

Follow-Up Safety Evaluation of the General Chemical- Richmond Works Facility



Public Draft Report to:

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December 10, 2003

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Executive Summary

The Executive Summary provides a brief overview of the follow-up safety evaluation as well as a summary of the actions that have been taken by General Chemical-Richmond Works (GCRW) to address the major findings and recommendations from the initial safety evaluation. The reader is encouraged to review the entire report to gain a better understanding of the progress GCRW has made in addressing all of the findings and recommendations.

Background

An initial safety evaluation was conducted at the GCRW facility in Richmond, California, from October 7–11, 2002, at the request of the Contra Costa Health Services (CCHS) and the City of Richmond.

The objectives of the Safety Evaluation were to complete a thorough evaluation of the current management practices and safety culture at the GCRW facility. The focus of the evaluation was on the safety management systems, human factors, and safety culture.

The scope of work for this assignment was developed by an ad hoc safety evaluation committee, with representatives from CCHS, the City of Richmond, General Chemical, the General Chemical employee union, the Hazardous Materials Commission, and the public. The evaluation was not intended as a compliance audit, and as such, the initial safety evaluation report was not meant to imply legal certification of compliance or noncompliance with safety regulations. Rather, the evaluation was intended to evaluate the GCRW safety management systems in relation to industry practices and to identify potential deficiencies.

The safety evaluation identified 54 findings. For each finding, recommendations were developed to address the deficiency. All of the recommendations were intended to provide a way to achieve safety performance improvement. The recommendations were prioritized based on the degree of risk associated with the finding. Marine Research Specialists (MRS) presented the report "*Safety Evaluation of the General Chemical Richmond Works Facility*" to the Contra Costa County Board of Supervisors and the Richmond City Council on January 14, 2003.

Scope and Approach to the Follow-up Safety Evaluation

The scope of the follow-up safety evaluation included four major tasks.

- Review and Comment on the General Chemical Action Plan
- Review the Implementation of the Action Plan
- Follow-up Evaluation
- Public Participation

The first two tasks were conducted during the months of February through October 2003. During this period the MRS team reviewed and commented on the GCRW Action Plan as well as three quarterly reports that were prepared by GCRW documenting the progress on various action items.

The follow-up safety evaluation involved two parts. The first was to conduct a safety climate survey using the same survey form from the initial evaluation. The survey was conducted in October 2003. The second part of the evaluation was the onsite work that was conducted at the General Chemical Richmond Works facility in Richmond, California from November 10-14, 2003.

The objectives of the follow-up evaluation were to:

- Review the actions GCRW has taken in addressing the findings and recommendations from the initial safety evaluation.
- Determine if these actions were adequate to address the findings and recommendations from the initial safety evaluation.
- Suggest further actions GCRW could take to enhance the effectiveness of their Action Plan.
- Conduct a follow-up safety evaluation that is trusted and considered credible by the public and other key stakeholders.

The follow-up evaluation was designed and implemented in a manner intended to be impartial and objective. The onsite evaluation was conducted using a team of safety professionals working at the GCRW over a period of one-week beginning November 10, 2003. During the onsite evaluation, the team conducted more than 30 interviews with individuals and groups, and reviewed over 100 documents that had been generated or modified as a result of GCRW's Action Plan. In addition, the evaluation team received a number of presentations from the GCRW facility staff on the status of various safety related projects being undertaken by the facility. These included topics such as training, security, the distributed control system, mechanical integrity, etc.

Our review of the actions taken by GCRW was based on evidence gathered during the follow-up evaluation. This evidence was obtained from interviews with key people involved in the development and implementation of the respective action items, review of documents, and limited physical observations.

A four-step approach was used to assess the progress GCRW has made in addressing the recommendations.

1. Based on the interviews, document reviews, and inspection, a summary was developed that described the actions taken by GCRW to address each of the recommendations.
2. The evaluation team then determined if the actions taken by GCRW met the intent of the recommendation, and if the action items had been implemented.
3. The implementation status was determined for each recommendation.

4. Recommended further actions were developed as needed. In addition, suggestions were made for GCRW to consider as steps for continuous improvement.

Since cultural change is an ongoing aspect of continuous improvement, the actions taken by GCRW in response to many of the safety evaluation findings are never truly “complete,” so it is inappropriate to conclude that an action item is “closed” or not. GCRW’s approach has been to use the term “implemented” to indicate that a critical milestone has been met in the implementation effort. In the follow-up evaluation, we evaluated the process used to implement each action item, and we made an assessment of how effective the implemented action item appears to be based on the results of our interviews and review of documents.

Conclusions

There have been many impressive accomplishments and improvements to the GCRW safety programs during the last year. GCRW has addressed all 54 findings from the initial safety evaluation, and they have made excellent progress in working towards a more positive safety culture. In many ways, GCRW’s commitment to this process has been exemplary. In particular, there has been a very positive change in safety culture. The change was very evident from the onsite interviews and from the various program documents that were shared with the evaluation team. Some of the initiatives that have contributed to this change are as follows:

- A safety visioning process which involved a wide cross section of employees.
- A revamped near miss reporting program.
- A new safety suggestion program.
- A new employee safety rewards program.
- A new employee recognition program.
- Improvements to way in which the Health and Safety Council meetings are used to communicate safety issues to the employees.
- Visits offsite that allow workers to share experiences with other workers in the local area and at other General Chemical locations.
- A training summit to review all training needs and training delivery alternatives,
- Pilot testing of the full versions of the Maximo maintenance management system, and the appointment of a new maintenance planner.
- The ongoing process to design and install a new Distributed Control System (DCS) at the plant.

In these initiatives, the common themes have been an open invitation to all employees to participate in the development process, to consider workers’ opinions, and to emphasize collaboration between hourly and salaried employees.

There are still a number of challenges facing GCRW before the values expressed in their own Safety Vision are met. Some of these challenges are summarized below:

- There is an imperative need to “win over” all employees to the new Safety Vision and to have a higher level of participation in the GCRW safety initiatives. Some workers still have resistance to this change and are reluctant to get involved. This reluctance is not uncommon when a major change like this is instituted at a facility, and it takes time for all staff to become aligned with the new initiative.
- For some workers, there is a lingering distrust of management. This perspective is understandable, given the style of management and the inconsistent leadership in the past.
- Even though workers are being given opportunities to share their ideas on safety (e.g., safety suggestion program and communications meetings), there is a perception among some workers that management does not listen to them. Some are unwilling to risk being blamed (e.g., for near misses), some doubt that management will really act on their safety suggestions if the solutions are expected to be complex or costly, and some lack confidence that their ideas are worthy of consideration.
- Some workers still perceive that disciplinary action is not always based on actual events. They sense that managers do not listen to their positions, and disciplinary actions are not always based on fact. There is some uncertainty with workers about the steps in the disciplinary process, and the time steps involved for follow-up.
- In Operations, there are some limited personality conflicts that continue to adversely affect the morale of the group and the ability of Operations to function well as one team.
- Some workers argue that the Maintenance Department is understaffed to complete the high volume of work orders that is currently being generated.
- Even though there is help available, some Operators with minimal experience expressed a lack of confidence when working at night on non-routine tasks. They understand that working safely is the priority, but they are also aware of the need to complete their tasks in a timely manner.

The challenges listed above are not unexpected after one year of working to improve safety culture at the plant. It can take a number of years to get all the employees aligned with the safety vision and to achieve the desired safety culture. GCRW has made tremendous progress at the plant over the past year. If they continue with this degree of diligence, there is a very high likelihood they will achieve the goals of their safety vision and create a positive safety culture throughout the organization.

The results section of this report includes a number of suggestions for further improvement. If implemented, these suggestions will likely help to address the issues discussed above. It should be noted, however, that MRS considers that GCRW has met their commitments in addressing the findings of the initial Safety Evaluation (January, 2003), so the suggestions for further improvement are for GCRW’s consideration only. They are not required to be implemented as part of this follow-up evaluation.

Whether or not the suggestions for further improvement are implemented, there will be a need for GCRW to demonstrate an on-going commitment to their safety initiatives to sustain the positive advances in safety culture that they have achieved over the past year. The ultimate success of this effort will be reflected in the extent to which the safety culture continues to improve over time and the extent to which GCRW can achieve their goal “to prevent all injuries, accidents, and incidents and to generate a positive impact in the community”.

I. Introduction

This section of the report discusses the objectives of the follow-up safety evaluation, presents some background information on the initial safety evaluation, and provides the reader with an overview on the format of the report.

A. Background

Because of incidents that have occurred at the General Chemical-Richmond Works (GCRW) facility, the communities surrounding the facility, the Richmond City Council, the Contra Costa County Board of Supervisors, and the Contra Costa Health Services (CCHS) are concerned about safety at the facility. In response to these incidents, the Richmond City Council and CCHS arranged for a third party safety evaluation to be performed on this facility.

A Safety Evaluation Oversight Committee was formed that included representatives from CCHS, the City of Richmond, General Chemical, the General Chemical employee union, Hazardous Materials Commission, and the public. This committee solicited bids from a number of consulting firms to conduct the third party safety evaluation. The committee selected MRS to conduct the evaluation.

The initial Marine Research Specialists (MRS) safety evaluation was conducted at the GCRW facility in Richmond, California from October 7–11, 2002. The final safety evaluation report was issued on January 6, 2003.

