



July 2001

Implementation Plan for Dissolved Nickel in the Houston Ship Channel System

For Segments 1001, 1005, 1006, 1007, 1013, 1014, 1016,
1017, 2426, 2427, 2428, 2429, 2430, and 2436

Distributed by the
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Introduction

In keeping with the Texas commitment to restore and maintain water quality in impaired water bodies, the Commission recognized from the inception of the total maximum daily load (TMDL) program that implementation plans would need to be established for each TMDL developed.

The TMDL is a technical analysis that:

- 1) determines the maximum loadings of the pollutant a water body can receive and still both attain and maintain its water quality standards, and
- 2) allocates this allowable loading to point and non-point source categories in the watershed.

Based on the TMDL, an implementation plan is then developed. An implementation plan is a detailed description and schedule of regulatory and voluntary management measures that will be effective and appropriate to achieve the pollutant reductions identified in the TMDL.

The implementation plan contained herein will provide the following components:

- 1) a description of control actions and management measures¹ that generally will be implemented to achieve the water quality target;
- 2) legal authority for implementation of the control actions;
- 3) how we will develop a schedule for implementing specific activities determined necessary to achieve TMDL objectives;
- 4) a follow-up surface water quality monitoring plan to determine the effectiveness of the control actions and management measures undertaken;
- 5) reasonable assurances that the implementation of voluntary management measures will achieve the load allocations for NPS; and
- 6) measurable outcomes for determining whether the implementation plan is properly executed and water quality standards are being achieved.

¹ Control actions refer to point source pollutant reduction strategies, generally TPDES permits. Management measures refer to nonpoint source pollutant reduction strategies, generally voluntary best management practices.

This implementation plan is designed to achieve the reductions or other changes in permitted discharges of dissolved nickel to the Houston Ship Channel (HSC) System as defined in the adopted TMDLs (see Figure 1).

This implementation plan was prepared by:

- C the TMDL Team in the Strategic Assessment Division of the Office of Environmental Policy, Analysis, and Assessment of the Texas Natural Resource Conservation Commission.

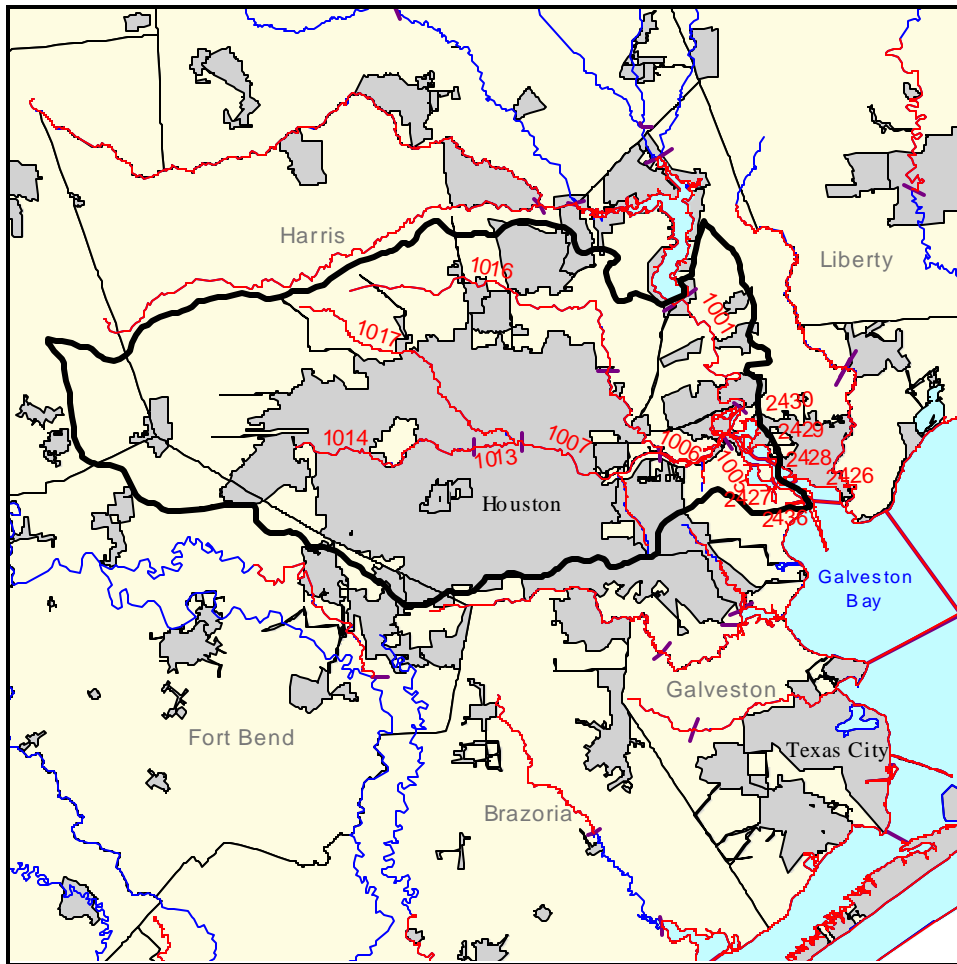


Figure 1. Houston Ship Channel System

Technical assistance was provided by:

- C the Water Quality Assessment Section in the Water Permits and Resource Management Division of the Office of Permitting, Remediation and Registration of the Texas Natural Resource Conservation Commission.

This implementation plan was approved by the Texas Natural Resource Conservation Commission on July 13, 2001. This implementation plan, combined with the TMDL, establishes a Watershed Action Plan (WAP). A WAP provides local, regional, and state organizations a comprehensive strategy for restoring and maintaining water quality in an impaired water body. TNRCC has ultimate responsibility for ensuring that water quality standards are restored and maintained in impaired water bodies.

Summary of TMDLs

The TMDLs for dissolved nickel in the Houston Ship Channel System specifically allocate nickel loading sufficient to account for all existing sources with some margin of safety and allowance for growth. Except in Tucker Bayou, there is a large amount of potentially usable loading capacity remaining unallocated at this time. The unallocated loading capacity provides a significant but implicit margin of safety for this allocation. Modern clean data have indicated that nickel criteria are being met in the HSC system. Any exceedances that may have occurred historically were apparently very localized and/or of short duration—but there is significant doubt that any such exceedances ever truly existed.

The amount of nickel loading allocated at this time is 148.1184 lbs/day. Expressed in the standard TMDL equation, the total allocation for all 14 segments is distributed as:

$$\begin{array}{rcccccc} \underline{LA} & + & \underline{WLA} & + & \underline{AFG} & = & \underline{TMDL} \\ \mathbf{0.1810} & + & \mathbf{101.2608} & + & \mathbf{46.6766} & = & \mathbf{148.1184 \text{ lbs/day}} \end{array}$$

Because this is a critical condition low-flow allocation, the nonpoint loading (LA) shown is allocated entirely to background sources.

The waste load allocation (WLA) shown above incorporates all currently permitted nickel loading, plus the assumed loading from sources not known to be discharging nickel.

The allowance for future growth (AFG) shown above is included in case additional permitted discharge is needed in the near term. The AFG is taken from the unallocated loading capacity, but represents only a small part of that unallocated loading capacity. Reallocation of the AFG to specific permits will be reviewed using the QUAL-TX model to assure that the location or magnitude of the discharges will not cause cumulative exceedance of the water quality criteria.

More information concerning the TMDL allocations is presented in the report *Fourteen Total Maximum Daily Loads For Nickel In The Houston Ship Channel System* (TNRCC, August 2000).

Control Actions and Management Measures

Based on the TMDL analyses, and the allocation summarized above, nickel loading to the Houston Ship Channel System will be controlled through implementation of the Texas Pollutant Discharge Elimination System (TPDES) program for wastewater discharges. Nonpoint sources of nickel are currently not significant enough to require specific additional management measures. Case-specific analyses for permitting activities will be performed using TEXTOX, which is routinely used for permit analyses. The methodology used in the TEXTOX program for calculating water-quality based effluent limits is described in the TNRCC guidance document *Implementation of the Texas Natural Resource Conservation Commission Standards Via Permitting* (TNRCC, 1995). The other models used are a series of QUAL-TX model applications that together portray the entire HSC system.

Reasonable assurance that the necessary control actions will be implemented is provided by the well-established TNRCC permitting and enforcement programs.

Legal Authority

In Texas, state statutory provisions require the commission to establish the level of quality to be maintained in, and to control the quality of, water in the state (Texas Water Code (TWC) §26.011). Texas fulfills its obligations under Section 303(d) of the Clean Water Act to list impaired segments and create TMDLs through functions assigned by the legislature to TNRCC. The 303(d) List is prepared by TNRCC as part of its monitoring, planning and assessment duties (TWC §26.0135).

TMDLs themselves are part of the state water quality management plans that TNRCC is charged by statute to prepare (TWC §26.036). As the state environmental regulatory body, the Commission has primary responsibility for implementation of water quality management functions within the State (TWC §§26.0136, 26.127). The Executive Director of the TNRCC must prepare and develop, and the Commission must approve, a comprehensive plan for control of water quality in the state (TWC § 26.012). The list of impaired segments and resulting TMDLs are tools for water quality planning.

Current Situation

When the TMDL allocation model simulations were performed, the marine chronic standard for dissolved nickel in the HSC system was 13.20 µg/L. Since then, revision of the Texas Surface Water Quality Standards has slightly reduced the marine chronic standard to the current value of 13.02 µg/L. Implementation procedures described in this report are intended to maintain the current standards, for freshwater or marine (saltwater), and should remain applicable even if the standards change in the future. However, this implementation plan is flexible, so that it can adjust to such changes. It should also be noted that this implementation plan is not a substitute for the permitting process. The need for further monitoring requirements or permit limits for nickel will be determined for each permit as the permit goes through the review process.

Appendix 1 provides a summary of the permits with specific nickel limits when the TMDL allocation modeling was done. That table will also serve as part of the inventory procedures for tracking implementation of the load allocation. Note that permit names may change at any time, but permit numbers generally remain the same as facility ownership or names change, so references to specific facilities often include the permit number to avoid confusion caused by transfers or name changes.

Appendix 2 provides a summary of the wastewater discharges included in the TMDL allocation models, including the discharge flows, concentrations, and loading used in the QUAL-TX models. Appendix 2 will also serve as part of the inventory procedures for tracking implementation. Appendix 2 lists all permitted wastewater discharges in the HSC system, including those also listed in Appendix 1. Facility names in Appendix 2 are also subject to change, so permit numbers are provided.

The model simulations performed for the TMDL allocation predicted dissolved nickel concentrations to be less than the current marine chronic criterion of 13.02 µg/L in most of the mainstem classified segments of the HSC. The allocation modeling simulated full permitted loading, with assumed loading for permittees without individual nickel limits calculated using the chronic standard, under critical low-flow conditions. Simulation of full permitted loading means that the model used the largest discharge flow authorized by the final permit phase for each facility (regardless of whether they are currently operating at that flow or phase), combined with effluent nickel concentrations either taken from permit limits (where they existed) or presumed for modeling purposes. When presumed effluent concentrations were used, industrial permits were assigned an effluent concentration of 13.20 µg/L (the former marine chronic standard), and municipal permits were assigned effluent concentrations of 5 µg/L. This presumption for municipal permits is based on effluent data collected in 1990 (EPA, 1990).

Unclassified tidal tributary bayous were considered to be most likely to show model-predicted standard exceedances, due to numerous dischargers and low headwater flows. However, Tucker Bayou was the only tributary where such exceedances were predicted with the ten existing permitted dischargers at full permitted loading..

Nickel concentrations predicted for marine designated segments, and for several tidal tributaries that are major streams or contain concentration of industrial facilities, are summarized in Table 1. The summary focuses on waters that are tidal and thus considered to be marine or saltwater, because the marine criteria are much more restrictive and control this allocation. No exceedances of freshwater standards for nickel were predicted.

