

North Pole Refinery Technical Project Team
September 25, 2012
Alaska Department of Environmental Conservation, Fairbanks Office
Fairbanks, Alaska

Technical Project Team Members in Attendance

Dr. Dave Barnes	UAF, Civil and Environmental Engineering, Department Chair
Cindy Christian	DEC, Drinking Water Program, Compliance Program Manager
Ann Farris	DEC, Contaminated Sites Program, Project Manager
Loren Garner	FHRA Project Manager
Mark Gebbia	Williams
Nim Ha	DHSS, Health Educator, DHSS
Ali Hamade	DHSS, Toxicologist (via telecon)
Lee Johnson	DEC, Drinking Water Program
Elizabeth Page	Koch Remediation and Environmental Services, Director
Shannon Price	FHRA, Drinking Water
David Smith	Koch Remediation (via telecon)

Support Personnel in Attendance

Rebecca Andresen	Arcadis
Brian Angerman	Barr Engineering (via telecon)
Dr. Mary Beth Leigh	UAF, Department of Biology and Wildlife, Assistant Professor
Cody Black	ERM/OASIS Environmental
Robert Burgess	DEC, Graduate Intern
Stephanie Buss	SPB Consulting, Toxicologist (via telecon)
Todd Dejournett	Barr Engineering (via telecon)
JoAnn Grady	Grady and Associates, Team Facilitator
Patrick Haas	P.E. Haas and Associates
Brad Koons	Arcadis, Principal Engineer (via telecon)
Kimberly Lake	Johnson and Wright (via telecon)
Michael Lilly	GW Scientific (via telecon)
Johnny Mendez	DEC, Drinking Water Program, Engineer
Meg Mitchell	Environmental Standards (via telecon)
Andrew Ohrt	Arcadis
Jane Paris	ERM/OASIS Environmental
Gary Remple	Barr Engineering (via telecon)
Max Schwenne	ERM/OASIS Environmental, Project Manager
Eric Zentner	Boreal Communications Strategies

DEC Management in Attendance

Steve Bainbridge	DEC, DEC Contaminated Sites Program, Director
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INTRODUCTIONS AND ACTION ITEM REVIEW

The meeting began at 9:00 AM Alaska Time as team members introduced themselves and reviewed the action items from the previous meeting. With regard to Action Item 3, Mr. Garner said that, due to access issues, his team has decided to see if incoming transducer data from project wells are adequate to characterize seasonal variation before attempting to conduct intrusive river stage monitoring. He noted that he would like to continue discussing the issue as the transducer data are compiled. With regard to Action Item 6, Mr. Garner will continue reviewing FHRA's records of the fire retardants used in the Fire Training Area to determine whether they contained PFOS or PFOA. He added that FHR would review documentation of past activities in the Fire Training Area. The team determined that all of the remaining action items had been completed. The team reviewed and approved the agenda for the upcoming meeting.

ACTION ITEM: FHR will review documentation of past activities in the Fire Training Area.

UPDATE ON A RECENT MEETING WITH THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY CONCERNING STATE MANAGEMENT OF THE SITE

Ms. Farris described her recent meeting with representatives of the Environmental Protection Agency's (EPA) Superfund program. She said that the representatives of the EPA reviewed the work of the Technical Project Team (TPT) and that they are in general agreement with the direction in which the TPT is moving and with the level of oversight that has been put in place by state regulators. Ms. Farris remarked that it appears the EPA will not seek to have the site listed under the Superfund program, but rather, they will likely agree to informally (or formally) defer the management of the site to the state. Under such an agreement, the EPA would assign a project manager to the site to act in an advisory role, but they would allow the state to take the lead on the management of its assessment and cleanup. Ms. Farris said that the representatives of the EPA mentioned that their agency may be able to offer technical support to assist the state in its efforts to research the degradation of sulfolane and the possible application of such research in the cleanup of the site. Ms. Farris also discussed that preparing a final cleanup plan by the end of the year would be impossible and identified the following data gaps: fate & transport of downgradient sulfolane, sulfolane degradation pathway, the amount of sulfolane degradation downgradient, new source areas: the wash skid and fire training area, and the onsite remediation scope.

THE SITE CHARACTERIZATION SUBGROUP

Ms. Paris gave a brief overview of the recent meetings of the LNAPL (light non-aqueous phase liquids) and Groundwater Working Groups. She explained that the LNAPL working group conducted three meetings to identify existing data gaps in the characterization of LNAPL contamination at the site. Filling the data gaps was identified by the Alaska Department of Environmental Conservation (ADEC) team as being important to the evaluation of potential remedial alternatives for LNAPL contamination. The outcome of the LNAPL working groups was to discuss technical topics in depth and identify areas of

agreement and impasse concerning the objectives and techniques of the proposed remediation efforts. Ms. Paris clarified that the data gaps and areas of impasse identified by the working group would later be addressed by ADEC management.

