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

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Table of Contents

1	Introduction.....	1
2	Best Management Practices.....	3
2.1	Vegetative Controls.....	3
2.2	Structural Controls.....	5
3	Pre-mining Phase.....	9
3.1	Mine Plan and Site Evaluation.....	9
3.2	Understanding Site Drainage.....	11
3.3	Site Preparation.....	12
4	Mining Phase.....	14
4.1	Dredging Activities.....	14
4.2	Aggregate Wash Plant Area (Wet Processing).....	15
4.3	Aggregate Processing Plant Area (Dry Processing).....	15
4.4	Maintenance Area(s).....	16
4.5	Petroleum Product Storage and Handling Area.....	16
5	Post-mining Phase.....	19
5.1	Site Stabilization.....	19
5.2	Debris and Vegetative Waste Removal.....	20
5.3	Property Grading.....	20
6	Final Stabilization Report.....	20
6.1	Report Requirements.....	20
7	Glossary.....	21
8	Resources.....	25
	Appendix A: A Map of the San Jacinto River Watershed.....	26

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.

TCEQ established a new rule on best management practices (BMPs) for sand mining operations in the San Jacinto River Watershed based on petitioner's requests (Texas Aggregates and Concrete Association and the Lake Houston Area Grassroots Flood Prevention Initiative).

Using input from the petitioners and stakeholders and a similar guidance document written by the Louisiana Department of Environmental Quality, TCEQ developed this regulatory guidance to support the new rule in Subchapter J, [Title 30, Texas Administrative Code](#) (30 TAC) Chapter 311.

Sand mining operations disturb land and soil when building entrance roads to the site, leveling the area where the equipment will be installed, and leveeing the entire site and the pit where stormwater will be retained once the operations are fully functional.

It is necessary to properly install and maintain BMPs to minimize exposure and erosion, address good housekeeping practices and sediment control, and manage runoff. In addition, implementing 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 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 can affect water quality, including:

- Geographic location
- Hydrogeology
- Hydrology
- 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 include:

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

The purpose of this TCEQ regulatory guidance document is to provide the types of BMPs that must be utilized by operators during every phase of the sand mining operation to prevent pollutants from leaving the site. Sand mining operators must comply with the BMP requirements in 30 TAC Chapter 311, Subchapter J for vegetative and structural controls, and pre-mining, mining, and post-mining phases. As required by the rules, all sand mining operators must develop and implement all BMPs listed in this regulatory guidance for vegetative and structural controls, and pre-mining, mining, and post-mining phases, unless they are infeasible. If a BMP is infeasible following the criteria in the rules the operator must identify, develop, and implement an alternative equivalent BMP and maintain written documentation of the reason(s) onsite. ([30 TAC¹ 311.103](#)),

This guidance 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). TCEQ will update these BMPs 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 statewide TPDES stormwater Construction General Permit (TXR150000) and Multi-Sector General Permit (TXR050000), as applicable, sand mining facilities in the San Jacinto River Watershed must also comply with the requirements in Subchapter J of the Watershed Protection Rules ([30 TAC² Chapter 311](#)).

For the purpose of Subchapter J of the rule and this regulatory guidance, 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.

¹ www.tceq.texas.gov/goto/view-30tac

² www.tceq.texas.gov/goto/view-30tac

- 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.
- Cypress Creek in Harris and Waller Counties.

See Appendix A for a map of the San Jacinto River Watershed. See also Section 7 for a glossary of terms used in this guidance document.

Before commencing or continuing sand mining activities, facility operators are required to develop and implement all BMPs and the Mine Plan, and before terminating operations at the site or portion(s) of the site, must prepare and implement a Final Stabilization Report, all as outlined in this guidance.