The objectives of the Safety Evaluation were to complete a thorough evaluation of the current management practices and safety culture at the GCRW facility. The focus of the evaluation was on the safety management systems, human factors, and safety culture.

The scope of work for this assignment was developed by the Safety Evaluation Oversight Committee. The evaluation was not intended as a compliance audit, and as such, the initial safety evaluation report was not meant to imply legal certification of compliance or noncompliance with safety regulations. Rather, the evaluation was intended to evaluate the GCRW safety management systems in relation to industry practices and to identify potential deficiencies.

The safety evaluation identified 54 findings. For each finding, recommendations were developed to address the deficiency. The recommendations were intended to provide a way to achieve safety performance improvement. The recommendations were prioritized based on the degree of risk associated with the finding.

MRS presented the report "*Safety Evaluation of the General Chemical Richmond Works Facility*" to the Contra Costa County Board of Supervisors and the Richmond City Council on January 14, 2003. At both the Board of Supervisors and City Council meetings covering the initial safety evaluation, the issue of an onsite follow-up evaluation was discussed. It was

decided that the Oversight Committee would meet to determine the type and extent of any follow-up evaluation.

The Oversight Committee determined that a follow-up evaluation should be performed by MRS, and that the objectives would be as follows.

1. To assess the actions that are being taken by GCRW to determine if they are addressing the findings and recommendations from the Safety Evaluation Report dated January 6, 2003.
2. To determine the changes in the overall Safety Culture at the GCRW facility and if any trends in the Safety Culture can be determined.

The Oversight Committee developed a scope of work for the follow-up safety evaluation that would meet the objectives listed above. A copy of the scope of work developed by the Oversight Committee is included as Appendix A.

As part of the onsite follow-up evaluation, MRS has reviewed and commented on the GCRW Action Plan. In addition, MRS has been reviewing and commenting on the quarterly progress reports prepared by GCRW. Appendix B contains copies of the MRS comment letters on the GCRW Action Plan and quarterly progress reports reviewed to date.

B. Objectives

This report summarizes the results of the follow-up safety evaluation conducted by MRS at the GCRW facility in Richmond, California, at the request of Contra Costa Health Services and the City of Richmond. The objectives of the follow-up evaluation were to:

- Review the actions GCRW has taken in addressing the findings and recommendations from the initial safety evaluation.
- Determine if these actions were adequate to address the findings and recommendations from the initial safety evaluation.
- Suggest further actions GCRW could take to enhance the effectiveness of their Action Plan.
- Conduct a follow-up safety evaluation that is trusted and considered credible by the public and other key stakeholders.

The initial and follow-up safety evaluations were not intended as a compliance audit, and as such, this report is not meant to imply legal certification of compliance or noncompliance with safety regulations. The intent of the follow-up safety evaluation was to review the actions that GCRW has taken to implement the initial safety evaluation recommendations.

C. Report Format

Section II of the report describes the scope and approach for the follow-up evaluation. Section III presents the follow-up evaluation findings. The findings are presented in a text table, which provides the text of each finding from the initial safety evaluation, a description of the actions taken by GCRW to address the finding, the implementation status, and a set of comments and suggested follow-up actions. Section IV presents the overall conclusions from the follow-up evaluation.

The report contains a number of Appendices that include the following:

- A. The Oversight Committee Scope of Work for the Follow-up Evaluation.
- B. The MRS comment letters on the General Chemical Action Plan and Quarterly Reports.
- C. A listing of the initial safety evaluation findings and recommendations.
- D. The initial safety study scope of work.

II. Scope and Approach

This section presents the scope and approach for the follow-up safety evaluation.

A. Scope

The scope of work for the follow-up evaluation is composed of four separate tasks. Each of the tasks is described below.

Review and Comment on General Chemical Action Plan – MRS reviewed and commented on the GCRW Action Plan developed to address the recommendations and findings from the initial safety evaluation. Appendix B contains a copy of the MRS comments on the Action Plan.

Review the Implementation of the Action Plan – MRS reviewed and commented on GCRW's quarterly progress reports that provided a detailed status on the implementation of the action items. Appendix B contains a copy of the MRS comments on the first three quarterly progress reports.

Follow-up Evaluation – MRS conducted a follow-up evaluation to determine how GCRW was addressing the findings and recommendations from the initial safety evaluation and to evaluate if the actions taken by GCRW were addressing the findings and recommendations. The follow-up evaluation was conducted in two parts. The first part was to conduct a safety culture survey, which took place in October 2003. The second part was the onsite evaluation, which took place in November 2003. The onsite portion of the follow-up evaluation involved reviewing documents, conducting interviews, and limited site inspections.

Public Participation – Public participation is a key element of the follow-up safety evaluation scope. The public participation steps include:

- The issuance of a draft work plan for the follow-up evaluation for public comment, which occurred in October 2003.
- The issuance of a draft follow-up evaluation report for a 30-day public comment period.
- Meetings with the Contra Costa County Board of Supervisors and the Richmond City Council to present the final follow-up evaluation report. This hearing should occur in February 2003.

B. Approach

There were two main steps to the follow-up evaluation, which are discussed below.

Safety Climate Survey

MRS conducted a Safety Climate Survey prior to the onsite follow-up evaluation. The survey was distributed to all employees at the GCRW facility, to selected contractors, and to those managers at the corporate level with responsibilities for safety at the GCRW facility. The survey was used to obtain an initial perspective of people's views and perceptions on key aspects of health and safety in the GCRW organization as it exists today. It included questions based on the Health and Safety Climate Survey Tool developed by the UK HSE Assessment Tool. The survey was the same as was used as part of the initial safety evaluation.

The survey was administered in a way that protects the anonymity of the respondents and the confidentiality of the information provided. MRS provided a stamped, addressed envelope with each form distributed to allow the completed form to be sent directly to MRS (an independent consultant) in a sealed envelope. All the individual results from the survey were kept in confidence and not shared with any party outside of MRS.

The Safety Climate Survey offered several advantages for the onsite follow-up safety evaluation; which included:

- Allowing MRS to determine how the perceptions of the safety culture may have changed since the first survey, which was conducted prior to the initial safety evaluation in September 2002.
- Providing a convenient way of soliciting input from a wider range of people (onsite and offsite) than could be achieved with interviews and focus groups alone.
- Providing anonymity. With the small number of employees at this facility, workers may be concerned about the evaluation team's ability to preserve anonymity with the interview process. This anonymity may help to alleviate this concern during the initial phase of the follow-up evaluation.
- Providing the evaluation team with an opportunity to review safety concerns and perceptions identified in the survey prior to their onsite work. This review helped the team to plan more effectively, and target key issues.

Onsite Follow-up Evaluation

One of the main purposes of the onsite follow-up evaluation was to determine how GCRW was addressing the findings and recommendations from the initial evaluation and to report on the progress that was being made in addressing these findings and recommendations.

Reviews of the actions taken by GCRW were based on evidence gathered during the onsite follow-up safety evaluation. This evidence was obtained from interviews with key people involved in the development and implementation of the respective action items, review of documents, and limited physical observations.

A four-step approach was used to assess the progress GCRW had made in addressing the findings and recommendations.

1. Based on the interviews, document reviews, and inspection, a summary was developed that described the actions taken by GCRW to address each of the findings/recommendations.
2. The evaluation team then determined if the actions taken by GCRW met the intent of the finding/recommendation, and if the action items had been implemented.
3. The implementation status was then determined for each findings/recommendation.
4. Recommended further actions were developed as needed.

The approach taken by GCRW to address the MRS recommendations was to develop a series of Action Items intended to address the recommendations and the underlying findings. Since cultural change is an ongoing aspect of continuous improvement, the actions taken by GCRW in response to the safety culture findings are never truly “complete,” so it is inappropriate to conclude that an action item is “closed” or not. GCRW’s approach has been to use the term “implemented” to indicate that a critical milestone has been met in the implementation effort. In the follow-up evaluation, we evaluated the process used to implement each action item, and we made an assessment of how effective the implemented action item appears to be based on the results of our interviews and review of documents.

We consider this to be an appropriate way of designating sufficient progress. Our determination of the critical milestone is based on the issue of whether the program is sustainable from that point. For example, in terms of the near miss reporting program, we agree that a critical milestone has been reached when the program has been developed, employees have been trained, near misses are being reported, and management is acting on the information. The real benefit of this program is achieved later when all employees are participating in the process, but after the program is rolled-out, it is reasonable to conclude that the critical milestone has been met.

The other purpose of the onsite follow-up evaluation was to assess the overall culture at GCRW and determine if any trends in the safety culture can be identified. To address this issue, the evaluation conducted an extensive series of employee interviews, using the results of the safety climate survey to focus in on key issues. Information obtained from these interviews was used together with a review of applicable documents provided by GCRW to make an assessment of the present culture compared with that observed a year ago.

III. Follow-up Safety Evaluation Findings

The findings in this section are presented separately for safety management systems, human factors, and safety culture, consistent with the initial safety evaluation. The findings provide a discussion of the actions GCRW has taken to address each of the recommendations from the initial safety evaluation. The findings are based on evidence gathered during the follow-up safety evaluation. This evidence was obtained from interviews with key people involved in the development and implementation of the respective actions, interviews of other people throughout the refinery organization, review of documents, and limited physical observations.

In addition GCRW gave a number of presentations to the evaluation team that addressed areas where they had implemented significant programs to address various aspects of safety at the plant. The presentation topics included the following.