Table 1. Summary of Maximum Predicted Nickel Concentrations in Marine Waters

Segment or Water Body	Dissolved Nickel Criterion (µg/L)	Ultimate Nickel Concentration* (µg/L)	Unused Assimilative Capacity (µg/L)
San Jacinto River Tidal (1001)	13.02	13.11	0.00
HSC/San Jacinto River (1005)	13.02	3.37	9.83
Houston Ship Channel (1006)	13.02	4.63	8.57
Tucker Bayou (Unclassified Trib 1006)	13.02	100.12 **	0.00
Patrick Bayou (Unclassified Trib 1006)	13.02	10.99	2.21
Greens Bayou (tidal) (Unclassified Trib 1006)	13.02	4.58	8.62
Carpenter Bayou (Unclassified Trib 1006)	13.02	3.76	9.44
HSC/Buffalo Bayou Tidal (1007)	13.02	4.94	8.26
Vince Bayou (Unclassified Trib 1007)	13.02	4.84	8.36
Brays Bayou (Unclassified Trib 1007)	13.02	4.64	8.56
Sims Bayou (Unclassified Trib 1007)	13.02	4.89	8.31
Buffalo Bayou Tidal (1013)	13.02	3.75	9.45
Tabbs Bay (2426)	13.02	2.40	10.8
San Jacinto Bay (2427)	13.02	2.62	10.58
Black Duck Bay (2428)	13.02	2.37	10.83
Scott Bay (2429)	13.02	2.84	10.36
Burnett Bay (2430)	13.02	3.21	9.99
Barbours Cut (2436)	13.02	2.13	11.07
<p>* Maximum in stream concentration resulting from dischargers at full permitted flow and permitted or assumed concentrations, as predicted in saltwater/tidal/marine reaches. ** A maximum concentration of 146.10 µg/L was predicted in the freshwater, above-tidal reach of Tucker Bayou. That is less than the freshwater criterion for Tucker Bayou.</p>			

Four Tucker Bayou dischargers have effluent characteristics that resulted in permit limits for nickel, and those permit limits were used for QUAL-TX model analyses. The other six Tucker Bayou discharges, which have no permit limits for nickel, were assumed to be discharging 13.2 µg/L of nickel for modeling purposes (because that was the criterion at the time of modeling). Those conditions resulted in the model-predicted concentration of 100.12 µg/L in tidal Tucker Bayou, indicating that if current discharges to Tucker Bayou were at their full, permitted levels during low-flow conditions, nickel concentrations in the tidal portion of the bayou could exceed the chronic marine water quality criterion of 13.02 µg/L.

Additional model runs were used to estimate relative contributions by the facilities, and permit limits that would maintain the marine water quality standard in Tucker Bayou under modeled conditions. Of the current four dischargers with nickel limits, Hampshire Chemical (02558-001), because of its extremely small flow and discharge to the above-tidal reach, was found to have a negligible effect on nickel concentrations in the tidal zone, and no change to the Hampshire Chemical permit is anticipated. Appropriate limits for the other three Tucker Bayou facilities with significant nickel discharges will be determined as described below.

The nickel water quality criterion for Tucker Bayou could be achieved through various combinations of load reduction and/or diversion by the Tucker Bayou dischargers. The three Tucker Bayou dischargers identified as needing load reductions have generally performed much better than the existing permits require, and there have been no indications that dissolved nickel concentrations in Tucker Bayou have exceeded the water quality standard. Review of self-reported discharge data from the past four years indicates that Intercontinental Terminals (01984-001) has very seldom exceeded one-tenth of the permitted load, with average and median loading rates of approximately 0.006 lbs/day, and a maximum loading rate of 0.039 lbs/day. Self-reported data from Safety-Kleen (01429-001) (formerly Rollins) indicates that the median loading rate over six years was approximately 0.374 lbs/day, and the average loading during that period was approximately 0.482 lbs/day. Both median and average loading from Safety-Kleen were well below the current permit limit. Self-reported data from Rohm & Haas (00458-007) indicates that the median loading rate over five years was approximately 0.302 lbs/day, and the average loading during that period was approximately 0.347 lbs/day. Rohm & Haas loading has consistently been well below the current permit limit.

There are at least two ways, other than reducing the permitted loading, that these facilities may address nickel discharge issues. One way would be to relocate the discharge points, most likely to the Houston Ship Channel mainstem in the vicinity of Tucker Bayou. The QUAL-TX model has been used to analyze diversion of these facilities' discharges to the mainstem channel, and indicates that all water quality criteria and standards would be met with the current permitted loads in that scenario. Another approach might be to develop site-specific information, such as nickel partitioning coefficients or site-specific water effect ratios (WER) for Tucker Bayou, based on data supplied by the dischargers as part of the permitting process. These possibilities are recognized in the permit implementation procedures (TNRCC, 1995). Permittees also may develop and provide site-specific data, information, or analyses to support proposed revisions

of the TMDL model as it assumes individual waste load allocations. Permittees decide which method to use, and TNRCC review then determines if that method is adequate, or if new information justifies adaptive changes to the implementation plan.

The highest predicted concentration in the San Jacinto River Tidal occurred at the discharge point of Equistar Chemicals, L.P. (00391-001) (formerly Lyondell Petrochemical), where an ultimate nickel concentration of 13.11 µg/L was predicted. Preliminary analysis of alternative effluent concentrations, using the QUAL-TX model, indicated that a slight reduction in the permitted loading would suffice to assure the criterion is met. Subsequent to the TMDL modeling, but before completion and approval of the TMDL allocation, as part of a routine permit renewal and amendment process, Equistar Chemicals voluntarily reduced the permitted nickel loading for that facility to meet the current criterion of 13.02 µg/L. Consequently, no further changes to that permit are anticipated at this time.

Implementation Schedule

Since there are no current exceedances of the nickel criteria, and since the potential for future exceedances is remote and somewhat hypothetical, the schedule for implementation of control actions and management measures will be based on the TNRCC basin permitting cycle. Revised permit limits or monitoring requirements will be developed as needed for each permittee when each permit is next addressed by the permit application process. Renewals are generally processed based on the basin permitting cycle with permit terms typically five years in duration. Amendments or new permits may be processed at any time. If new or more stringent permit limits for nickel are incorporated into an existing permit, a compliance period not to exceed three years is typically allowed for construction of infrastructure needed to achieve compliance with the new limits.

Changes to the three Tucker Bayou permits, as discussed previously, will occur when each of those permits is next processed for renewal or amendment following TNRCC adoption of this implementation plan. Table 2 shows the expiration dates in the current (March 2001) permits for those three facilities.

Implementation Of The TMDL

Available data and information indicates that dissolved nickel standards and criteria are now being met in the Houston Ship Channel System. The load allocation and implementation plan described in this report will assure that Houston Ship Channel System continues to meet dissolved nickel standards in the future.

The TNRCC document, *Implementation of the Texas Natural Resource Conservation Commission Standards via Permitting (IP)* (TNRCC, August 1995), will still be the primary method for initially screening wastewater discharges from industrial facilities and domestic facilities classified as major facilities and those with approved pretreatment programs.

However, if information should become available to indicate that localized exceedances of the criteria are occurring, monitoring requirements for those discharges in the immediate area may be revised to provide data to support further control actions.

Table 2. Implementation Schedule
Permit Expiration Dates for Certain Facilities

Permit Number and Name	Current Expiration Date	Implementation Strategy
00458-007 Rohm & Haas	May 2000	Permit application currently pending. TMDL requirements will be implemented as part of the next available permit action after EPA approval of the TMDL.
01429-001 Safety-Kleen	April 1999	Permit application currently pending. TMDL requirements will be implemented as part of the next available permit action after EPA approval of the TMDL.
01984-001 Intercontinental Terminals	May 2000	Permit application currently pending. TMDL requirements will be implemented as part of the next available permit action after EPA approval of the TMDL.

Sources of assessment information may include, but are not limited to, the most recent approved State of Texas Water Quality Inventory 305(b) report. Monitoring will be used to assist in the analysis of pollutant loads, calibrate/verify modeling efforts, more accurately determine assimilative capacities, and track the need for adjustment of the TMDL to better address water quality issues. If information should become available to indicate the amount of nickel allocated to point sources for this TMDL (147.9374 lbs/day) is exceeded, or a segment in the TMDL appears on the TNRCC's 303(d) Impaired Waters List, monitoring and/or limits for all point source dischargers will be derived using methods similar to those described in the IP document.

Details of the calculations and methods applied to wastewater discharges are presented in the IP document. When the IP document is periodically updated or revised, methods used to review permits under this TMDL implementation plan will change accordingly. Reference is made herein to the 1995 version of the IP because that is the version currently in effect as this document is prepared. Whichever version of the IP is in effect at any time, the TNRCC permitting process allows applicants the opportunity to provide new data, information, or analyses that may support site-specific modifications of TMDL assumptions with regard to individual effluent limitations.

A computer program named TEXTOX uses the methodology outlined in the IP document to calculate effluent concentration limits that will maintain water quality standards at the edge of the mixing zone, after effluent has mixed with the receiving water body. The calculated concentration limits are compared to the concentration of nickel provided in the permit application. If a discharger reports a nickel concentration in its effluent that is less than 70% of the TEXTOX-derived limit, no monitoring requirements or limits for nickel are put into the discharger's permit. If a discharger reports 70% to less than 85% of the TEXTOX-derived limit in its effluent, a requirement to monitor and report nickel concentrations and loading will be put into the discharger's permit. If a discharger reports equal to or greater than 85% of the TEXTOX-derived limit in its effluent, specific numeric limits for nickel are developed for the permit, along with effluent monitoring and reporting requirements.

If a permit limit or monitoring requirement for nickel is needed in the draft permit based on application screening using TEXTOX model, or for any other reason, then the limit will be assessed based on the TMDL using the QUAL-TX models to verify that the chronic marine or freshwater criteria in effect at that time will be met. Monitoring frequency and requirements for self-reported data for permits with specific nickel limits will be in accordance with 30 TAC Section 319.

If the permit limit (usually based on TEXTOX) for an existing discharge is larger than the loading used in the allocation modeling (Appendix 2) for that discharge, the larger limit will be assessed using the QUAL-TX model. This type of assessment will affect the three largest Tucker Bayou dischargers at their next permit renewals.

TEXTOX-derived effluent limits for proposed new dischargers not included in the TMDL model analyses already performed will also be assessed using the QUAL-TX models in order to assure that their outfall locations or effluent quality do not cause cumulative concentrations above the standards for their particular receiving waters. New discharges will be added to the QUAL-TX model, and to the tables in Appendices 1 and/or 2, as appropriate depending on whether or not specific permit limits for nickel are needed. Permit amendments to increase discharge flow will also be reviewed with the QUAL-TX model, in order to assure that the increased loading associated with the increased flow would not cause a standards exceedance. New or enlarged discharges will be modeled with presumed nickel concentrations if no specific limit is developed based on TEXTOX or other factors, but the presumed nickel concentrations will not be permit limits for nickel.

If the QUAL-TX analyses indicate that the cumulative effects of all the discharges do not exceed the appropriate nickel standards for various reaches or segments of water bodies, the TEXTOX-derived limits are used for the permit. In many cases, this will mean that no nickel limit is specified in a permit, because the nickel concentration expected in the discharge is below the concentration that could cause exceedances at the edge of the mixing zone.

If any nickel standard is exceeded in the QUAL-TX analysis, then more stringent limits may be recommended, as derived from iterations of the QUAL-TX analysis. Alternatively, the discharger may consider relocation of outfalls, development of a site-specific information, or other approaches consistent with the IP and pertinent regulations.

Inventory of the permitted nickel loading for the Water Quality Management Plan will be accomplished by maintaining the lists presented as Appendices 1 and 2 in this report. Changes to existing permits with specific nickel limits will be recorded by modifying the appropriate parts of Appendices 1 and 2. Nickel loadings that do not require limitations will still be incorporated into Appendix 2, and will contribute to the WLA. New specific nickel limits imposed on permits will be recorded in both lists, with Appendix 1 recording which permits have specific limits and Appendix 2 recording the flow and nickel load values used for QUAL-TX analyses. New permits without specific nickel limits will be recorded in Appendix 2 only, with the flow and nickel loading values used in QUAL-TX analyses.

Increases in nickel loading that pass the model scrutiny described above will be incorporated into the Water Quality Management Plan, and Appendices 1 and 2, without need to reconsider this allocation and implementation process, unless or until the total permitted nickel loading in the Houston Ship Channel System reaches 147.9374 lbs/day. This reopener load limit is the sum of the WLA and AFG components of the TMDL allocation equation shown previously. As Appendix 2 is updated to reflect changes in permits, the sum of the total nickel loading as modeled (not permitted) shown at the foot of the table will change. When that modeled total nickel loading from point source discharges reaches or approaches the reopener limit of 147.9374 lbs/day, the TMDL allocation will be revised as appropriate at that time, and the Water Quality Management Plan will subsequently be updated to reflect the changes. The water quality standards and criteria for dissolved nickel can be maintained even if permitted loading exceeds the reopener limit, because of the large margin of safety implicitly embodied in the allocation via unallocated loading capacity and conservative analytical methods.