Ms. Paris said that while the members of the working group generally agreed that the LNAPL contamination at the site area must be further delineated, there were a number of outstanding questions and areas of impasse regarding the contamination. Ms. Paris specified that the outstanding issues and areas of impasse include questions of whether the LNAPL contamination is significantly contributing to the sulfolane plume, whether it will be necessary to complete a mass estimate of the LNAPL contamination, and the extent to which additional characterization and remediation of the LNAPL is necessary in the short to intermediate timeframe.

The team discussed Mr. Paris' summary of the working group meetings. Mr. Garner stated that FHRA believes that the suitability of the timeframe for remediation and additional characterization is a matter of policy decision and thus it falls outside of the purview of the working groups. He suggested that several of the characterization and remediation techniques for LNAPL could significantly interfere with the operations at the refinery and he cautioned the team against making far reaching decisions before the properties of the LNAPL at the site and applicability of the proposed remediation technologies are adequately understood. He pointed out that several investigations are currently underway to provide more information in these areas and he advised the team to consider the timeframe for these investigations when considering the timeframe for making decisions regarding the remediation efforts.

The team engaged in a more general discussion on the long-term goals for the site cleanup. Ms. Farris remarked that while most of the remediation efforts at the site have been devoted to risk management, the ADEC regulations will require additional cleanup efforts beyond those related to risk management for the long-term, site-wide goals. ADEC will seek to have the approach to LNAPL remediation included in the Compliance Order and, to some extent, the Feasibility Study (FS). She agreed that the approach to LNAPL remediation will have to take into account the properties of the potential remediation technologies, the limitations associated with on-site infrastructure, and various points of consideration to be made in determining whether a given timeframe is reasonable. She acknowledged that some aspects of the approach may be revisited as more detailed information becomes available.

Meg Michelle of Environmental Standards requested to reduce the data validation packages from Level IV to Level II for most samples, with level IV validation only required for samples with interference or calibration issues. DECs Earl Crapps will review the request and get back to the group.

Ms. Paris finished her update on the LNAPL working group by briefly reviewing the group's discussion of issues related to soil gas. She said that the group discussed soil gas issues that pertain to both human health risk and safety concerns and site remediation goals. The team disagreed about the need for soil gas data to address the potential risk associated with vapor intrusion. The group also discussed whether it will be necessary to evaluate soil gas in the vadose zone in order to evaluate the efficacy of potential treatment technologies.

THE GROUND WATER WORKING GROUP

Ms. Paris continued her presentation and updated the team on the recent meetings of the Ground Water working group. Ms. Paris said that the working group discussed whether the results of the ongoing air sparge studies and recent hydropunch sampling have addressed various data gaps identified for impacted ground water at the site. After reviewing the results of recent hydropunch sampling, the group identified outstanding questions concerning the presence of sulfolane in the ground water below 50 feet Below Ground Surface (BGS) and with results from certain areas that indicate that the concentrations of sulfolane and benzene, toluene, ethyl benzene, and xylenes (BTEX) may not be decreasing with depth. She added that the team noted and discussed results that seem to indicate that the leading edge of the BTEX plume appears to be forked. Ms. Paris commented that some team members suggested that ground water monitoring wells be placed in certain areas in the vicinity and upgradient of the Wash Pad Area and Fire Training Area.

Ms. Paris reviewed the working group's discussions on the ongoing air sparge pilot testing. The main question in the discussions was whether the specific flow rates observed in the relatively shallow area of the application of the pilot system could be effectively applied to the deeper depths where sulfolane contamination has been found. More generally, the team discussed whether certain design parameters for the onsite air sparge treatment must be in the Feasibility Study (FS) to satisfy ADEC's requirements that the proposed remediation system be productive and effective.

Ms. Paris said the working group discussed FHRA's alternative proposals for Remedial Action Objectives (RAOs) and Operable Units (OUs) for the project area but could not reconcile the RAOs and OUs that were proposed by FHRA with those proposed by ADEC's contractors. The team agreed to forward the points of impasse on the issue to ADEC's management for their decisions.

THE FIRE TRAINING AREA

The team discussed the scope of an investigation outlined in a project Work Plan to address the possibility that the Fire Training Area may have been contaminated by the use of fire retardants containing perfluorosulfonate (PFOS) and perfluorocarboxylate (PFOA) compounds. The team agreed that the investigation should proceed in a phased fashion in which additional steps would be evaluated at the conclusion of each phase. Mr. Hass and Ms. Farris remarked that the approach outlined in the Work Plan should be regarded as the first phase in the investigation and that it should be augmented by additional wells and the use of an expanded analyte list. Mr. Haas further suggested that the investigators should take grab samples from direct push hydropunch borings from the northern and western edges of the Fire Training Area to determine the presence or absence of contaminants.

