1 of 1

DOE/CE/15558-T1

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FIRST QUARTER TECHNICAL PROGRESS REPORT FOR THERMALLY MODIFIED SAND

PREPARED FOR

Mr. Elliott P. Levine, Inventions Coordinator
U.S. Department of Energy
Inventions and Innovation Division
Mail Stop EE-521
1000 Independence Avenue, SW
Washington, D.C. 20585

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GE²T PROJECT No. 93093

February 28, 1994

MASTER

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February 28, 1994

Mr. Elliott P. Levine, Inventions Coordinator
U.S. Department of Energy
Inventions and Innovation Division
Mail Stop EE-521
1000 Independence Avenue, SW
Washington, D.C. 20585

RE: **Technical Progress Report No. 1 for Thermally Modified Sand**
DOE Grant No. DE-FG01-93CE15558
GE²T Project No. 93093

Dear Mr. Levine:

Attached is the technical progress report on the first quarter (3 months) of work done on the above referenced project. As described in the DOE's *Notice of Financial Assistance Award* the Project Aim is: *Demonstrate suitability of Thermally Modified Sand (TMS) for large scale use by demonstrating its performance on icy roadways maintained by the State of Alaska Department of Transportation*. This first quarter of work primarily involved the startup of the demonstration project.

The work plan for this demonstration project consists of six (6) specific tasks (described herein). The format of this technical progress report describes the work for each task that was done during this first quarter. The first quarter began on September 17, 1993 and ended on December 31, 1993.

We welcome your comments on this report and will continue to implement the remaining tasks in the approved work plan. If you have any questions regarding this report, please do not hesitate to call on me at 277-2021.

Sincerely,
GILFILIAN ENGINEERING & ENVIRONMENTAL TESTING, INC.

Robert E. Gilfilian, P.E.

c: Dino Talavera
Bernard G. Canlas, DOE Office of Placement & Administration
DOE Office of Scientific & Technical Information (OSTI) ✓
Chris Kepler, P.E., ADOT&PF Palmer Maintenance Facility
Jim Palin, Alaska Science & Technology Foundation

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BACKGROUND

On June 1, 1992 Mr. Dino Talavera of Wasilla, Alaska, submitted a grant application prepared by Gilfilian Engineering, Inc. to the U.S. Department of Energy (DOE). The application was submitted for a grant from the Energy-Related Inventions Program (ERIP) administered by DOE. The DOE grant was approved on September 22, 1993 with a total approved budget for \$94,771. The grant recipient is Thermally Modified Sand, Incorporated with Mr. Dino Talavera as the Recipient Project Director. The grant identified Mr. Robert Gilfilian, P.E. of Gilfilian Engineering & Environmental Testing, Inc. (GE²T) as the Recipient Business Officer. The Project Objective for this grant is:

The objective of the demonstration project is to have the State of Alaska Department of Transportation use the TMS material for the treatment of icy State highways. Results of the field test will be compared to similar sections of icy highways treated with the conventional salt/sand mixture. The demonstration project will take place on roadways located in the south central area of Alaska where air temperatures persist below freezing throughout most of the winter. The demonstration project will also evaluate the suitability of stockpiling TMS material throughout the winter season without the need for additional refinement or inside storage.

To meet the above objective, the Grantee (TMS, Inc.) is required to perform the following tasks:

Task 1 - Produce Thermally Modified Sand (TMS)

Task 2 - Construct Stockpiles of TMS Material

Task 3 - Apply TMS Material on Icy Roadways at a Designated Test Location

Task 4 - Determine Effectiveness of TMS Application

Task 5 - Evaluate Undisturbed TMS Stockpile

Task 6 - Prepare Quarterly and Final Reports

This first quarter technical progress report summarizes the activities that took place under each task. The reporting period began in the month of September 1993 and ended on December 31, 1993.

TASK 1 - PRODUCE THERMALLY MODIFIED SAND (TMS)

This task involved the production of Thermally Modified Sand (TMS) material for use by the Alaska Department of Transportation & Public Facilities (ADOT&PF) on state roadways located near Palmer, Alaska. The TMS material was to be made available for use on the roadways during the winter of 1993/1994.

Because of the delay in obtaining DOE funds to purchase pure sand, an agreement was made in September 1993 between Mr. Dino Talavera, the Alaska Science & Technology Foundation (ASTF) and ADOT&PF to purchase pure sand and have it delivered to the ADOT&PF Palmer Maintenance Facility before the start of the winter season. The sand was purchased by ASTF, and ADOT&PF made the arrangements with the supplier to have it delivered to their Palmer Maintenance Facility. ASTF was reimbursed at a later date by Mr. Dino Talavera after he received his first grant disbursement from DOE. This purchase arrangement was essential since it provided the same type of sand for the TMS demonstration project as was used by ADOT&PF for their salt/sand mixture.

On October 13, 1993 approximately 2,600 cubic yards of pure sand was delivered to the ADOT&PF Palmer Maintenance Facility for the TMS demonstration project. The stockpile of pure sand designated for the TMS project was kept separate from ADOT&PF's 13,000 cubic yard sand stockpile mixed with salt. On October 14, 1993 Mr. Peter Curtis of GE²T collected representative soil samples from both sand stockpiles. A mechanical sieve analyses of the two (2) samples was done in accordance with the American Society of Testing Materials (ASTM) Procedures No. C136 and C117. TABLE 1 summarizes the results of the mechanical (gradation) analyses.