Pollution Prevention and Industry Assistance

Dischargers that are required to achieve lower effluent concentrations of nickel, or any other pollutant, may wish to contact the Pollution Prevention and Industry Assistance Section of the TNRCC Small Business and Environmental Assistance program for information concerning available technology for treating wastes. Through that program, TNRCC offers free, nonregulatory, and confidential technical assistance for industries, businesses, and institutions looking for pollution prevention ideas to reduce or eliminate waste and emissions, conserve water, and save money. Services include:

- C site assistance visits
- C permanent pollution prevention program
- C case studies

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- C vendor information
 - C innovative technologies
 - C information referrals
 - C recycling information

For more information concerning Small Business and Environmental Assistance programs or assistance, call 512/239-3100, and ask for the Engineering and Technical Assistance Team..

Surface Water Quality Monitoring Plan

Monitoring of nickel in the HSC system is performed by the TNRCC Region 12 Office. Dissolved nickel data are currently collected at the stations and frequencies shown in Table 3.

More sites may be included in the TNRCC Regional Office monitoring in the near future, as monitoring of the HSC system is further coordinated to address TMDL issues. Potential future sites and frequencies suggested by the Regional Office are shown in Table 4. These sites would be sampled for dissolved metals, including nickel.

Table 3. Current TNRCC Regional Office Monitoring for Dissolved Nickel in the Houston Ship Channel System

Segment	Station ID(s)	Station Name	Number of samples per year
1001	11193	San Jacinto River at I-10	4
1006	11264	HSC at Monument	4
	11273	Patrick Bayou at Oxychem Bridge	4
1007	11292	HSC Turning Basin	4
	11299	Vince Bayou at pipeline crossing	4

Note: All metals are collected at these stations for comparison with standards, not just nickel.

Table 4. Potential TNRCC Regional Office Monitoring for Dissolved Nickel in the Houston Ship Channel System

Segment	Station ID(s)	Station Name	Number of samples per year
1005	11258	HSC at CM120	4
1006	TBD	Tucker Bayou	4
	11271	HSC at Greens Bayou confluence	4
1007	11287	HSC at Sims Bayou confluence	4
1013	TBD	Buffalo Bayou Tidal - station not yet designated	6

TBD = To Be Determined

This monitoring by the TNRCC Regional Office will include two tributaries, Patrick Bayou and Tucker Bayou, that appear to be most likely to exhibit high nickel concentrations relative to other parts of the HSC system.

As part of the TNRCC Surface Water Quality Monitoring Program (SWQMP) and the Clean Rivers Program(CRP), an annual coordinated monitoring schedule is developed for each basin in the state. In the Houston area, the Houston-Galveston Area Council (HGAC) acts as the coordinating entity through the CRP.

TNRCC’s CRP contributes significantly to the collection and assessment of water quality data around the state. The CRP is coordinated by the Watershed Management Team in the Technical Analysis Division. The CRP coordinates with the TNRCC’s SWQM Team to ensure consistency in water quality sampling, assessment, and data reporting protocols. In addition to other data, the City of Houston Health Department (HH) and Harris County Pollution Control (HC) collect nickel in water at 23 mainstem and 47 tributary sites in Segments 1001, 1005, 1006, 1007, 1013, 1014, 1016, and 1017 (Table 5). A total of 2,784 nickel in water samples are collected annually by these two entities. These sites are part of a long-term, routine fixed-station monitoring program for both entities. Frequency of sample collection for all City of Houston sites is twice monthly and Harris County Pollution Control collects monthly samples.

Monitoring at the stations shown in Table 6 is currently (Yr 2001) measuring total metals, not dissolved. This means that results are not directly comparable to water quality standards expressed as dissolved metals, which include nickel. However, the data can still reveal significant increases or local variations in metals concentrations. Efforts to coordinate the monitoring of regional entities with the needs of the TMDL program may enhance those monitoring efforts to include dissolved metals within a few years.

Table 5. Summary of Nickel Samples to be Collected by Clean Rivers Program Partners

Segment	1001	1005	1006	1007	1013	1014	1016	1017
Total Number of Nickel Samples per Segment	60	36	396	1140	192	432	240	288
Tributary Samples	-	-	336	1104	96	288	192	240
Mainstem Samples	60	36	60	36	96	144	48	48
Number of Tributary Sites	-	-	7	23	2	6	4	5
Number of Mainstem Sites	5	3	5	3	2	3	1	1

The following list includes all sites scheduled for long-term monitoring that include the analysis of nickel in water.

Table 6. Summary of HSC System Stations That Include Nickel in Water Analyses

Segment	Station Description	Station ID	Annual Frequency	Agency	Mainstem
1001	San Jacinto River Tidal @ IH-10	11193	12	HC	Y
1001	San Jacinto River Tidal @ Wallisville Rd.	11198	12	HC	Y
1001	San Jacinto River @ US90	11200	12	HC	Y
1001	San Jacinto River Tidal @ Magnolia Gardens	11201	12	HC	Y
1001	San Jacinto River Tidal @ Banana Bend	16622	12	HC	Y
1005	Houston Ship Channel/San Jacinto River west of Exxon Docks north of Alexander Island	16618	12	HC	Y
1005	Houston Ship Channel @Lynchburg Ferry Inn S of Lynchburg Rd	16619	12	HC	Y
1005	Houston Ship Channel @ Baytown Tunnel (CM 103)	11254	12	HC	Y
1006	Houston Ship Channel @ San Jacinto Park	11264	12	HC	Y
1006	Houston Ship Channel @ Greens Bayou (CM 152)	11271	12	HC	Y
1006	Green Bayou Tidal @ Ley Rd	11279	12	HC	Y
1006	Houston Ship Channel @ Cargill Terminal N of Tidal Rd	16617	12	HC	Y
1006	Big Gulch @ Wallisville Rd	16662	48	HH	
1006	Spring Gully @ Barnesworth Dr	16663	48	HH	
1006	Goodyear Creek @ I-10	16664	48	HH	
1006	Unnamed Tributary of Halls Bayou @ Langley Rd	16665	48	HH	
1006	Unnamed Tributary of Halls Bayou @ Talton St	16666	48	HH	
1006	Unnamed Tributary of Halls Bayou @ Woodlyn Rd	16667	48	HH	
1006	Unnamed Tributary of Greens Bayou @ Smith Rd	16676	48	HH	
1007	Houston Ship Channel/Buffalo Bayou @ Mayo Shell Rd	16620	12	HC	Y
1007	Houston Ship Channel @ Buffalo Bayou	11283	12	HC	Y
1007	Houston Ship Channel @ Turning Basin	11292	12	HC	Y
1007	Hunting Bayou @ North Loop East	11129	48	HH	
1007	Hunting Bayou @ Falls Street	11131	48	HH	

Segment	Station Description	Station ID	Annual Frequency	Agency	Mainstem
1007	Sims Bayou @ Telephone Rd	11132	48	HH	
1007	Sims Bayou @ Hiram Clark	11135	48	HH	
1007	Brays Bayou @ Main	11139	48	HH	
1007	Brays Bayou @ South Main	11140	48	HH	
1007	Keegans Bayou @ Roark Rd	11169	48	HH	
1007	Hunting Bayou @ Neches Ave.	15868	48	HH	
1007	Hunting Bayou @ Cavalcade	15869	48	HH	
1007	Unnamed Tributary of Buffalo Bayou @ Clinton Central	16649	48	HH	
1007	Country Club Bayou @ S. Wayside Dr (US 90A)	16650	48	HH	
1007	Country Club Bayou @ Hughes St	16651	48	HH	
1007	Willow Waterhole @ McDermed Dr	16652	48	HH	
1007	Kulhman Gully @ Brock St	16653	48	HH	
1007	Unnamed Tributary of Brays Bayou @ Dumfries Dr	16654	48	HH	
1007	Unnamed Tributary of Sims Bayou @ Dulcimer St	16655	48	HH	
1007	Sims Bayou S. Branch @ Tiffany Dr	16656	48	HH	
1007	Plum Creek @ Old Galveston Rd	16658	48	HH	
1007	Pine Gully @ Old Galveston Rd	16659	48	HH	
1007	Berry Bayou @ Howard Dr	16660	48	HH	
1007	Berry Bayou @ S. Richie St	16661	48	HH	
1007	Harris County Flood Control Ditch @ Minden	NA047	48	HH	
1007	Bintliff Ditch @ Bissonet	NA048	48	HH	
1013	Buffalo Bayou @ Main	11347	48	HH	Y
1013	Buffalo Bayou @ Shepherd	11351	48	HH	Y
1013	Little White Oak @ Trimble St	11148	48	HH	
1013	Unnamed Tributary of Buffalo Bayou @ Glenwood Cemetery Rd	16675	48	HH	
1014	Buffalo Bayou @ Voss	11356	48	HH	Y
1014	Buffalo Bayou @ West Belt	11360	48	HH	Y
1014	Buffalo Bayou @ SH 6	11364	48	HH	Y
1014	Turkey Creek @ Memorial	15847	48	HH	
1014	Langham Creek @ Memorial	11163	48	HH	

Segment	Station Description	Station ID	Annual Frequency	Agency	Mainstem
1014	Rummel Creek @ Memorial	11188	48	HH	
1014	Spring Branch Creek @ Long Point Rd	16591	48	HH	
1014	Spring Branch Creek @ Wirt Rd.	16592	48	HH	
1014	Niemans Bayou @ Memorial Dr	16597	48	HH	
1016	Greens Bayou @ US 59	11371	48	HH	Y
1016	Unnamed Tributary of Greens Bayou @ Green Ranch	11124	48	HH	
1016	Garners Bayou @ North Belt	11125	48	HH	
1016	Garners Bayou @ Atascocita Rd	16589	48	HH	
1016	Unnamed Tributary of Greens Bayou @ Mesa Dr	16590	48	HH	
1017	White Oak Bayou @ Heights Blvd.	11387	48	HH	Y
1017	Cole Creek @ Bolivia Blvd.	16593	48	HH	
1017	Brickhouse Gully @ US 290	16594	48	HH	
1017	Unnamed Tributary of White Oak Bayou @ US 290	16595	48	HH	
1017	Unnamed Tributary of White Oak Bayou @ W 14 th St	16596	48	HH	
1017	Little White Oak Bayou @ White Oak Dr	16648	48	HH	

Bay Monitoring

The Galveston Bay Estuary Program is a program of the Texas Natural Resource Conservation Commission (TNRCC), successfully working with a variety of partners and stakeholders to facilitate implementation of The Galveston Bay Plan (GBP). The Plan is a Comprehensive Conservation and Management Plan (CCMP) for the Galveston Bay ecosystem, developed as a part of the National Estuary Program process. The Plan was developed by building consensus among citizens, industry, business, development, academia, and government. Currently, water quality monitoring in the Galveston Bay System is directed by this plan. Unlike the routine fixed-station monitoring program, random stations identified in the Plan are monitored on a rotating basis. In addition to the main bay system, side bays (Tabbs Bay-2426, San Jacinto Bay-2427, Black Duck Bay-2428, Scott Bay-2429, Burnett Bay-2430, Barbours Cut-2436) are covered by the Plan. Parameter coverage at the random sites is also directed by the GBP. The coverage does not include long-term metals in water monitoring.

Measurable Outcomes— Determining Support of Water Quality Standards

Since there are no current exceedances of the nickel standard in the HSC system, there is no need to develop special monitoring practices or goals to document predicted reductions in nickel concentrations. Instead, monitoring the success of these TMDLs will involve assuring that exceedances of the nickel standards that may occur in the future will be noticed and will trigger appropriate responses. The TNRCC has already established routine procedures, through water quality monitoring programs and compliance and enforcement programs, to fulfill that mission, for nickel as well as many other water quality pollutants or stressors.

The Texas Water Quality Inventory (also called the 305(b) report) is prepared by the TNRCC and submitted to the United States Environmental Protection Agency (EPA) biennially on even-numbered years in accordance with Section 305(b) of the Clean Water Act (CWA). The 305(b) report enables the public, local governments, state agencies, the Texas Legislature, the EPA, and Congress to evaluate water quality in Texas. Water bodies identified with impaired designated uses as a result of the 305(b) assessment are placed on the 303(d) list of impaired water bodies, as required under CWA Section 303(d). Data collected under the coordinated monitoring schedule are used to support the 305(b)/303(d) process.

