

Best Management Practices (BMPs) for Sand Mining Operations in the San Jacinto River Watershed

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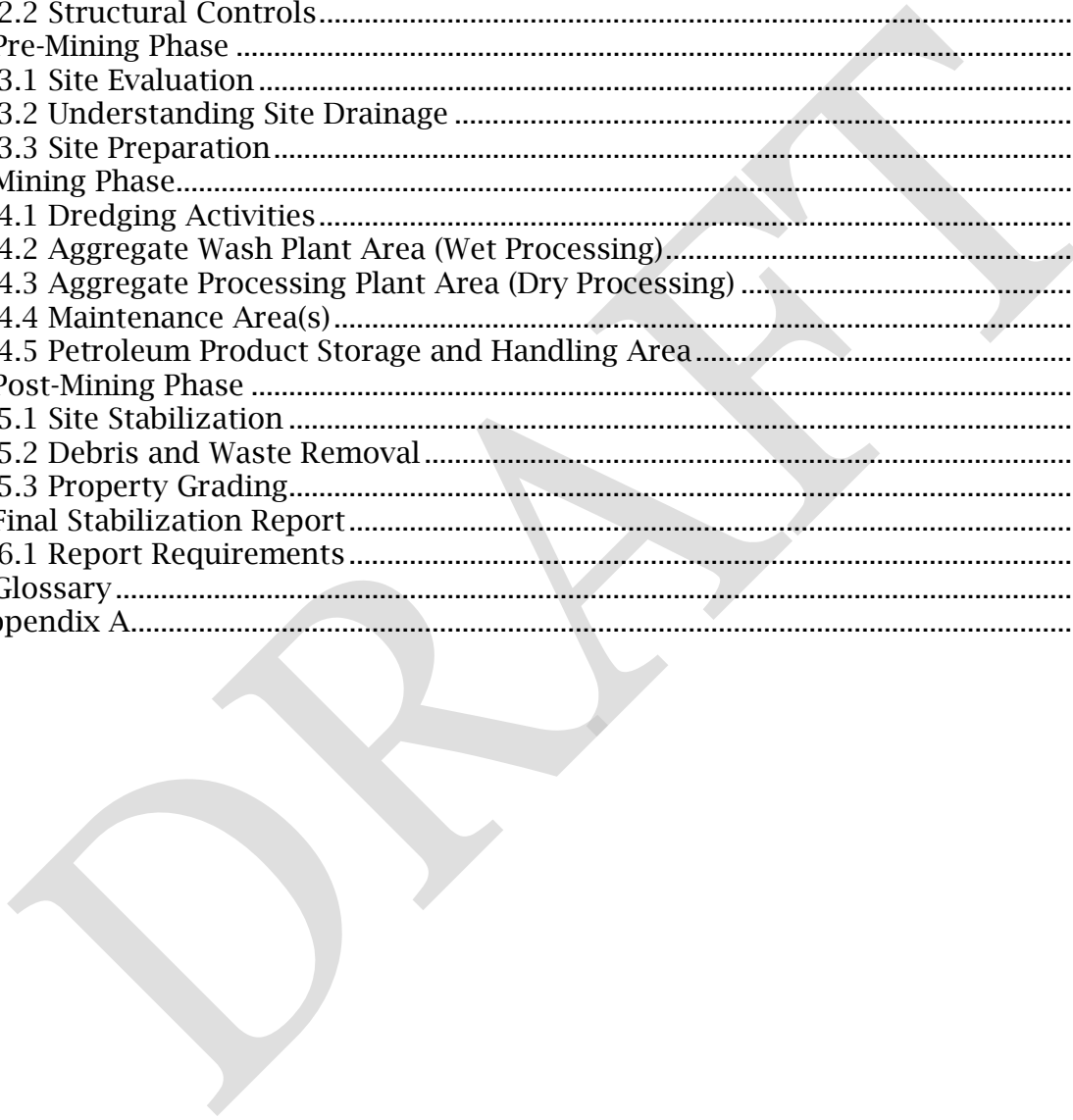
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1 Introduction

The impact on water quality from sand mining operations in the San Jacinto River Watershed has been an increasing concern of many citizens and elected officials over the recent years due to heavy rain and urban development. Sand mining operations disturb land and soil in order to build entrance roads to the site, level the area where the equipment will be installed, and levee the entire site and the pit where stormwater will be retained once the sand mining operations are fully functional. Properly installed and maintained best management practices (BMPs) to address good housekeeping practices, minimize exposure, erosion and sediment control, and management of runoff. In addition, the implementation of approved final stabilization reports can reduce the likelihood of sediments moving off of the sand mining operation from the time the site is cleared of the trees or other vegetation, to the time the site or portion(s) of the site are closed.

Pollutants present in stormwater discharges from sand mining facilities may vary. Numerous factors influence how these industrial activities and can affect water quality, including:

- Geographic location
- Hydrogeology
- Topography
- Mineralogy of the extracted resource and the surrounding rock
- How the mineral was extracted (e.g., quarrying/open face, dredging, etc.)
- Type of ground cover (e.g., vegetation, crushed stone, or dirt)
- Outdoor activities (e.g., material storage, loading/unloading, vehicle maintenance, etc.)
- Size of the operation
- Type, duration, and intensity of precipitation events

Potential pollutants present at a sand mining site may include¹:

- Dust
- Total suspended solids
- Total dissolved solids
- Turbidity
- pH
- Diesel/gas fuel
- Oil
- Heavy metals
- Solvents

The purpose of this regulatory guidance document is to provide the types of BMPs that must be utilized during every phase of the sand mining operation to prevent pollutants from leaving the site. Sand mining operations must comply with the BMP

¹ List not exclusive

requirements in Title 30 Texas Administrative Code (TAC) Chapter 311, Subchapter J regarding vegetative and structural controls, and pre-mining, mining, and post-mining phases. As required by the rules, all vegetative and structural control BMPs listed in this regulatory guidance document must be developed and implemented by the sand mining operators. For the pre-mining, mining, and post-mining phases, sand mining operators must identify, develop and implement all other BMPs identified in this regulatory guidance document, unless they are infeasible. If a BMP is infeasible following the considerations listed in the rules (30 TAC §311.103), the operator must identify, develop, and implement an alternative equivalent BMP and maintain written documentation of the reason(s) onsite.

