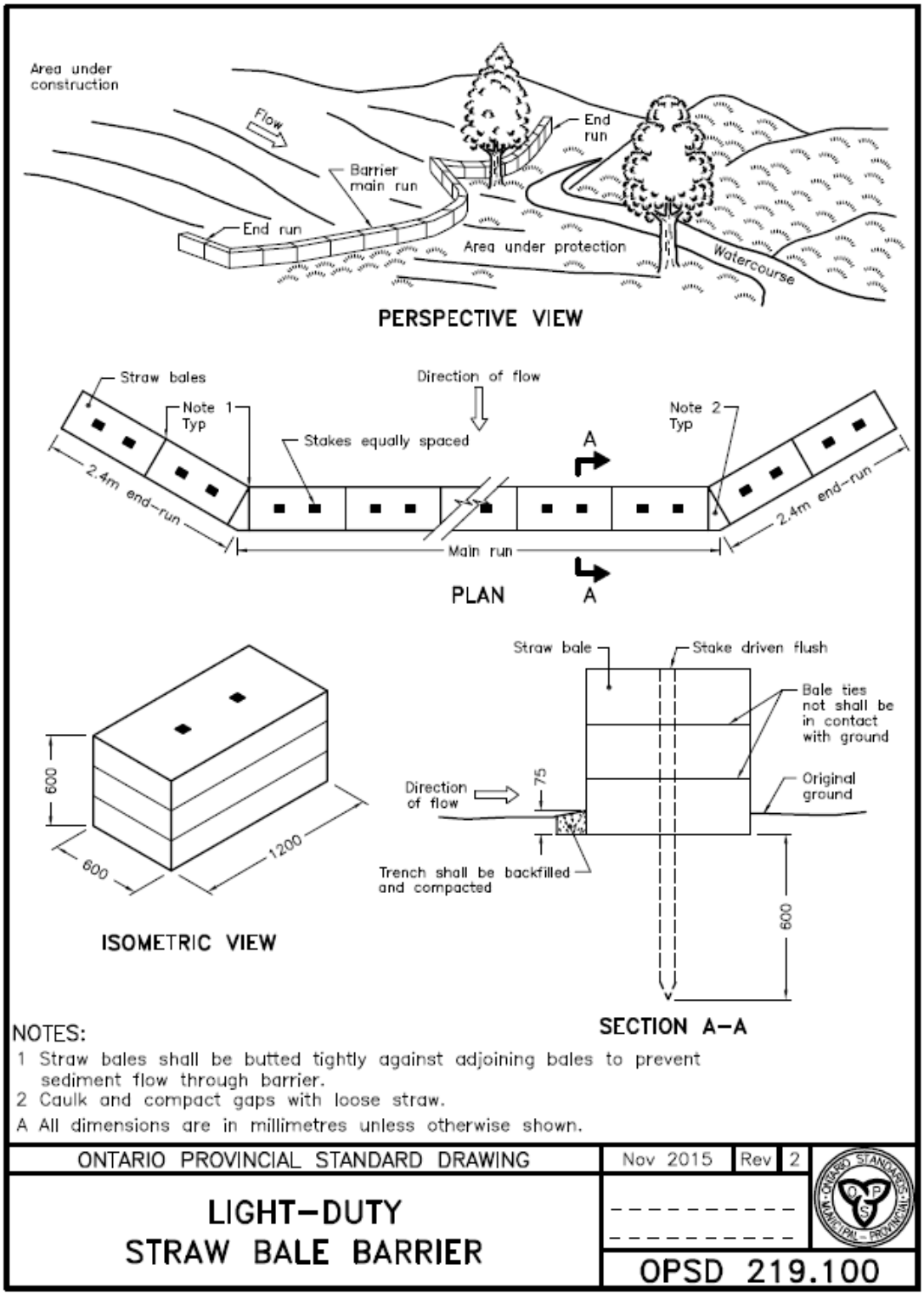

Figure 5. OPSD 219.100 Straw bale barrier (light duty).