As shown in TABLE 1, the two (2) soil sample gradations were relatively consistent. There was approximately 1 percent more fines (greater than No. 200 sieve) in the TMS sand compared to the ADOT&PF sand. According to Mr. Talavera, he did not believe the fines would cause any problems in the processing of the TMS sand since he had used pit run sand in the past that had a much greater percentage of fines.

TABLE 1: GRADATION OF SAND

Sieve Size	Percent Passing	
	TMS Material	ADOT&PF Sand/Salt Mixture
3/8"	100	100
#4	90	93
#16	55	52
#40	17	14
#60	7	5
#100	4	3
#200	2.2	1.2

Shortly after the pure sand was delivered to the ADOT&PF Palmer Maintenance Facility, Mr. Talavera mobilized his TMS processing equipment to the project site. Mr. Talavera processed the sand during the night hours when the air temperatures fell below freezing. By October 19, 1993 a stockpile of approximately 300 cubic yards of TMS sand was available for use by the ADOT&PF road maintenance crews. By October 23, 1993 Mr. Talavera had processed an additional 300 cubic yards of TMS material and set it aside for the long-term storage stockpile (see Task 5).

On October 26, 1993 Mr. Peter Curtis of GE²T collected representative samples from the stockpiles of processed TMS material and unprocessed (pure) sand. The samples were tested for moisture content in accordance with ASTM procedures. The TMS stockpile had a moisture content of 5.3 percent, and the stockpile of pure sand had a moisture content of 6.0 percent. The lower moisture content in the processed TMS material was possibly due to the evaporative losses caused by the fan unit used to freeze the sand particles.

Because of the unusually mild winter conditions that were experienced in the Southcentral area of Alaska, Mr. Talavera was unable to complete the production of the TMS material during the initial three (3) months of operation. The second quarterly report will provide additional information on the weather conditions. Mr. Talavera was only able to produce approximately 800 to 1,000 cubic yards of TMS material by the end of December 1993.

Mr. Talavera attempted to dry out the sand by spreading it in shallow layers. He believed this method would reduce the moisture content in the sand; and thereby, improve the free flowing characteristics of the sand. On November 24, 1993 Mr. Peter Curtis of GE²T collected soil samples from several locations in the sand stockpiles. The samples were taken to the laboratory for moisture content analyses summarized in TABLE 2.

TABLE 2: SAND MOISTURE CONTENT

Sample Location	Percent Moisture
TMS Material from ADOT&PF truck	8.3
TMS Stockpile (50 cubic yard)	7.1
Air-Dried Pure Sand (for Future TMS Processing)	7.0
Stockpiled Pure Sand (Not Air-Dried and Not Processed)	6.9
TMS Material (Large Stockpile)	6.7

Overall, the above moisture contents were relatively consistent in all the sampling locations. The slightly higher moisture level in the TMS material from the ADOT&PF truck may have been a contributing factor that caused the sand to bind in the bin of the sand spreading truck (refer to TASK 3 for discussion on this observation). More important, however, is the fact that the moisture contents of the air dried sand compared to the non-air dried sand were essentially the same. This finding indicates the air drying effort may not be as beneficial as perceived by Mr. Talavera. Further evaluation of the air drying technique is needed in order to make a determination of its usefulness in the pre-processing of the sand used for the TMS production.

TASK 2 - CONSTRUCT STOCKPILES OF TMS MATERIAL

The original work plan submitted to DOE proposed the construction of two (2) discrete stockpiles of processed TMS material on the ADOT&PF Palmer Maintenance Facility. The first stockpile was to consist of approximately 2,000 cubic yards of TMS material to be used on the icy roadways by ADOT&PF road maintenance crews (see TASK 3). The second stockpile (consisting of 500 cubic yards of TMS material) was to be set aside for long-term monitoring purposes (see TASK 5).

As explained under the sand purchase agreement in TASK 1, the pure sand for the demonstration project was delivered directly to the ADOT&PF Palmer Maintenance Facility. This arrangement allowed Mr. Talavera to thermally process the sand on-site. He was able to construct the TMS stockpiles on-site and avoid transporting the processed TMS material from a gravel pit to the maintenance facility.

During this quarterly reporting period, Mr. Talavera processed approximately 500 cubic yards of TMS material for use by ADOT&PF on the roadways and 300 cubic yards of TMS material for the long-term storage stockpile. The unusually mild winter season hampered Mr. Talavera's attempt to process the balance of the stockpiled sand. However, Mr. Talavera constructed one large stockpile of non-processed pure sand that was used by ADOT&PF when the air temperatures were above freezing. This pile of unprocessed sand was constructed by the spreading of sand in shallow layers, and then pushing the sand into a large stockpile. Mr. Talavera erected placards on the various sand piles to instruct the ADOT&PF maintenance crews which sand to use for different temperature conditions.

Attached to this report is a Site Plan (FIGURE 3) that shows the general locations of the sand stockpiles. These stockpiles included the multi-piles of pure sand used in the processing of TMS material, the ADOT&PF's sand/salt stockpile and the long-term storage stockpile of TMS material.