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 native plants appropriate for the Texas ecoregion where the site is located and must not include any noxious or invasive species. As a resource, refer to the [Texas Parks and Wildlife Department website](#)³ for more information about the appropriate plant species to be used in the site's ecoregion. Noxious and invasive species are identified by the [Texas Department of Agriculture](#)⁴ in [4 TAC](#)⁵ 19.300(a).

Site operators must do all of the following:

- Inspect and document disturbed areas of the site where vegetative controls have been implemented once every seven calendar days.
- Inspect all vegetative controls to ensure that they are installed properly, appear to be operational, and minimizing pollutants in discharges, as intended.

³ tpwd.texas.gov/

⁴ www.texasagriculture.gov/

⁵ www.tceq.texas.gov/goto/rg-347

- Check for signs of visible erosion and sedimentation that can be attributed to the points of discharge where discharges leave the site.
- 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, or 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. Disperse construction site runoff over the entire buffer zone if possible. A minimum 100-foot buffer zone is required adjacent to perennial streams greater than 20 feet wide, 50 feet for perennial streams less than 20 feet wide, and 35 feet for intermittent streams. Measure buffer zones from the stream bank to the nearest area of disturbance at the site.

2.1.2 Sod Stabilization

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

Protecting trees involves preserving and protecting selected native 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 and increase 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, replace them within 30 days with an equivalent or better soil stabilizing tree.

2.1.3 Temporary Seeding

Temporary seeding is the planting of fast-growing native 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), initiate permanent seeding. 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, or 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 or the Natural Resources Conservation Service (NRCS) can analyze soil for lime and fertilizer needs. Refer to the [NRCS website](http://www.nrcs.usda.gov/)⁶ for more information.

⁶ www.nrcs.usda.gov/

2.1.4 Permanent Seeding

Permanent seeding is the use of native perennial grass (with native trees and shrubs) to stabilize the soil. Vegetation is often not fully established until one year from planting. Operators must 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.

2.1.5 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. Apply the mulch in an appropriate manner that prevents it from leaving the site during heavy rain events.

2.1.6 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.

2.1.7 Surface Roughening

Surface roughening, using heavy equipment, creates horizontal grooves across the slope which reduces runoff velocity and erosion and aids seed growth. Immediately seed and mulch roughened slopes.

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 comply with local rules and permitting requirements.

Site operators must inspect disturbed areas of the site where structural controls have been implemented once every seven 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 minimize pollutants in discharges, as intended.
- Check for signs of visible erosion and sedimentation that can be attributed to the points of discharge where discharges leave the site.

- 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 vegetate the areas disturbed by the temporary structures.

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, cover them with temporary or permanent native vegetation as soon as possible, but no later than seven days after establishment. 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 (toed-in) in a trench a minimum of 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). Never install silt fences across streams, whether flowing or intermittent. They may be placed in minor swales, if appropriate, or ditch lines where the maximum contributing drainage area is no more than two acres.

Maintain the fencing and remove sediment 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 instead implement straw bale barriers if appropriate for the site. 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). Locate the barrier so that the water depth does not exceed one foot at any point. Straw bales, with bindings oriented around the sides, must 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.

Wedge gaps between bales 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 must 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% x height x surface area. Remove sediment 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. Measure and record the depth of sediment basins at least annually.

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.

Lateral erosion from the river can cause draining and erosion of pits, as well as possible pit capture, where breaching of the dike can potentially reroute the river through the pit area. Therefore, give special consideration to stability of the outer dike, separating pits from the vegetated buffer zone adjacent to the river.

2.2.6 Riprap Outlet Protection

Place riprap outlet protection 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.

Remove accumulated sediment from behind the check dams when it reaches one half the dam height. Correct erosion around dam edges 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 Entrances and Exits

Construction entrances and exits must be aggregate stabilized to reduce sediment tracked onto public roads. Ensure that aggregate is 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. Implement all of the following good housekeeping practices:

- 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.
- Adequately maintained sanitary facilities.