- The Safety Vision for the plant
- Training
- Cognitive Task Analysis
- Distributed Control System
- Initial Safety Evaluation Action Item Documentation
- Quarterly Progress Reports
- Security
- Turnaround Planning
- Mechanical Integrity Program
- Supplemental Back-up Data on the Initial Safety Evaluation Action Items

The remainder of this section provides some general discussion on the findings of the follow-up safety evaluation. At the end of the section is a text table that presents the initial safety evaluation findings, a summary of the actions taken by GCRW to address the findings, the implementation status, as determined by the MRS team, and a set of comments and suggestions for further improvement.

A. Safety Management Systems

The evaluation of the safety management systems was not intended as a compliance audit, and as such, this report is not meant to imply legal certification of compliance or noncompliance with safety regulations. Rather, the evaluation was intended to evaluate the GCRW facility safety management systems in relation to industry practices and to identify potential deficiencies. The emphasis was to evaluate the safety management systems in place to prevent incidents that could impact workers and the community.

Safety management systems are the policies, procedures and practices that a facility uses to ensure that the facility is operated in a safe manner and to ensure that process related incidents are minimized to the maximum extent feasible.

During the initial safety evaluation, the GCRW facility was found to have a written set of safety management systems in place. The facility has done a considerable amount of work on the safety management procedures over the past 3 years. They had updated the majority of the procedures

including the operating procedures, the incident investigation procedures, portions of the emergency response manual, as well as the management of change (MOC) procedure.

The facility had a written process hazards analysis (PHA) procedure, and all of the PHAs had been revalidated. As part of this revalidation process the facility had conducted a human factors and facility siting assessment.

GCRW has taken a number of significant actions to address the finding related to safety management systems, which include the following.

- Incident investigation training was provided to all supervisors at the plant. As part of the training the supervisors learned the Power Analysis method, which is a tool for identifying root causes. A review of a number of incident investigations shows that root causes were being identified. In addition, the number of incident investigations conducted at the plant has increase substantially. This was due to the large increase in the number of near misses reported.
- GCRW has implemented annual emergency response and emergency evacuation drills. Emergency response and emergency evacuation drills were conducted in 2002 and drills are planned for the end of November 2003. GCRW conducted critiques of drills which lead to a number of action items that have been implemented.
- GCRW has implemented a program to ensure that all policy and procedure changes that affect safety are handled through the MOC process. This includes any changes to the Emergency Response Manual.
- GCRW is in the process of upgrading and expanding the Maximo system, which is used to track work orders at the facility. When fully implemented, the expanded Maximo system will allow GCRW to better track maintenance activities and will serve as the data base system for the mechanical integrity program.
- While mechanical integrity was not part of the initial safety evaluation scope, it is important to note that GCRW has made significant progress on updating their mechanical integrity program. Significant work has been done in updating and verifying all of the process safety information, inspections and repairs have been completed to all of the electrical systems, and work is ongoing on various elements of the predictive maintenance program such as vibration analysis for rotating equipment.

The initial safety evaluation found that the plant had well-documented safety management systems that were, for the most part, being implemented. The follow-up safety evaluation found that GCRW had made improvements to a number of their safety management systems and had developed processes to ensure that these systems were being fully implemented.

B. Human Factors

Human factors engineering is a multidisciplinary practice that seeks to promote safety through more effective design of sociotechnical systems (i.e., systems that are comprised of complex interactions between people and technology). Its primary focus is the effect of human-machine interactions on safe work performance. However, human factors also include related issues such as training, teamwork and team performance, and the effect of fatigue, workload, and stress on worker performance.

As part of the initial safety culture evaluation, effort was devoted to examining human factors issues related to safe work practices. The human factor issues identified as part of the initial safety evaluation focused on the design of control room displays and alarm systems, training, and teamwork among the Operators.

In the area of design of the control room displays and alarms, GCRW is in the process of completing the design of a new Distributed Control System (DCS). The current plan is to have the new DCS system in place within the next 12 to 18 months. GCRW's commitment to a DCS is a clear indication of how seriously they are taking the issues associated safety culture. This is one of many cases where GCRW went beyond what was the recommendation in the initial safety evaluation to further improve the safety and operability of the plant. GCRW used a "best management practice" in developing the design of the DCS. They conducted a cognitive task analysis (CTA) that involved extensive input from the Operators to identify need alarms and their priority. The CTA also was used to develop a control room layout as well as preliminary operating screens for the DCS.

GCRW has implemented a process to review and update all of the training programs at the plant. As part of the training improvement program, a training summit was held that included both salary and hourly staff. The main objectives of the summit were to look at the existing training programs and identify how they could be enhanced and improved. The summit was used to identify the needed training programs, the essential elements of the training programs, and a rating of the effectiveness of the existing training programs. Some of the key elements of a training program that were identified as part of the summit included a method for providing feedback on the training, a means of measuring effectiveness of the training, and assuring that the training programs included both theory as well as hands-on training elements. A training summit steering committee has been established to track progress on the development of the training programs. A schedule has been developed for completing the updates on the various training program. A number of training program updates have been completed.

GCRW is in the process of evaluating a number of computer based training programs. GCRW is committed to implementing a number of computer based training programs that will be used to supplement the existing training programs. These programs provide both instruction and well as testing of knowledge.

As part of the new contract with the Operators union the shift structure was modified so that all of the Operators work with the same team on a 12-hour shift. Based on discussions with the Operators it was clear that this has increased the amount of team work on each of the shifts. For the most part, the change in shift structure has increased the teamwork bonds on the shifts, and

has promoted a sense of caring and awareness of other team members' strengths and weaknesses. Operators appear to be more willing to ask for and provide help to other Operators on their shift as well as with other shift teams. The Operators had made significant improvements in their communications particularly relating to shift change.

C. Safety Culture

"Nothing is more important than safety."
GCRW Safety Vision, March 2003

The results of the safety culture evaluation are discussed below. The first section addresses the onsite evaluation of safety culture, and includes some highlights of the improvements made in commitment and communications, employee participation and teamwork, and in competence and training. The second section includes a discussion of the main results from the safety culture survey and how the survey results compared with the onsite evaluation.

Onsite Evaluation of Safety Culture

Based on the results the follow-up interviews and review of documents, it was clear to the MRS team that there has been a very positive change in safety culture at GCRW during the last year. Some of the initiatives that have contributed to this change are as follows:

- A safety visioning process which involved a wide cross section of employees.
- A revamped near miss reporting program.
- A new safety suggestion program.
- A new employee safety rewards program .
- A new employee recognition program.
- Improvements to way in which Health and Safety Council meetings are used to communicate safety issues.
- Visits offsite that allow workers to share experiences with other workers in the local area and at other GC locations.
- A training summit to review all training needs and training delivery alternatives.
- Pilot testing of the full version of a computerized maintenance management system (Maximo), and the appointment of a new maintenance planner.

In these initiatives, the common themes have been an open invitation to all employees to participate in the development process, to consider workers' opinions, and to emphasis collaboration between hourly and salaried employees. Other achievements that have played a role in improving the safety culture during the last year include considerable progress with the enhanced mechanical integrity program, acquisition of a cogeneration unit (to be installed by the end of 2003), enhancements to plant security, improvements to the Operations shift structure, a Cognitive Task Analysis of Operations, and planning and design for a new DCS.

The following sections provide brief summaries of the culture change initiatives that are ongoing in some of the important safety culture areas.

Commitment and Communications

Based on the follow-up interviews and review of GCRW documents, the clear message was that “Safety is #1 in everything we do” (the first guiding principle of the new Safety Vision).

Observations that led to this conclusion are as follows:

- There is good written and verbal communication from management on business and performance issues, so “there are no rumors any more”. The Plant Manager is providing written “Communications Memos” on a weekly basis. Communications meetings with all employees are also held on a quarterly basis.
- In all communications from management, there is a clear and consistent emphasis on safety.
- Everyone is clear about the importance of safety, even though there is still some reluctance to fully embrace the new Safety Vision.
- Expectations of the workers are more clearly defined, and workers are using “one set of rules”. This differs from past experience when workers were given mixed messages about the relative importance of safety and production.
- Environmental, health and safety policies have been rewritten to ensure there is consistency in the messages from General Chemical (Corporate) and GCRW. The safety programs at GCRW have been structured to make them consistent with the Corporate “3P” (People, Practices, Performance) structure.
- There is now a written disciplinary policy that spells out the steps that will be taken in the event that a worker fails to comply with a requirement of the job position.
- Leading and lagging indicators are being used to measure safety performance, and the results are being shared with workers.
- Management is insistent that time be given to assure safety, when work is being planned and implemented.

Employee Participation and Teamwork

The following observations were made with respect to teamwork and employee participation in the safety programs:

- Morale at GCRW appears to be higher across the board.
- There is more decisive leadership that is setting a clear and consistent direction for employees.
- The shift structure in Operations has been changed in a way that greatly enhances teamwork. Each shift team (three Operators) now works together at all times in 12-hour shifts.
- Operators are very willing to ask for help, both from their fellow Operators and from Supervisors.
- Many Operators said that their “comfort level” was now much higher because of the support they have (from management and fellow workers).
- Workers said that they are now “looking out for each other”. It appears that individual workers are no longer being ostracized by their peers.
- The evaluation team found that there was a greater sense of purpose in the Maintenance Department work ethic.