TASK 3 - APPLY TMS MATERIAL ON ICY ROADWAYS AT A DESIGNATED TEST LOCATION

Prior to the start of this demonstration project, Mr. Chris Kepler of ADOT&PF recommended the originally planned road test section be changed from the Palmer/Wasilla Highway to Bogard Road (located approximately 5 miles west of the City of Palmer). Attached to this report is a Vicinity Map (FIGURE 1) that shows the general area of Palmer with respect to the State of Alaska. A map of the road test section is given on FIGURE 2 with respect to the location of the ADOT&PF Palmer Maintenance Facility. The approximate daily traffic count on the state highways in the Palmer area are also depicted in FIGURE 2.

Mr. Talavera obtained ADOT&PF permission to erect road signs to inform users that the Bogard Road was a test section for salt free sand. After the signs were erected, ADOT&PF received numerous complaints from road users that they were concerned about the safety of the non-salted roadway. They also protested the use of Bogard

Road in this demonstration project because of its proximity to several schools. It was agreed between ADOT&PF, GE²T and Mr. Talavera to change the road test section to the Palmer/Fishhook Road, located northeast of Palmer shown on FIGURE 2.

The Palmer/Fishhook Road test section consists of a relatively high volume, paved highway. The test section is approximately 7 miles long. In several respects, the test section was ideal for this demonstration project. The east end of the test section typically has mild winter conditions with high winds. Because of its proximity to the Talkeetna Mountains, the northern end of the test section normally receives a large snow accumulation compared to other roads in the Palmer area.

As proposed in the original work plan, ADOT&PF was to maintain a daily log on the use of the TMS material. A copy of the log used by ADOT&PF is attached to this report. The first log entry for use of TMS material occurred on October 26, 1993. It was reported that the sand discharged from the truck with no apparent problems at a temperature of 35 degrees F. However, on the following day there were several frozen chunks of sand in the truck load. Also, it was noted the sand that was applied on October 26 was not visible on the road surface. In addition, the log indicated there were problems with Mr. Talavera's vibrator units that were installed on the sanding trucks. Subsequently, Mr. Talavera devised a method to protect the vibrators from salt intrusion.

During the months of October and November, most of the sand material used for application on the ADOT&PF roadways consisted of non-processed pure sand (as explained in TASK 1). The non-processed pure sand was used when the air temperatures were above freezing (32 degrees F). The initial 300 cubic yard stockpile of processed TMS material was used in mid-November when the air temperature fell below freezing. As noted on the attached log, ADOT&PF experienced difficulty with several loads of TMS material starting on November 16 when the air temperatures fell to 15 degrees F.

By November 23, 1993 the TMS material was not functional for ADOT&PF sand spreading purposes. An emergency meeting was held on November 24 at the ADOT&PF Palmer Maintenance Facility to discuss the problems with spreading the TMS material. The meeting was attended by Mr. Dino Talavera, Mr. Peter Curtis, Mr. Bill McKechnie of ADOT&PF, Mr. Chris Kepler and Mr. Robert Gilfilian.

During the November 24, 1993 meeting, an ADOT&PF sanding truck with a load of recently processed TMS material returned to the Palmer facility with the entire load. The truck driver was not able to discharge the TMS material onto the icy roads. The TMS material appeared to be slightly "cemented" in the truck bin. Although the truck's vibrator units were operational, the cementation (binding) prevented the sand from freely flowing onto the truck's spreader apparatus. Also, several stockpiles of sand were inspected. It was determined that the freeze/thaw cycles had hampered the quality and production of the TMS material.

In light of the above situation and ADOT&PF's responsibility for maintaining safe public roadways, Mr. Gilfilian requested ADOT&PF to temporarily suspend the TMS demonstration. During the interim period of time, ADOT&PF would use the sand/salt mixture on the road test section. It was agreed by all parties that as the weather allowed, Mr. Talavera would resume the production of TMS material for the continuation of this demonstration project. Unfortunately, the mild winter conditions persisted throughout this quarterly reporting period. Mr. Talavera was unable to satisfactorily resume TMS production until the month of January 1994 (to be reported in the next quarterly progress report).

TASK 4 - DETERMINE EFFECTIVENESS OF TMS APPLICATION

This task was to compare the effectiveness of the TMS material on icy roadways to the standard sand/salt mixtures used by ADOT&PF. As explained above, the mild winter weather conditions prevented the production of large quantities of TMS material. However, several loads of TMS and non-processed TMS material were used by ADOT&PF on the test section of the Palmer/Fishhook Road.

As indicated on the attached ADOT&PF log, the sand was placed on the icy roadways during the later part of October and in the month of November through November 23, 1993. During this period of time, representatives from GE²T visited the road test section on several occasions. GE²T documented the conditions of the road surface with photographs and videos. Mr. Talavera also extensively videotaped the road conditions.

Until mid-November, ADOT&PF road maintenance crews noted that it required approximately two to three times more pure sand compared to the sand/salt mixture to treat comparable icy road conditions. It appeared the pure sand did not adhere to the road surface as well as the sand/salt mixture. Also, the sanding crews noted the

road sections with high snow accumulation that were treated with pure sand developed a snow pack condition. The snow pack created glare ice conditions that was not removable by plowing. Similar road sections with high snow loads that were treated with the sand/salt mixture did not develop a snow pack. The improved road surface condition on the salted roads was the apparent result of salt reaction with snow that formed slush which was removed by plowing.