2.2.10 Post Construction/Stormwater Management Measures

Install measures 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 provide complete onsite storage and treatment of a specific volume of stormwater runoff by using infiltration, evaporation, and recycling. The retention pond must provide storage for a volume of runoff from a two year 24-hour storm. This must be calculated using representative rainfall data from the National Oceanic and Atmospheric Administration (NOAA), or the United States Geological Survey (USGS). Refer to the [NOAA](http://www.noaa.gov/)⁷ and [USGS](http://www.usgs.gov/)⁸ webpages for more information.

⁷ www.noaa.gov/

⁸ www.usgs.gov/

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 Mine Plan and Site Evaluation

Carefully evaluate the targeted property to be mined in terms of how the overall mining process will take place, including the mining sequence. This will be your Mine Plan and must provide a description of potential pollutant sources (activities and materials) that may reasonably be expected to affect the quality of discharges from the sand mine.

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 \(USDA\) website](#)⁹

The operator must develop the Mine Plan prior to commencing or continuing operations at the site. The plan, and all updates to it, must be signed and certified by a Texas licensed professional engineer or a Texas licensed professional geoscientist. The plan must be kept current and updated regularly, but no later than seven days after a change has occurred at the site.

At a minimum, the Mine Plan must include all elements below.

3.1.1 Site Map

Include a topographic map identifying:

- Property boundaries and the area(s) where mining and construction, if applicable, will occur.
- Location of haul roads or access roads.
- Outfall locations.
- The drainage area and direction of flow to the outfalls.

⁹ www.usda.gov/

- Surface waters (including wetlands) adjacent to and within one mile of the property boundaries.
- Areas where soil disturbance will occur (note any phasing).
- Areas that will not be disturbed.
- Slopes for pre- and post-disturbed areas.
- Locations of all major structural controls planned or in place.
- Locations where stabilization practices are expected to be used.
- Locations of materials, waste, overburden, or stockpiles.
- Locations of equipment storage areas, material processing areas, and vehicle and equipment maintenance areas.
- Location of onsite water wells and any offsite water wells within 500 feet of the property boundary.

3.1.2 Site Description

Include a site description with all of the following:

- Description of activities, potential pollutants and their sources at the sand mine.
- Description of the intended schedule or sequence of mining and construction activities if applicable, that will disturb soils.
- Number of acres of the entire sand mine property and the total number of acres where mining and soil disturbance will occur.
- Data describing the soil types and anticipated quality of any discharge from the sand mine.

3.1.3 Inventory of Exposed Materials

Provide an inventory listing materials handled at the site that may have contact with or may be exposed to stormwater.

3.1.4 Spills and Leaks

List significant spills and leaks of toxic or hazardous pollutants that occur in areas that may have contact with or be exposed to stormwater. The operator must maintain and update this list.

The operator must maintain all records for compliance with 30 TAC Chapter 311, Subchapter J.

3.2 Understanding Site Drainage

For the development of the Mine Plan and commencement of operations, operators must 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 the 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 for developing the Mine Plan 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 latest TCEQ and EPA approved Clean Water Act (CWA) 303(d) List) additional erosion controls may be needed.

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. You can find this information in the latest TCEQ and EPA approved *Texas Integrated Report of Surface Water Quality for CWA Sections 305(b) and 303(d)* at the [Integrated Report of Water Quality webpage](#)¹⁰.

An understanding of site drainage can be obtained by using light detecting and ranging (Lidar) data available through the [Texas Natural Resources Information System \(TNRIS\) website](#)¹¹ or the appropriate USGS Topographic Quadrangle map(s) for the area in question, and by studying the drainage features across the property. The 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. Refer to the [USGS website](#)¹² for more information.

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

¹⁰ www.tceq.texas.gov/waterquality/assessment

¹¹ tnris.org/

¹² www.usgs.gov/

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.