[Return to 8-8]

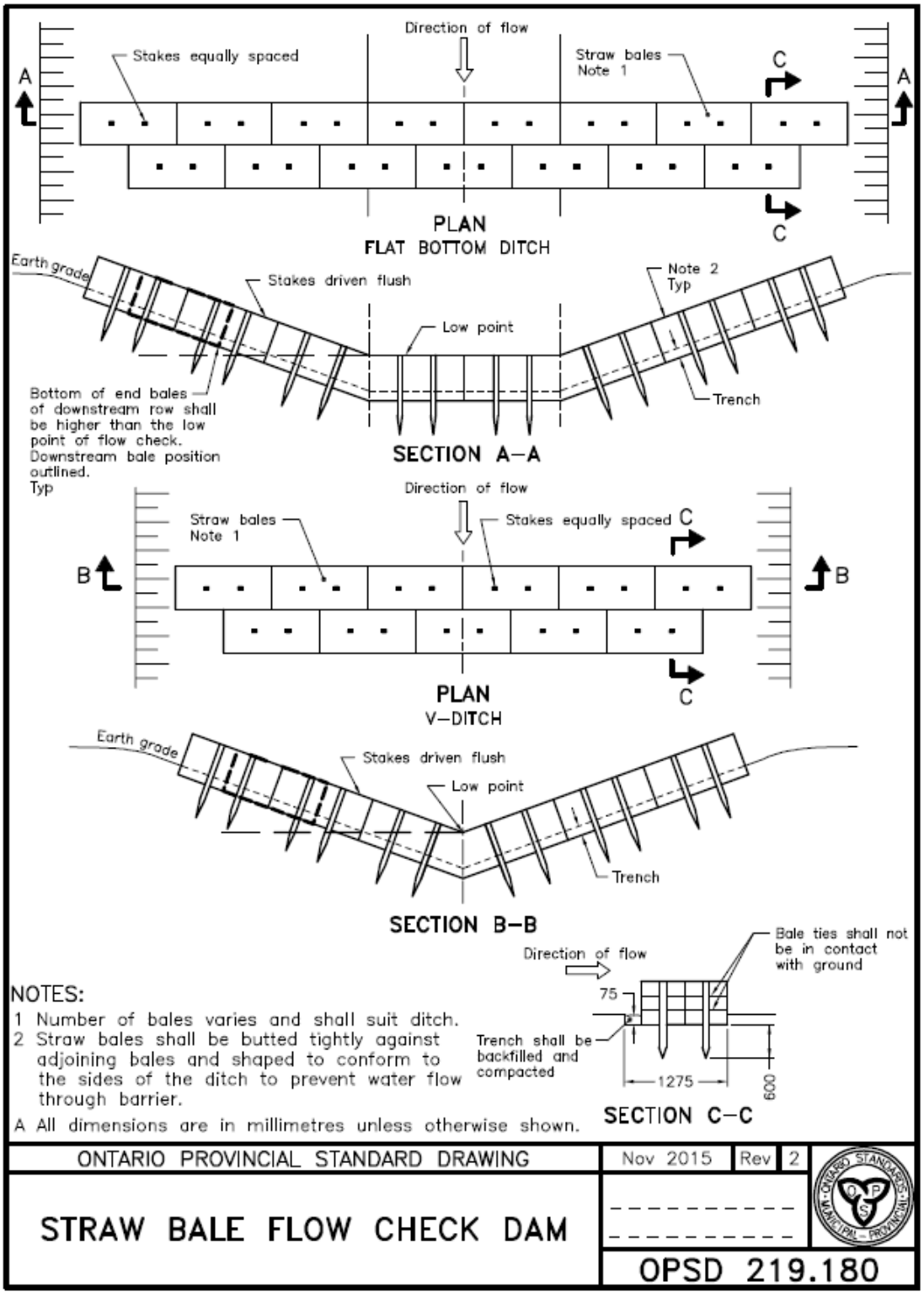

Figure 6. OPSD 219.180 Straw bale flow check dam.

[Return to 8-9]