After the on-set of colder freezing weather, Mr. Robert Gilfilian and Mr. Peter Curtis drove over the Palmer/Fishhook Road test section and confirmed the icy snow pack road conditions reported by ADOT&PF. A video of the road conditions was made later that day by Mr. Peter Curtis - who drove several roads in the Project Study Area under varying snow and ice conditions. These findings are preliminary and should not be considered conclusive. Further evaluation of the road conditions under different weather conditions needs to be done in the future reporting periods.

TASK 5 - EVALUATE UNDISTURBED TMS STOCKPILE

Under this task, a 500 cubic yard stockpile of TMS material was to be left undisturbed. The stockpile was to be monitored to determine its long-term storage characteristics. Because of the unfavorable weather conditions for the production of TMS material, Mr. Talavera was only able to construct a 300 cubic yard stockpile of TMS material. Fortunately, the size of this stockpile appeared to be adequate to meet the needs of this task.

The location of the long-term test stockpile is shown on the Site Plan (FIGURE 3) attached to this report. The stockpile is located in a partially protected area near the new ADOT&PF maintenance garage on the northwest section of the Palmer Maintenance Facility. The garage partially protects the stockpile from the prevailing winds and exposure to the low lying southern sun during the winter months.

During the month of December 1993, Mr. Kent Sheets of GE²T installed an array of calibrated thermistor probes on the south side of the long-term storage stockpile. The probes were placed at depths of 1, 2 and 3 feet below the surface of the stockpile, and approximately half way up the side of the stockpile. Beginning on December 17, Mr. Sheets visited the stockpile on a weekly basis and measured the soil temperatures with the thermistor probes. He also made observations on the workability of the stockpile material. The next quarterly report will provide a detailed description of the temperature measurements and the characteristics of the stockpile material.

TASK 6 - PREPARE QUARTERLY AND FINAL REPORTS

This task involves the preparation of quarterly and final reports on the TMS demonstration project. During the first quarterly reporting period, no reports were prepared; however, several letters of correspondence prepared by Mr. Chris Kepler and Mr. Robert Gilfilian were sent to the parties involved in this demonstration project. These letters reported activities during the startup of this project. A chronological list of these letters is as follows:

August 6, 1993	Letter sent to Mr. Chris Kepler from Mr. Robert Gilfilian that confirmed the understanding of the roles of the various parties in the demonstration project.
August 16, 1993	Letter from Mr. Chris Kepler to Mr. Talavera that allowed signs to be erected on the road test section.
August 30, 1993	Letter from Mr. Chris Kepler to Mr. Robert Gilfilian that recommended the road test section be changed from Palmer/Wasilla Highway to Bogard Road.
September 20, 1993	Letter from Mr. Robert Gilfilian to Mr. Chris Kepler that provided an understanding on the startup of the demonstration project.
October 14, 1993	Letter from Mr. Robert Gilfilian to Mr. Chris Kepler that agreed to the relocation of the road test section from Bogard Road to the Palmer/Fishhook Road.
November 26, 1993	Letter from Mr. Robert Gilfilian to Mr. Chris Kepler that gave notice of the temporary suspension of the TMS demonstration due to mild winter conditions.

Copies of the above correspondences are attached to this report.

CLOSURE

This first quarter progress report described the work completed during the startup of the TMS demonstration. A considerable amount of work beyond the original scope of work was done to deal with the non-favorable mild winter conditions. Although Mr. Talavera earnestly attempted to produce the TMS material, he was not able to produce large quantities during this reporting period. However, one benefit of the mild winter conditions was that it provided valuable information on the processing and application of TMS material in a climate similar to the "Lower 48" states.

The next quarterly progress report will describe the work that was done to produce the balance of TMS material during the months of January, February and March 1994. At this time, it is recommended the work proceed as originally proposed under the original work plan tasks. This would enable us to obtain more information on the production and use of TMS material during the remainder of the winter in 1994.

ATTACHMENTS

FIGURE 1 - Vicinity Map

FIGURE 2 - Map of Project Study Area

FIGURE 3 - Site Plan of TMS Staging Area

ADOT&PF Logs On Use of TMS Material

Correspondence

(Letters dated August 6, August 16, August 30,
September 30, October 14 and November 26, 1993)

SEE FIGURE 2

THERMALLY MODIFIED SAND - TECHNICAL PROGRESS REPORT No. 1 - FIGURE 1

GILFILIAN ENGINEERING &
ENVIRONMENTAL TESTING, INC.

Mat-Su Office: 1800 E. Parks Highway, Suite D-100, Wasilla, Alaska 99654
Anchorage Office: 255 E. Fireweed Ln., Suite 102, Anchorage, Alaska 99503

SCALE: N.T.S.

DATE: 1/25/94

GEI PROJECT NO. 93093

SCALE: 1" = 100'

FIGURE 3 - SITE PLAN OF TMS STAGING AREA
ADOT&PF PALMER MAINTENANCE FACILITY - LOT H-2B, PALMER INDUSTRIAL PARK, PALMER, AK

GILFILIAN ENGINEERING &
ENVIRONMENTAL TESTING, INC.

