USFWS Windom Construction Standards

Last update 3/2024

By Scott Ralston – PFW Biologist

These are construction standards used by Wildlife Biologist Scott Ralston at the Windom USFWS office. They represent standard specifications based on experience at the Windom office but are not meant to be official FWS policy. Not comprehensive and may add to this over time and improve. Windom would ask partners designing on our behalf to follow these guideline minimums. Many may already exceed standards but we set these as minimum considerations. Likely acceptable for other FWS wetland district offices as well.

Embankment dimensions including spillway slopes – Minimum 5:1, longer slopes the better. Safety for equipment traversing a well as longer slopes have less rodent issues or wave action damage. Minimum 10ft wide top, Strip sod/topsoil on base and core trench if needed to reach water tight base. Dikes must be built in 6 inch or less lifts with compaction great than 100psi (eg. Loaded scraper or sheepsfoot). Track built "dozer dikes" will not be sufficient without additional compaction. No borrow holes within 50ft of the base of a dike which can reduce stability of the face for slumping, increase rodent usage of the face or increase saturation exposure of the face extending the phreatic line.

Sediment Removal – When possible, consider sediment removal particularly on basins less than 1 acre in size in areas with a farming history. Do soil cores. Look for layers of soil via texture, color or composition that doesn't match the other layers. Sediment may not be uniform across a basin bottom so may need to find an average or designate zones. Do not dig too deep to expose the subsoil as we need some organic material for vegetation. Wetland bottoms are not engineered flat systems. Don't use an exact elevation as a target for a contractor on a whole basin but rather a specified depth and follow the contour of the basin. Some variation is good creating micro environments with deep and shallow lobes.

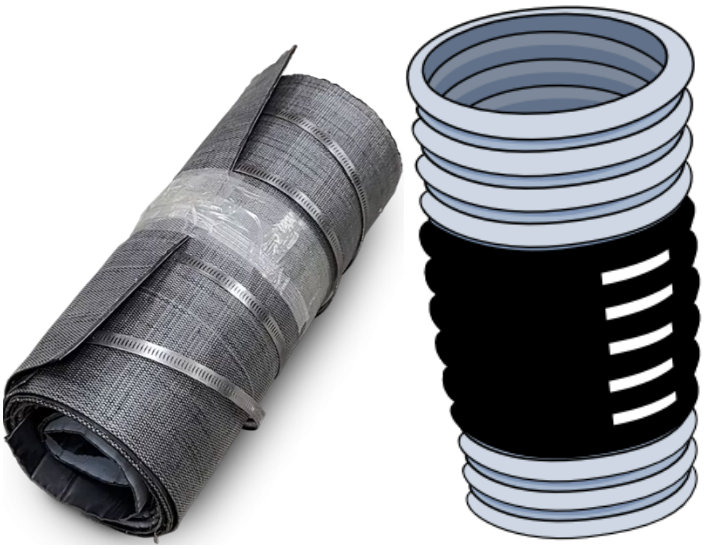
Spoil Piles – Spoil spread from sediment removals should be outside the wetland boundary and not impede watershed flow into the basin. Spread in a low mound of 10:1 or greater integrating into the landscape where possible so not an obvious un-natural form/pile. Possibly the downstream side of a wetland acting as an uncompacted berm/dike that could help raise the outlet of the wetland slightly if appropriate for the location.

Ditch plug vs fill – If possible fill in a ditch and reshape to natural landscape as opposed to a simple plug. Better long term solution, natural landscape and less hazards. Sediment removal spoil can often be used as the ditch fill as long as there is at least a short solid clay plug section. Mound fill for settling.

Tile replacement type – Dual wall non-perf HDPE in all possible cases unless specifically installing a perforated segment for drainage. Reason is single wall can sag due to compactions or backfill or take damage more easily from rocks, frost heave or vegetation. Often excavating old single wall it will be found sagged in oval shape with cracks in the wall or joints come loose because of the warping. Roots then penetrate those crack and can plug the tile or reduce flow. Dual wall is more ridged and hold strength better as well as 2 layers for better seal from roots. Dual wall has smooth interior giving better flow dynamics and less sedimentation in the line for long term cleaning. FWS land is permanent so need long term low maintenance.