- Several small groups and committees have been established to work on safety-related initiatives. These work groups provide hourly workers an opportunity to express their opinions and concerns about safety issues. These group activities are helping to increase the level of participation by hourly workers, and they are also helping to build trust between hourly and salaried employees.

Competence and Training

Several initiatives are in progress to address the effectiveness of the GCRW training programs and to raise the competence level of the GCRW workforce:

- When new hires are recruited, the GCRW employees who will work most closely with the new person are involved in the interview process. This increases the level of employee participation, it provides important input to management, and it helps to increase the level of support for the new person when hired.
- GCRW has started to use drills and simulations to help raise the confidence level of workers during upsets and emergency conditions.
- A new policy has been issued that describes the proposed cross-training program for Operators. This program will be formally implemented during the first quarter of 2004.
- As discussed in the Human Factors section above, several new initiatives are being pursued to improve the training programs, both in terms of content and method of delivery.
- While there is a mix of apprehension and excitement among Operators about the proposed DCS, GCRW management expects that Operators will receive extensive training on this prior to implementation.
- The selection of a new Maintenance Supervisor, a new Maintenance Planner and a new Maintenance Technician supports the goal of continued improvement in the Maintenance Department.

Safety Culture Survey

The results of the 2003 survey are presented in Figures 1 and 2. The figures show how the responses compare between the hourly workers, supervisors and managers. Figure 1 shows the percentages of favorable responses for each of 11 cultural factors, and Figure 2 shows percentages of unfavorable responses. Apart from helping to identify the factors where there may be cultural concerns, the two figures highlight the factors where the employee categories differ in their perspectives. Note that the summation of favorable and unfavorable responses in Figures 1 and 2 do not usually add up to 100% because they do not include the neutral responses (not shown).

The results from the 2003 survey were compared with the results from an identical survey conducted in 2002. In general, the survey data suggest that for most factors, there have been only minor changes in safety culture during the last year, and the cultural factors that had the least favorable responses in 2003 were generally the same ones that had the least favorable ratings in 2002. These were “job security” and “some obstacles to safe behavior” (workers, supervisors and managers), “reporting of accidents and near misses” (workers), and “risk taking behavior” (managers).

Figure 1 GCRW Safety Climate Survey, 2003 – Favorable Responses

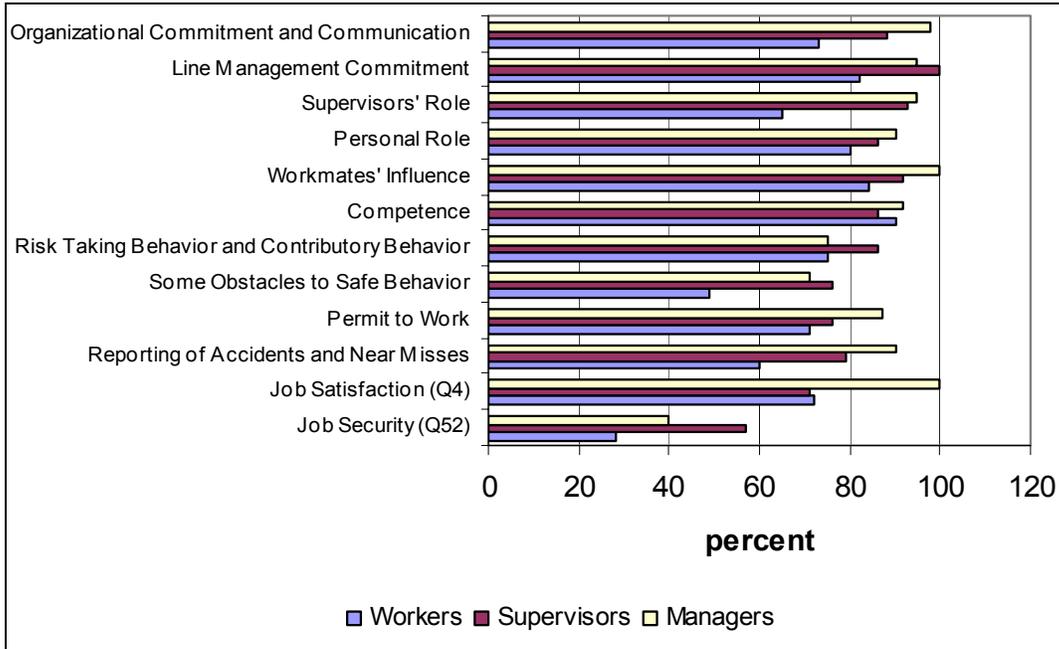
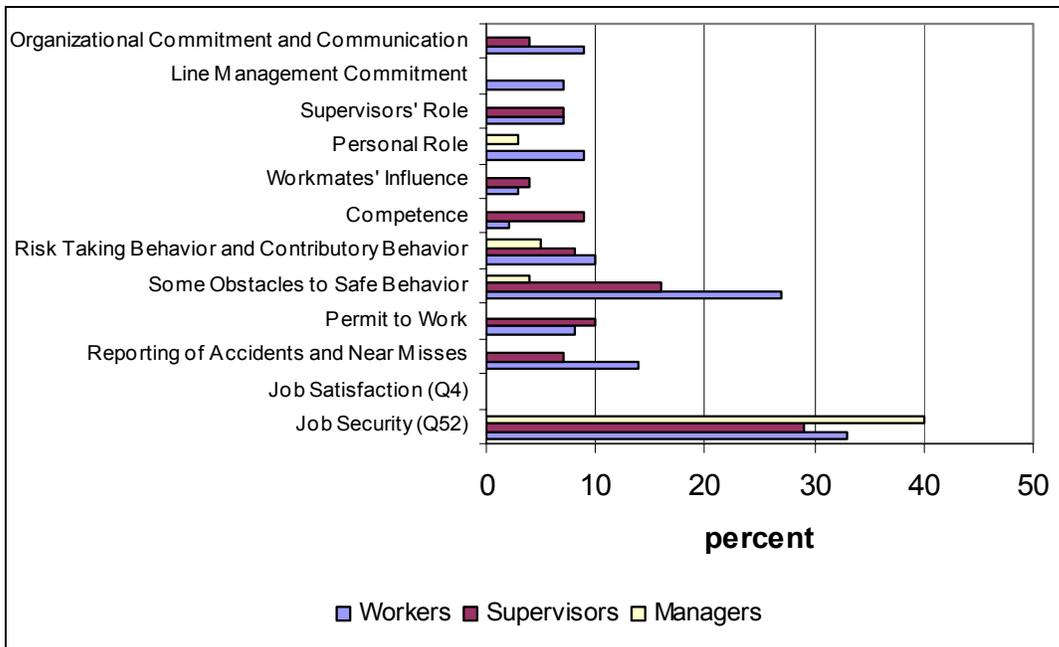


Figure 2 GCRW Safety Climate Survey, 2003 – Unfavorable Responses



As stated above, it was clear from the onsite follow-up evaluation and the content of the quarterly progress reports reviewed by MRS that there has been a positive change in safety culture at GCRW during the last year. However, the improvements were not generally reflected in the results of the most recent safety culture survey. Given the considerable effort that has been devoted to improvement efforts during the last year, it is surprising that the survey results did not reflect more favorable responses. This is especially true for the hourly workers, where the survey responses show no clear improvement in any of the safety culture factors.

In general, there may not yet have been sufficient time for the improvements to be reflected in the survey results. The survey results may be influenced by a relatively small percentage of workers who may still not fully accept management's commitment to the new emphasis on safety. For this relatively small group, past practices at the plant may still be influencing the way they rate the safety culture statements. Also, the expectations for safety performance were raised during 2003, so in the most recent survey the employees may have been rating the statements against a higher standard.

Another factor that may influence some of the results for the Supervisors' group is that there has been a relatively high turnover within this small group (two out of six) during the last year. For example, this may explain why there was an increase in the ratings for Job Security in this group, but not for the other two groups.

Apart from Job Security, the one other safety culture factor that is rated less favorably by all three groups is "obstacles to safe behavior." The statements which are rated in this category are:

- Some jobs here are difficult to do safely.
- Some health and safety procedures/instructions/rules are not really practical.
- Some health and safety procedures/instructions/rules do not reflect how the job is now done.
- Some health and safety procedures/instructions/rules are difficult to follow.
- Some health and safety procedures/instructions/rules are only there to protect management's back.
- People can always get the equipment which is needed to work to the health and safety procedures/instructions/rules.
- There are always enough people available to get the job done according to the health and safety procedures/instructions/ rules.
- Sometimes physical conditions at the workplace restrict people's ability to work safely.
- Sometimes it is necessary to take risks to get the job done.

It is interesting to note that managers' rating for this factor decreased from 95% to 71% (favorable responses). This may indicate a better appreciation by management of the issues which workers consider to be "obstacles to safe behavior".