Mat-Su Office: 1800 E. Parks Highway, Suite D-100, Wasilla, Alaska 99654
Anchorage Office: 255 E. Fireweed Ln., Suite 102, Anchorage, Alaska 99503

SCALE: 1" = 100'

DATE: 2/28/94

GEI PROJECT NO. 93093

1997

FREEZE DRIED SAND USED ON PALMER FISHHOOK

<u>DATE</u>	<u>OPERATOR</u>	<u>AMOUNT</u>	<u>TIME</u>	<u>OPERATOR COMMENTS</u>
10/26	Ron	8 yds	3 PM	Came out of truck real good 35°
10/27	SLICK			
10/27	Several frozen chunks on load			No sign of sand from 10/26
	Russ			
10-28	WTW	-	9: AM	Dry in sunny areas SLICK in SHADE
10-31	N.H.	8 yds	2: PM (37°)	met - slush water - snow shoulders
10-31	Testing	Russ vibrator		and it broke at one of the bolt holes
11-6	R.C.	14 yds	10:30 A	SAND Came out ok
11-7				Road wet on South end snow build-up in center + shoulders plowed and put one load on RSM
11-8	Buck	1 Load	9:30 AM	Chunks of sand ice Trunk Rd 100-76
11-8	WTW	Ice Build up on shoulders	8:30 AM	Slick mile 3 and up.
11-8	WTW	8 yds	5:00 PM	- SNOWPACK
11-9	Bob			SNOW PACK - HARDER TO SCRAPE
11-10	John	10 yds 2 Loads	1:00 AM	Required 3 Passes to do it
11-12	WTW		9: AM	SAND ON SNOWPACK
11-12	BILL			WE HAVE TO SAND 2-3 TIMES MORE THAN
11-14	Ron	8 yds	2 PM	Snow pack Last Hill
11-14	Jack	8 yds	11:30 PM	SCAPED SAND
11-15	Buck			SCAPED ON WAY to N. Pass
11-16	Bill			ICE Mile 2 - 7 SLICK
11-16	RICK			SAND

FREEZE DRIED SAND USED ON PALMER FISHHOOK

<u>DATE</u>	<u>OPERATOR</u>	<u>AMOUNT</u>	<u>TIME</u>	<u>OPERATOR COMMENTS</u>
11-16	Rick	3 Loads	11:30 AM	snow & ice pack FROZEN chunks on sander grates, up to 3" chunks 1st Load - sand FROZE to grates & sander FENDERS - 3/4 of 2nd 3' load stuck.
11/22	Russ	1 Load	6:30	36° Took 4 scoops to fill truck, had to keep scraping off large chunks Load hollowed out at Auger most of load still in truck used vibrators till lights got dim on truck
11-22	J BREEDEN	1 Load	10:00	Load Stuck had to
11/23/93	L Russell	1 Load		won't come out of truck dig out SAND, chunks too big to get to spinner thru chute.
11-23-93	KNUYSON	LOAD		WONT COME OUT.

GILFILIAN ENGINEERING, INC.

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November 26, 1993

Mr. Chris Kepler, P.E.
Transportation Maintenance Superintendent
Mat-Su District
Department of Transportation & Public Facilities
289 Inner Springer Loop Road
Palmer, Alaska 99645

RE: Temporary Suspension of TMS Demonstration
Dino Talavera TMS Process
DOE Grant No. 558
GEI Project No. 93093

Dear Mr. Kepler:

This letter is to confirm our conversation regarding the temporary suspension of the above referenced demonstration project. The decision to temporarily cease the TMS demonstration was the result of problems experienced by your Department's sand spreading trucks with the spreading of the TMS sand. The demonstration project will resume at such time Mr. Talavera demonstrates the processed TMS sand is free flowing and would not jeopardize the operation of your sanding program.

On November 24, 1993 we met with you to review the status of the demonstration project. In addition to you and I, the meeting was attended by Dino Talavera, Peter Curtis (GEI) and Bill McKechnie (ADOT&PF Palmer Maintenance Facility). During our meeting, we had the opportunity to walk over your maintenance facility and observe the various sand piles constructed by Mr. Talavera.

Because of the rather unusual winter conditions we've been experiencing this year in the southcentral area of Alaska, Mr. Talavera has been earnestly trying to accommodate the Department with free flowing sand. The freeze/thaw cycles in the weather have hampered the production of the TMS material. Also, as a result of the wetter conditions, Mr. Talavera has attempted to "dry out" the sand by spreading the sand out in shallow layers prior to processing it with his equipment.

During our November 24 site visit, a Department sanding truck returned to the maintenance yard with nearly a full load of TMS material. Apparently, the truck driver was not able to discharge the TMS material onto the icy roads. Upon inspection of the truck content, it was noted the TMS material was slightly "cemented" in the truck bin. The cementation prevented the sand from flowing onto the spreader apparatus. Several photographs were taken of the sand condition to document the cementation problem. Also, Mr. Peter Curtis collected representative samples from the sand piles for subsequent testing to determine the gradation and moisture contents.