Tile cover and routing - Generally at minimum 2ft of cover over tile so if shallower may need to mound over it. Avoid damage of shallow tile by crushing/compacting or if tillage is used over it. Route around wetlands where feasible to avoid potential maintenance access issues, potential future leaks causing drainage points or floatation where a hollow sealed pipe is buoyant in saturated loose soil so could tend to float or raise in the soil profile. If it must be installed through a wetland bottom, consider if drawdown capability is possible in case maintenance access is needed.

Tile segment type and joints – Dual wall role tile is often preferred over sticks for less joints. Joints are more potential failure points. DW sticks can be stronger so if higher strength is needed then go to sticks. When sticks are needed, bell and spigot gasketed joints are required over butt joints with external couplers which do not provide as good of a seal. Any butt joints should also be wrapped in fabric and quickcrete over to help secure the joint. This would include joints that can not always be a spigot like a T or elbow or when joining to a CMP or other pipe material type. Other good preferred external couplers are a Polyseal geotextile/Kevlar type wrap backed with a mastic tar surface which wraps around the pipe joint and is secured with a metal band pipe clamp. These polyseal couplers are expensive so only use on high strength joints such as an intake riser T joint etc, not on normal inline pipe joints. Double wide bands are better when available. These bands are also available for metal and concrete pipes. https://marmac.com/construction-products/catalog/polyseal-pipe-couplers-external-seals-for-hdpe-hdpp-pipe/



Tile Inspection ports – Any tile coming in or leaving FWS property should have an inspection port in the line at the property line unless other access is reasonably close. This may also serve as an intake if appropriate landscape position or simply inspection if higher. This would be for inspection of flow coming through the property or access for maintenance. Long distance runs of non-perforated line particularly low grade lines should also have inspection ports at least every 200 yards or sooner. This provides additional access but also release for air locks in sealed non-perf lines. Inspection cameras can often run 200-300ft so if the line needs inspection the whole length could be accessed from various ports.

Surfacing tile – In most cases surface outlet any incoming tile into restored wetlands where possible to avoid maintaining any lines through the property. When possible offset outlets in at minimum 20ft from the property line to allow dry access around the property edge with equipment.

Tile breaks – Break all tile necessary for wetland function. Minimum tile break is generally 100ft but often more if possible. Greater in more permeable soils. Breaks under dikes would include complete removal under the entire dike footprint. On wetlands breaks would be at minimum from the wetland edge/spill point 100ft downstream. Breaks limited by a property line on the downstream side would start at the property line and go upstream the specified length. Pattern tile in an upland not affecting a direct wetland, at minimum break up major joints or main lines to stop the flow and restore natural groundwater movement. This may include breaking at significant grade changes to avoid pressurized systems blowing out on a hillside. Both ends of all breaks should be capped to avoid blowout holes or sinkholes forming in the future from residual flow on the broken end. Most often with a bag of quickcrete but in the case of smaller plastic tile some may be flattened and kinked over and tile tape or band the kink together. Internal plastic tile rib caps or end caps are not acceptable as they have been found to come loose during backfill. Hard cement or clay tile can be broken up and mixed completely in the backfill. Don't leave a crushed line in place as water can still follow it like a gravel seam. Plastic tile should be removed completely from the trench as even broken segments can carry water. Either dispose off site or consolidate in non-drainage area burry hole if allowed on that property. GPS locations of start and end of breaks along with any lateral joints found in the break should be recorded with the as-built data.

Tile Intake/outlet armor – Exposed tile ends of intake or outlet need to be armored. This is in most cases a cement collar like a 6 inch riser put a 12" pipe over it and fill the gap between with quickcrete. Outlet could be a cement or metal end piece. If those options aren't available then place rock around the end. Reason is fire is used as a management tool and don't want to melt or burn the tile. Also secure against damage strike by equipment. In the case of intakes with specified elevation, a cement collar also avoids tampering with the specified elevation by someone cutting the riser off lower. All intakes and outlets need tall marking flags installed as well as trash guards or rat guards for pipe ends.