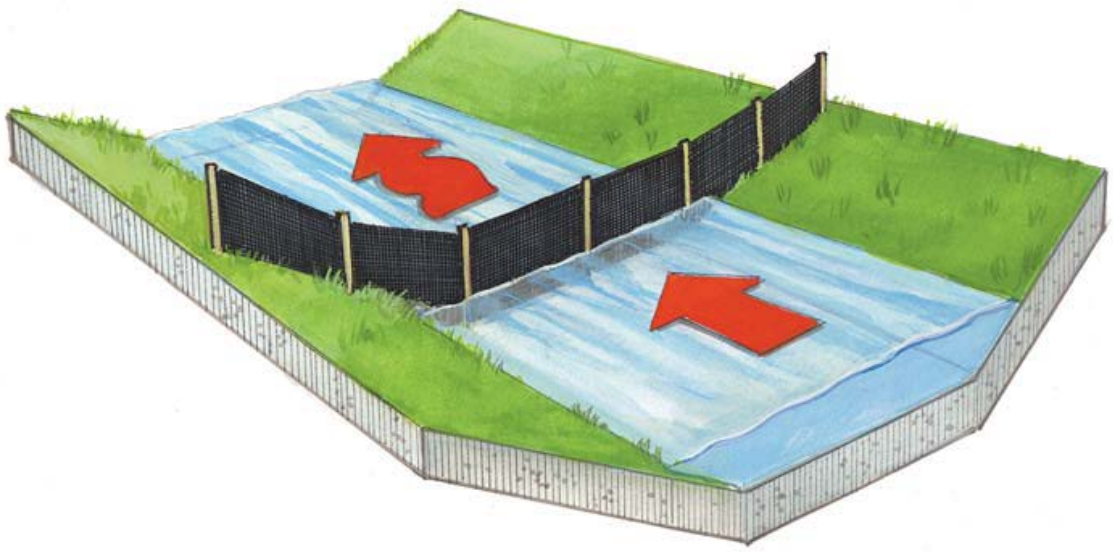

Figure 7. Temporary silt fence flow check dam.

Return to 8-9

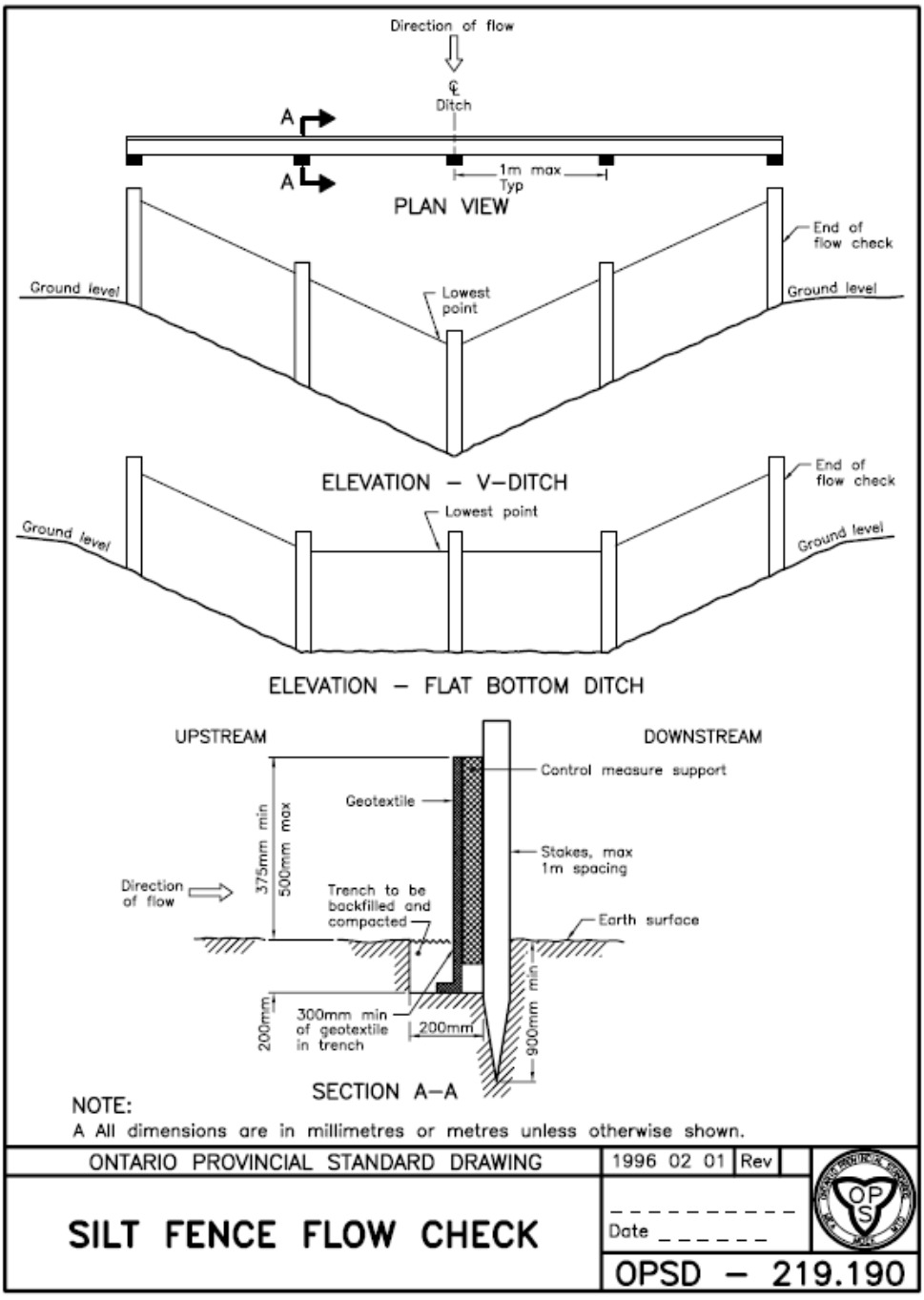

Figure 8. OPSD 219.190 Silt fence flow check dam.