As a result of the above observations, it was recommended the sanding operation with the TMS material be temporarily halted until such time Mr. Talavera can "fine-tune" the sand processing method. During the interim, the test section of road on Palmer-Fishhook Road should be treated with salted sand. Mr. Talavera will continue to work with the 2500 cubic yard stockpile of pure sand for the processing of the TMS material. As the winter season progresses and colder weather persists, it is anticipated the sand will be satisfactorily processed by Mr. Talavera for resumption of this demonstration project. We will notify the Department in writing to resume the TMS demonstration project at such time the TMS material is ready for use.

In closing, I would like to express our appreciation to you and your staff for the patience and understanding you've shown in this matter. Your records on the use of the TMS material will be of value to us in the evaluation of the process. If you have any questions or need additional information on this matter, please do not hesitate to contact me at 277-2021.

Sincerely,

GILFILIAN ENGINEERING, INC.

Robert E. Gilfilian, P.E.
President

c: Dino Talavera, President of TMS, Inc.
Dr. John Sibert, ASTF Executive Director
Jim Palin, ASTF Circuit Rider
Elliott Levine, DOE Inventions Coordinator
Boyd Brownfield, Director of Maintenance & Operations, ADOT&PF

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October 14, 1993

Mr. Chris Kepler
Transportation Maintenance Superintendent
Mat-Su District ADOT&PF
289 Inner Springer Loop Road
Palmer, Alaska 99645

RE: **TMS Demonstration Project**
Relocation of Road Test Section
GEI Project NO. 93093

Dear Chris:

Per our telephone conversation held on October 13, 1993, it is understood the road test section for the above referenced project has been changed from Bogard Road to the Palmer Fishhook Road. The test section will start at the intersection of the Glenn Highway and will end at the "Y" intersection of the Palmer Fishhook Road with the Wasilla Fishhook Road. The length of the test section is approximately 7 miles. Typically, this section of road uses approximately 8 cubic yards of sand application (equivalent to one (1) sander truck load).

The change in the location of the road test section is the result of public concern (expressed in phone calls) from school system users along the Bogard Road. Apparently, the road signs announcing the proposed application of the TMS material caused a number of citizens to object to the use of Bogard Road as a test section for this demonstration project. Consequently, we informed Mr. Talavera not to install new signs on the application of TMS material along the Palmer Fishhook Road.

We appreciate your assistance in relocating the road test section. We believe the Palmer Fishhook road will be adequate for the needs of the demonstration project. We should be able to compare the TMS road conditions to the salted sand treated section of the Wasilla Fishhook Road. However, because of the high wind area on the east end of the Palmer Fishhook Road, we will observe other local roads that were treated with salted sand for comparison to the TMS material.

We look forward to the startup of this project, which is anticipated in the month of November. If you have any questions regarding this letter and our understanding of the change in the road test section, please do not hesitate to contact me at 277-2021.

Sincerely,

GILFILIAN ENGINEERING, INC.

Robert E. Gilfilian, P.E.
President

c: Dino Talavera, TMS, Inc.
Jim Palin, Alaska Science & Technology Foundation

GILFILIAN ENGINEERING, INC.

Professional Environmental Consultants

Main Office: 255 E. Fireweed Lane, Suite 102, Anchorage, Alaska 99503-2025
(907) 277-2021 • FAX (907) 274-8683

Mat-Su Office: 1800 E. Parks Highway, Suite D-100, Wasilla, Alaska 99654
(907) 376-3005 • FAX (907) 373-5686

September 20, 1993

Mr. Chris Kepler, P.E.
Transportation Maintenance Superintendent
Mat-Su District
Alaska Department of Transportation & Public Facilities
289 Inner Springer Loop Road
Palmer, Alaska 99645

RE: TMS PROCESS DEMONSTRATION PROJECT
GEI Project No. 93093

Dear Chris:

This letter is to confirm our understanding of the arrangements we discussed during a meeting held at your office on September 17, 1993. The meeting was attended by you, Dino Talavera, Peter Curtis (Senior Engineering Technician with Gilfilian Engineering, Inc.) and myself. We appreciated the opportunity to meet with you since it was helpful to walk-over your facility and discuss the start-up of the demonstration project.

I concur with your August 30, 1993 recommendation on changing the location of the road test section to the east half of Bogard Road rather than the Palmer/Wasilla Highway. The traffic load and road conditions of Bogard Road would be more suited for the demonstration needs of this project. It is understood the test section of the Bogard Road for the application of TMS material would start at the intersection of the Palmer/Wasilla Highway and Moffitt Road, proceed north on Moffitt Road to it's intersection with Bogard Road, and west on Bogard Road to the intersection of Lakeview Drive. The remainder of Bogard Road, west of its intersection with Lakeview Drive, would be treated with salted sand as you normally do.

It was also decided the 500 cubic yard TMS stockpile material would be located in an isolated area on the northern edge of your Inner Springer Loop Road facility. The 2,000 cubic yard TMS stockpile material would be located near the salted sand stockpile. Mr. Talavera will set up his TMS processing equipment near the 2,000 yard

stockpile. It is anticipated that he should begin processing the sand, weather dependent, by mid to late October. Although Mr. Talavera may be processing sand through the month of December there should be an ample supply of TMS material available for your use.