This regulatory guidance document includes pollution prevention and source control BMPs that are technically supported and generally relied upon by professionals within the appropriate environmental area or discipline (e.g. civil engineering). This regulatory guidance document of BMPs will be updated by the TCEQ as needed to allow for technological advancements and improved industry practices.

Sand mining activities in Texas are regulated statewide by the Texas Pollutant Discharge Elimination System (TPDES) program through various rules to prevent or minimize water pollution from stormwater runoff. In addition to complying with the requirements of the TPDES stormwater Construction General Permit (TXR150000) and Multi-Sector General Permit (TXR050000), as applicable, sand mining facilities located in the San Jacinto River Watershed must also comply with the requirements in Subchapter J of the Watershed Protection Rules (30 TAC Chapter 311).

For the purpose of the rule and this regulatory guidance document, the San Jacinto River Watershed includes those portions of the San Jacinto River Watershed that includes the watersheds of the following and its tributaries:

- the East Fork of the San Jacinto River in Montgomery, Harris and Liberty Counties;
- Peach Creek in Montgomery County;
- Caney Creek in Montgomery and Harris Counties;
- the West Fork of the San Jacinto River from the Lake Conroe Dam in Montgomery and Harris Counties to the Lake Houston Dam in Harris County;
- Lake Creek in Montgomery and Grimes Counties;
- Spring Creek in Montgomery and Harris Counties; and
- Cypress Creek in Harris and Waller Counties.

A map of the San Jacinto River Watershed can be found in Appendix A.

The rules in 30 TAC Chapter 311, Subchapter J require that prior to commencing or continuing sand mining activities, sand mining facilities develop and implement BMPs

from this guidance document. Additionally, sand mining facility operators must prepare and implement a final stabilization report as outlined in this guidance document prior to operations terminating at the site or portion(s) of the site.

2 Best Management Practices

2.1 Vegetative Controls

Vegetation is an inexpensive and effective way to protect soil from erosion. It also decreases erosion from flowing water by reducing its velocity. Roots hold soil and increase infiltration. In areas that are outside the active sand mining operation and not expected to handle vehicle traffic, vegetative stabilization of disturbed soil is required using the BMPs described below.

Vegetative controls must consist of plants appropriate for the ecoregion where the site is located and must not include any noxious or invasive species. As a resource, operators may refer to the Texas Parks and Wildlife Department for more information about the appropriate plant species to be used in their site's ecoregion. Noxious and invasive species are identified by the Texas Department of Agriculture in 4 TAC §19.300(a).

Site operators must inspect and document disturbed areas of the site where vegetative controls have been implemented once every seven (7) calendar days. Operators must inspect all vegetative controls to ensure that they are installed properly, appear to be operational, and minimizing pollutants in discharges, as intended. Operators must check for signs of visible erosion and sedimentation that can be attributed to the points of discharge where discharges leave the site. Operators must replace or modify controls in a timely manner, but no later than the next anticipated storm event. Documentation of measurable rain events must be maintained and determined using a device to measure rain fall, such as a rain gauge.

2.1.1 Vegetative Buffer Zones

Vegetative buffer zones are continuous undisturbed or planted vegetated areas that surround a development, land disturbance activity or that border an intermittent stream or permanent water body. Buffer zones aid in sediment filtration and removal by slowing surface water flow through these areas. Construction site runoff must be dispersed over the entire buffer zone if possible. A minimum 100-foot buffer zone is required adjacent to perennial streams greater than 20 feet in width, 50 feet for perennial streams less than 20 feet in width, and 35 feet for intermittent streams.

2.1.2 Sod Stabilization

Sod stabilization involves establishing long-term stands of grass with sod on exposed surfaces. When installed and maintained properly, sodding can be more than 99 percent effective in reducing erosion.

Protection of trees involves preserving and protecting selected trees that exist on the site prior to development. Mature trees provide extensive canopy and root systems that hold soil in place. Shade trees also keep soils from drying rapidly and becoming susceptible to erosion, as well as increasing property value. Consideration must be given to the tree root structure. If trees die or are no longer viable for soil stabilization for any reason, then they must be replaced within 30 days with an equivalent or better soil stabilizing tree.

2.1.3 Temporary Seeding

Temporary seeding is the planting of fast-growing annual grasses to hold the soil in areas that will not be disturbed again for 30 or more days. For long-term protection (greater than one year), permanent seeding must be initiated. Mulching helps ensure seed growth and maintains soil moisture and helps prevent erosion. It is essential when slopes are steep, the weather is hot or dry, and soil conditions are not favorable.

Tillage, with lime and fertilizer, to maintain adequate soil pH and nutrient content, may be important before seeding. The local county agent and/or the Natural Resources Conservation Service (NRCS) can analyze soil for lime and fertilizer needs.

2.1.4 Permanent Seeding

Permanent seeding is the use of perennial grass (with trees and shrubs) to stabilize the soil. Vegetation is often not fully established until one year from planting. Inspect, repair and re-seed as needed, evaluating choice of seed and quantities of lime and fertilizer. Use temporary seeding if the time of year is not appropriate for permanent seeding.

2.1.6 Mulching

Mulching is the placement of hay, grass, wood chips, straw, or synthetic material on the soil. Mulch holds moisture, lessens temperature extremes, and retards erosion on steep slopes during seed establishment. Soils that cannot be seeded due to the season must be mulched to provide temporary protection. Operators must apply the mulch in an appropriate manner that prevents the mulch from leaving the site during heavy rain events.