The factors where the survey results suggest there have been changes in perspectives of the safety culture (better or worse) are highlighted below, together with a discussion of the underlying issues that may have influenced the survey scores:

- **Reporting of accidents and near misses.** Favorable responses from managers increased from 50% to 90%. Favorable responses from supervisors, however, decreased from 92% to 79% during the last year. Based on the onsite component of the evaluation, it seems reasonable to conclude that the response by managers is reflective of the success of the revamped near miss reporting program that was launched at the beginning of the year. Supervisors' responses on the other hand may suggest that there are near misses that are still not being reported.
- **Line management supervision.** Favorable responses from supervisors increased from 79% to 100%. This is likely to be in response to the clear safety message that is being delivered from the plant manager. The team-building and leadership training provided to all supervisors may also have contributed to this particular increase.
- **Competence.** Favorable responses from managers increased from 80% to 92%. This increase may be attributable to the improved teamwork and collaboration among the Operators and Maintenance workers discussed above. Workers were also provided additional training on hazards recognition.
- **Job security.** Favorable responses for workers and managers both decreased by more than 20%. It is possible that these decreases are attributable to the GCRW Chapter 11 bankruptcy proceedings, and/or the absence of a long-term contract to supply acid to a large regional customer. A small percentage of workers still expressed concern about job security because of the potential for termination from disciplinary action. (Note that in November 2003, GCRW announced that they have emerged from the Chapter 11 bankruptcy.)
- **Job satisfaction for supervisors.** Favorable responses decreased from 100% to 71%. The decrease in job satisfaction may be a result of the increased workload placed on Supervisors during the course of this year, implementing the new programs and safety improvements, and maintaining operations.
- **Obstacles to safe behavior.** Favorable responses decreased from 60% to 49% for workers and from 95% to 71% for managers. (Refer to the discussion of Current Challenges below.)
- **Work permits.** Favorable responses for Supervisors decreased from 100% to 76%. This may be attributable to an increased awareness of the level of detail needed in the permits, and the ability of supervisors to recognize deficiencies.
- **Supervisors' role.** Favorable responses for workers decreased from 74% to 65%.

In summary, it is disappointing that the survey results did not reflect the positive changes that were observed during the onsite follow-up evaluation. There are several possible explanations for this, but it is apparent that further work is needed by GCRW management to establish unanimous support for the new Safety Vision and all it represents, and to address the perceived obstacles to safe behavior.

The use of the HSE Safety Culture Survey for this evaluation has been helpful in singling out cultural factors that may have been contributing to poor safety performance in the past. However, the evaluation process has shown how the survey is limited in its ability to measure changes in culture in an environment where considerable change is occurring in a relatively short time period. To gain a thorough appreciation of culture during these times, it is probably necessary to combine the survey with onsite interviews and observations.

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
2.1.1	The PHAs do not include sufficient documentation to show how past incidents were addressed in the PHA.	Medium	GCRW did a review of the PHA revalidations conducted in 2001 and 2002 and generated a list of the incidents that were discussed during the PHA revalidations. The PHA procedure covers the need to address incidents as part of any revalidation effort.	1	Suggestion for Further Improvement GCRW may want to consider modifying the PHA procedure to include that incidents be identified in the specific deviation line items that address the incident.
2.1.2	There is no written procedure that covers the development, revisions, and certification of operating procedures.	Medium	A review of the Richmond Works Operating Procedures Manual shows that a procedure has been added to the manual that covers the development, revisions and certification of operating procedures.	1	
2.1.3	A review of the Emergency Response Manual showed that the list of contacts was out of date.	High	The June 23, 2003 Emergency Response Manual contained an accurate and up to date list of contacts. The new policy is that any personnel changes that require modification to the Emergency Response Procedures will be made within 10 business days.	1	
2.1.4	The Emergency Response Manual does not contain a written procedure for reviewing and updating the manual, and for specifying how any changes are communicated to the employees.	High	A policy statement has been added in front of the Emergency Response Manual procedures stating that they the document will be reviewed and certified at least annually by the EHS Manager, Plant Manager, Production Superintendent and Union representative and updated accordingly. The MOC procedure dated December 27, 2002 includes a statement that changes to the procedures in the Emergency Response Manual also trigger the MOC procedure. When changes are made to the Emergency Response Manual, all of the copies are updated and notification of the changes is sent to all of the plant employees.	1	
2.1.5	The Emergency Response Manual does not contain a written policy regarding	High	A section has been added to the Emergency Response Manual that covers medical emergencies. The policy	1	

¹ 1-Recommendation implemented; 2-Recommendation not fully implemented.

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	the rescuing of workers.		<p>states that employees will assist in medical emergencies involving fellow employees if safe to do so. The section goes on to state that any assistance must be in compliance with other safety programs.</p> <p>The Emergency Response Flow Diagram makes it clear that what safety gear and staffing is required in order to enter a hazardous area where there has been a release.</p>		
2.1.6	Some of the Operators are unclear as to what is the proper procedure for agency notifications in the event of an emergency.	High	A flowchart was developed to aid employees in determining the appropriate notifications for various emergency situations. Training was provided to all Operators on the use of this emergency response flow diagram. The training was in the form of table top drills on how to use the flowchart. This flow diagram is also discussed as part of the annual HAZWOPPER training.	1	
2.1.7	Evacuation drills have not been conducted to test the Emergency Action Plan.	Low	<p>The Emergency Response Manual dated June 20, 2003 contains a new requirement that an emergency evacuation drill will occur at least once per year. The manual also states that selected employees will participate in annual table top drills. The evacuation drills and table top drills have been added to the "EHS Calendar" as annual events.</p> <p>The annual emergency evacuation drill and emergency response drill were completed on December 30, 2002 and the evacuation and response drills are scheduled for November 30, 2003.</p> <p>A critique of the drills were conducted and documented. The documentation provided a description of the incident and the actions taken by the</p>	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			employees. A number of issues were identified as a result of the critique and corrective actions were developed and assigned to various staff members. All of the corrective actions have been implemented.		
2.1.8	Changes in policies and procedures that affect operations and safety have not always been handled through the MOC process.	Medium	<p>The MOC Procedure, dated December 27, 2002 has been modified to include a section that requires the use of the MOC procedure for any changes in policies or procedures that affect operations.</p> <p>A review of the MOCs conducted by the facility show that a number of the MOCs were to address changes to facility policies and procedures. For example, changes to the agency notification guidance policy under went an MOC as did changes to a number of procedures such as the start-up procedures.</p>	1	
2.1.9	Changes in key personnel assignments or responsibilities have not gone through the MOC process as required by the facility's Management of Change Procedures dated June 7, 2002.	Medium	Refresher training on the MOC procedure to ensure that changes in key personnel assignments or responsibilities are handled through the MOC process was conducted with the employees. In the last year two new positions were added to the organization and both of these organizational changes when through the MOC process.	1	
2.1.10	A review of incident and near-miss reports for the years 2000, 2001, and 2002 indicate that near misses are being under reported. For example in the year 2001, only 4 of the 29 reported incidents were near misses and this reporting is much lower than would normally be expected for this type of facility.	High	A near miss reporting program has been developed and added to the Safety Manual. The near miss process also includes an incentive program for reporting near misses. Training on the near miss program and need to report near misses was provided to all employees. An analysis of near misses is now conducted as part of the monthly safety council meetings. As of the end of September 2003 there had been 116 near miss reports. This represents an enormous increase over the number that had been	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>reported in 2001 and 2002.</p> <p>As part of the incident investigation process the near miss reports are used to evaluate the near miss and develop recommendations for addressing the root cause of the near miss.</p>		
2.1.11	<p>Incident investigation recommendations do not appear to be closed out in a timely manner. A review of 2002 incident investigation recommendations showed that 18 of 53 have not been closed out by the target completion date. A number of these items showed target completion dates in March 2002.</p>	Medium	<p>A monthly EHS meeting is now held to highlight open and overdue action items to help understand the obstacles for not getting items closed. The EHS Manager tracks action items to help ensure timely closure. From January through the end of October 2003, there had been 292 recommendations developed from 137 incident investigations. Based on a random sampling of 120 recommendations 12 had not been closed out by the target completion date. This represents a significant improvement over 2002 given the large increase in the number of action items generated as part of the incident investigation program.</p>	1	
2.1.12	<p>Documentation showing that recommendations from incident investigations had been closed out was not consistently tracked. Of the 32 closed incident recommendations reviewed for the period of 2001 and 2002, twelve did not have documentation verifying that the recommendation had been closed.</p>	Medium	<p>The safety procedures in the Injury and Illness Prevention Plan dated February 26, 2003, has been modified to include a requirement that action items are completed in a timely manner and that documentation be filed for each recommendation to indicate that the action item was closed. The EHS manger is responsible for maintaining all incident investigation documentation including the documentation covering the closure.</p> <p>Based on a random sampling of 30 of the 257 incident investigation recommendations that had been closed in 2003, all 30 had documentation verifying that the action item had been closed.</p>	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
2.1.13	There is no systematic application of incident investigation action items to like equipment/systems throughout the facility.	Medium	<p>The Incident Investigation form and Near Miss/First Aid form has been amended to include applying action items across like equipment/systems at the facility. This change in the procedure also went through the MOC process.</p> <p>Based on a random sampling of 22 of 137 incident investigations conducted in 2003 showed that all 22 had completed the section covering application to similar equipment/systems. For 6 of the 22 it was found that the corrective actions would be applicable to similar equipment/systems. Review of the applicable equipment/systems was conducted and documented for all 6 of the reviewed incident investigations.</p>	1	
2.1.14	There is no documented training course for incident investigation team leaders.	Medium	<p>All supervisors participated in an incident investigation training course. The course was conducted an outside consultant with the Safety Center. The training course covered how to conduct incident investigations. The course provided instruction on the use of the Power Analysis-Linear Problem Solving Technique, which is a tool that is used to define the incident (data collection) and then a structured process for evaluating the incident to assist in determining the root-causes.</p> <p>Certificates of Completion for the incident investigation training course were issued to all of the participants.</p>	1	
2.1.15	The incident investigation procedure does not indicate who is qualified to conduct incident investigations, and	Low	As discussed in item 2.1.14 above, incident investigation training was provided to all supervisors. The training covered the use of the Power Analysis-	1	<i>Suggestion for Further Improvement</i> GCRW may want to consider modifying Section IX.F of the Injury