[Return to 8-9]

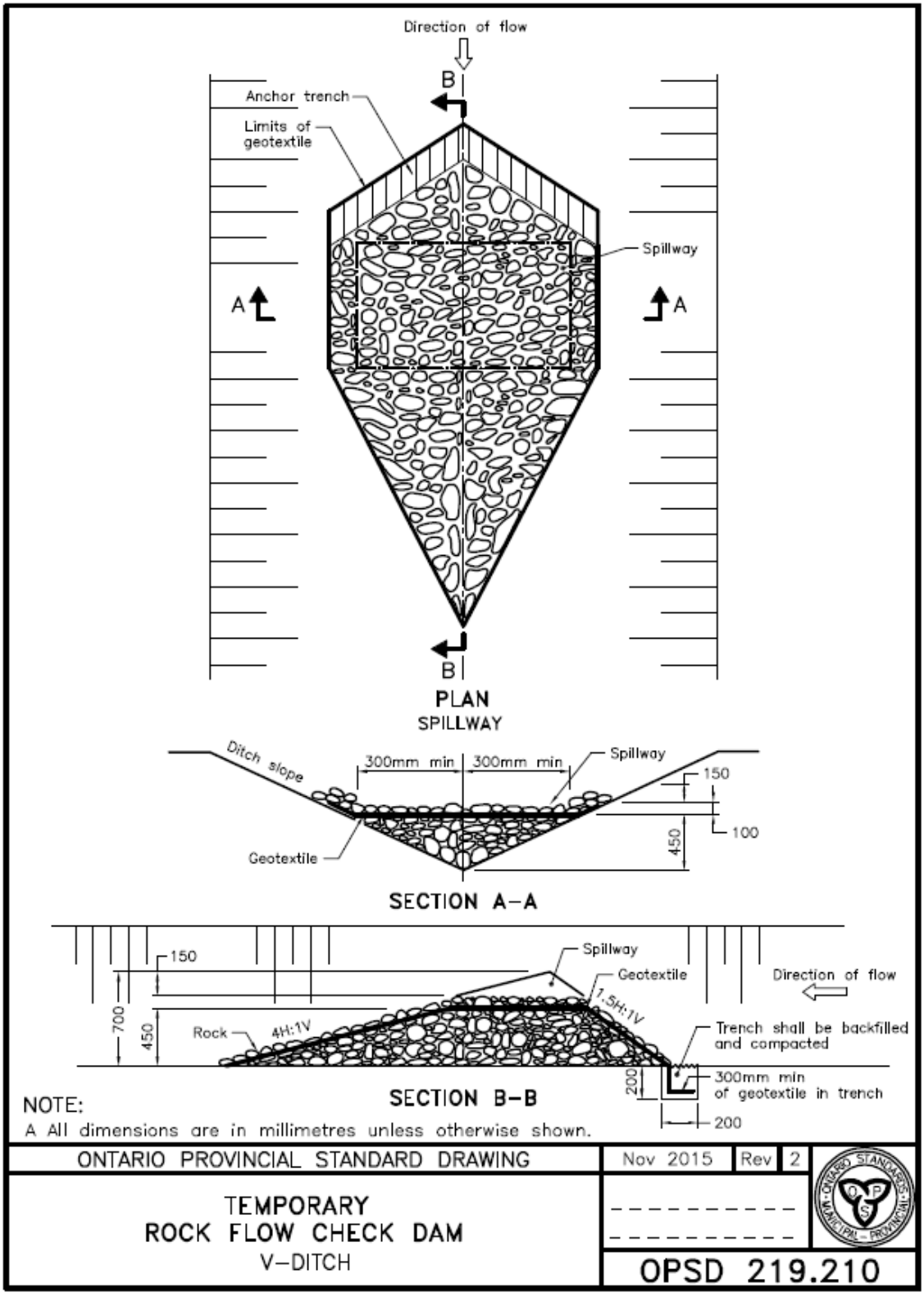

Figure 9. OPSD 219.210 Temporary rock flow check dam, V-ditch.