According to Dino, vibrators for the sand spreading trucks are ready to be installed. A pair of vibrators will be installed by Weld Air Alaska on two (2) ADOT & PF sanding trucks. It was agreed you would make arrangements to deliver the trucks to Weld Air Alaska located off Knik Road in Wasilla for installation in their garage. If there are any problems with coordinating this work, please contact Peter Curtis so that we could make other arrangements as necessary.

We appreciate your time and interest in coordinating this work with us. We look forward to continuing working with you on this demonstration project. If there are any questions on this matter, please do not hesitate to call Peter Curtis at 376-3005 in the Mat-Su office or myself at 277-2021.

Sincerely,

GILFILIAN ENGINEERING, INC.

Robert E. Gilfilian, P.E.
President

c: Dino Talavera
Boyd Brownfield, M & O Director, ADOT & PF
Jim Palin, Alaska Science & Technology Foundation
Elliot Levine, Department of Energy

Let

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

CENTRAL REGION - DIVISION OF MAINTENANCE & OPERATIONS

August 30, 1993

4111 AVIATION AVENUE
P.O. BOX 196900
ANCHORAGE, ALASKA 99519-6900
(FAX 243-1512)

Robert P. Gilfilian, PE
Gilfilian Engineering, Inc.
1800 E. Parks Hwy., Suite D-100
Wasilla, AK 99654

Dear Mr. Gilfilian:

In your letter of July 8, 1993, that outlined the proposed "Thermally Modified Sand" project, you mentioned having the experimental test section run along Palmer-Wasilla Highway. The test section would go from Palmer to the Trunk Road.

We would like to propose that a section of Bogard Road be used instead. This section would go from the Trunk Road to Lakeview Road. The length of the two sections is about the same and they are both within a short range of the Palmer maintenance yard.

We prefer Bogard Road because it has enough traffic on it to provide a good test, however, if something goes wrong, the possibility of having serious problems is less. According to our Department of Transportation and Public Facilities Planning section, Bogard has an ADT of up to 6000 vehicles per day where as the Palmer-Wasilla Highway has over 9000 vehicles per day.

Please let us know if you agree with this change.

Sincerely,

K. Chris Kepler, PE
Trans. Maint. Superintendent
MatSu District

cc: Boyd Brownfield, PE, M&O Director, Central Region

KCK/jlm

93093

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

CENTRAL REGION - DIVISION OF MAINTENANCE & OPERATIONS

WALTER J. HICKEL, GOVERNOR

4111 AVIATION AVENUE
P.O. BOX 196900
ANCHORAGE, ALASKA 99519-6900
(FAX 243-1512)

August 16, 1993

Mr. Dino Talavera
President
Thermally Modified Sand, Inc.
P.O. Box 871690
Wasilla, AK 99687

Dear Mr. Talavera:

Signs that you have made saying:

"This Road Is Free of Salt For Ice Control Test"

will be allowed to be erected at the beginning and end of the experimental test section.

Slogans, company names, or any form of outdoor advertising will not be allowed.

I consulted Jim Childers, a DOT/PF traffic engineer in the Central Region office, regarding this sign.

Sincerely,

K. Chris Kepler, PE
MatSu District Superintendent

cc: Boyd Brownfield, M&O Director, Central Region

KCK/srf

Post-It™ brand fax transmittal memo 7671		# of pages > 1	
To	BOB GILFILLAN	From	NIM PALIN
Co.	GEI	Co.	ASTEC
Dept.		Phone #	
Fax #	274-8683	Fax #	

Bob - F.Y.I.
Jim 8/17/93cc: Ann Kampfer
Bob Gilfillan
8/17/93

COW

GILFILIAN ENGINEERING, INC.

Professional Environmental Consultants

Main Office: 255 E. Fireweed Lane, Suite 102, Anchorage, Alaska 99503-2025
(907) 277-2021 • FAX (907) 274-8683

Mat-Su Office: 1800 E. Parks Highway, Suite D-100, Wasilla, Alaska 99654
(907) 376-3005 • FAX (907) 373-5686

August 6, 1993

Mr. Chris Kepler
Transportation Maintenance Superintendant
Alaska Department of Transportation & Public Facilities
Mat-Su District
289 Inner Springer Loop Road
Palmer, Alaska 99645

RE: **TMS DEMONSTRATION PROJECT**
Thermally Modified Sand (TMS) for the Treatment of Icy Roads
GEI Project No. 93093

Dear Chris:

The purpose of this letter is to confirm our understanding of the roles of the various parties involved in the above referenced demonstration project. I would like to express our appreciation for your participation in the meeting held on August 5, 1993 at the offices of the Alaska Science and Technology Foundation (ASTF) in Anchorage, Alaska. The meeting was very beneficial since it provided an opportunity for all parties to discuss the purpose of the TMS Demonstration Project and the means in which the demonstration will be conducted. A copy of this letter will be sent to the individuals who attended the meeting, including a copy for your supervisor, Mr. Boyd Brownfield.