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	incident investigators do not receive training in the incident investigation technique and how to identify root causes.		Linear Problem Solving Technique for determining root causes. Supervisors are currently the ones at the plant that lead the incident investigations.		<p>and Illness Prevention Program to include a requirement that the incident investigation team leader be trained in incident investigation techniques and how to identify root causes.</p> <p><i>Suggestion for Further Improvement</i> GCRW may want to consider a more formal use of the Power Analysis-Linear Problem Solving Technique, which is the incident investigation technique that the Supervisors have received training on. The more formal approach would involve the use of the Power Analysis Investigation Report forms as a means of documenting the incident investigation analysis. An alternative technique based on a simplified checklist may be more suitable for minor incidents and near misses.</p> <p>The more formal approach to incident investigation documentation and analysis might only need to be applied to the more serious incidents such as those that result in or could have resulted in a release of acutely or highly hazardous material. GCRW may want to consider expanding IX.F (Incident Investigation) of the Injury and Illness Prevention Program to provide guidance on when this more formal documentation and analysis needs to be used in an incident</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
					investigation.
2.1.16	The work order form generated by the Maximo system does not show who requested the work to be performed.	Low	<p>The work order from the Maximo system has been modified to include a line item that shows who requested the work to be performed.</p> <p>Based on a random sampling of 12 work order forms all 12 provided the name of the person who requested the work.</p>	1	
2.1.17	<p>In reviewing the Contractor Program documents, the following issues were identified:</p> <ul style="list-style-type: none"> • The date of the job-specific training for each contract employee is not always the same as the date provided on the top of the sign-in form. • The job-specific training form includes a number of information items that are not required, and are often left blank on the completed forms. These items include the AR No., Job No., Req No., PO No., Owners Representative and Title. 	Low	The job specific training form used for contract employees has been modified to include a line item for the data that the contract employee received the training. The form was reviewed and a number of non-essential items have been removed from the form.	1	
2.1.18	Several safety management programs lack adequate document control to ensure that they are developed, implemented, revised and distributed in an effective manner.	Medium	<p>GCRW has developed a document control procedure that is used for ISO. This procedure has been adopted for the Emergency Response and Safety procedures. The document control procedure covers the purpose, application, responsibility, and a detailed procedure for controlling documents.</p> <p>A review of the Safety and Emergency Response</p>	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			Manuals indicated that they were up to date and contained the most recent set of revisions.		
2.2.1	The majority of displays in the control room are comprised of very old technology whose interpretability is non-intuitive, particularly for inexperienced Operators and for all Operators under upset or stressful conditions. There is a high degree of inconsistency among display formats, and a lack of displays that provide a quick, overall, “at-a-glance” summary of the state of plant processes. The mimic displays that are available for the CP plant are good, particularly at providing at-a-glance summaries of CP processes. However, similar displays are not available for other processes throughout the facility.	Medium	<p>During the months of August, September and October 2003 an outside consultant conducted a human factors assessment of the control system. The process used for the assessment was a cognitive task analysis (CTA). This work included a review of the alarm philosophy, development of control room layout criteria, a review of the existing control room layout, a review of current steady state workload for the Operators, an alarm response analysis, evaluation of upset response requirements, and a review of the overall results of the consultant’s analysis.</p> <p>The results of this study were presented to GCRW in mid-November 2003. The data and results of this study will be used in the development and design of the new Distributed Control System (DCS) that the facility will be installing. The design phase for the DCS should be complete by the end of 2003. In the first quarter of 2004 bid packages should be issued for the DCS. The goal of the facility is to complete the installation of the DCS by the end of 2004.</p> <p>The DCS system is currently in the design phase and will involve the installation of a new control system for the plant and upgrading the instrumentation. The project will involve the replacement of manually controlled field devices, improving the level of monitoring and recording in the control room, and integrating the chemically pure acid plant controls with the main acid plant controls.</p> <p>The installation of the DCS at the plant will serve to</p>	1	<p>Comment The recommendation in the initial safety evaluation was to conduct a CTA and to consider the implementation of the DCS. GCRW has completed the CTA and has made the decision to design and install a new DCS control system for the plant. As such, this finding is considered to be implemented.</p> <p>Comment There is some concern among the Operators about the move to the DCS system since it will represent a significant change in the way the plant is currently operated. It is critical that management continue the ongoing communication with the Operators regarding the status and timing of the installation and transition to the DCS system. In particular, information on the training that Operators will receive on the DCS system is considered critical.</p> <p>Suggestion of Further Improvement GCRW may want to want to consider conducting a field trip with the Operators to a facility that has a DCS so that Operators can see what a DCS looks like. This type of field visit</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>address the finding from the initial safety assessment, and will represent a significant improvement as it relates to the operability of the plant. The use of a CTA to support the DCS design is considered a best practice since it helps to ensure that key operational issues are addressed and incorporated into the new DCS system.</p> <p>The commitment of GCRW to the installation of a DCS at the plant is a significant indication of their commitment to improving the overall safety and operability of the plant.</p>		<p>would also provide an opportunity for the GCRW Operators to discuss the benefits of a DCS with Operators at the other facility.</p>
2.2.2	<p>Senior management and training personnel have not had sufficient training or background in human factors and ergonomics. Their lack of training in these areas prevents them from being able to adequately train plant personnel in these areas and prevents them from being sufficiently aware of human factors and ergonomic safety issues throughout the facility.</p>	Low	<p>The Plant Manager, EHS Manager and Operations Superintendent and Plant Safety Coordinator attended a course on human factors in process safety management. The course covered the fundamentals of human factors and human errors, an overview of methods to analyze human errors, issues associated with ergonomics in system designs, and how to reduce human errors through improved design and behavior based safety programs.</p>	1	
2.2.3	<p>Human factors and human performance issues are not adequately covered as part of training for plant personnel. The majority of plant personnel have had no exposure to concepts related to causes of human error, human performance risk factors for injury, etc.</p>	Low	<p>The existing ergonomics training program has been expanded to include issues on human factors and human performance. The self-audit program has been amended to include the identification of human factors and human performance issues.</p> <p>Refresher training was provided on human factors, which covered a general overview of the concepts associated with human factors, and human performance as it relates to human error and human risk taking.</p>	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>Section VIII.E covering Latent Condition Checklist as been added to the Injury and Illness Prevention Plan dated October 6, 2003. Once per quarter a latent condition checklist is completed for an hourly employee's respective job function. The purpose of the checklist is to identify human factors that may lead to injuries or incidents that may not otherwise be identified through a traditional audit program.</p> <p>As of November 2003, two latent condition checklists had been for two specific job functions. A review of the completed latent condition checklists showed that a number of recommendations were developed that are currently being implemented.</p>		
2.2.4	<p>Control room alarms lack sufficient discriminability and are not sufficiently prioritized. For instance, when Operators are outside the control room and hear an alarm it is generally not possible to identify its source without returning to the control room or communicating with someone in the control room. Additionally, once alarms are acknowledged they will not repeatedly sound even if Operators fail to address the underlying condition. This could cause an Operator to forget about an alarm condition should he/she become preoccupied with another existing situation.</p>	High	<p>In conjunction with plant employees, including Operators, the CTA consultant developed a general alarm philosophy for the plant. A review of all of the existing alarm points in the plant were then identified and analyzed according to the alarm philosophy. As part of the alarm response analysis, a process was used to define what points should be alarmed, the purpose of each alarm, its importance, and the Operators response to the alarm. The results of the alarm response analysis were a set of alarm priorities and a detailed list of alarms that should fall into each priority.</p> <p>The results of the alarm analysis task are being incorporated into the design package for the new DCS, which will replace the existing set of controls and alarms at the plant.</p> <p>The CTA process also led to the development of</p>	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>various process control screen layouts that will be used in the new DCS for displaying process information and alarm data. The preliminary screens layouts provide detailed information on alarms and their priority.</p> <p>The use of a CTA to support the DCS design is considered a best practice since it helps to ensure that key operational issues are addressed and incorporated into the new DCS system.</p>		
2.2.5	<p>The current approach to training relies heavily on classroom-style instruction and testing, as well as on-the-job training. However, simulations and drills are not used to full advantage as training methods. While minimal use of these techniques has recently been introduced in the facility, they are not sufficiently employed. Additionally, there appears to be a lack of awareness among managers of modern training technologies such as desktop computer-based simulation tools.</p>	Medium	<p>GCRW has a program in place to substantially improve the current training program. The improvements have included development of comprehensive training elements to address emergency operating procedures and emergency response actions.</p> <p>As part of the training improvement program, a training summit was held that included both salary and hourly staff. The main objectives of the summit were to look at the existing training programs and identify how they could be enhanced and improved. The summit was used to identify the needed training programs, the essential elements of the training programs, and a rating of the effectiveness of the existing training programs. Some of the key elements of a training program that were identified as part of the summit included a method for providing feedback on the training, a means of measuring effectiveness of the training, and assuring that the training programs included both theory as well as hands-on training elements. A training summit steering committee has been established to track progress on the development of the training programs. A schedule has been</p>	1	<p>Comment The steps that GCRW has taken to improve the training programs at the plant have gone well beyond what was suggested as part of the recommendation from the initial safety assessment. This demonstrates a high level of commitment to improving safety at the plant.</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>developed for completing the updates on the various training program. A number of training program updates have been completed.</p> <p>GCRW is in the process of evaluating a number of computer based training programs. GCRW is committed to implementing a number of computer based training programs that will be used to supplement the existing training programs. These programs provide both instruction and well as testing of knowledge.</p> <p>The DCS that GCRW is planning to install for operating the plant will include a computer based simulator of the plant. This simulator will allow the Operators to practice response to various emergencies and upset conditions. It will also serve as a strong learning tool for training Operators on the operations of the plant.</p> <p>The annual emergency response drill was completed on December 30, 2002 and the response drill is scheduled for November 30, 2003.</p> <p>A critique of the emergency response drill was conducted and documented. The documentation provided a description of the incident and the actions taken by the employees. A number of issues were identified as a result of the critique and corrective actions were developed and assigned to various staff members. All of the corrective actions have been implemented.</p>		
2.2.6	There is insufficient emphasis placed on reward and positive reinforcement	Medium	GCRW has developed a safety incentive program that focuses on positive rewards. The rewards are based	1	<i>Suggestion of Further Improvement</i> Consider an annual review of the