2.1.7 Erosion and Sediment Control Blankets

Erosion and Sediment Control Blankets are machine-produced mats of straw or other fibers held together with netting that provide temporary or permanent stabilization in critical areas, such as slopes or channels, so that vegetation may be established. These blankets often contain seeds to help establish vegetation.

2.1.8 Surface Roughening

Surface roughening, using heavy equipment, creates horizontal grooves across the slope which reduces runoff velocity/erosion and aid the growth of seed. Roughened slopes must be immediately seeded and mulched.

2.2 Structural Controls

Structural controls divert flows away from disturbed areas, reduce runoff velocities, filter sediment, and remove sediment by ponding. Various types of structural controls are described below. All structural controls must be in compliance with local rules and permitting requirements.

Site operators must inspect disturbed areas of the site where structural controls have been implemented once every seven (7) calendar days. Inspections must address areas used for storage of materials that are exposed to precipitation, all structural control measures for effectiveness and necessary maintenance, and locations where vehicles enter or exit the site for evidence of off-site sediment tracking.

Operators must inspect all structural controls to ensure that they are installed properly, appear to be operational, and minimizing pollutants in discharges, as intended. Operators must check for signs of visible erosion and sedimentation that can be attributed to the points of discharge where discharges leave the site. Operators must replace or modify controls in a timely manner, but no later than the next anticipated storm event. Documentation of measurable rain events must be maintained and determined using a device to measure rain fall, such as a rain gauge.

2.2.1 Temporary Structures

Temporary structures are installed before and during construction. After removing temporary stormwater controls the areas disturbed by the temporary structures must be vegetated.

2.2.2 Permanent Structures

Permanent structures remain after construction activities have been completed. Once construction of areas outside of the sand mining pit has ceased, permanent structural control BMPs must be implemented and operational.

2.2.3 Diversion Ridges, Berms or Channels of Stabilized Soil

Diversion ridges, berms or channels of stabilized soil can divert runoff from disturbed areas or sediment-laden runoff into sediment basins. If diversions will remain in place more than 30 days, they must be covered with temporary or permanent vegetation. Diversions must have enough slope to assure drainage, but not enough to cause erosion within the channel. Allow sufficient room around diversions to permit machine re-grading, if needed. The maximum allowable drainage area is five acres.

2.2.4 Silt Fences or Straw Bale Barriers

Silt fences are typically used below disturbed areas to capture sediment from sheet flow. Six to eight inches of the fence material must be buried in a trench about four inches deep and four inches wide. Silt fences that are not buried have no useful function. The maximum slope length behind a fence is 100 feet with maximum gradient of two horizontal feet to one vertical foot (2:1 or 50% slope). Silt fences must never be installed across streams, whether flowing or intermittent. They may be placed

in minor swales or ditch lines where the maximum contributing drainage area is no more than two acres.

The fencing must be maintained, and sediment removed when deposits reach one-half the fence height. After the fence is no longer needed, the area must be graded, seeded and mulched.

Alternatively, operators may implement straw bale barriers. Straw bale barriers are also used on small disturbed areas to capture sediment from sheet flow. The drainage area must be restricted to 1/8 acre per 100 feet of barrier. Maximum gradient behind the barrier is three horizontals to one vertical (3:1 or 33.3% slope). The barrier must be located so that the water depth does not exceed one foot at any point. Straw bales, with bindings oriented around the sides, shall be entrenched a minimum of four inches and anchored with two stakes driven toward the previously laid bale. Straw bales that are not buried are improperly installed.

Gaps between bales shall be wedged with straw. Loose straw scattered immediately uphill increases barrier efficiency. Under no circumstances should straw bale barriers be placed in flowing streams. For minor dry swales, the end bale bottoms shall be higher than the middle bale top to assure runoff will not flow around the barrier. Repair damaged bales, end runs and undercutting. Remove sediment when it reaches one-half barrier height. When upslope areas are stabilized, remove bales and grade, seed, and mulch the barrier line.

2.2.5 Sediment Basins

Sediment basins allow retention and deposition of sediment prior to discharge or recycling. Sediment basins are made by diking, excavating or a combination of the two. Because of typical basin shapes and embankment side slope requirements of 2:1 or less, the capacity of the basin may be estimated by using the trapezoidal rule approximation of 40 percent x height x surface area. Sediment must be removed when the volume has been reduced to 27 cubic yards (yd³) per acre drainage area. The length must be twice the width, with maximum surface area and outlet as far from the inlet as possible. If using a dike, it must be well compacted and vegetated, with an outlet pipe or coarse aggregate spillway. Install basins prior to construction but not in flowing streams. Use diversions to direct drainage to basins.

2.2.6 Riprap Outlet Protection

Riprap outlet protection must be placed at the outlet end of culverts or channels to reduce the depth, velocity, and energy of water so that the flow will not erode the receiving stream.

2.2.7 Check Dams

Check dams are small dams constructed across swales or drainage ditches (lateral or wing ditches) to reduce flow velocity and erosion. These are not used in flowing streams. Check dams can be constructed of stone, straw bales, or logs, with a maximum height of two feet. The check dam center must be at least six inches lower than the outer edges to prevent erosion around the edges. The maximum spacing

between dams must be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

Accumulated sediment must be removed from behind the check dams when it reaches one half the dam height. Erosion around dam edges must be corrected immediately, ensuring that the dam center is six inches lower than the edges. In grass-lined ditches, grass must be established prior to dam removal. The dam site must be seeded and mulched or sodded, as needed. This practice is limited to small open channels that drain 10 acres or less.

2.2.8 Construction Entrance/Exits

Construction entrance/exits must be aggregate stabilized to reduce sediment tracked onto public roads. Aggregate must be at least six inches thick and 50 feet long. Tire washing may also be needed.

2.2.9 Housekeeping Practices

Pollutants that may enter stormwater from construction sites because of poor housekeeping include various petroleum products, paints, solvents, litter, debris, sanitary waste, and sediment from unstabilized areas. The following good housekeeping practices must be implemented:

- designated areas for equipment maintenance and repair;
- waste receptacles at convenient locations;
- regular collection of waste;
- protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic or hazardous materials; and
- adequately maintained sanitary facilities.