Pipe bedding – While many manufactures and standard engineering specs call for bedding pipe in sand or small rock we caution from experience that may not be appropriate in all wetland restoration conditions. You are introducing a porous medium as a conduit through an embankment or outlet path and will encourage seepage/leakage along side the pipe draining the wetland. You may bed the pipe through non-drainage areas if needed but in areas where a seal is desired like through a dike, lay the pipe and backfill with clay. Additional anti-seep collars as needed.

Anti-seep collars – Recommend using solid plastic collars not the rubber diaphragm type which tear or collapse during backfill. These come in halves with a cutout for your specific pipe size. Burry the bottom half, lay the pipe in at grade and bolt on the top half. This is a good manufacture of those types of collars. https://www.scheibdrainage.com/

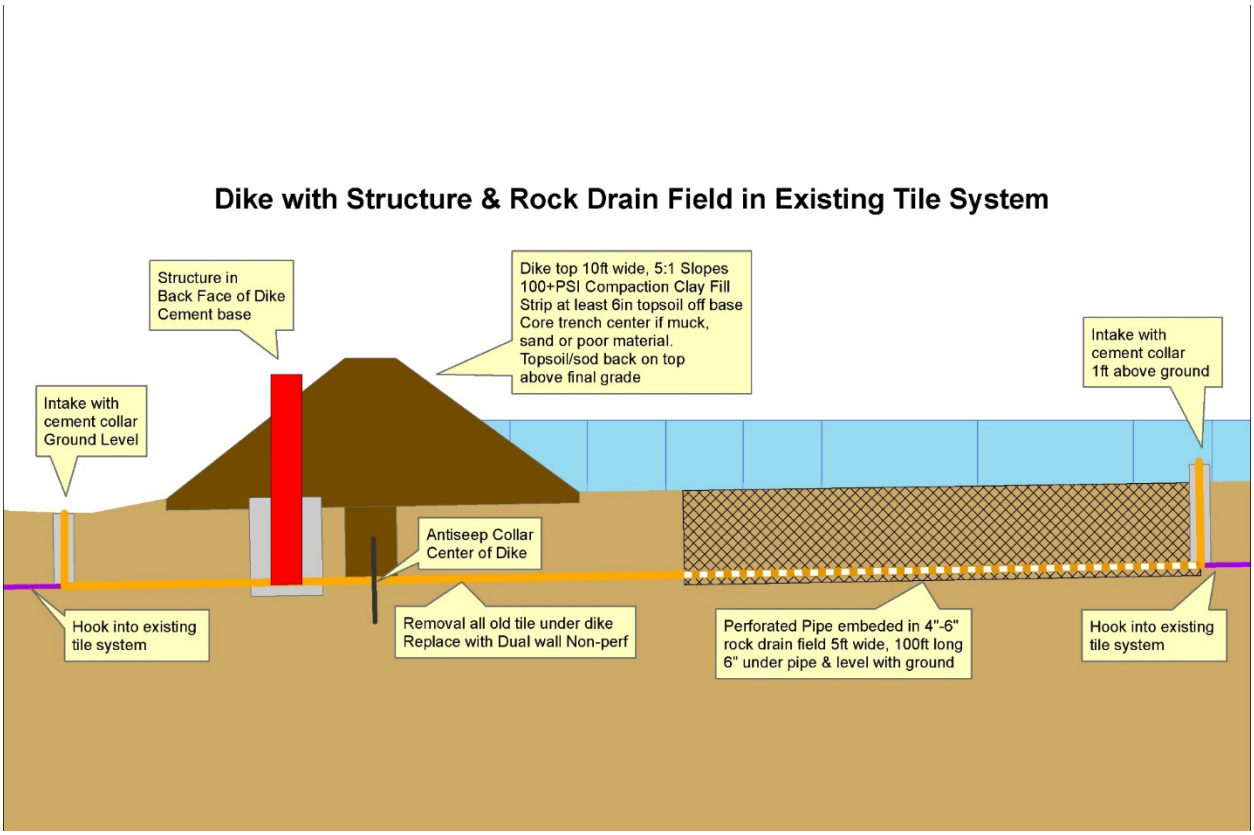
Structures – Variable crest water control structures may be used on larger pools where potential for variable vegetation condition is needed, fish kill or potential for drawdown for maintenance or access might be needed. Consider as low maintenance design as possible. Management must be available without personnel going into a confined space environment. Must be lockable and safe from public access or tampering. If a stoplog puller tool is needed should use a common standard type tool if possible and where possible a method to securely store the tool and spare stoplogs on site. Rugged design so utilizing synthetic or aluminum type stoplogs that will not corrode. Long term materials so concrete or plastic. For something like an agridrain type structure, base and joints around pipe must be