The importance of your Department's role in this project can not be over emphasized. For this reason, it is important to clearly state the arrangements with your Department so that the project can commence as scheduled in the late fall of this year. The following section summarizes the various tasks that will take place at your maintenance facilities in Palmer, Alaska:

1. It is essential the sand used by ADOT&PF for mixing with salt be identical (gradation and type) to that used for the TMS Demonstration Project. The demonstration project will use 2,500 cubic yards of pure sand. The sand will

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be thermally modified by Dino Talavera's TMS Process and placed in two (2) separate stockpiles. The smaller stockpile (approximately 500 cubic yards) will be left undisturbed and used as a test pile throughout the winter season. The second, larger pile (approximately 2,000 cubic yards) will be used for application on the icy roads described below.

According to Dr. John Sibert, it may be possible for ASTF to purchase the ADOT&PF sand with a Reciprocal Services Account (RSA) between the ASTF and ADOT&PF. It is understood the purchase of the sand with a RSA would be reimbursed at a later date when the grant is issued by the Department of Energy (DOE). It is anticipated the DOE grant will be appropriated by October 1, 1993. Mr. Jim Palin of ASTF will be checking on how this purchase agreement can be done.

2. Mr. Dino Talavera will be responsible for thermally processing the 2,500 cubic yards of pure sand at the ADOT&PF maintenance facility in Palmer. Mr. Talavera will mobilize his sand processing equipment (conveyor and fan) to your facility. Mr. Talavera will freeze the sand with his TMS process when the air temperatures fall below freezing. He will also mobilize the necessary equipment, such as a loader and a dozer, for the loading of sand into the conveyor and the stockpiling of the processed sand. However, it may be necessary on occasion to request minor assistance from you for the stockpiling of the sand with the understanding it does not become an inconvenience nor a problem to the operation of your facility.

As explained by Mr. Talavera during the August 5 meeting, it may be necessary during the start of the winter season to process the sand during the late night hours in order to have ideal conditions for the freezing process. Dependent on the extent of the freezing temperatures that are experienced this fall/winter, the sand freezing process may require several days of processing. Regardless of the amount of effort required of Mr. Talavera to process the sand, it is understood that sand from the 2,000 cubic yard stockpile will be available at all times for application to the test sections of icy roads described below. Eventually as the weather permits, Mr. Talavera's processing work should cease and the stockpiled sand consist entirely of TMS material.

3. A pair of vibrator devices will be installed on the sides of the sand storage bins on two of ADOT&PF sand spreading trucks. Mr. Talavera will be responsible for purchasing and installing the electrically operated vibrators. The vibrators will be controlled by a switch mounted on the driver side of the truck cab. The vibrators would be used to loosen the TMS material if it sticks to the sides of the bins which may occur during the wetter times of the winter. Provided it does not become a coordination problem for your road sanding operation, it would be best for the two (2) vibrator mounted trucks be the only vehicles used for the application of the TMS material.
4. Another critical part of this demonstration project relies on the use of a section roadway that remains the same throughout the winter. The road test section would then be compared to a similar road section that had ADOT&PF salted sand applied to it. As discussed during our August 5 meeting, the Palmer/Wasilla Highway appears to be an excellent candidate for this demonstration project. The Palmer end of the highway (approximately 5 to 6 miles) could be used for the exclusive application of the TMS material and the Wasilla half of the highway for the normal salted sand application. Throughout the winter season, the road conditions would be monitored by representatives from Gilfilian Engineering, Inc. (GEI) and Mr. Talavera. It is clearly understood that public safety will not be jeopardized in the event that unforeseen problems occur with the application of the TMS material. At your discretion, this may necessitate the use of salted sand on the TMS test section.
5. The 500 cubic yard stockpile of TMS material will be placed at an isolated location on your facility. The stockpile would remain undisturbed throughout the entire winter season and not be used for roadway application. The stockpile would be monitored by representatives from GEI throughout the winter to evaluate its workability (free-flowing characteristics). Soil samples will be collected from the stockpile and temperature profiles measured in the stockpile on a monthly basis.
6. It is requested that your department maintain a log on the use of the TMS material. The log should record the date of use, section of highway treated, weather conditions, amount of TMS material used and comments on the workability of the stockpile and spreading operation. The workability

information should include a description on the behavior of the TMS material as it is loaded into the sand spreading trucks and applied onto the icy roadways.

Prior to starting up the demonstration project, we would like to have an opportunity to visit your facility and meet with you to go over the details of the work plan as approved by DOE. I expect Mr. Peter Curtis from GEI's Wasilla office and Mr. Dino Talavera to join us at that time so that we can discuss the details for the storage of the TMS material. I will contact you by phone to make the arrangements for the scheduling of this meeting.

In closing, I would like to again express our appreciation for your involvement in this demonstration project. I trust we can coordinate the work activities to minimize the impact on your normal operation. I look forward to working with you on this project and believe the findings will be of great benefit to the State of Alaska.

If you have any questions on this letter of understanding, please do not hesitate to contact me at 277-2021.

Sincerely,

GILFILIAN ENGINEERING, INC.

Robert E. Gilfilian, P.E.
President

c: Dino Talavera, President of TMS, Inc.
Dr. John Sibert, ASTF Executive Director
Jim Palin, ASTF Circuit Rider
Elliott Levine, DOE Inventions Coordinator
Boyd Brownfield, Director of Maintenance & Operations, ADOT&PF

DATE

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4 / 12 / 94

END