References

Texas Natural Resource Conservation Commission, 1995. *Implementation of the Texas Natural Resource Conservation Commission Standards via Permitting*. RG-194. August 1995. Austin, Tx.

Texas Natural Resource Conservation Commission, 2000. *Fourteen Total Maximum Daily Loads For Nickel In The Houston Ship Channel System*. August 2000. Austin, Tx.

U. S. Environmental Protection Agency, 1990. Data collection of effluent from 150 Houston Ship Channel dischargers.

Appendix 1

Summary of Existing Permitted Dischargers for Nickel

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW (m ³ /s)	TOTAL NICKEL DLY AVG (mg/L)	TOTAL NICKEL DLY AVG (lbs/day)	TOTAL NICKEL IND GRAB (mg/L)
EQUISTAR CHEMICALS, L.P.	00391-001	QM1005	1001	0.28483		6.4	0.31
OCCIDENTAL CHEMICAL CORP	01539-001	QM1005	1005	0.09421		1.96	0.5
ROHM AND HAAS	00458-001	QM1005	1006	0.28395		22.1	2.0
ROHM AND HAAS	00458-007	QM1005	1006	0.06573		1.57	0.6
ALBEMARLE CORP	00492-001	QM1005	1006	0.27011		4.2	0.28
SAFETY-KLEEN (formerly ROLLINS)	01429-001	QM1005	1006	0.12620	0.15		0.6
INTERCONTINENTAL TERMINALS	01984-002	QM1005	1006	0.01196		0.34	0.44
SEQUA CORP	02160-001	QM1005	1006	0.00197		0.03	0.5
HOWELL CHEMICAL SYSTEMS	02419-001	QM1005	1006	0.00219			3.0
HAMPSHIRE CHEMICAL	02558-001	QM1005	1006	0.00219		0.047	0.45
DICKSON WEATHERPROOF	02650-001	QM1005	1006	0.00066			0.5
ARMCO INC.	00509-003	QM1005	1007	0.01578	0.15		0.6
GCWDA-WASHBURN TUNNEL	01740-001	QM1005	1007	2.39695		12.96	0.2
HOUSTON-69TH STREET	10495-090	QM1005	1007	8.76400	Rpt	Rpt	
WYMAN-GORDON FORGINGS	01402-002	QM1089	1014	0.01972			3.0
SC PIPE SERVICES	03420-001	QM1045	1016	0.00088	1.0		3.0
PILOT INDUSTRIES OF TEXAS	01899-001	QM1017	1017	0.02800	1.102		3.05
TEXAS ARAI INC.	03014-001	QM1017	1017	0.00158		0.71	3.0
QUALITY PRODUCT FINISHING	03223-001	QM1017	1017	0.00053	2.38		4.0
DU PONT	00474-001	QM1005	2427	0.25416		7.16	0.5

Appendix 2

Summary of Estimated Total Nickel Loading Used in Qual-Tx Modeling

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW (MGD) (m ³ /s)		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
OCCIDENTAL CHEMICAL CORP	00002-001	QM1005	1006	4.000	0.17528	13.2	0.4408
OCCIDENTAL CHEMICAL CORP	00305-005	QM1005	1006	1.750	0.07669	13.2	0.1929
UNITED STATES GYPSUM	00353-001	QM1005	1007	0.375	0.01643	13.2	0.0413
LYONDELL PETROCHEMICAL	00391-001 *	QM1005	1001	6.500	0.28483	118.0	6.4031
MOBIL CHEMICAL CO.	00393-001	QM1005	1007	1.500	0.06573	13.2	0.1653
SHELL OIL CO.	00402-001	QM1005	1006	9.900	0.43382	13.2	1.0910
DEER PARK REFINING LTD	00403-001	QM1005	1006	2.300	0.10079	13.2	0.2535
DEER PARK REFINING LTD	00403-007	QM1005	1006	7.920	0.34705	13.2	0.8727
EGP FUELS CO.	00440-001	QM1005	2436	0.300	0.01315	13.2	0.0331
ELF ATOCHEM	00445-001	QM1005	1006	0.400	0.01753	13.2	0.0441
HOLNAM, INC	00456-001	QM1005	1007	0.070	0.00307	13.2	0.0077
ROHM AND HAAS	00458-001 *	QM1005	1006	6.480	0.28395	409.0	22.1252
ROHM AND HAAS	00458-007 *	QM1005	1006	1.500	0.06573	125.0	1.5653
DU PONT	00474-001 *	QM1005	2427	5.800	0.25416	148.0	7.1662
ALBEMARLE CORP	00492-001 *	QM1005	1006	6.164	0.27011	82.0	4.2197
ARMCO INC.	00509-003 *	QM1005	1007	0.360	0.01578	150.0	0.4509
GOODYEAR TIRE & RUBBER	00520-001	QM1005	1007	2.700	0.11831	13.2	0.2975
QUANTUM CHEMICAL CORP	00534-001	QM1005	2427	1.920	0.08413	13.2	0.2116
QUANTUM CHEMICAL CORP	00534-002	QM1005	2427	0.800	0.03506	13.2	0.0882
QUANTUM CHEMICAL CORP	00534-004	QM1005	2427	1.800	0.07888	13.2	0.1984
QUANTUM CHEMICAL CORP	00534-007	QM1005	2427	2.500	0.10955	13.2	0.2755
PHIBRO ENERGY USA	00535-001	QM1005	1007	1.423	0.06236	13.2	0.1568
RHONE-POULENC	00542-001	QM1005	1007	1.400	0.06135	13.2	0.1543
SOLVAY POLYMERS	00544-001	QM1005	1005	1.590	0.06967	13.2	0.1752
SOLVAY POLYMERS	00544-003	QM1005	1005	1.000	0.04382	13.2	0.1102
BAYER CORP	00587-001	QM1005	1007	1.000	0.04382	13.2	0.1102
BAYER CORP	00587-002	QM1005	1007	5.500	0.24101	13.2	0.6061
EXXON CORP	00592-001	QM1005	1005	27.500	1.20505	13.2	3.0304
EXXON CORP	00592-003	QM1005	1005	2.500	0.10955	13.2	0.2755
EXXON CORP	00610-001	QM1005	1007	0.190	0.00833	13.2	0.0209
CAMCO INTERNATIONAL	00635-001	QM1005	1007	0.432	0.01893	13.2	0.0476
CAMCO INTERNATIONAL	00635-003	QM1005	1007	0.035	0.00153	13.2	0.0038
CAMCO INTERNATIONAL	00635-004	QM1005	1007	0.035	0.00153	13.2	0.0038
LUBRIZOL CORP	00639-001	QM1005	1006	1.000	0.04382	13.2	0.1102
MOBIL OIL CORP	00649-001	QM1005	1007	0.970	0.04251	13.2	0.1069
MOBIL OIL CORP	00649-002	QM1005	1007	0.785	0.0344	13.2	0.0865
MOBIL OIL CORP	00649-006	QM1005	1007	0.720	0.03155	13.2	0.0793
MOBIL OIL CORP	00649-007	QM1005	1007	0.432	0.01893	13.2	0.0476
REICHHOLD CHEMICALS	00662-001	QM1005	1006	0.100	0.00438	13.2	0.0110
DOW CHEMICAL CO	00663-001	QM1005	2427	1.650	0.0723	13.2	0.1818
AMERADA HESS CORP	00671-001	QM1005	1007	0.730	0.03199	13.2	0.0804

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
ISK BIOSCIENCES CORP	00749-001	QM1005	1006	0.900	0.03944	13.2	0.0992
AZROCK INDUSTRIES	00785-001	QM1017	1017	0.016	0.00072	13.2	0.0018
AMERICAN TEXMARK	00786-001	QM1005	1007	0.080	0.00351	13.2	0.0088
PHILLIPS PETROLEUM	00815-001	QM1005	1007	4.300	0.18843	13.2	0.4739
FINA OIL AND CHEMICAL	01000-001	QM1005	1005	0.700	0.03067	13.2	0.0771
KOPPERS INDUSTRIES	01034-001	QM1005	1007	0.022	0.00096	13.2	0.0024
GULF STATES ASPHALT	01058-001	QM1040	1007	0.060	0.00263	13.2	0.0066
HI-PORT INC.	01062-001	QM1005	2430	0.115	0.00504	13.2	0.0127
CHAMPION INTERNATIONAL	01160-001	QM1005	1006	19.640	0.86062	13.2	2.1643
PRAXAIR, INC.	01173-001	QM1005	1006	0.430	0.01884	13.2	0.0474
GREIF BROS.	01217-001	QM1005	2427	0.003	0.00013	13.2	0.0003
TEXAS INSTRUMENTS	01225-001	QM1041	1007	1.500	0.06573	13.2	0.1653
TEXAS INSTRUMENTS	01225-002	QM1041	1007	0.450	0.01972	13.2	0.0496
GRIFFIN CORP.	01260-001	QM1049	1007	0.100	0.00438	13.2	0.0110
AIR PRODUCTS	01280-001	QM1005	2427	0.500	0.02191	13.2	0.0551
TEXAS MEDICAL CENTER	01286-001	QM1041	1007	0.300	0.01315	13.2	0.0331
CHEVRON CHEMICAL CO	01310-001	QM1005	1006	0.200	0.00876	13.2	0.0220
NATURAL GAS ODORIZING, INC.	01385-001	QM1044	2426	0.015	0.00066	13.2	0.0017
WYMAN-GORDON FORGINGS	01402-002 *	QM1089	1014	0.450	0.01972	13.2	0.0496
SAFETY-KLEEN (formerly ROLLINS)	01429-001 *	QM1005	1006	2.880	0.1262	150.0	3.6064
ASHBROOK-SIMON-HARTLEY	01536-001	QM1046	1006	0.004	0.00018	13.2	0.0005
OCCIDENTAL CHEMICAL CORP	01539-001 *	QM1005	1005	2.150	0.09421	109.0	1.9563
AKZO NOBEL CHEMICALS	01689-001	QM1005	1005	0.030	0.00131	13.2	0.0033
EMPAK, INC.	01731-001	QM1005	1006	0.302	0.01323	13.2	0.0333
GCWDA-WASHBURN TUNNEL	01740-001 *	QM1005	1007	54.701	2.39695	13.3	6.0643
CHEVRON USA	01745-002	QM1005	1007	0.010	0.00044	13.2	0.0011
WITCO CHEMICAL CORP	01785-001	QM1005	2427	0.100	0.00438	13.2	0.0110
SHELL DEVELOPMENT	01853-001	QM1041	1007	0.475	0.02081	13.2	0.0523
PILOT INDUSTRIES	01899-001 *	QM1017	1017	0.028	0.00123	13.2	0.0031
ADVANCED AROMATICS	01914-001	QM1044	2426	0.060	0.00263	13.2	0.0066
BAROID MANAGEMENT	01970-001	QM1047	1007	0.250	0.01096	13.2	0.0276
INTERCONTINENTAL TERMINALS	01984-002 *	QM1005	1006	0.273	0.01196	149.0	0.3395
INTERCONTINENTAL TERMINALS	01984-007	QM1005	1006	0.050	0.00219	13.2	0.0055
NEWPARK SHIPBUILDING	02034-001	QM1005	1007	0.100	0.00438	13.2	0.0110
HOUSTON BELT & TERMINAL	02039-001	QM1005	1007	0.004	0.00018	13.2	0.0005
OILTANKING HOUSTON	02053-001	QM1005	1006	6.000	0.26292	13.2	0.6612
GEORGIA GULF CORP	02067-004	QM1005	1006	0.550	0.0241	13.2	0.0606
GEON COMPANY	02097-001	QM1005	1005	1.570	0.0688	13.2	0.1730
ICO, INC.	02104-001	QM1084	1014	0.036	0.00158	13.2	0.0040
ARISTECH CHEMICAL CORP	02107-001	QM1005	2427	0.300	0.01315	13.2	0.0331
SEQUA CORP	02160-001 *	QM1005	1006	0.045	0.00197	80.0	0.0300
AIR PRODUCTS, INC.	02177-001	QM1005	1006	0.012	0.00053	13.2	0.0013
EXXON CHEMICAL ASSET	02184-001	QM1005	2429	0.987	0.04325	13.2	0.1088
IGLOO PRODUCTS	02229-001	QM1084	1014	0.030	0.00131	13.2	0.0033
H. MUEHLSTEIN & CO.	02294-001	QM1049	1007	0.020	0.00088	13.2	0.0022
H. MUEHLSTEIN & CO.	02294-004	QM1049	1007	0.006	0.00026	13.2	0.0007