2.2.10 Post Construction/Stormwater management Measures

Control measures must be installed to control pollutants in stormwater after construction is complete. These controls include, but are not limited to, one or more of the following:

Retention Ponds

Retention Ponds provides complete onsite storage and treatment of a specific volume of stormwater runoff by using infiltration, evaporation, and recycling. The minimum volume for a retention pond is the first inch or half inch of stormwater runoff containing the first flush of pollutants.

Vegetated Swales and Natural Depressions

Vegetated swales and natural depressions are grass-lined areas that filter sediments from runoff thus helping to prevent erosion. Vegetated swales must have side slopes of 4:1 or less.

3 Pre-Mining Phase

The pre-mining phase of a project requires advanced planning of the mining process itself and consideration of post-closure options for the site.

3.1 Site Evaluation

The targeted property to be mined must be evaluated in terms of how the overall mining process will take place, including mining sequence. This is typically called a Mine Plan and includes location of processing plant, office and support facilities, haul road and/or access routes, product staging areas, and overburden placement. An evaluation of the soil type(s) in the area planned for mining is valuable. Susceptibility of erosion to these soils must be known in the pre-planning stages. Since sands, silts and clays act differently when worked by earthmoving equipment, knowledge of the soil type(s) can reduce the cost incurred during site preparation. Detailed soil survey maps for each county are available from the United States Department of Agriculture (USDA).

3.2 Understanding Site Drainage

It is important to determine the pre-existing drainage patterns and the areas where concentrated flow may exit for a potential mine site. Drainage areas are those locations of the site where runoff will flow in one preferential direction or towards particular discharge points. Understanding these factors will greatly enhance your selection and design of appropriate sediment control structures (i.e., BMPs) such as culverts, to minimize any adverse impacts to the site.

3.2.1 Surface Water Flow

Identifying the receiving waters (i.e., lake, stream, pond, or wetland) is vital before site preparation can take place. Operators must determine all appropriate agencies with jurisdiction over the receiving waters (i.e., in the case where agencies other than TCEQ hold jurisdiction). If sensitive water bodies are downstream (i.e., wild and scenic rivers, recreational streams, natural aquatic sites, private ponds and lakes or receiving streams listed on the Clean Water Act (CWA) 303(d) List) additional erosion controls may be needed. The TCEQ and USEPA Region 6 are continuously in the process of developing total maximum daily loads (TMDL) for water bodies within the state that are not meeting their designated uses. If the TMDL has already been developed, it may not allow additional inputs (discharges) to the receiving stream. Therefore, it is important to know which water bodies have had TMDLs developed for them or are scheduled for TMDLs. This information can be found in the latest EPA approved *Texas*

Integrated Report of Surface Water Quality for CWA Sections 305(b) and 303(d) on TCEQ's website: <https://www.tceq.texas.gov>.

Understanding site drainage can be obtained by using the appropriate United States Geological Survey (USGS) Topographic Quadrangle map(s) for the area in question and studying the drainage features across the property. These maps show changes in elevation by a series of contour lines. These lines can be used to determine slope of the ground surface through the site to identify drainage patterns.

Actual inspection of the property during or after a rainfall event can provide a substantial amount of information regarding how surface water flows across the subject site.

3.2.2 Ground Water Conditions

Ground water comes from aquifers which transmit water through the subsurface. It is important to understand that mining of a potable aquifer can negatively affect the well yield of a potable well.

The following BMPs will help guide a ground water preservation effort:

- When a new sand and gravel operation is being considered, operators must first check the Texas Water Development Board water well reports data and the TCEQ water well report viewer to determine if registered public and private drinking water supply wells are located nearby.
- Perform a visual check for possible unregistered private wells or abandoned wells in the immediate vicinity of the new sand and gravel pit. If an unregistered private well or abandoned well is discovered, operators must refer to TCEQ's Regulatory Guidance *Landowner's Guide to Plugging Abandoned Water Wells* (RG-347) for more information on the necessary actions which must be taken.

3.3 Site Preparation

Site preparatory activities must be initiated at the mine site only after surface water drainage and ground water conditions are thoroughly understood. Once the proposed mine site is understood in terms of surface water drainage and ground water conditions, site preparation can be initiated.

Operators must inspect disturbed areas (cleared, graded, or excavated) of the site at least once every seven (7) calendar days. Operators must check for signs of visible erosion and sedimentation that can be attributed to the points of discharge where discharges leave the site.

3.3.1 Construction of Access and Haul Roads

Access or secondary and/or haul roads are a necessary component of a sand and gravel mining operations, especially on large pieces of property which can require the construction of several roads. Care must be taken in the construction of those roads so

as to minimize impacts to the environment. Roads must be designed to drain at all times by using crowning, graveling, compacting, ditching, and/or culverting. Proper construction and maintenance of permanent or temporary access or haul roads is of vital importance. Road systems must be kept in serviceable condition to minimize erosion by rainfall runoff, dust, and normal vehicle use. Where necessary, road surfaces must be graveled if the base does not already contain sufficient aggregate.

Crowning of Roads

Road surfaces, when constructed, must be crowned or out-sloped to dissipate surface runoff and minimize erosion of the roadbed.

Graveling and Compacting

Graveling and compacting of the road surface allows for a more permanent and less maintenance-required road surface. It minimizes loose sediment runoff or tracking of sediment during wet periods onto public roads or highways.

Ditching and Culverting

Ditches (diversion, lateral and/or wing ditches) and culverts can be temporary or permanent drainage structures that, when adequately sized for a specific use, carry water flow from rainfall alongside or underneath a roadbed. Ditches and culverts must be sized based on anticipated rainfall events for the specific region of the state where it is being constructed. These structures must be installed at the time of roadway construction. Ditches must be sloped to prevent silting and to allow for maintenance (i.e., digging out sediment buildup). Ditches and culverts must be kept free of debris and obstructions in order for them to allow unrestricted passage of water. Typically, ditches can be used for routing surface water flow away from adjacent properties offsite.