sealed in cement as fernco couplers tend to break down over time and leak. Utilize largest reasonable outlet for the situation. Planning for climate change and larger flow conditions may be different 50 years from now than when put in. Larger structures tend to plug less or easier to clean out. Consider fish barrier or passage where appropriate. Don't use bar guards on submerged intake pipes. If the guard plugs with vegetation there is no way to access without diving in to free a submerged pipe which can be unsafe. When using inline type structures through an embankment consider the structure on the downstream side of the dike rather than the front face. If the structure ever plugs and water rises too high it can often submerge a front face structure and hard to access to repair. Work can often be done on a back side of a dike without compromising the whole dike or digging in water. Staff gauges should be installed on structures to indicate water level during management.

Wetland depth and bounce – Most of our wetland systems have a priority for wildlife habitat which is often best being more stable. Thus in sizing outlets try to reduce the amount of bounce in the basin which may help prevent flooding of nests etc. in overwater areas. Depth is also a consideration. Deeper isn't always better for waterfowl. Keep wetlands to their appropriate type. Temporary and seasonal basins may be shallow enough o periodically or seasonally dry out and have vegetation covering much of it. Larger basins may have a mosaic of depths creating a hemi-marsh. Shallow zones for cover and deeper zones for open water. Feeding areas, we attract mostly dabbler ducks here not divers so they can only feed on what they can reach tipping up from the surface so 2-3ft depth is good. Deeper water may not be utilized as much.

Beaver & Maintenance of structures – Beavers issues are common. Make considerations for reducing beaver activity on structures and intakes whenever possible. Make structures accessible with a mini-excavator with less than 15ft reach to clean out a structure if possible. Thus a platform or pad available to park over top or next to a structure. Grates or guards to keep debris out of pipes. Riprap or hard armor out in front of a structure or spillway can help with beavers as they can push mud up from the wetland bottom to plug an inlet but harder to push mud a long distance over riprap to reach an intake. Submerged intakes sometimes have less rodent issues as beavers tend to plug surface flowing water they can hear and see flowing more than subsurface.

Rock drain fields – Common wetland intake structures may include a rock lined drain field in a wetland leading to an outlet pipe/structure. While this can be a good design for low to moderate flows and reduce beaver issues it comes with design considerations. Hook in existing tile from the wetland into the drain field line to increase input. Use clean rock greater than 3 inch without fines so as not to plug the tile perforations and keep plenty of pour space for flowage. Include an open intake at the end of the drain field possibly set at an overflow level to accept additional flow if the drain field becomes plugged or can't filter enough water through fast enough then the open intake will function. Can also serve for inspection or maintenance access. Overestimate linear feet of your drain field as capacity will reduce over time with siltation.


Dike with Structure & Rock Drain Field in Existing Tile System
Structure in Back Face of Dike Cement base
Dike top 10ft wide, 5:1 Slopes 100+PSI Compaction Clay Fill Strip at least 6in topsoil off base Core trench center if muck, sand or poor material. Topsoil/sod back on top above final grade
Intake with cement collar 1ft above ground
Intake with cement collar Ground Level
Antiseep Collar Center of Dike
Hook into existing tile system
Removal all old tile under dike Replace with Dual wall Non-perf
Perforated Pipe embeded in 4"-6" rock drain field 5ft wide, 100ft long 6" under pipe & level with ground
Hook into existing tile system

Wetland elevations – No wetland should be restored to an elevation that would impact a neighbors drainage, or other structure unless that condition has been explained to the affected party and have documented agreement or easement. This would include neighbors crop fields flooded or eliminate access. Could also be water in road rights of way that would impact the stability or safety of the road for transportation. Mitigation such as separation berms or building benches off of roads may be utilized.