[Return to 8-10]

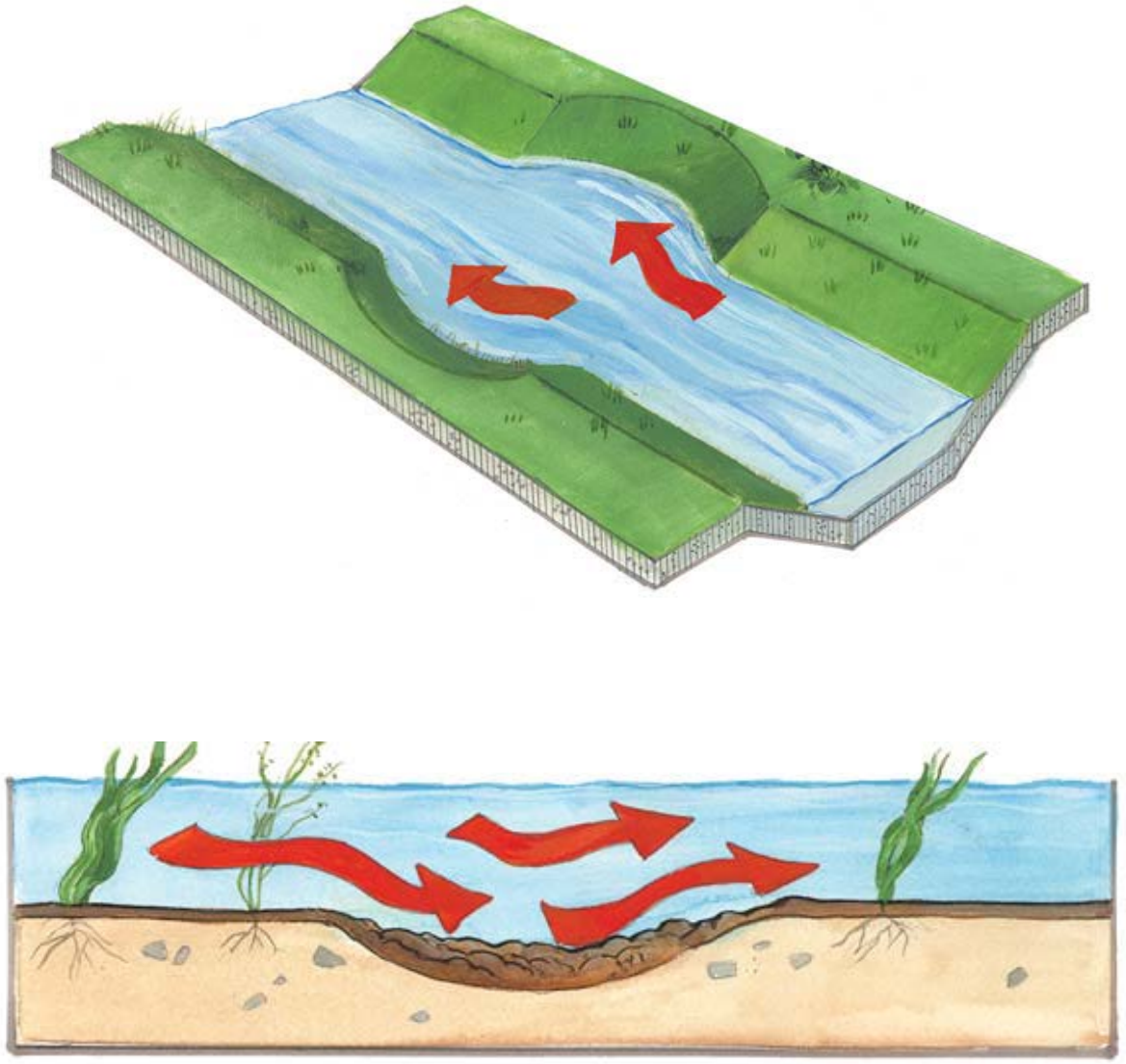

Figure 10. Basic design of a refugia pool/sediment trap in municipal drains.

[Return to 8-10; 8-13]