Silt Fencing

Silt fencing can aid in soil erosion caused by surface runoff from roadways provided it is installed correctly, as described in section 2.2.4 above. The fencing must be installed and secured beneath the ground surface to prevent undermining or under-washing from occurring.

3.3.2 Land Clearing and Grubbing Activities

Land clearing and grubbing is a surface operation that consists of cutting and removing all trees, stumps, roots and other debris from the site. Land clearing may also include the removal and disposal of unwanted structures such as old foundations. The proper disposal of wastes from clearing and grubbing is discussed below in section 5.2.

Experienced and trained equipment operators must be used during this stage of the mining process so that soil disturbance, compaction and displacement are only provided on those areas ready for immediate use. It is best construction practice to install/construct sediment holding basins before major site grading takes place. These

basins can catch and hold surface runoff before it leaves the site. Additionally, diverting upslope water around a planned area for disturbance is also good practice. The time of year of land clearing and grubbing activities takes place can also minimize the impact that inclement weather can have on disturbed/affected areas. If possible, disturbed areas must be temporarily stabilized or covered as soon as possible to minimize impacts on the environment.

Operators must only clear and grub acreage needed for activities occurring before the next anticipated storm event. Clearing or grubbing too much land too early in the construction phase of the mining operation will dramatically increase the potential for environmental impacts from surface water runoff and will increase the costs to control runoff from the mining site. Operators must schedule or limit grading activities as necessary to protect disturbed areas from stormwater runoff.

A minimum 100-foot buffer zone is required adjacent to perennial streams and water bodies in the State of Texas.

3.3.3 Stripping Activities

Stripping is a term used to describe the removal of overburden material or material which is present atop the valuable sand reserves. The overburden material is typically comprised of the valuable topsoil near the immediate ground surface and then the vadose zone soil (i.e., soil above the normal water table). Composition or makeup of the overburden material is typically clay, silt, and fine sand. The topsoil material can be temporarily stockpiled for future use in post-mining activities. Operators must implement appropriate controls to control runoff from stockpiles. Stockpile protection is most effective when stockpiles are located away from concentrated flows of storm water, drainage courses, and inlets, and when properly protected with perimeter sediment barriers and covered.

However, physical space limitations may limit the amount of overburden material that may be stockpiled at any given time. The cost to strip the material, typically using a trackhoe and haul trucks, can outweigh the value of holding on to this material for future use. Once a mining operation has created a mine pit, concurrent reclamation allows for much of the overburden material to be placed back into the mine pit.

This negates or minimizes the cost of hauling it to an area of the mine property for temporary storage. During the stripping phase of the mining process, care must be taken to not affect or disturb too great of an area such that surface runoff from stripped areas and stockpiles of overburden material cannot be controlled effectively. Such a case might allow an excessive buildup of silt or clay in ditches constructed to control the surface water flow across the site. Normally, surface water flow is directed to the pit to keep the water table high in extended periods of dry weather.

Operators must allow enough undisturbed buffer at property boundaries to provide sufficient lateral support of property lines as determined by the licensed professional engineer or geoscientist certifying BMPs at the site.

4 Mining Phase

4.1 Dredging Activities

After stripping away overburden material to expose the mineable sand reserves, the dredging process begins. Dredging is performed by suction and pumping to a wash plant where the material is separated using a sizing screen. Water generated during the pumping process can flow back into the pit. Sand is typically separated from the gravel and either stockpiled or allowed to flow back into the pit via a sand flume. Sized aggregate is stockpiled onsite until its sale.

4.2 Aggregate Wash Plant Area (Wet Processing)

Process wastewater is any water that is used for or results from the production, clean-up, or use of any raw material, intermediate product, finished product, byproduct, or waste product. Wastewater treatment alters the characteristics of the wastewater before discharge and it is often required to achieve compliance. Examples of treatment include pH adjustment and either physical or chemical means to settle solids prior to discharge to surface water.

BMPs required during this portion of the mining process include proper berming and/or ditching of pump water from the dredge to the wash plant and back into the open pit. The pump water is typically allowed to flow back into the mining pit to avoid unpermitted process water from potentially leaving the property.

Runoff from the stockpiles must be controlled by routing this water back to the open pit. Rainfall runoff from these stockpiles must also be directed to the open pit. Other BMPs must include silt fencing, berms, and vegetated buffers, as needed to ensure runoff from stockpiles is controlled.

4.3 Aggregate Processing Plant Area (Dry Processing)

Although significant amounts of sand are used for fill, bedding, subbase, and basecourse without processing, most domestic sand is processed prior to use. The processing of sand for a specific market involves the use of different combinations of washers, screens, and classifiers to segregate particle sizes; and storage and loading facilities.

After being transported to the processing plant, the wet sand (raw feed) is stockpiled or emptied directly into a hopper, which typically is covered with a set of parallel bars to screen trash or debris. From the hopper, the material is transported to fixed or vibrating scalping screens by gravity, belt conveyors, hydraulic pump, or bucket elevators. The scalping screens separate the oversize material from the smaller sizes. The oversize material may be directed to a crusher for size reduction, to produce manufactured sand. Crushing generally is carried out in one or two stages. Following crushing, the material is returned to the screening operation for additional sizing.

Alternatively, oversize material (greater than two inches) may be used for erosion control, reclamation, or other uses. The material that passes through the scalping screen is fed into a battery of sizing screens, which generally consist of horizontal or sloped, single or multi-deck vibrating screens. Rotating trommel screens with water sprays are also used to process and wash wet sand. Screening separates the sand into different sizes. Water is sprayed onto the material throughout the screening process in order to remove clays and other deleterious material. The sand is freed from clay and organic impurities by log washers or rotary scrubbers. After scrubbing, the sand typically is sized by water classification. Wet and dry screening are rarely used to size the sand. After classification, the sand is dewatered using screws, cyclones, or hydroseparators. After processing, the sand is transported to storage bins or stockpiles by belt conveyors, bucket elevators, or screw conveyors.