ACTION ITEM: Ms. Farris will coordinate a meeting with the Chemistry subgroup to discuss issues related to the certification process of lab procedures associated with the analysis of PFOS and PFOA.

ACTION ITEM: Ms. Farris will send her comments to Loren and give FHRA a chance to look at the scope and the timing to resolve general issues related to the work plan for the Fire Training Area.

ACTION ITEM: Ms. Buss will schedule a subgroup to discuss the analytical methods associated with the work plan for the Fire Training Area.

THE BIODEGRADATION SUBGROUP

Dr. Leigh updated the team on recent developments within the Biodegradation subgroup. She said that studies being carried out at the University of Alaska at Fairbanks (UAF) have provided some evidence that sulfolane-degrading bacteria may be present throughout the plume. Ms. Leigh said that researchers at the University of Oklahoma (OU) are developing Compound-Specific Isotope Analysis (CSIA) methodology for sulfolane.

Dr. Leigh explained that UAF researchers have isolated 22 strains of organisms which appear to be sulfolane degraders based on their ability to survive on agar plates with sulfolane as a sole carbon source. These organisms were isolated from ground water samples from Monitoring Wells 110, 130, the Air Sparge Pilot Test Network, and the Granulated Activated Carbon (GAC) filters from the residential point of entry (POE) treatment systems. Dr. Leigh said that while the agar tests provide strong evidence that the organisms are sulfolane degraders; the researchers will continue to culture them to be certain that this is the case. Specifically, these organisms will be grown in liquid culture with sulfolane as the sole carbon source. The researchers are in the process of sequencing the DNA of the isolates and have thus far identified a few known species of sulfolane degraders which include *Variovorax*, a species that has been studied in a sulfolane plume in Alberta, Canada. Cultures of the Alberta isolates have been sent to UAF for comparative studies. She added that the sequencing has also revealed that some of the isolates belong to genera that are known to be sulfolane degraders. Dr. Leigh said the researchers will perform additional experiments on these strains to determine how they degrade sulfolane, how they act at different temperatures, and how they compare to other, previously studied strains.

UAF researchers will start microcosm incubations with soil and groundwater samples taken from soil bore holes at the project site. The soil will be mixed with groundwater to make slurries to which additional sulfolane will be added. Different microcosms will be incubated aerobically or anaerobically at room temperature or at 4°C. Sulfolane concentration will be monitored over time to measure degradation rates in different conditions. Sterile controls (autoclaved and poisoned) will also be analyzed over the same time series to determine if biotic or abiotic degradation occurs in aerobic and anaerobic conditions and at different temperatures. These incubations will also be analyzed for potential intermediates of sulfolane degradation. The researchers will conduct additional tests to determine whether the degradation is limited by the availability of certain nutrients or ranges of temperature. Dr. Leigh said that she hopes that the analysis of soil samples will be completed by May 2013.

Dr. Leigh said since the vast majority of microorganisms cannot be cultured in a lab, it is very likely that the cultured isolates only represent a very small portion of the sulfolane degrading organisms that are present in the plume area. The UAF researchers will use DNA stable isotope probing (SIP) methods to acquire the 16S gene sequences of unculturable sulfolane degraders which will allow them to determine

the identity of the broader range of sulfolane degrading bacteria and to give insight into the various environmental factors that control their populations. Dr. Leigh said she hopes that these efforts will be completed by December 2013.

AIR SPARGE PILOT TEST UPDATE

Mr. Angerman updated the team on the status of the Air Sparge Pilot Test. He reiterated that the main objective of the pilot testing is to determine whether injecting air into the aquifer would create the same set of iron-oxidation and sulfolane destruction reactions that were observed earlier in the Gallery Pond and to determine the extent to which this technique can be applied in situ within the affected area. Mr. Angerman remarked that his team believes that the pilot testing that has been conducted to date has demonstrated that the aforementioned reaction and its consequent sulfolane destruction can be induced through air injection. He added that the ongoing objectives of the test are to determine the optimal operating conditions for the system to maintain sulfolane removal and to minimize or eliminate problems such as short circuiting and aquifer plugging.