Neighboring drainage – We will not impede neighboring drainage in or out of the property in a way that would negatively affect the neighbor's established flowage rights. We will not design elements than would make their drainage situation worse unless they are informed and have a documented agreement. In some cases may be neutral/the same as historic or better. We will also not accept new drainage that did not historically exist prior to the project. Our project will not assist in enhancing new wetland drainage from off our property. When modifying existing drainage we will only replace to existing or required capacity as needed for the project unless specific permission is given by the FWS for an upgrade of a neighbors capacity. Future maintenance of tile on FWS property that does not serve as a benefit to the FWS will be allowed by the affected party at their expense under a permit to repair or replace up to pre-exiting capacity only. New future lines or upgrades will not be granted.

Topsoil and seedbed– All areas should have some black dirt/topsoil that will grow vegetation unless specifically identified as not needed. In excavation try to separate topsoil from subsoil and refill as needed to replace black back on top. Construction should be left in a condition ready for seeding. If very rough, a disk may be required.

Native disturbance – Limit disturbance to true native prairie/unbroken sod. Minimize footprint of work area to only that area necessary for the work.

Cultural and Biological considerations – All projects must pass cultural and biological NEPA reviews. Due diligence must be done and documented to avoid impact to and historical or cultural resources on site. Look for any evidence, ask those that may know history of the site review any background documentation available. Consult historical preservation or tribal offices if needed. If any evidence is found of potential historical significance, further review should be done and cleared by an archeologist. General guild lines if no evidence/indication is found just avoid areas of potential encampments such as flat hill top areas, streambanks, lake shores etc. Use borrow or excavation areas in low bottoms of wetlands or along slopes greater than 10% grade. Review the site for any rare or significant biological features. Reference the DNR natural heritage layer for good indications of T & E species. Avoid damage to habitat types or areas used by species in your area or excavating in an area that may be unbroken sod. Consult FWS for further guidelines as needed.

Maintenance cost obligations – FWS can not accept any management activity that includes a legal obligation to incur maintenance costs. This is a legal requirement due to the Anti-deficiency act stating it is unlawful for the agency to encumber financial obligations that have not yet been authorized by congressional budget allocations. While we will have a moral obligation and likely willing to do management as we are able when needed, we just can't be legally obligated to do so. So worst case a structure or feature would need to be able to sit in disrepair if needed or be the responsibility of a 3rd party if FWS is unable to do a maintenance activity. This would include a partner acting on our behalf installing a tile line that has joint benefits from a neighbor and a drainage agreement is implemented for this line. That agreement can not say the FWS will accept any obligation to pay for maintenance of the

line if needed. Design accordingly such as there is no hazard or safety issues if something is not operated like no outlets dependent solely on a pump which if turned off would flood a road or infrastructure.

Site cleanup - Safety is a primary concern as this will be used by the public for recreation as well as management staff for equipment operation so look at a finished site in terms of potential future hazards. Once tall grass grows or water fills wetlands it is hard to see hazards before you hit them. Thus no ruts, large clumps of clay or sod or rocks and boulders. Users on an ATV or other small equipment should not have any terrain or objects they could hit without seeing and get knocked off or with injury or damaging the machine or clumps that would damage a mower going over it. Anything that can not be smoothed out like boulders or large clumps of sod should be pushed into non-traffic areas like bottom of borrow holes, front toe slope of dikes below water lines etc. If the site is too wet to do finish grading without ruts and clumps the contractor may need to plan on returning after it dries down enough to level spoil areas. No steep borrow holes. Changes in slope below a water line need to be gradual so a hunter in waders would not hit a drop-off without feeling the change in slope before stepping down. No trash, grease containers, rags, chunks of plastic tile exposed or other litter left on site.

Seeding – Seeding disturbed areas should be done as soon as possible after construction for erosion control. Seed with the appropriate method for the time of year. Seeding mid-summer through fall with native grasses will cause germination of the grass but likely not long enough to establish well enough to survive the winter so will winter kill and leave the area without cover the following year. Thus outside of normal planting dates use cover crops then return and plant natives in appropriate time periods.