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	as a means of increasing good safety behaviors and practices. While discipline for unsafe practices appears to be well enforced, there is no formal arrangement for plant personnel to be rewarded (e.g., with letters of commendation, awards, informal positive statements from management, etc.) for good safety decisions and practices.		<p>on the number of near misses reported, safety test score and safety suggestions. Each employee's status is posted and included in the monthly safety council meetings to encourage friendly competition.</p> <p>Based on interviews with staff at the facility, the incentive program appears helping to reinforce the guiding principals of the safety vision, and in particular that "safety is #1 in everything we do."</p>		safety incentive program to make sure rewards are serving to align behavior with the guiding principles of the Safety Vision, and to make the program as equitable as possible to all employees.
2.2.7	There is little or no "team concept" among plant Operators, perhaps primarily due to the fact that the current shift structure prevents the formation of cohesive teams (i.e., Operators do not work with the same individuals on a consistent basis). This prevents Operators from forming the type of teamwork bonds that promote a sense of caring and awareness of other team members' strengths, weaknesses, habits, etc.	High	As part of the new contract with the Operators union the shift structure was modified so that all of the Operators work with the same team on a 12-hour shift. Based on discussions with the Operators it was clear that this has increased the amount of team work on each of the shifts. For the most part, the change in shift structure has increased the teamwork bonds on the shifts, and has promoted a sense of caring and awareness of other team members' strengths and weaknesses. Operators appear to be more willing to ask for and provide help to other Operators on their shift as well as with other shift teams. The Operators had made significant improvements in their communication particularly as it relates to shift change.	1	
2.3.1	Managers and workers at GCRW do not have a clear vision for the facility health and safety program. Safety slogans and safety messages do not provide a persuasive and compelling vision of the safety objectives for the plant, and there is no consistent communication of a Safety Visions.	High	In developing a response to this finding, GCRW has established a Safety Vision which provides a focal point for the safety culture change that is now under way at this facility. The process used to craft the vision statement and to share the vision inside and outside of GCRW exemplifies the participatory process that serves to build trust and a sense of teamwork within an organization.	1	<p><i>Suggestion for Further Improvement</i> Consider having the Safety Vision Team reconvene at regular intervals (perhaps quarterly) to help employees stay focused on the values expressed in the Safety Vision Statement.</p> <p><i>Suggestion for Further Improvement</i></p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>The main objective of this process was to develop a Safety Vision that could be used to communicate a strong and consistent safety message to employees. All GCRW employees were invited to participate or to provide input. A team that finally worked on the vision statement included the Plant Manager, supervisors, engineers, Operators and maintenance personnel. Workers were able to speak openly about safety concerns, and as the process proceeded, it helped to increase the level of employee participation and program ownership.</p> <p>The team was given an open agenda to develop new solutions from the ground up, and not to be constrained by top-down direction or pre-existing safety statements.</p> <p>After the Safety Vision was finalized, it was communicated with GCRW employees, and then shared openly with the local community. Notices were placed in the local newspaper, and a public roll-out was scheduled in May, 2003. Mayor Anderson of Richmond and Supervisor John Gioia attended the roll-out, as did several Vice Presidents from GCRW. The willingness of GCRW to go public with this Safety Vision demonstrated their commitment to the vision's guiding principles, and the attendance by GCRW executives at this roll-out demonstrates a top-level commitment from the company.</p> <p>GCRW appears to be taking steps to align the financial and human resource systems with the intended safety objectives. For example, a commitment has been made to provide salaried</p>		<p>Consider implementing a mechanism that would require all workers to become involved in the group meetings and committees working on safety-related initiatives. The mechanism should provide a way to consider the merits of teams consisting of hourly workers, teams of salaried employees, and teams with both. The ad hoc approach to forming teams – voluntary participation – has worked well through the initial stages of the change process. However, the change process will move faster if others are encouraged to participate.</p> <p>Suggestion for Further Improvement The hourly workers who have participated in the Safety Vision process have expressed a willingness to meet with their fellow workers to explore their reluctance to being more involved in the safety activities. Management should support and encourage these individuals and assist with preparation efforts and provide any help that may be needed.</p> <p>Suggestion for Further Improvement Consider requiring all employees to join a team to explore ways for improving the pace at which the Safety Vision guiding principles are being accepted by the GCRW workers.</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>employees with timely performance appraisals, and to consider developing an employee feedback process of hourly workers. (See 2.3.15)</p> <p>The Safety Vision is now displayed prominently on boards and banners within the plant, and most of the Safety Vision team are already embracing the guiding principles. It is likely that it will take some time before all workers are aligned with this vision, but resistance to change is very normal when an ambitious change program is initiated in an established organization, even if the change has obvious benefits.</p> <p>GCRW recognizes this as a challenge, and this is an issue which management will need to work through. Sound, supportive decisions will be needed to build trust with valued employees who may be naturally resistant to the change effort.</p> <p>A Safety Vision Team follow-up meeting was held on September 29, 2003. The meeting included discussions of how the momentum could be maintained for the safety change initiatives. The meeting identified some barriers to widespread acceptance of the Safety Vision, and also many ideas for helping to surmount these barriers.</p> <p>It could be advantageous for the Safety Vision team to convene on a regular basis until there is broad support for the Safety Vision across the entire GCRW workforce. With perseverance, we expect that the guiding principles of the Safety Vision will become fully integrated into the GCRW work processes.</p>		
2.3.2	There is little awareness among	Medium	GCRW has evaluated the Corporate 3P program and	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	<p>workers of the full scope of the General Chemical 3P Program, and the importance of 3P participation has not been effectively conveyed to workers. Operators and maintenance personnel are aware that they can receive a \$50 quarterly bonus if no recordable injuries occur during that time period, but are almost unanimously unaware of any other features of the program.</p>		<p>developed an approach to incorporate the 3P program into regular safety communications at GCRW. Of particular note is the way 3P principles (People, Performance, Processes) are used to guide the format of the monthly Health and Safety Committee meetings.</p> <p>For these meetings, the PEOPLE element is being used to address: (1) the Safety Incentive Program; (2) annual performance evaluations for all employees, with a section dedicated to safety; (3) quarterly Plant Manager meetings to address the plant's safety performance; and (4) the way that individuals are recognized to acknowledge good safety performers.</p> <p>The PERFORMANCE element is being used to address: (1) leading and lagging indicators and the way they are shared with employees; and (2) a monthly comparison of recordable injuries at GCRW with other General Chemical sulfuric acid plants and with the plant's own goals.</p> <p>The PRACTICES element is being used to address: (1) annual certification of standard operating procedures by the Plant Manager, EHS Manager, Production Superintendent and Union representative; (2) annual certification of all emergency response procedures by the Plant Manager, EHS Manager, Production Superintendent and Union representative; and (3) annual certification of all safety procedures by the Plant Manager, EHS Manager, Production Superintendent and Union representative.</p> <p>Management has also re-issued the applicable GCRW Health and Safety policies to make them consistent</p>		