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
METTON AMERICA	02406-001	QM1005	1005	0.010	0.00044	13.2	0.0011
FOUR K HOUSTON PROPERTY	02416-001	QM1084	1014	0.003	0.00013	13.2	0.0003
HOWELL CHEMICAL SYSTEMS	02419-001 *	QM1005	1006	0.050	0.00219	13.2	0.0055
SMITH INTERNATIONAL	02453-001	QM1045	1016	0.150	0.00657	13.2	0.0165
JOHANN HALTERMANN	02458-001	QM1005	1006	0.220	0.00964	13.2	0.0242
HL&P-CHANNELVIEW	02499-001	QM1005	1006	0.002	0.0001	13.2	0.0002
PRAXAIR, INC.	02529-001	QM1005	2427	0.540	0.02366	13.2	0.0595
AIR LIQUIDE AMERICA	02543-001	QM1089	1014	0.020	0.00088	13.2	0.0022
CHARLIE THOMAS INC.	02550-001	QM1045	1016	0.006	0.00026	13.2	0.0007
HAMPSHIRE CHEMICAL	02558-001 *	QM1005	1006	0.050	0.00219	113.0	0.0471
THE GROCE CO.	02569-001	QM1005	1007	0.150	0.00657	13.2	0.0165
HL&P-GREENSPOINT	02596-001	QM1045	1016	0.020	0.00088	13.2	0.0022
EVANS COOPERAGE OF HOUSTON	02602-001	QM1005	1001	0.020	0.00088	13.2	0.0022
TX SOUTHWEST SHIPYARD	02605-001	QM1005	1005	0.050	0.00219	13.2	0.0055
FMC CORP.	02611-004	QM1045	1016	0.041	0.0018	13.2	0.0045
DICKSON WEATHERPROOF	02650-001 *	QM1005	1006	0.015	0.00066	310.0	0.0390
ECONO-RAIL CORP.	02659-001	QM1005	1007	0.216	0.00947	13.2	0.0238
TIAMPO, PILAR	02684-001	QM1045	1016	0.031	0.00136	13.2	0.0034
TIAMPO, JAMIE	02685-001	QM1045	1016	0.077	0.00337	13.2	0.0085
WENDY'S INTERNATIONAL	02710-001	QM1017	1017	0.002	0.0001	13.2	0.0002
KMCO, INC.	02712-001	QM1048	1001	0.120	0.00526	13.2	0.0132
WEST ROAD WSC	02761-001	QM1045	1016	0.013	0.00057	13.2	0.0014
RIEDEL, ANTHONY	02798-001	QM1017	1017	0.003	0.00013	13.2	0.0003
MCDONALDS RESTAURANTS	02844-001	QM1046	1006	0.004	0.00018	13.2	0.0005
CO-GEN LYONDELL INC.	02845-001	QM1005	1001	0.504	0.02209	13.2	0.0556
NIPPON PIGMENT	02892-001	QM1005	2427	0.015	0.00066	13.2	0.0017
NIPPON PIGMENT	02892-002	QM1005	2427	0.005	0.00022	13.2	0.0006
ARCO CHEMICAL CO	02927-001	QM1005	1001	2.560	0.11218	13.2	0.2821
TEXAS ARAI INC.	03014-001 *	QM1017	1017	0.036	0.00158	2361.0	0.7107
GRANT PRIDECO	03022-001	QM1084	1014	0.008	0.00033	13.2	0.0008
WEATHERFORD FARMS	03060-001	QM1041	1007	0.036	0.00158	13.2	0.0040
WESTLAKE INDUSTRIES	03069-001	QM1005	1001	0.050	0.00219	13.2	0.0055
STOLT TERMINALS	03129-003	QM1005	1006	0.144	0.00631	13.2	0.0159
SOUTHCOAST TERMINALS	03133-001	QM1005	1007	0.050	0.00219	13.2	0.0055
TOSHIBA INTERNATIONAL	03153-001	QM1089	1014	0.050	0.00219	13.2	0.0055
TOSHIBA INTERNATIONAL	03153-002	QM1089	1014	0.050	0.00219	13.2	0.0055
AIR LIQUIDE AMERICA	03167-001	QM1005	1006	0.020	0.00088	13.2	0.0022
QUALITY PRODUCT FINISHING	03223-001 *	QM1017	1017	0.012	0.00053	2380.0	0.2403
NORTHWESTERN STEEL & WIRE	03272-001	QM1005	1007	0.202	0.00885	13.2	0.0223
KAW TRANSPORT CO.	03317-001	QM1005	1006	0.002	0.0001	13.2	0.0002
AMERICAN ENVIROTECH	03319-001	QM1005	1006	0.020	0.00088	13.2	0.0022
WESTERN TOWING CO	03349-001	QM1005	1001	0.035	0.00153	13.2	0.0038
GLOBAL OCTANES	03375-002	QM1005	1006	0.250	0.01096	13.2	0.0276
BEAZER EAST, INC.	03388-001	QM1017	1013	0.130	0.0057	13.2	0.0143
GSE LINING TECHNOLOGY	03402-001	QM1045	1016	0.016	0.0007	13.2	0.0018
GSE LINING TECHNOLOGY	03402-002	QM1045	1016	0.000	0	13.2	0.0000

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
SC PIPE SERVICES	03420-001 *	QM1045	1016	0.020	0.00088	1000.0	0.1677
OTTO MARINE ENTERPRISE INC.	03445-001	QM1005	1001	0.100	0.00438	13.2	0.0110
OTTO MARINE	03448-001	QM1005	1005	0.008	0.00035	13.2	0.0009
TRUCK STOP CORP	03517-001	QM1005	1001	0.008	0.00035	13.2	0.0009
USS-CHC TUBULAR PROCESSING	03540-001	QM1005	1001	0.006	0.00026	13.2	0.0007
USS-CHC TUBULAR PROCESSING	03540-002	QM1005	1001	0.122	0.00534	13.2	0.0134
USS-CHC TUBULAR PROCESSING	03540-003	QM1005	1001	0.086	0.00379	13.2	0.0095
HATHEWAY PATTERSON CORP	03572-001	QM1017	1013	0.014	0.00063	13.2	0.0016
JOHN HANCOCK LIFE INS	03765-001	QM1005	1006	0.012	0.00053	13.2	0.0013
AMERI-FORGE CORP	03767-001	QM1005	1007	0.010	0.00044	13.2	0.0011
UNIVERSAL TUBULAR SERVICES	03787-001	QM1005	1001	0.023	0.00101	13.2	0.0025
UNIVERSAL TUBULAR SERVICES	03787-002	QM1005	1001	0.040	0.00175	13.2	0.0044
BROWN & ROOT	03792-001	QM1005	1006	0.030	0.00131	13.2	0.0033
BUILDING MATERIALS CORP	03828-001	QM1005	1007	0.002	0.0001	13.2	0.0002
BUILDING MATERIALS CORP	03828-002	QM1005	1007	0.004	0.00018	13.2	0.0005
ISK MAGNETICS INC	03834-001	QM1005	1006	0.920	0.04031	13.2	0.1014
HARRIS CO FWSD 051	10032-001	QM1043	1006	6.300	0.27607	5.0	0.2630
PASADENA-DEEPWATER	10053-002	QM1005	1006	4.000	0.17528	5.0	0.1670
PASADENA-GOLDEN ACRES	10053-003	QM1005	1006	10.000	0.4382	5.0	0.4174
PASADENA-VINCE BAYOU	10053-005	QM1005	1007	7.000	0.30674	5.0	0.2922
WEST UNIVERSITY PLACE	10058-001	QM1041	1007	2.000	0.08764	5.0	0.0835
FORT BEND CO WCID 002	10086-002	QM1049	1007	0.500	0.02191	5.0	0.0209
HARRIS CO WCID 001	10104-001	QM1005	1001	2.350	0.10298	5.0	0.0981
HARRIS CO WCID 021	10105-001	QM1005	1006	2.500	0.10955	5.0	0.1044
HARRIS CO FWSD 006	10184-001	QM1005	1006	0.400	0.01753	5.0	0.0167
JACINTO CITY	10195-001	QM1005	1007	1.640	0.07186	5.0	0.0685
SUNBELT FWSD	10236-001	QM1046	1006	0.450	0.01972	5.0	0.0188
SOUTH HOUSTON	10287-001	QM1040	1007	4.000	0.17528	5.0	0.1670
BAYTOWN-CENTRAL	10395-002	QM1005	2426	6.200	0.27168	5.0	0.2588
BAYTOWN-WEST DISTRICT	10395-008	QM1005	1001	4.000	0.17528	5.0	0.1670
NITSCH & SON	10419-001	QM1046	1006	0.250	0.01096	5.0	0.0104
CHAMPS WATER CO.	10436-001	QM1046	1006	0.150	0.00657	5.0	0.0063
HOUSTON-SIMS BAYOU NORTH	10495-002	QM1005	1007	39.901	1.74842	5.0	1.6655
HOUSTON-SIMS BAYOU SOUTH	10495-002	QM1005	1007	54.001	2.36628	5.0	2.2540
HOUSTON-ALMEDA SIMS	10495-003	QM1049	1007	28.000	1.22696	5.0	1.1688
HOUSTON-CHOCOLATE BAYOU	10495-009	QM1049	1007	7.000	0.30674	5.0	0.2922
HOUSTON-CLINTON PARK	10495-010	QM1005	1007	2.000	0.08764	5.0	0.0835
HOUSTON-FWSD #23	10495-016	QM1046	1006	11.400	0.49955	5.0	0.4759
HOUSTON-HOMESTEAD	10495-023	QM1047	1007	9.400	0.41191	5.0	0.3924
HOUSTON-WEST DISTRICT	10495-030	QM1084	1014	26.400	1.15685	5.0	1.1020
HOUSTON-SOUTHWEST	10495-037	QM1041	1007	60.001	2.6292	5.0	2.5045
HOUSTON-WCID 047	10495-050	QM1040	1007	3.750	0.16433	5.0	0.1565
HOUSTON-WCID 051	10495-053	QM1049	1007	4.000	0.17528	5.0	0.1670
HOUSTON-EASTHAVEN	10495-065	QM1040	1007	3.000	0.13146	5.0	0.1252
HOUSTON-NORTHWEST	10495-076	QM1017	1017	21.000	0.92022	5.0	0.8766
HOUSTON-NORTHEAST	10495-077	QM1005	1006	7.250	0.3177	5.0	0.3026