Mr. Angerman presented a series of slides showing the location and layout of the Air Sparge Network. He briefly summarized various control measures, such as altering the flow rate of the system and operating a pulsed and continuously operating line, that were applied to determine their effect on the efficacy of the system. He said that, based on these results, his team concluded that pulsed operation was not necessary for sulfolane removal, but it may provide some benefits to the system with regard to its hydraulic components and its energy consumption. Mr. Angerman added that his team did not observe aquifer fouling or short circuiting while operating the system within the flow rates used during the testing period.

Mr. Angerman presented a series of graphs showing the concentration of sulfolane, the concentration of dissolved oxygen, and the ground water levels that were measured near each of the sparge points throughout the testing period. He pointed out that the concentration of sulfolane decreased in each monitoring well in the pilot test area during active operation. There appears to be a correlation between the rate of sulfolane removal and increased dissolved oxygen concentrations. Sulfolane concentration fluctuations measured in the upgradient well (AS-MW-8) are generally attributable to changes in the water level and dissolved oxygen concentrations from snow melt and heavy rainfall events.

Mr. Angerman said that his team has been performing a Tentatively Identified Compound (TIC) scan each week to determine whether there are persistent chemical intermediates that have resulted from the degradation of sulfolane. Mr. Angerman said that, to date, his team has not detected any intermediates that were identified in the earlier bench testing. He added that his team is currently reviewing additional data from the TIC scans and that it hopes to soon provide additional information on them to the subgroups and the working groups. The team discussed how it would coordinate its efforts to identify degradation intermediates. The team agreed to take up further discussion of the issue during upcoming subgroup meetings.

ACTION ITEM: Ms. Buss will schedule an auxiliary meeting of the biodegradation subgroup to discuss how to coordinate the team's efforts to identify potential degradation intermediates of sulfolane.

FIELD WORK UPDATE

Mr. Ohrt updated the team on the status of various field activities that were conducted during the 2012 field season. He reviewed the number of hydropunch, Laser Induced Fluorescence (LIF), and soil boring samples that were collected over the summer and pointed out the general areas from which they were taken. Mr. Ohrt reviewed the number and locations of the proposed monitoring wells that had been installed in the on-site and off-site areas. He noted instances when proposed samples could not be obtained, nor proposed wells installed, due to permafrost or complications associated with existing utilities. Mr. Ohrt said that 66 of the 69 pressure transducers that were proposed in the project work plan have been installed. He pointed out the location of an additional transducer that was added and the locations of frozen wells where transducers could not be installed. Mr. Ohrt briefly reviewed the results of water and soil samples that were collected during the month of August. He made a specific note of the results of additional sampling that was recently performed in and about Lagoon B to augment the work plan.

Mr. Ohrt updated on the status of various field efforts that are associated with the ongoing biostudies. He said that his team is currently evaluating the results of samples that were taken from ground water wells and from various points in the Pilot Study Network and the Groundwater Extraction Unit. Mr. Ohrt said that his team is in the process of recovering the seven biotrap that have been deployed. He added that his team is waiting on the results of a biomass analysis to see whether the samples will yield a sufficient amount of biomass.

THE DRINKING WATER SUBGROUP

Ms. Christian, Mr. Mendez, and Mr. Price updated the team on recent developments within the Drinking Water subgroup. Mr. Price said that, to date, FHRA has identified approximately 300 commercial and residential properties that have had sulfolane detections. Of the 300, 265 property owners have opted for a permanent water solution. Among the remaining property owners, eight are scheduled to have their systems installed this year and the others are either still deciding on a permanent solution or residences are vacant. Mr. Price said that there are 33 remaining properties that have not selected a long-term alternative water supply but have been provided bottled water in the interim.

Mr. Mendez gave a brief update on recent efforts to certify three federally regulated water systems that have recently been installed in the project area. Mr. Mendez said that although the plan review process for the installation of two of these systems is still underway at ADEC, samples taken from the one installed system indicate that it is working and sample results have been ND for sulfolane. Ms. Christian said that ADEC is currently working to establish ways of automatically tracking the data from the systems as it is submitted from the analytical labs to the state and federal drinking water databases. She explained that this would also allow ADEC to automatically be informed in the event of a lapse of compliance with the sampling schedule that has been set forth for the systems. Ms. Christian briefly transitioned to an update on the results of the latest samples that have been taken from the City of North Pole's new municipal wells. She said that sulfolane was not detected in the latest samples, nor has it been detected in any of the samples that have been taken since the wells went into production.

FUTURE MEETINGS

The team discussed the schedule for its upcoming meetings. The team agreed to hold the next meeting on October 30th, 2012 at the ADEC office in Fairbanks, Alaska. The team tentatively agreed to hold the following meeting on December 4th but that has subsequently been changed to January 8th, and will be held at the DEC offices in Fairbanks.

The meeting adjourned at 3:25 PM Alaska Time.