4.4 Maintenance Area(s)

Optimal site management is critical to the control of contamination of stormwater. Stormwater quickly picks up pollutants from improperly stored materials, spills, and erosion. Coverage for toxic materials, site grading, channeling of stormwater, preventative maintenance, and employee training are typical and practical to curtail potential problems associated with pollutant-laden stormwater discharge. Source control must be provided for activities such as fueling, loading and unloading liquids, and outside storage of raw materials. A Spill Prevention Control & Countermeasures (SPCC) Plan must be in place to implement spill prevention and response. Ongoing inspection assures that site management is having the desired effect.

Fuel and oil storage and handling facilities must be located some distance from the main sediment and wash water retention facility. All such facilities must be equipped with approved containment, monitoring, and collection systems. It is recommended that fuel storage be done above ground. Runoff from adjacent surfaces must be routed to a retention pond that can be monitored and cleaned in the event of a spill.

4.5 Petroleum Product Storage and Handling Area

1. Regulatory Requirements

Operators must comply with all local, state, and federal requirements for petroleum storage tanks. Petroleum storage tanks are regulated by TCEQ and a number of other local, state, and federal agencies. For a complete overview of the regulating agencies, operators must refer to TCEQ Regulatory Guidance *Who Regulates Petroleum Storage Tanks?* (RG-475).

TCEQ requires registration of petroleum storage tanks. TCEQ's complete rules and regulations for petroleum storage tanks can be found in 30 TAC Chapter 334.

Additionally, a written SPCC Plan is required to meet federal regulatory requirements for any facility that has a total aggregate petroleum product (i.e., oil, diesel fuel, gasoline, used oil, etc.) storage capacity greater than 1,320 gallons in containers 55 gallons or greater.

2. BMPs

There are many types of BMPs associated with the proper storage, handling, and transfer of petroleum products. Some of the more important BMPs include:

- During fuel transfer activities, signs must be posted instructing drivers to remain with their vehicles at all times to prevent overfill or spillage.
- Fuel delivery drivers must be instructed on proper procedures, including chocking of wheels or locking brakes prior to offloading fuel, and checking that all hoses are properly disconnected prior to removing chocks or unlocking brakes for departure.
- In the event of an equipment failure all fuel transfer areas must have secondary containment adequate to contain the contents of the largest single compartment of any tank truck utilized in the facility or the discharged material must be directed to a containment pond through the use of berms and swales.
- Use drip pans or buckets at disconnection points of hoses and/or piping to collect drippage of oil.
- All storage tanks must be inspected once per month for signs of fatigue or failure that could lead to the spillage of fluid. Documentation of these inspections are required. Any item noted that is leaking, corroded, deteriorated or has a high potential for discharging oil into the environment must be promptly repaired.
- All pollution prevention equipment must be examined once per month to ensure such equipment is in good operating condition. A monthly report must be filled out by the inspector and kept onsite as part of the facility records.
- All bulk oil and lubricant storage tanks must have secondary containment for the purpose of containing any spills caused by rupture or leakage of the storage tank.
- All secondary containment structures must have a minimum free board to account for precipitation events. This freeboard is usually 110 percent of the capacity of the largest storage tank within the containment and must be constructed of material impervious to contents of the tank.
- All containment structures must be equipped with manually operated gate valves used solely for the drainage of rainwater that could accumulate in the containment area. If the containment structure does not have a valve, a sump must be available to allow a portable pump to drain the containment area. All manually operated valves must be locked closed when not in use.
- Accumulated rainwater must be visually inspected prior to discharge to ensure that there is no sheen due to the presence of a petroleum product.

Water with a sheen must never be discharged, but may be pumped for disposal, allowed to evaporate, or removed by some other appropriate method. Documentation of this visual inspection is required.

Oil Discharge Response and Cleanup

In the event of an oil discharge within the plant area, all manpower and equipment available must be utilized to prevent the discharge from reaching a navigable waterway. The most important steps that need to be taken are stopping the discharge and controlling its impact to the environment.

Procedure to be followed in the event of a discharge:

- The first person to notice the discharge must immediately notify the plant superintendent; the superintendent, in turn, must simultaneously implement best management practices to capture the discharge.
- Depending on the volume of the spill, the operator is required to notify TCEQ immediately, or at least within 24 hours. Operators must refer to 30 TAC Chapter 327 for complete rules and regulations regarding spills.
- If possible, the source of the leak must be plugged and/or valves closed to prevent further leakage.
- A front-end loader must be immediately available to build a berm or dike with dry sand to absorb the discharge if the secondary containment should fail.
- In the event of a discharge on the concrete in the shop or other hard surface, the following procedure must be used:
 - Absorbents must be used to keep the discharge from leaving the hard surface.
 - The source of the discharge must be identified, and the leak rectified by whatever means necessary.
 - Used absorbent must be placed in a drum (labeled with USED ABSORBENT, NON-HAZARDOUS). The drum must have a lid, which is kept on at all times when not in use. The drum must have the first date the used absorbent was placed in the drum. The drum must be kept under a roofed structure to prevent stormwater contamination.
- If any discharged material has left the impervious surface, the media contaminated from the discharge must be properly removed and disposed of in accordance with all applicable local, state, and federal environmental regulations.

- If the discharge is too large for plant personnel to contain and clean-up, a contractor must be contacted.

After the leak is repaired, the discharged product must be recovered from the secondary containment and appropriately managed in accordance with current state and federal regulations (e.g., industrial solid or hazardous waste; used oil, batteries, antifreeze, tires, etc.). If contaminated sand or contaminated surface soils are generated, they must be disposed of in accordance with current state and federal regulations for the contaminant.