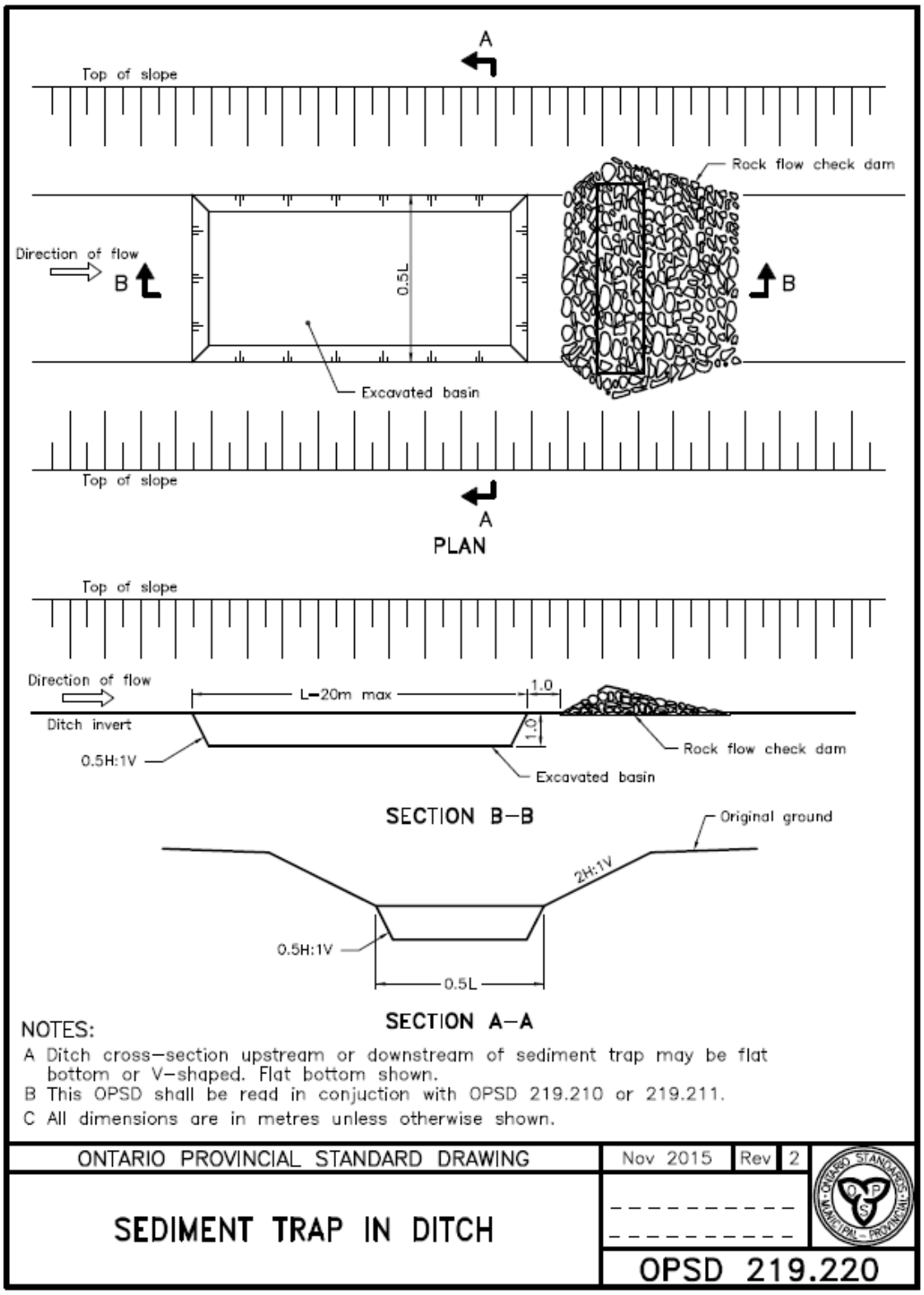

Figure 11. OPSD 219.220, Sediment trap in ditch.

[Return to 8-10; 8-13]