To develop the Mine Plan and to guide a ground water preservation effort do the following:

- When a new sand and gravel operation is being considered, operators must first check the Texas Water Development Board (TWDB) water well reports data on the [TWDB website](#)¹³ and the [TCEQ water well report viewer](#).¹⁴ to determine if registered public and private drinking water supply wells are 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](#)¹⁵ (RG-347) for more information on the necessary actions to take.

3.3 Site Preparation

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

Inspect disturbed areas (cleared, graded, or excavated) of the site at least once every seven 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 and secondary (haul) roads are a necessary component of sand and gravel mining operations, especially on large pieces of property which can require the construction of several roads. Take care 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 culverting. Proper construction and maintenance of permanent or temporary access or haul roads is of vital importance. Keep road systems 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.

¹³ www.twdb.texas.gov/

¹⁴ www.tceq.texas.gov/gis/waterwellview.html

¹⁵ www.tceq.texas.gov/goto/rg-347

Road Crowning

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 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. Install these structures at the time of roadway construction. Ditches must be sloped to prevent silting and to allow for maintenance (i.e., digging out sediment buildup). Keep ditches and culverts free of debris and obstructions 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. Install the fencing and secure it beneath the ground surface to prevent undermining or under-washing.

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 only occur on those areas ready for immediate use. It is best construction practice to install or 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 that land clearing and grubbing activities take place can also minimize the impact that inclement weather can have on disturbed or affected areas. If possible, stabilize or cover disturbed areas temporarily as soon as possible to minimize impacts on the environment.

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.

The required buffer zones described in 2.1.1 must be maintained.

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. Implement appropriate controls for runoff from stockpiles. Protection from runoff 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, don't affect or disturb too great of an area. Otherwise, it may be difficult to effectively control surface runoff from stripped areas and stockpiles of overburden material. That 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.

Allow enough undisturbed buffer at property boundaries to provide sufficient lateral support of property lines as determined by the licensed professional engineer or licensed professional 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 which, during manufacturing or processing, comes into direct contact with or results from the production 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 is often required to achieve compliance. Examples of treatment include pH adjustment and either physical or chemical means to settle solids before discharging to surface water.

BMPs required during this portion of the mining process include proper berming 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.

Control runoff from the stockpiles 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 that 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. Processing sand for a specific market involves the use of different combinations of washers, screens, and classifiers to segregate particle sizes; and utilizing storage and loading areas.

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, a 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 watersprays 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 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 controlling stormwater contamination. Stormwater quickly picks up pollutants from improperly stored materials, spills, and erosion. Considerations for toxic materials, site grading, channeling stormwater, preventative maintenance, and employee training are typical and practical to curtail potential problems associated with pollutant-laden stormwater discharge. Provide source control 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.

Locate fuel and oil storage and handling facilities 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 be stored above ground. Route runoff from adjacent surfaces to a retention pond that can be monitored and cleaned in the event of a spill.

4.5 Petroleum Product Storage and Handling Area

4.5.1 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's regulatory guidance [Who Regulates Petroleum Storage Tanks?](#)¹⁶ (RG-475).

TCEQ requires registration of petroleum storage tanks. You can find TCEQ's complete rules and regulations for petroleum storage tanks in [30 TAC](#)¹⁷ 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.

¹⁶ www.tceq.texas.gov/goto/rg-475

¹⁷ www.tceq.texas.gov/goto/view-30tac

4.5.2 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, post signs instructing drivers to remain with their vehicles at all times to prevent overfill or spillage.
- Instruct fuel delivery drivers on proper procedures, including chocking wheels or locking brakes prior to offloading fuel, and checking that all hoses are properly disconnected before 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 or piping to collect drippage of oil.
- Inspect all storage tanks once per month for signs of fatigue or failure that could lead to fluid spillage. Documentation of these inspections are required. Promptly repair any item noted that is leaking, corroded, or deteriorated or that has a high potential for discharging oil into the environment.
- Examine all pollution prevention equipment once per month to ensure that it 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 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% of the capacity of the largest storage tank within the containment and must be constructed of material impervious to the tank's contents.
- Equip all containment structures with manually operated gate valves used solely for rainwater drainage 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.
- Visually inspect accumulated rainwater before 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.