5 Post-Mining Phase

The Post-Mining Phase stabilization is dependent on the agreement with the landowner. These activities may involve the stabilization of inactive mining pit or borrow areas with herbaceous perennial plants, stabilizing the soil, preventing wind or water erosion from causing on-site or off-site damage and improving the aesthetic appeal and the ability of the site to support wildlife. This practice is applicable to sand borrow areas which have had the soil profile replaced to approximate original conditions or where the soil profile has been removed.

5.1 Site Stabilization

Soil characteristics need to be evaluated to help maintain soil stability and prevent erosion. The following guidelines may be used to ease the tasks of meeting site stabilization objectives.

Slope stability: Cut and fill slopes must not exceed 2:1 to provide better stability. Gentler slopes (3:1) are preferred to facilitate seeding efforts. Long slopes must be avoided to help prevent erosion and to allow access for seeding, mulching, and maintenance.

Diversions: Construct diversions at tops of slopes to divert runoff away from the slope banks to a stable outlet.

Chutes: Construct aggregate lined chutes or equivalent to conduct concentrated flow of water to stable outlets.

Soil Conservation: Reclamation of abandoned roads require reshaping, recontouring, and resurfacing with topsoil and seeding for vegetative growth. Removal of structures such as bridges, culverts, cattle guards, and signs is recommended. In addition, the remaining sand stockpiles must be removed from property boundaries to eliminate the potential for offsite discharge from stormwater flow.

Operators must practice good soil conservation and seed bare ground during the post-mining phase to aid in minimizing and/or reducing the potential for stormwater to wash sediment loads from unvegetated areas into nearby waterways. Natural regeneration takes time and during that process much sediment could be washed away as sheet, rill or gully erosion over that period.

If active revegetation is selected, seeds that are conducive to the season and type of soil present must be used to vegetate any bare areas. Mulching (using hay or erosion control blankets, for example) also aids in seed germination and helps prevent or minimize sheet, rill and gully erosion. The NRCS office can help in the proper selection of the types of seeds and nutrients required for proper vegetative growth.

5.2 Debris and Vegetative Waste Removal

Typical debris from sand mining usually involves trees and shrubs generated from the land clearing stage of the mining process. These trees and shrubs may be placed back into the mined portion of the property and covered with overburden material. This debris can also be stockpiled and burned if the operator complies with the outdoor burning rule in 30 TAC §§111.201 - 111.202. For more information about complying with the outdoor burning rule, operators must refer to the TCEQ guidance document *Outdoor Burning in Texas* (RG-049),

All waste disposal for the site must be done in accordance with TCEQ Municipal Solid Waste Rules found in 30 TAC Chapters 330, 328, and 332.

5.3 Property Grading

After the mining activities are completed, grading of the property must be conducted. This minimizes non-point source stormwater pollution (i.e., sediment fines) from impacting potential pathways such as streams, creeks, tributaries, lakes, etc.

6 Final Stabilization Report

Prior to operations terminating at a sand mining facility site or portion(s) of the site, a final stabilization report must be submitted to the executive director for review and approval at the following address:

Texas Commission on Environmental Quality
Stormwater Team Leader (MC-148)
P.O. Box 13087
Austin, Texas 78711-3087

The Final Stabilization Report must, at a minimum, include and demonstrate that the items described below in section 6.1 *Report Requirements* have been addressed.

6.1 Report Requirements

Vegetative Cover:

- The operator shall establish perennial vegetative cover in all areas except where ponds, highwalls, permanent structures, or paved areas exist.

- Perennial vegetative cover must be uniform (i.e. evenly distributed with no large bare areas) and have a density of at least 70 percent of the native background vegetative cover for the area.

Vehicle and Equipment Storage and Maintenance Areas:

- The operator shall remove fluids and batteries from, and thoroughly clean all vehicles and equipment remaining on-site.
- All fuel and chemicals must be removed from maintenance areas. Maintenance areas must be thoroughly cleaned and cleared. If maintenance areas are unpaved, these areas must have vegetative cover established.

Structural Controls:

All temporary structural controls must be removed from the site. Remaining permanent structural controls must be adequate to manage remaining on-site drainage.

Highwalls:

The permittee shall demonstrate that all remaining highwalls are stable and safe.

Waste:

All waste must be removed from the site and disposed in accordance with applicable TCEQ rules.

Landowner Agreement:

If applicable, a copy of all existing agreements with landowners regarding stabilization of the site must be included.

Certification:

The Final Stabilization Report must be signed and certified by a Texas licensed professional engineer or a Texas licensed professional geoscientist.

7 Glossary

Access road — A temporary or permanent access route for vehicular traffic.

Aggregate - Hard materials such as sand, gravel, and crushed stone, used for mixing with cementing or bituminous material to form concrete, mortar, or asphalt, or used alone as in railroad ballast, road base, landscaping rock, or graded fill.

Best management practices (BMPs)- Schedules of activities, prohibitions of practices, maintenance procedures, and other techniques to control, prevent or reduce the discharge of pollutants into surface water in the state. The BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spills or leaks, sludge or waste disposal, or drainage from raw material storage areas.

Buffer - A relatively undisturbed section of vegetated or forested land adjacent to an area requiring special attention or protection such as a stream or lake.

Channel - A natural stream which conveys surface runoff water within well-defined banks.

Contour - An imaginary line on the surface of the earth connecting points of the same elevation.

Contour line - A line drawn on a map connecting points of the same elevation.

Culvert - Pipe made of metal, plastic, or other suitable material; installed under roads to transmit water from the roadway or side ditches, storm runoff, seeps and drains.

Discharge - The drainage, release, or disposal of process wastewater, mine dewatering, stormwater associated with sand mining, construction stormwater, into or adjacent to water in the state.

Ecoregion - an area that is defined by the plants, animals and land that make it different.

Ephemeral stream - A water course generally without a well-defined channel that flows only in response to rainfall. These streams flow less than 20 percent of the year during normal rainfall conditions. Flows along a course that may or may not have a well-defined channel.