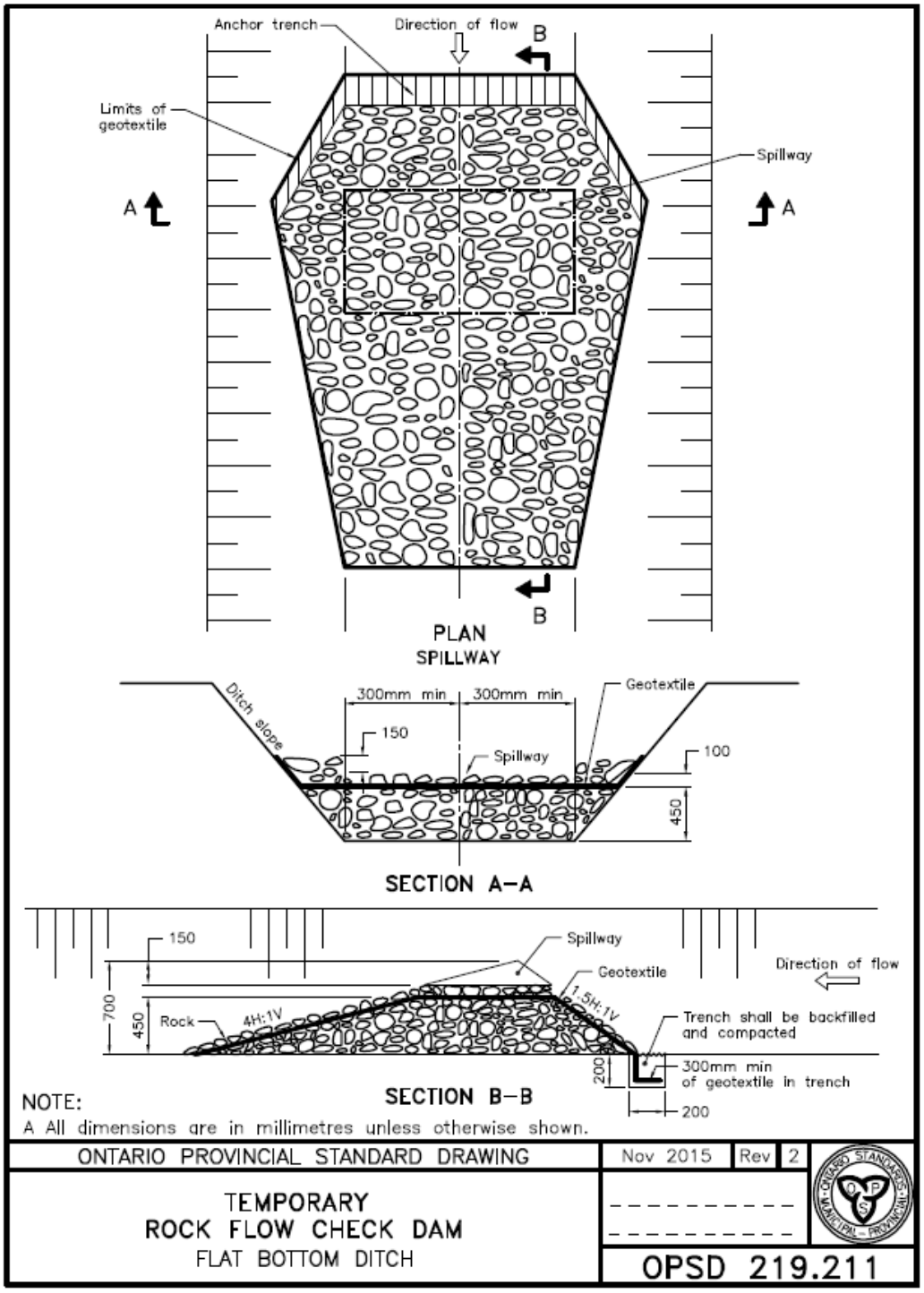

Figure 12. OPSD 219.211 Temporary rock flow check dam, flat bottom ditch.
Return to 8-10; 8-15