4.5.3 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 to take are stopping the discharge and controlling its impact to the environment.

Procedure to follow 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](#)¹⁸ Chapter 327 for complete rules and regulations on spills.
- If possible, plug the source of the leak or close valves 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, use the following procedure:
 - Use absorbents to keep the discharge from leaving the hard surface.
 - Identify the source of the discharge and rectify the leak by whatever means necessary.
 - Used absorbent must be placed in a drum kept under a roofed structure to prevent stormwater contamination. The drum must be labeled with “USED ABSORBENT, NON-HAZARDOUS” and the first date the used absorbent was placed in it. The drum must have a lid, which is kept on at all times when not in use.
- If any discharged material has left the impervious surface, the media contaminated from the discharge must be properly removed and disposed of, following 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, recover and manage the discharged product from the secondary containment per current state and federal regulations (e.g., industrial solid or hazardous waste; used oil, batteries, antifreeze, tires, etc.). Likewise, if contaminated

¹⁸ www.tceq.texas.gov/goto/view-30tac

sand or surface soils are generated, dispose of them per 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 stabilizing 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

Evaluate soil characteristics to help maintain soil stability and prevent erosion. Use the following guidelines to meet 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: Reclaiming abandoned roads requires reshaping, recontouring, and resurfacing with topsoil; and seeding for vegetative growth. Removing structures such as bridges, culverts, cattle guards, and signs is recommended. In addition, remove the remaining sand stockpiles from property boundaries to eliminate the potential for offsite discharge from stormwater flow.

Practice good soil conservation and seed bare ground during the post-mining phase to aid in minimizing 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, use seeds that are conducive to the season and type of soil present 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 properly select 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](#)¹⁹ sections 111.201 - 111.202. For more information about the outdoor burning rule, refer to TCEQ's regulatory guidance [Outdoor Burning in Texas](#)²⁰ (RG-049)⁷,

All waste disposal for the site must comply with TCEQ Municipal Solid Waste Rules in [30 TAC](#)²¹ Chapters 328, 330, and 332.

5.3 Property Grading

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

6 Final Stabilization Report

Before terminating operations at a sand mining facility site or portion(s) of the site, submit a Final Stabilization Report to the executive director for review and approval at:

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:

- 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% of the native background vegetative cover for the area.

¹⁹ www.tceq.texas.gov/goto/view-30tac

²⁰ www.tceq.texas.gov/goto/rg-049

²¹ www.tceq.texas.gov/goto/view-30tac

Vehicle and Equipment Storage and Maintenance Areas:

- Remove fluids and batteries from, and thoroughly clean all vehicles and equipment remaining on-site.
- Remove all fuel and chemicals from maintenance areas, which must be thoroughly cleaned and cleared. If these areas are unpaved, they must have vegetative cover established.

Structural Controls: Remove all temporary structural controls from the site. Remaining permanent structural controls must be adequate to manage remaining on-site drainage.

Highwalls: The permittee must demonstrate that all remaining highwalls are stable and safe.

Waste: Remove all waste from the site and dispose of it per applicable TCEQ rules.

Landowner Agreement: If applicable, include a copy of all existing landowner-agreements about site stabilization.

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% 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](#)²² 450.11(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.

²² www.ecfr.gov/current/title-40

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% 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.

8 Resources

Louisiana Department of Environmental Quality. (2007). *Recommended Best Management Practices Nonpoint Source Pollution Sand and Gravel Mining Industry*.

Texas Commission on Environmental Quality. (2005). *Complying with the Edwards Aquifer Rules Technical Guidance on Best Management Practices RG-348*.

Appendix A: A Map of the San Jacinto River Watershed