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
HOUSTON-INTERCONT AIRPORT	10495-078	QM1045	1016	8.000	0.35056	5.0	0.3339
HOUSTON-69TH STREET	10495-090 *	QM1005	1007	200.003	8.764	5.0	8.3482
HOUSTON-WCID 111	10495-095	QM1041	1007	7.200	0.3155	5.0	0.3005
HOUSTON-WHITE OAK MUD	10495-099	QM1017	1017	4.000	0.17528	5.0	0.1670
HOUSTON-NORTHGATE UD	10495-100	QM1045	1016	3.710	0.16257	5.0	0.1549
HOUSTON-IMPERIAL VALLEY	10495-101	QM1045	1016	4.000	0.17528	5.0	0.1670
HOUSTON-MUD 123	10495-107	QM1041	1007	1.400	0.06135	5.0	0.0584
HOUSTON-TURKEY CREEK	10495-109	QM1084	1014	12.000	0.52584	5.0	0.5009
HOUSTON-GREEN RIDGE	10495-110	QM1049	1007	7.050	0.30893	5.0	0.2943
HOUSTON-BELTWAY	10495-111	QM1041	1007	13.340	0.58456	5.0	0.5568
HOUSTON-NORTHBOROUGH MUD	10495-115	QM1045	1016	3.000	0.13146	5.0	0.1252
HOUSTON-UPPER BRAYS	10495-116	QM1041	1007	18.000	0.78876	5.0	0.7513
HOUSTON-KEEGANS	10495-119	QM1041	1007	23.100	1.01224	5.0	0.9642
HOUSTON-NORTHBELT	10495-122	QM1045	1016	5.000	0.2191	5.0	0.2087
HOUSTON-INTERWOOD MUD	10495-123	QM1045	1016	0.250	0.01096	5.0	0.0104
HOUSTON-WILLOWBROOK REG.	10495-126	QM1045	1016	2.000	0.08764	5.0	0.0835
HOUSTON-HCMUD #237	10495-128	QM1045	1016	0.985	0.04316	5.0	0.0411
HOUSTON-HCMUD #254	10495-129	QM1045	1016	0.800	0.03506	5.0	0.0334
HOUSTON-WILLOW CHASE	10495-130	QM1045	1016	0.600	0.02629	5.0	0.0250
HOUSTON-HCMUD #159	10495-131	QM1045	1016	0.600	0.02629	5.0	0.0250
HOUSTON-HCMUD #203	10495-133	QM1045	1016	3.000	0.13146	5.0	0.1252
HOUSTON-PARK TEN	10495-135	QM1084	1014	3.500	0.15337	5.0	0.1461
HOUSTON-HCMUD #266	10495-137	QM1045	1016	0.200	0.00876	5.0	0.0083
HOUSTON-WESTWAY UD	10495-139	QM1017	1017	0.500	0.02191	5.0	0.0209
HOUSTON-HCMUD 107	10495-141	QM1084	1014	0.650	0.02848	5.0	0.0271
HOUSTON-RIVERWOOD	10495-145	QM1045	1016	0.700	0.03067	5.0	0.0292
HOUSTON-HUNTERWOOD	10495-147	QM1005	1006	0.600	0.02629	5.0	0.0250
HOUSTON-TIDWELL TIMBERS	10495-148	QM1045	1016	0.488	0.02138	5.0	0.0204
SUNBELT FWSD	10518-001	QM1046	1006	0.300	0.01315	5.0	0.0125
DEER PARK	10519-002	QM1005	1006	6.000	0.26292	5.0	0.2504
HARRIS CO WCID 070	10530-001	QM1048	1001	0.350	0.01534	5.0	0.0146
SHELDON RD MUD-SHELDON WOODS	10541-001	QM1005	1001	0.210	0.0092	5.0	0.0088
SHELDON RD MUD-ROLLING HILLS	10541-002	QM1005	1001	0.220	0.00964	5.0	0.0092
BELLAIRE	10550-001	QM1041	1007	4.500	0.19719	5.0	0.1878
HARRIS CO WCID 084	10558-001	QM1005	1006	1.000	0.04382	5.0	0.0417
HARRIS CO WATER CONTROL	10570-001	QM1041	1007	0.600	0.02629	5.0	0.0250
MEMORIAL VILLAGES WA	10584-001	QM1084	1014	3.050	0.13365	5.0	0.1273
ROYALWOOD MUD	10608-002	QM1005	1006	0.260	0.01139	5.0	0.0109
SOUTHERN SANITARY	10610-001	QM1046	1006	0.475	0.02081	5.0	0.0198
HARRIS CO FWSD 058	10668-001	QM1048	1001	0.350	0.01534	5.0	0.0146
HARRIS CO. WCID 074	10679-001	QM1046	1006	0.720	0.03155	5.0	0.0301
SOUTHWEST UTILITIES	10694-001	QM1045	1016	0.100	0.00438	5.0	0.0042
WILLOW RUN PUBLIC SERV	10699-001	QM1046	1006	0.750	0.03287	5.0	0.0313
KATY	10706-001	QM1084	1014	2.625	0.11503	5.0	0.1096
SOUTHSIDE PLACE	10712-001	QM1041	1007	0.180	0.00789	5.0	0.0075

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
HUMBLE-SOUTH	10763-002	QM1045	1016	3.300	0.14461	5.0	0.1378
HUMBLE-TIMBERWOOD	10763-003	QM1045	1016	0.650	0.02848	5.0	0.0271
MORGAN'S POINT	10779-001	QM1005	2436	0.200	0.00876	5.0	0.0083
SEQUOIA ID	10785-001	QM1045	1016	0.200	0.00876	5.0	0.0083
HARRIS CO FWSD 047	10794-001	QM1043	1006	0.520	0.02279	5.0	0.0217
SUNBELT FWSD	10812-001	QM1046	1006	0.990	0.04338	5.0	0.0413
AZALEA PLACE	10825-001	QM1046	1006	0.023	0.00101	5.0	0.0010
GALENA PARK	10831-001	QM1005	1007	0.950	0.04163	5.0	0.0397
GALENA PARK	10831-002	QM1005	1007	0.100	0.00438	5.0	0.0042
HARRIS CO FWSD 061	10876-001	QM1017	1017	2.000	0.08764	5.0	0.0835
HARRIS CO FWSD 061	10876-002	QM1017	1017	3.000	0.13146	5.0	0.1252
NORTH FOREST MUD	10905-001	QM1045	1016	0.300	0.01315	5.0	0.0125
FALLBROOK UD	10919-001	QM1046	1006	1.300	0.05697	5.0	0.0543
HARRIS COUNTY-BEAR CK	10932-001	QM1089	1014	0.042	0.00184	5.0	0.0018
NOR-SHAM INC.	10980-001	QM1045	1016	0.050	0.00219	5.0	0.0021
CHAMP'S WATER CO.	11005-001	QM1017	1017	0.280	0.01227	5.0	0.0117
HARRIS CO WCID #109	11026-002	QM1045	1016	3.000	0.13146	5.0	0.1252
MEADOWS	11039-001	QM1041	1007	1.500	0.06573	5.0	0.0626
VANCOUVER MANAGEMENT	11051-001	QM1017	1017	0.060	0.00263	5.0	0.0025
DENNY'S INC.	11055-001	QM1045	1016	0.020	0.00088	5.0	0.0008
GREENWOOD UTILITY DISTRICT	11061-001	QM1045	1016	0.850	0.03725	5.0	0.0355
HUNTERWOOD ASSOC.	11066-001	QM1005	1006	0.120	0.00526	5.0	0.0050
BRIGHT LIGHT HOSPITALITY	11069-001	QM1045	1016	0.040	0.00175	5.0	0.0017
CENTERAMERICA PROPERTY	11082-001	QM1046	1006	0.099	0.00434	5.0	0.0041
WAGNER, F.	11145-001	QM1045	1016	0.100	0.00438	5.0	0.0042
WEST MEMORIAL MUD	11152-001	QM1084	1014	6.480	0.28395	5.0	0.2705
HARRIS CO WCID 133	11153-001	QM1017	1017	3.000	0.13146	5.0	0.1252
MOUNT HOUSTON ROAD MUD	11154-001	QM1046	1006	0.200	0.00876	5.0	0.0083
CHAMP'S WATER CO.	11158-001	QM1045	1016	0.028	0.00123	5.0	0.0012
AIRPORT UTILITIES	11159-001	QM1045	1016	0.100	0.00438	5.0	0.0042
CLARK, HAROLD	11161-001	QM1045	1016	0.050	0.00219	5.0	0.0021
ROLLING FORK PUD	11188-001	QM1017	1017	0.490	0.02147	5.0	0.0205
BRITMORE UTILITY	11193-001	QM1017	1017	1.000	0.04382	5.0	0.0417
HARRIS CO FWSD 001A	11195-001	QM1044	2426	0.350	0.01534	5.0	0.0146
DOUGLAS UTILITY CO.	11200-001	QM1045	1016	0.380	0.01665	5.0	0.0159
EMERALD FOREST UD	11201-001	QM1045	1016	1.000	0.04382	5.0	0.0417
TPWD-SAN JACINTO BATTLEGRND	11214-001	QM1005	1005	0.010	0.00044	5.0	0.0004
SUNBELT FWSD.	11231-001	QM1046	1006	0.500	0.02191	5.0	0.0209
HARRIS CO MUD 005	11238-002	QM1045	1016	0.900	0.03944	5.0	0.0376
SOUTHWEST UTILITIES	11255-001	QM1046	1006	0.158	0.00692	5.0	0.0066
HARRIS CO MUD 006	11273-001	QM1017	1017	0.750	0.03287	5.0	0.0313
WESTLAKE MUD 001	11284-001	QM1089	1014	1.200	0.05258	5.0	0.0501
JACKRABBIT ROAD PUD	11290-001	QM1089	1014	5.100	0.22348	5.0	0.2129
EL DORADO UD	11302-001	QM1045	1016	0.900	0.03944	5.0	0.0376
HARRIS CO MUD 019	11329-001	QM1048	1001	2.000	0.08764	5.0	0.0835

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
HARRIS CO MUD 011	11351-001	QM1045	1016	0.500	0.02191	5.0	0.0209
CREEKSIDE UTILITIES	11375-001	QM1017	1017	0.637	0.02791	5.0	0.0266
FAMILIA/EL DORADO INC	11376-001	QM1045	1016	0.100	0.00438	5.0	0.0042
CROSBY MUD	11388-001	QM1048	1001	0.770	0.03374	5.0	0.0321
CBI NA-CON INC.	11389-001	QM1017	1017	0.045	0.00197	5.0	0.0019
SASSON, ELI	11414-001	QM1089	1014	0.011	0.00048	5.0	0.0005
BERTHA G. CORP	11443-001	QM1046	1006	0.003	0.00011	5.0	0.0001
BISSONNET MUD	11461-001	QM1041	1007	0.600	0.02629	5.0	0.0250
SPENCER ROAD PUD	11472-001	QM1089	1014	0.980	0.04294	5.0	0.0409
BLUE BELL MANOR UTILITY	11473-001	QM1046	1006	0.600	0.02629	5.0	0.0250
HARRIS CO MUD 023	11485-001	QM1017	1017	0.750	0.03287	5.0	0.0313
HARRIS CO MUD 070	11486-001	QM1089	1014	1.500	0.06573	5.0	0.0626
HARRIS CO MUD 012	11523-001	QM1089	1014	1.300	0.05697	5.0	0.0543
HARRIS CO MUD 109	11533-001	QM1045	1016	6.000	0.26292	5.0	0.2504
WHITE OAK JOINT POWERS	11538-001	QM1017	1017	4.500	0.19719	5.0	0.1878
BLUE RIDGE WEST MUD	11553-001	QM1049	1007	1.300	0.05697	5.0	0.0543
REID ROAD MUD 001	11563-001	QM1017	1017	1.750	0.07669	5.0	0.0731
NORTH BELT UD	11597-001	QM1045	1016	1.500	0.06573	5.0	0.0626
WILLIAMSBURG REGIONAL	11598-001	QM1084	1014	2.000	0.08764	5.0	0.0835
CHELFORD CITY MUD	11599-001	QM1041	1007	15.500	0.67921	5.0	0.6470
HUNTERS GLEN MUD	11618-001	QM1045	1016	0.750	0.03287	5.0	0.0313
WESTON MUD	11632-001	QM1084	1014	0.500	0.02191	5.0	0.0209
ABB VETCO GRAY INC	11651-001	QM1017	1017	0.024	0.00105	5.0	0.0010
G & C PROPERTIES	11657-001	QM1046	1006	0.008	0.00035	5.0	0.0003
CSA LIMITED	11661-001	QM1045	1016	0.004	0.00018	5.0	0.0002
SUNBELT FWSD	11670-001	QM1017	1017	0.990	0.04338	5.0	0.0413
JOPATA INDUSTRIES	11673-001	QM1046	1006	0.011	0.00048	5.0	0.0005
KOOLSUM ENTERPRISES	11678-001	QM1045	1016	0.050	0.00219	5.0	0.0021
LANGHAM CREEK UD	11682-001	QM1089	1014	3.000	0.13146	5.0	0.1252
ADDICKS UD	11696-001	QM1089	1014	0.200	0.00876	5.0	0.0083
ADDICKS UD	11696-002	QM1089	1014	1.000	0.04382	5.0	0.0417
PINE TRAILS UTILITY	11701-001	QM1005	1006	0.800	0.03506	5.0	0.0334
HARRIS CO MUD 008	11727-001	QM1005	1006	0.700	0.03067	5.0	0.0292
CHAMP'S WATER CO.	11739-001	QM1045	1016	0.025	0.0011	5.0	0.0010
VARCO SHAFFER	11758-001	QM1089	1014	0.050	0.00219	5.0	0.0021
HARRIS CO MUD 050	11770-001	QM1005	1001	0.550	0.0241	5.0	0.0230
PORT TERMINAL RAILROAD	11773-001	QM1005	1007	0.009	0.00038	5.0	0.0004
SUNBELT FWSD	11791-001	QM1045	1016	0.500	0.02191	5.0	0.0209
HARRIS CO MUD 105	11792-002	QM1089	1014	1.250	0.05478	5.0	0.0522
HYDRILL CO.	11794-001	QM1045	1016	0.050	0.00219	5.0	0.0021
HANOVER COMPRESSOR CO.	11797-001	QM1017	1017	0.030	0.00131	5.0	0.0012
FOREST HILLS MUD	11807-001	QM1046	1006	0.200	0.00876	5.0	0.0083
HARRIS CO MUD 148	11818-001	QM1045	1006	0.250	0.01096	5.0	0.0104
GILLIS, THOMAS	11821-001	QM1046	1006	0.050	0.00219	5.0	0.0021
HARRIS CO MUD #149	11836-001	QM1089	1014	0.925	0.04053	5.0	0.0386
DYNAMIC PRODUCTS	11841-001	QM1005	1006	0.005	0.00022	5.0	0.0002