Erosion - The detachment and transportation of soil particles.

Grade - The slope of a road, usually expressed as a percent.

Highwall - Vertical face remaining from the final cut of a surface mining operation.

Infeasible - Not technologically possible, or not economically practicable and achievable in light of best industry practices. (40 CFR §450.11(b)).

Intermittent stream - A stream that has a period of zero flow for at least one week during most years. Where flow records are available, a stream with a seven-day, two-year low-flow of less than 0.1 cubic feet per second is considered intermittent.

Jurisdictional waters or wetlands - Areas subject to the regulations of the Clean Water Act of 1987; generally, concave or low lying topographic forms that collect, store, or flow water frequently enough to favor a majority of plants that are adapted to saturated soil conditions.

Minimize - To reduce or eliminate to the extent achievable using control measures that are technologically available and economically practicable and achievable in light of best industry practices.

Mulching - Covering an area loosely with some material to hold soil in place and facilitate revegetation. Straw, bark, hay, or wood fibers are common mulches.

Native - a species that originated in a certain region

Natural regeneration - The planned regeneration of a forest that either uses existing trees as a source of seed or encourages sprouting from stumps or roots.

Noxious and Invasive Plant - Any plant species that has a serious potential to cause economical or ecological harm to the agriculture, horticulture, native plants, ecology, and waterways of Texas.

Nutrients - Mineral elements in the forest ecosystem such as nitrogen, phosphorus, and potassium, usually insoluble compounds that are present naturally or they may be added to the forest environment as forest chemicals, such as fertilizer.

Operator - A person responsible for the management of an aggregate production operation (APO) facility subject to the provisions of this subchapter. The APO facility operators include entities with operational control over APO regulated activities, including the ability to modify those activities; or entities with day-to-day operational control of activities at a facility necessary to ensure compliance with this subchapter (e.g., the entity is authorized to direct workers at a facility to carry out activities required by this subchapter).

Overburden - All materials displaced in an aggregates extraction operation that are not, or reasonably would not be expected to be, removed from the affected area.

Perennial stream - A watercourse that flows continuously (at least 90% of the year) in a well-defined channel.

Permanent road - A high specification permanent road which is maintained periodically and serves as a main artery in a network of roads.

Pit - An open excavation from which aggregates have been, or are being, extracted with a depth of five feet or more below the adjacent and natural ground level.

Pollution - The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose

Regeneration - The young tree crop replacing older trees removed by harvest or disaster; the process of replacing old trees with young.

Riparian - The land adjacent to and pertaining to the banks of streams, rivers, or other water bodies with a high density, diversity and productivity of plants and animal species.

Sand - Granular material resulting from rock disintegration, consisting primarily of particles having a diameter in the range of 2 mm (about the size of a pinhead) to 1/16 mm (like very fine sandpaper).

Sand Mining Facilities - The APOs engaged in activities described by Standard Industrial Classification codes 1442 and 1446, concerning industrial and construction sand. Additionally, this applies to any other APO that the executive director has determined to be a sand mining facility by sending written notice to the APO operator.

San Jacinto River Watershed - Those portions of the San Jacinto River Watershed that includes the watersheds of the following and its tributaries:

- the East Fork of the San Jacinto River in Montgomery, Harris and Liberty Counties;
- Peach Creek in Montgomery County;
- Caney Creek in Montgomery and Harris Counties;
- the West Fork of the San Jacinto River from the Lake Conroe Dam in Montgomery and Harris Counties to the Lake Houston Dam in Harris County;
- Lake Creek in Montgomery and Grimes Counties;
- Spring Creek in Montgomery and Harris Counties; and
- Cypress Creek in Harris and Waller Counties.

Secondary road - A road constructed for a particular use or single operation and normally abandoned upon completion of the operation.

Sediment - Soil material suspended in air or water which is being transported or moved from its original site; the material which is deposited.

Sheet erosion - The removal of a fairly uniform layer of soil from the soil surface by water runoff.

Slope - Steepness of the land expressed as the amount (in percent) of vertical fall per 100 feet of horizontal distance.

Soil - The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

Soil conservation - Using the soil within the limits of its physical characteristics and protecting it from unalterable limitations of climate and topography.

Storm Event - A precipitation event that results in a measurable amount of precipitation.

Stream - A well-defined natural channel that has a flow anywhere below its headwaters greater than 5 cubic feet per second at least 50 percent of the time (EPA—US Army Corps of Engineers). A permanently or intermittently flowing body of water that follows a defined course.

Stream bank - The boundaries of a stream which contain normal flows.

Suspended sediments - Particles of rock, sand, soil, and organic detritus carried in suspension in the water column. Typically carried by flowing water but not always the case. Very small particle size sediments (i.e., clays) may stay suspended for extremely long periods of time (i.e., months or years).

Turbidity - Reduced clarity of surface water because of the presence of suspended fine particles (i.e., sediment) usually in the form of clays and silts.

Water body - A navigable watercourse, river, stream, or lake within the water quality protection area.

Water quality - A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Wetland - An area (including a swamp, marsh, bog, prairie pothole, or similar area) having a predominance of hydric soils that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances supports the growth and regeneration of hydrophytic vegetation. The term "hydric soil" means soil that, in its undrained condition, is saturated, flooded, or ponded long enough during a growing season to develop an anaerobic condition that supports the growth and regeneration of hydrophytic vegetation. The term "hydrophytic vegetation" means a plant growing in: water or a substrate that is at least periodically deficient in oxygen during a growing season as a result of excessive water content. The term "wetland" does not include irrigated acreage used as farmland; a man-made wetland of less than one acre; or a man-made wetland where construction or creation commenced on or after August 28, 1989, and that was not constructed with wetland creation as a stated objective, including but not limited to an impoundment made for the purpose of soil and water conservation that has been approved or requested by soil and water conservation districts. If this definition of wetland conflicts with the federal definition in any manner, the federal definition prevails.

Appendix A

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