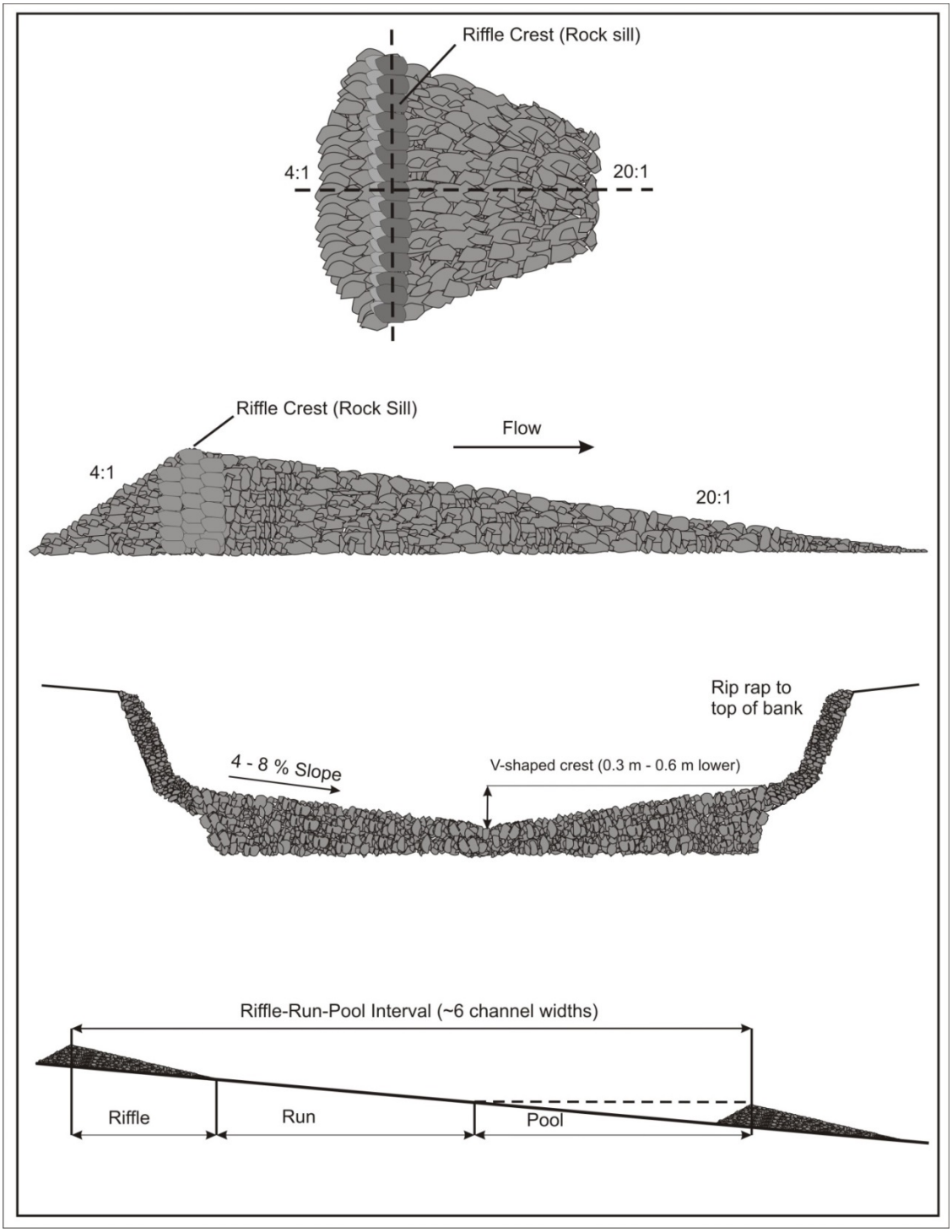

Figure 13. Drawings of a Newbury riffle (Modified from Slaney & Zaldokas, 1997; Newbury, 2013). **Return to 8-13**

Standard Measures to Avoid Serious Harm to Fish
(Return to 8-2; 8-7)

Standard Measures to Avoid Serious Harm to Fish

When implementing a project, the *Fisheries Act* requires a proponent to ensure they avoid causing *serious harm to fish* during any activities in or near water. The following advice will help one avoid causing harm and comply with the *Act*. Note: Not all advice provided may be applicable for drain maintenance and repair activities.

Project Planning

Timing

- Time work in water to respect timing windows to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms upon which they feed.
- Minimize duration of in-water work.
- Conduct instream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- Schedule work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.

Site Selection

- Design and plan activities and works in waterbody such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
- Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
- Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or the built structures.
- Undertake all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

Contaminant and Spill Management

- Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the watercourse.
- Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
- Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

Operation of Machinery

- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, and noxious weeds.
- Whenever possible, operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the waterbody.
- Limit machinery fording of the watercourse to a one-time event (i.e. over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure.
- Use temporary crossing structures or other practices to cross streams or waterbodies with steep and highly erodible (e.g. dominated by organic materials and silts) banks and beds. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g. swamp mats, pads) if minor rutting is likely to occur during fording.
- Wash, refuel, and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

Erosion and Sediment Control

- Develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation of the waterbody during all phases of the project. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the waterbody or settling basin and runoff water is clear. The plan should, where applicable, include:
    - Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
    - Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a vegetated area, construction of a settling basin or other filtration system.
    - Site isolation measures (e.g. silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g. dredging, underwater cable installation).
    - Measures for containing and stabilizing waste material (e.g. dredging spoils, construction waste and materials, commercial logging waste, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby waterbodies to prevent re-entry.
    - Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction.
    - Repairs to erosion and sediment control measures and structures if damage occurs.
    - Removal of non-biodegradable erosion and sediment control materials once site is stabilized.

Fish Protection

- Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.
- Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and

safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.

- Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.
- A fish screen with openings no larger than 2.54 mm (0.10 inches) should be equipped on any pump used during the operation. Note: Additional information regarding fish screens can be found in the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline document (http://www.dfo-mpo.gc.ca/Library/223669.pdf).

Bank Stabilization and Revegetation

- Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.
- Minimize the removal of natural woody debris, rocks, sand, or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.
- Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through revegetation with native species suitable for the site.
- Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately-sized, clean rock is used and that rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- Remove all construction materials from site upon project completion.