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
HARRIS CO MUD 150	11863-001	QM1045	1016	3.000	0.13146	5.0	0.1252
CASTLEWOOD MUD	11883-001	QM1084	1014	1.500	0.06573	5.0	0.0626
NORTHW HARRIS CO MUD 006	11884-001	QM1045	1016	0.475	0.02081	5.0	0.0198
MEMORIAL MUD	11893-001	QM1084	1014	3.000	0.13146	5.0	0.1252
TRAIL OF THE LAKES MUD	11901-001	QM1045	1016	0.600	0.02629	5.0	0.0250
HARRIS CO MUD 033	11904-001	QM1045	1016	3.000	0.13146	5.0	0.1252
HARRIS CO MUD 157	11906-001	QM1089	1014	1.500	0.06573	5.0	0.0626
MILLS ROAD MUD	11907-001	QM1045	1016	0.400	0.01753	5.0	0.0167
MILLS ROAD MUD	11907-002	QM1045	1016	0.600	0.02629	5.0	0.0250
HARRIS CO MUD 071	11917-001	QM1089	1014	0.450	0.01972	5.0	0.0188
HARRIS CO MUD 049	11919-002	QM1045	1016	0.400	0.01753	5.0	0.0167
G&C INVESTMENT CO	11923-001	QM1005	1006	0.005	0.00022	5.0	0.0002
NORTHWEST HARRIS CO WCID 16	11935-001	QM1089	1014	0.200	0.00876	5.0	0.0083
HARRIS CO MUD 208	11947-001	QM1089	1014	6.700	0.29359	5.0	0.2797
COUNTRY TERRACE WATER	11955-001	QM1044	2426	0.220	0.00964	5.0	0.0092
MAYDE CREEK MUD	11969-001	QM1089	1014	2.000	0.08764	5.0	0.0835
WHITE OAK BEND MUD	11979-002	QM1017	1017	0.400	0.01753	5.0	0.0167
FRY ROAD MUD	11989-001	QM1089	1014	0.800	0.03506	5.0	0.0334
NORTHW HARRIS CO MUD 012	11991-001	QM1089	1014	0.155	0.00679	5.0	0.0065
GCWDA-ALIEF REGIONAL	11998-001	QM1041	1007	3.550	0.15556	5.0	0.1482
MOULDING SPECIALISTS	12000-001	QM1045	1016	0.005	0.00022	5.0	0.0002
BAROID MANAGEMENT CO	12046-001	QM1045	1016	0.070	0.00307	5.0	0.0029
HARRIS CO MUD 086	12065-001	QM1045	1016	0.425	0.01862	5.0	0.0177
FORT BEND CO MUD 030	12068-001	QM1041	1007	0.730	0.03199	5.0	0.0305
ALDINE ISD	12070-001	QM1045	1016	0.063	0.00276	5.0	0.0026
ALDINE ISD-CHRISMAN RD	12070-002	QM1046	1006	0.060	0.00263	5.0	0.0025
ALDINE ISD-INEZ CARROL	12070-003	QM1046	1006	0.020	0.00088	5.0	0.0008
ALDINE ISD-ORANGE GROVE	12070-004	QM1046	1006	0.015	0.00066	5.0	0.0006
FORT BEND CO MUD 026	12073-001	QM1049	1007	0.800	0.03506	5.0	0.0334
RENN ROAD MUD	12078-001	QM1041	1007	2.500	0.10955	5.0	0.1044
HOOKS MOBILE HOME PARK	12083-001	QM1046	1006	0.018	0.00079	5.0	0.0008
KATY ISD	12110-001	QM1089	1014	0.100	0.00438	5.0	0.0042
DALHO CORP	12117-001	QM1046	1006	0.022	0.00096	5.0	0.0009
WEST HARRIS CO MUD 004	12119-001	QM1041	1007	0.500	0.02191	5.0	0.0209
HARRIS CO MUD 170	12121-001	QM1017	1017	2.500	0.10955	5.0	0.1044
INDUSTRIAL UTILITIES	12122-001	QM1005	1006	0.250	0.01096	5.0	0.0104
HARRIS CO MUD 185	12124-001	QM1089	1014	0.675	0.02958	5.0	0.0282
HARRIS CO MUD 180	12127-001	QM1045	1016	1.600	0.07011	5.0	0.0668
HORSEPEN BAYOU MUD	12128-001	QM1089	1014	0.950	0.04163	5.0	0.0397
WHITE OAK OWNERS ASSOC.	12132-001	QM1017	1017	0.059	0.00259	5.0	0.0025
YEH'S BROTHERS	12138-001	QM1045	1016	0.011	0.00049	5.0	0.0005
FAIRBANKS PLAZA SHOPPING	12139-001	QM1017	1017	0.040	0.00175	5.0	0.0017
WEST HARRIS CO MUD 007	12140-001	QM1089	1014	0.500	0.02191	5.0	0.0209
LOCHINVAR GOLF CLUB	12141-001	QM1045	1016	0.005	0.00022	5.0	0.0002
NORTHW HARRIS CO MUD 021	12144-001	QM1045	1016	1.900	0.08326	5.0	0.0793
MLR MANAGEMENT	12149-001	QM1045	1016	0.010	0.00044	5.0	0.0004

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
WEST HARRIS CO MUD 010	12171-001	QM1017	1017	3.500	0.15337	5.0	0.1461
TEX-SUN PARKS	12189-001	QM1089	1014	0.063	0.00276	5.0	0.0026
HASTINGS DEVELOPMENT CO.	12199-001	QM1084	1014	0.050	0.00219	5.0	0.0021
NORTH GREEN MUD	12206-001	QM1045	1016	1.200	0.05258	5.0	0.0501
HARRIS CO MUD 127	12209-001	QM1089	1014	0.330	0.01446	5.0	0.0138
HARRIS COUNTY-ALEX DEUSSEN	12213-001	QM1005	1001	0.020	0.00088	5.0	0.0008
CMH PARKS	12218-001	QM1045	1016	0.122	0.00535	5.0	0.0051
BRITMORE UTILITY	12222-001	QM1017	1017	0.250	0.01096	5.0	0.0104
WEST HARRIS CO MUD #15	12223-001	QM1089	1014	0.350	0.01534	5.0	0.0146
CARGILL, INC.	12231-001	QM1005	1006	0.050	0.00219	5.0	0.0021
BAYOU CLUB OF HOUSTON	12233-001	QM1084	1014	0.005	0.00022	5.0	0.0002
HARRIS CO MUD 189	12237-001	QM1045	1016	0.810	0.03549	5.0	0.0338
333 CONSTRUCTION	12238-001	QM1045	1016	0.025	0.0011	5.0	0.0010
SHELL OIL CO.	12244-001	QM1046	1006	0.002	0.0001	5.0	0.0001
WEST HARRIS CO MUD 017	12247-001	QM1089	1014	0.275	0.01205	5.0	0.0115
HARRIS CO MUD 122	12250-001	QM1041	1007	0.250	0.01096	5.0	0.0104
BEECHNUT MUD	12258-001	QM1041	1007	1.380	0.06047	5.0	0.0576
BAYOU FOREST VILLAGE	12259-001	QM1046	1006	0.030	0.00131	5.0	0.0012
SOLHJOU, HOUSHANG	12261-001	QM1046	1006	0.060	0.00263	5.0	0.0025
HARRIS CO MUD 182	12273-001	QM1045	1016	0.260	0.01139	5.0	0.0109
GREEN TRAILS MUD	12289-001	QM1084	1014	0.990	0.04338	5.0	0.0413
HARRIS CO MUD 200	12294-001	QM1045	1016	2.500	0.10955	5.0	0.1044
FORT BEND CO MUD 034	12298-001	QM1084	1014	0.200	0.00876	5.0	0.0083
CAMFIELD MUD	12304-001	QM1089	1014	0.900	0.03944	5.0	0.0376
J.H. COHEN	12309-001	QM1045	1016	0.030	0.00131	5.0	0.0012
VERRY, RICHARD	12310-001	QM1089	1014	0.030	0.00131	5.0	0.0012
KBM INVESTMENTS	12311-001	QM1005	1006	0.050	0.00219	5.0	0.0021
GLANVILLE, JAMES	12313-001	QM1005	1006	0.016	0.0007	5.0	0.0007
TRINITY INDUSTRIES	12314-001	QM1005	1006	0.008	0.00033	5.0	0.0003
TUFFLI CO.	12318-001	QM1005	1006	0.005	0.00022	5.0	0.0002
COMPONENT STRUCTURES	12320-001	QM1045	1016	0.002	0.0001	5.0	0.0001
WINDY HILL UTILITIES	12342-001	QM1017	1017	0.025	0.0011	5.0	0.0010
WEST PARK MUD	12346-001	QM1089	1014	0.500	0.02191	5.0	0.0209
VETCO PIPELINE SERV	12355-001	QM1084	1014	0.005	0.00022	5.0	0.0002
HARRIS CO. MUD #345	12356-001	QM1084	1014	0.710	0.03111	5.0	0.0296
MEHTA, SUNIL	12361-001	QM1084	1014	0.007	0.00031	5.0	0.0003
FORT BEND CO MUD 037	12370-001	QM1084	1014	0.175	0.00767	5.0	0.0073
PORT OF HOUSTON AUTHORITY	12375-001	QM1005	1006	0.007	0.00031	5.0	0.0003
NORTH MISSION GLEN MUD	12379-001	QM1041	1007	0.620	0.02717	5.0	0.0259
TUBOSCOPE VETCO	12386-001	QM1005	1001	0.009	0.00039	5.0	0.0004
DANIEL INDUSTRIES	12397-001	QM1017	1017	0.012	0.00053	5.0	0.0005
PETERSEN, JAMES	12398-001	QM1089	1014	0.020	0.00088	5.0	0.0008
KARBALAI, GHODRATOLLAH	12399-001	QM1046	1006	0.025	0.0011	5.0	0.0010
NORTH BELT 25-A JOINT VENTURE	12405-001	QM1045	1016	0.500	0.02191	5.0	0.0209
ADAGIO, INC.	12406-001	QM1084	1014	0.012	0.00053	5.0	0.0005