Natives – Diverse as possible but at least include some cool season natives for quick establishment like, wildrye, wheatgrasses etc. At least 60 seed/square foot rate for native mix and minimum 20+ species mix with ¼-1/3 grasses and rest forbs. Closer to 50 species is preferred if affordable. If in doubt for custom mix can use standard CP25 type mix available at most vendors for patching small areas, however, raise planting rate to about 60 seeds per square foot as most standard mixes are very low often around 35. Acceptable planting periods, fall after soil temps remain below 40 degrees so often November through spring up until about June 15th. Under abnormally wet conditions may plant until July 1. Check soil regimes and choose a mix based on dry, mesic or wet conditions for that zone. This is a good source for predesigned mixes for our region: https://bwsr.state.mn.us/seed-mixes

Cover Crops for interim planting periods:

Oats cover crop – 30-50lbs/acre rate (32lbs/bushel), plant June 1st through August 31st.

Winter Wheat – 55-90lbs/acre rate (60lbs/bushel), plant August 1st through October 20th

Regreen – Wheatgrass sterile hybrid for cover crop. See manufacture recommendations

Other more diverse cover crops are also available such as “Ranch Mix” that will mimic more diverse habitat until a Native planting can be done.

Plan changes – If project plans must be changed during construction after FWS has already approved final plans, FWS should be consulted and informed about the change particularly if it affects and of the before mentioned standards.

As-built records – GPS locations of anything sub-surface/not visible such as tile paths, joints etc so they can be found for future maintenance if needed. GPS critical elevations of outlets, structures and spillways. Photo document installation of structures/joints etc if any questions would be needed about how features were assembled after they are done. Provide electronic versions of these files in common formats that can be viewed on most devices, GIS programs etc.

Tree removal selection– Generally FWS supports tree removal on as much prairie areas as possible. When possible on visible sites, neighbors should be notified of the intent as there are often questions when tree removal begins. Species we can keep include all oaks, fruit or nut trees can be good wildlife food sources. Sandbar willow or dogwood type low brush type species may not be worth removing as they are prolific and will return unless excavating the area and they can often provide winter cover or erosion control. Riparian areas may have natural tree cover along a river or stream or historic fire shadows of lakes so could leave if it appears a natural condition for the site. Highest priority to remove very invasive and spreading trees like cedars, cottonwoods, ash, buckthorn, large seed source trees etc.

Tree removal methods – When possible choose timing to reduce disturbance to wildlife such as dormant season cutting. When in an active season due diligence on active nesting species, T & E species etc. Consider site for the type of removal such as native prairie, possible flush cut only or stump grind so as not to rip up the soil, where on non-native sites pulling rootballs may be acceptable. Consult FWS manager for site needs if flush cut stumps will be sufficient or if they will cause maintenance or access hazards. Treat all stumps as needed unless they are non-resprout species like most cedars & pines.

Tree disposal – Disposal must be considered with all cutting as the disposal of the biomass can often be a bigger undertaking than the cutting. In most cases a chipper/shredder method of cutting would be preferred such as a fecon type cutter so the biomass is distributed and cleared in the cutting step. If so try to have them spread the chipping so not a large thick mat of chips that will block grass regrowth. Downside to a fecon is stumps can often get buried in the chips so extra attention is needed to locate stumps for treatment. Hauling off usable lumber to repurpose is always a good option. Follow any state guidelines on transportation of wood across county lines. Burning on any federal land must follow federal NWCG qualification standards which is rare for most contractors so burning is limited. If possible utilize non-federal land areas to burn on. If piles are to be left for FWS to burn ourselves, consult the FWS manager 1st. Piles must generally be large, piled high and tight not loose and spread out to consume full trees. As few of piles as possible with large consolidated piles. Unburnable rootballs should be buried when appropriate.

Contractors – When possible include diverse and local contractors if you can within the required specs of the job and skillsets needed. FWS lands are integrated into a community and it is important to have local support for our projects. Often local contractors in a community may support local economies as well as gather community support more than a larger outside contractor. Often local contractors might have personal knowledge of drainage on a site which could help in the project. They are also more likely to do and stand by quality work if it is done in their neighborhood or repair something if it doesn't turn out right. This may mean trade-offs such as smaller crews, less variety of equipment, possible less technology such as GPS guided equipment but may also be cheaper so consider which elements are most important to the outcome vs convenient. Ultimately comes down to bid price and availability but at least include those local options in the RFQ.