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
COOPER CAMERON CORP	12412-001	QM1084	1014	0.015	0.00066	5.0	0.0006
MYERS, CAL J.	12414-001	QM1046	1006	0.035	0.00153	5.0	0.0015
PANALPINA INC.	12418-001	QM1045	1016	0.007	0.00031	5.0	0.0003
AIVAZIAN, GEORGE	12427-001	QM1084	1014	0.001	0	5.0	0.0000
HINOJOSA, BRIAN	12428-001	QM1045	1016	0.008	0.00033	5.0	0.0003
SUPERIOR DERRICK SERV	12443-001	QM1017	1017	0.003	0.00011	5.0	0.0001
HARRIS CO MUD 196	12447-001	QM1089	1014	0.500	0.02191	5.0	0.0209
DARLENE ANN YOUNG	12450-001	QM1045	1016	0.020	0.00088	5.0	0.0008
TIFCO INDUSTRIES	12465-001	QM1017	1017	0.035	0.00153	5.0	0.0015
TRITON TOOL & SUPPLY	12466-001	QM1084	1014	0.003	0.00013	5.0	0.0001
HARRIS CO MUD 166,257,276	12474-001	QM1089	1014	0.625	0.02739	5.0	0.0261
NOTTINGHAM COUNTRY MUD	12479-001	QM1084	1014	1.300	0.05697	5.0	0.0543
BORING SPECIALTIES	12484-001	QM1045	1016	0.005	0.00022	5.0	0.0002
HARRIS-FORT BEND COS MUD	12498-001	QM1084	1014	0.430	0.01884	5.0	0.0179
WEST HARRIS CO MUD 006	12499-001	QM1041	1007	0.500	0.02191	5.0	0.0209
WEST HOUSTON AIRPORT	12516-001	QM1089	1014	0.002	0.0001	5.0	0.0001
WEATHERFORD-PETCO	12522-001	QM1084	1014	0.011	0.00047	5.0	0.0004
MOVIMEX CO.	12527-001	QM1045	1016	0.010	0.00044	5.0	0.0004
FORNAX INDUSTRIES	12528-001	QM1005	1006	0.006	0.00026	5.0	0.0002
NCI BUILDING SYSTEMS	12552-001	QM1017	1017	0.010	0.00044	5.0	0.0004
NCI BUILDING SYSTEMS	12552-002	QM1017	1017	0.010	0.00044	5.0	0.0004
WESTFIELD MOBILE HOME PARK	12555-001	QM1046	1006	0.100	0.00438	5.0	0.0042
HARRIS CO MUD 191	12556-001	QM1045	1016	0.600	0.02629	5.0	0.0250
BOYLAN, MICHAEL	12564-001	QM1017	1017	0.100	0.00438	5.0	0.0042
CHAMP'S WATER CO	12571-001	QM1045	1016	0.100	0.00438	5.0	0.0042
TREETOP, INC.	12572-001	QM1005	1006	0.002	0.0001	5.0	0.0001
SMITH, WILLIAM	12573-001	QM1017	1017	0.012	0.00053	5.0	0.0005
HARRIS CO MUD 130	12574-001	QM1017	1017	0.500	0.02191	5.0	0.0209
LANCO-CONTINENTAL PLAZA	12591-001	QM1045	1016	0.100	0.00438	5.0	0.0042
GOODWIN, SANDRA	12617-001	QM1045	1016	0.035	0.00153	5.0	0.0015
THURBER	12626-001	QM1045	1016	0.019	0.00083	5.0	0.0008
HARRIS CO MUD 202	12631-001	QM1045	1016	0.750	0.03287	5.0	0.0313
SOWT HARRIS CO MUD 001	12641-001	QM1041	1007	0.400	0.01753	5.0	0.0167
NORTHW HARRIS CO MUD 024	12655-001	QM1045	1016	0.500	0.02191	5.0	0.0209
HARRIS CO MUD 247	12681-001	QM1017	1017	0.800	0.03506	5.0	0.0334
HARRIS CO MUD 216	12682-001	QM1084	1014	0.400	0.01753	5.0	0.0167
ADAMS, R.E.	12683-001	QM1017	1017	0.200	0.00876	5.0	0.0083
HARRIS CO MUD 250	12685-001	QM1089	1014	0.100	0.00438	5.0	0.0042
KARBALAI, G.J.	12692-001	QM1045	1016	0.050	0.00219	5.0	0.0021
GRIZZARD, JAMES	12716-001	QM1043	1006	1.750	0.07669	5.0	0.0731
HARRIS CO MUD 155	12726-001	QM1089	1014	2.000	0.08764	5.0	0.0835
ALLEN EARL	12738-001	QM1089	1014	0.100	0.00438	5.0	0.0042
GREENS PARKWAY MUD	12754-001	QM1045	1016	1.400	0.06135	5.0	0.0584
UNITED STRUCTURES	12765-001	QM1045	1016	0.008	0.00035	5.0	0.0003
QBN CORP.	12766-001	QM1045	1016	0.019	0.00083	5.0	0.0008
TAYLOR, HERMAN	12772-001	QM1046	1006	0.030	0.00131	5.0	0.0012

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
NORTHW HARRIS CO MUD 029	12795-001	QM1017	1017	0.565	0.02476	5.0	0.0236
TEK-RAP, INC.	12797-001	QM1005	1006	0.003	0.00011	5.0	0.0001
HARRIS CO MUD 238	12802-001	QM1089	1014	0.700	0.03067	5.0	0.0292
HARRIS-FT BEND CO MUD	12805-001	QM1084	1014	0.250	0.01096	5.0	0.0104
ADAMOLI, JAMES	12811-001	QM1089	1014	0.010	0.00044	5.0	0.0004
CASTONE INTERNATIONAL	12827-001	QM1084	1014	0.003	0.00013	5.0	0.0001
ROBINSON, J. WAYNE	12830-001	QM1084	1014	0.006	0.00026	5.0	0.0002
HARRIS CO MUD 167	12834-001	QM1089	1014	0.600	0.02629	5.0	0.0250
ROLLING CREEK UD	12841-001	QM1089	1014	0.900	0.03944	5.0	0.0376
HARRIS COUNTY-CULLEN	12858-001	QM1084	1014	0.026	0.00114	5.0	0.0011
UTILITIES INVESTMENT CORP	12863-001	QM1005	1001	0.100	0.00438	5.0	0.0042
S.F.M. MANAGEMENT	12869-001	QM1045	1016	0.025	0.0011	5.0	0.0010
COFLEXIP AND SERVICES	12874-001	QM1005	1006	0.002	0.0001	5.0	0.0001
SOLHJOU, BAHRAN	12882-001	QM1046	1006	0.012	0.00053	5.0	0.0005
1920 INTERPARK	12913-001	QM1045	1016	0.012	0.00053	5.0	0.0005
HARTZOG, WILLIAM	12917-001	QM1046	1006	0.006	0.00025	5.0	0.0002
HARTZOG, LINDA	12918-001	QM1046	1006	0.006	0.00025	5.0	0.0002
THOMAS, T.J.	12919-001	QM1046	1006	0.018	0.00079	5.0	0.0008
HARRIS CO MUD 276	12927-001	QM1089	1014	0.500	0.02191	5.0	0.0209
HARRIS CO MUD 285	12928-001	QM1043	1006	0.250	0.01096	5.0	0.0104
RANKIN RD WEST MUD	12934-001	QM1045	1006	0.800	0.03506	5.0	0.0334
HARRIS CO MUD 284	12949-001	QM1089	1014	0.100	0.00438	5.0	0.0042
TXI OPERATIONS	12966-001	QM1084	1014	0.001	0	5.0	0.0000
REDWOOD UTILITIES	12996-001	QM1005	1006	0.200	0.00876	5.0	0.0083
BIG OAKS MUD	13021-001	QM1084	1014	0.200	0.00876	5.0	0.0083
HARSCO CORP	13034-001	QM1005	1006	0.003	0.00015	5.0	0.0001
HARRIS CO MUD 278	13037-001	QM1045	1016	0.400	0.01753	5.0	0.0167
MOREAU, D&J	13060-001	QM1005	1006	0.013	0.00059	5.0	0.0006
HOAJEY, LTD.	13066-001	QM1045	1016	0.009	0.00039	5.0	0.0004
JEZERSKI PROPERTIES	13067-001	QM1046	1006	0.002	0.0001	5.0	0.0001
MCCULLOCH, XIU	13084-001	QM1046	1006	0.025	0.0011	5.0	0.0010
NORTHSIDE FORD	13111-001	QM1046	1006	0.025	0.0011	5.0	0.0010
CINCO MUD 001	13172-002	QM1084	1014	0.550	0.0241	5.0	0.0230
CHAPMAN, PAT G.	13184-001	QM1048	1001	0.100	0.00438	5.0	0.0042
PORT OF HOUSTON AUTH	13203-001	QM1005	1006	0.005	0.00022	5.0	0.0002
HARRIS CO MUD 321	13211-001	QM1046	1006	1.600	0.07011	5.0	0.0668
RLG REALTY HOLDINGS	13218-001	QM1084	1014	0.350	0.01534	5.0	0.0146
FT BEND CO MUD 050	13228-001	QM1084	1014	0.700	0.03067	5.0	0.0292
VIA RANCH MUD 004	13245-001	QM1084	1014	1.000	0.04382	5.0	0.0417
S.I. ENTERPRISES	13316-001	QM1005	1006	0.002	0.0001	5.0	0.0001
REMINGTON MUD 001	13327-001	QM1089	1014	0.150	0.00657	5.0	0.0063
REMINGTON MUD 001	13328-001	QM1089	1014	1.100	0.0482	5.0	0.0459
STEWART & STEVENSON	13365-001	QM1005	1006	0.050	0.00219	5.0	0.0021
HL&P-ENERGY CONTROL	13368-001	QM1045	1016	0.015	0.00066	5.0	0.0006
LAKES ON ELDRIDGE	13420-001	QM1089	1014	0.300	0.01315	5.0	0.0125
PACIFIC SOUTHWEST BANK	13433-001	QM1017	1017	0.100	0.00438	5.0	0.0042

Appendix 2 (continued)

PERMIT NAME	PERMIT NUMBER	MODEL	SEGMENT NUMBER	PERMITTED FLOW		TOTAL NICKEL (µg/L)	TOTAL NICKEL (lbs/day)
				(MGD)	(m ³ /s)		
FRM N E BELT VENTURE	13483-001	QM1045	1016	0.500	0.02191	5.0	0.0209
529 #35, LTD	13484-001	QM1089	1014	0.200	0.00876	5.0	0.0083
PROLER INTERNATIONAL CORP	13498-001	QM1005	1006	0.006	0.00026	5.0	0.0002
MAXEY ROAD WSC	13503-001	QM1005	1006	0.015	0.00066	5.0	0.0006
SMITH, BOB	13509-001	QM1017	1017	0.013	0.00059	5.0	0.0006
CINCO MUD 001	13558-001	QM1084	1014	1.690	0.07406	5.0	0.0705
HINOJOSA RENE	13559-001	QM1045	1016	0.015	0.00066	5.0	0.0006
LEE, C.K.	13560-001	QM1046	1006	0.013	0.00055	5.0	0.0005
HARRIS CO.-DETENTION CENTER	13561-001	QM1045	1016	0.500	0.02191	5.0	0.0209
HARRIS CO MUD #304	13564-001	QM1045	1016	0.650	0.02848	5.0	0.0271
COOPER CAMERON CORP.	13578-001	QM1017	1017	0.008	0.00035	5.0	0.0003
BAKER PERFORMANCE CHEMICAL	13580-001	QM1005	1001	0.001	0	5.0	0.0000
CHRISTIAN TABERNACLE	13581-001	QM1005	1006	0.005	0.00022	5.0	0.0002
ALDINE ISD-ANN LOUISE	13609-001	QM1046	1006	0.042	0.00184	5.0	0.0018
AQUILA REALTY FUND	13617-001	QM1045	1016	0.004	0.00018	5.0	0.0002
SAM HOUSTON RACE PARK	13623-001	QM1017	1017	2.000	0.08764	5.0	0.0835
STEBEC, INC.	13666-001	QM1005	1005	0.013	0.00057	5.0	0.0005
HARRIS CO METRO UD	13673-001	QM1017	1017	0.200	0.00876	5.0	0.0083
NOTTINGHAM COUNTRY MUD	13674-001	QM1084	1014	0.051	0.00223	5.0	0.0021
WEST HARRIS CO MUD 011	13689-001	QM1017	1017	1.500	0.06573	5.0	0.0626
ACADEMY DEVELOPMENT	13699-001	QM1084	1014	0.150	0.00657	5.0	0.0063
SKY PROPERTY MANAGEMENT	13709-001	QM1046	1006	0.010	0.00044	5.0	0.0004
MOORPARK VILLAGE	13727-001	QM1017	1017	0.035	0.00153	5.0	0.0015
BALABAN, IHOR	13749-001	QM1046	1006	0.025	0.0011	5.0	0.0010
TOWER MANAGEMENT SERV	13764-001	QM1017	1017	0.150	0.00657	5.0	0.0063
FATIMA FAMILY VILLAGE	13767-001	QM1046	1006	0.012	0.00053	5.0	0.0005
SMITH, WILLIAM D.	13770-001	QM1046	1006	0.028	0.00123	5.0	0.0012
HOUSTON AREA DEVELOPMENT	13775-001	QM1084	1014	0.250	0.01096	5.0	0.0104
FRIEDMAN, STEPHEN	13778-001	QM1089	1014	0.010	0.00044	5.0	0.0004
MCDONALDS CORP.	13807-001	QM1017	1017	0.003	0.00013	5.0	0.0001
FLINTLOCK, LTD	13848-001	QM1017	1017	0.018	0.00079	5.0	0.0008
COLUMN TOTALS	-----	-----	-----	1086.679	47.61748	-----	106.1155
* TOTAL OF CURRENT PERMITTED LOADS:							63.5382