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			with Corporate expectations as well as the new GCRW Safety Visions. The scope of the 3P process at GCRW will also be broadened to encompass the relationship with the American Chemical Council (ACC) Responsible Care Program.		
2.3.3	Management has not demonstrated to workers a convincing ability to act quickly over health and safety concerns and suggestions.	High	<p>From the employee interviews conducted during the follow-up evaluation, it was clear that management now takes much more decisive action in response to safety concerns. This is especially so for situations where safety concerns are identified during routine work processes. Those interviewed consistently stated that when a safety concern is identified, the work is halted, the safety concern is reviewed, and the work is only permitted to proceed when all parties are satisfied that the safety concerns have been adequately addressed. In this and many other ways, management is now clearly demonstrating that safety is the first priority in the operation and maintenance of the plant.</p> <p>A safety suggestion program was introduced at the beginning of 2003. Safety suggestion boxes are located throughout the plant allowing employees to bring up safety concerns. The safety suggestions are addressed promptly by management, and tracked through the monthly Health and Safety Council meetings. 137 suggestions were submitted in 2003 (Feb-Nov). The originators were all sent a written response within 10 days. In general workers are informed of progress, and in many cases the suggestions have been implemented quickly.</p> <p>Though the Safety Suggestion program in and of itself does not demonstrate management's ability to act quickly over safety concerns, it is a good example of</p>	1	<p><i>Suggestion for Further Improvement</i> Consider an annual review of the safety suggestion program to ensure that the method of implementation and the feedback it generates are optimized to meet the objectives of the program. Issues to consider include: (1) how to encourage employees to <i>write down</i> their suggestions; (2) how to reward employees that take action through Work Orders (rather than safety suggestions); (3) who the suggestions are assigned to, and the potential for "conflict of interest"; and (4) to assess resources and GCRW's ability to address the suggestions in a timely manner.</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			<p>how management is committed to identifying and resolving safety issues at GCRW. Between February and October 2003, 190 safety suggestions were submitted. GCRW is devoting considerable effort to addressing the issues raised in a timely manner. Each suggestion is assigned to a salaried employee for action. The suggestion originators are kept informed of the status until the suggestion is closed out and the action item(s) are completed. The safety suggestion program is playing a vital role in the effort to enhance the safety culture at GCRW.</p> <p>While the program is generally achieving the desired intent (identifying and resolving safety issues and getting employees involved), some workers expressed some concerns. For example, several workers commented that they would like management “to take their input more seriously” and others said that feedback is lacking. It is important for management to take these concerns seriously to avoid any adverse influence on the improvement in culture achieved so far.</p> <p>The success of the safety suggestion program will depend on the Health and Safety Council’s ongoing commitment to the program, the timeliness of their responses, and the extent to which the response actions meet the expectations of those submitting the suggestions. There will be a need to ensure that adequate resources are made available when there is a high backlog of safety action items to avoid long delays with implementation.</p>		
2.3.4	Workers perceive that some supervisors and managers appear to be	High	Under the direction of the new Plant Manager, it has been made clear to all employees (including managers	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	uncertain as to what is needed to ensure safety and health.		and supervisors) that safety is the number one priority at GCRW. This is echoed in the new Safety Vision as the first guiding principle. With this clear and decisive directive from the top, supervisors and managers are clearer about what is expected of them regarding safety and health requirements.		
2.3.5	Some managers perceive that supervisors may not be devoting sufficient effort to health and safety, and some workers think supervisors may not be good at detecting unsafe behaviors.	High	See response to 2.3.4.	1	
2.3.6	<p>Among the workers, there appeared to be an attitude of “resigned acceptance” as to the level of safety performance that is possible at GCRW. Workmates’ influence and peer pressure within the Operations Department do not appear to be conducive to team building and working as a group towards a shared vision of safety. The influence of fellow workers (including first line supervision) in the Maintenance Department appears to foster an attitude in which workers are reluctant to accept much responsibility for raising safety performance standards.</p> <p>The changes at management level and the limited expenditures on preventive maintenance at GCRW in the past have likely contributed to this attitude among the workers.</p>	High	<p>The evaluation team observed a much greater sense of participation in the safety process in the Operations and the Maintenance groups. In Operations, the shift change has helped to foster a better sense of teamwork, and many of those interviewed said that workers now “look out for each other”. In the Maintenance Department, workers are being challenged to take more initiative for safety. Also, across the organization, there are more opportunities for workers to participate in small groups and committees on safety-related initiatives such as developing the Safety Vision.</p> <p>A new training program has been developed to help workers employees recognize unsafe behaviors. Management is also demonstrating commitment to improving safety performance through other programs such as the Mechanical Integrity program, the CTA and DCS programs, maintenance and turnaround planning, and other programs. These programs provide a clear signal that General Chemical is</p>	1	<p><i>Suggestion for Further Improvement</i> Consider the potential benefits of providing team-building and motivational training to certain Operators and/or maintenance workers. Management may wish to offer or require this training when behaviors are identified that are counter productive to teamwork and trust.</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	(Note: the Safety Evaluation team was made aware of a program that is now being implemented to enhance preventative maintenance at this plant.)		<p>making long-term investments in safety-related programs.</p> <p>In August 2003, supervisors attended a third party leadership and teambuilding training session. We believe that leadership and motivational training for hourly workers could be beneficial. GCRW management argues that they are currently providing a heavy schedule of training and involvement for all plant employees, and as such they need to be very careful about adding further training obligations.</p> <p>The evaluation team did observe an improvement in the teamwork among workers, and the concern over workload is justified. However, MRS considers that – given at the appropriate time – this type of training may help to inspire workers to develop a greater sense of purpose and an increased ability to work as a team.</p>		
2.3.7	Safety metrics have not been developed and adopted for leading indicators of safety performance. The lagging indicators used by management do not convey information to reflect recent progress being made with regard to the safety program.	High	Leading indicators for safety metrics have been developed by GCRW as follows: the number of new safety suggestions reported and the number of safety suggestions closed; the number of near miss reports; results of the “safety tours”; and the status of the safety incentive program.	1	
2.3.8	Safety performance metrics and safety performance progress are not shared widely with hourly workers.	High	Safety metrics are shared with employees, and performance is measured on a monthly basis against the goals set for each item. The metrics are presented as trend reports and posted with the minutes of the monthly Health and Safety Council meetings. In addition to the leading indicators (discussed above,	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			2.3.7), the posted metrics include first aid injuries, recordable injuries, incident rates, audit findings, and any regulatory notices of violation.		
2.3.9	Some workers appeared to be apprehensive about making mistakes for fear of being disciplined by management or ostracized by their fellow workers.	Medium	<p>A new disciplinary policy was developed and issued by GCRW management with input from the local Union, General Chemical Corporate and local human resources personnel. This policy discusses the purpose of the policy, the actions that could result in the need for disciplinary action, the reporting and investigation requirements, the response (progressive disciplinary process), communications and follow-up.</p> <p>Developing a disciplinary policy is not a democratic process. It is management’s responsibility to establish clear expectations for workers, and it is important for workers to be accountable for their actions. In a high-risk manufacturing environment, there needs to be a balance whereby management is understanding of workers’ human vulnerabilities, and workers are accountable for any conscious violation of the safety rules. Finding the right balance is also a critical issue that strongly influences the culture of the organization.</p> <p>During the interviews conducted during the follow-up evaluation, workers mostly expressed support for the written policy. However, there was some uncertainty about the actual steps in the procedure and the follow-up process, and a few workers expressed doubts about the way management is implementing the policy.</p> <p>There was little evidence of workers being ostracized by their fellow-workers (as was observed in the initial evaluation). On the contrary, the change to shift teams</p>	1	<p><i>Suggestion for Further Improvement</i> Management should consider providing structured feedback throughout the follow-up period for workers who have been disciplined. This type of follow-up will help to demonstrate management’s intent to achieve a positive outcome for both parties.</p>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
			in Operations appears to have fostered a more collaborative approach to running the process, and workers are willing to ask their peers for help when needed.		
2.3.10	Communication among the Operators as a group is probably less than optimal because of the shift structure being used at the plant. Also, it was commented that communications at shift change in the recent past have been brief, with only limited exchange of information regarding the status of plant operations.	High	Changes to the Operators' shift structure is discussed in 2.2.7 (above). The shift change procedure was revised in June 2003 to clarify management's expectations of what needs to occur at handover, and to make it consistent with the new shift structure. The shift change checklist was also enhanced at that time. Interviews with Operators indicated that the shift changes now go smoothly. If there are non-routine activities, Operators often come in early or stay later to ensure there is sufficient time to fully brief the incoming Operator. .	1	
2.3.11	Plant managers receive no formal training on community relations and public outreach to help with the communication of safety and environmental issues.	Medium	The new Plant Manager has received media training with Ammerman Enterprises, media crisis training with Benchmark, Inc., and other related training through the Chemical Manufacturers Association and the American Chemical Council. In August, 2003, the EHS Manager and Operations Superintendent attended a formal training class on communicating environmental and safety issues with the public.	1	
2.3.12	Participation in the safety program has not been fully embraced by workers, so the potential for employee involvement is not being fully realized.	High	See 2.2.6 and 2.3.1.	1	
2.3.13	Workers are not always involved in developing and reviewing safety rules that affect their work, especially with	High	In March 2003, the Plant Manager and EHS Manager conducted meetings with all employees to review the status of the safety rules, and to discuss current safety	1	<i>Suggestion for Further Improvement</i> To help address the "obstacles to safe behavior", consider using a qualified

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	respect to personal protective equipment, clothing, and work permits.		<p>issues that they might have. Going forward, the safety suggestion boxes will allow employees the opportunity to raise safety issues including any issues they may have with the safety rules.</p> <p>During the follow-up evaluation interviews, employees gave several examples of how GCRW management is addressing the safety rules. For example, it was stated that GCRW is looking at replacing the older SCBAs with more modern equipment, and the rules for using safety goggles have been clarified by managers. On the other hand, management is clear that rubber protective gear needs to be worn for maintenance work involving acid. Personal Protective Equipment (and other obstacles to safety) are a key cultural issue. They need to be reviewed and revised (as necessary) on a regular basis and workers need to participate in this process to have ownership.</p>		independent third party (such as an Industrial Hygienist) to conduct a review of Personal Protective Equipment, and consider making radios available to those working alone in the plant.
2.3.14	Some workers perceive that the safety and health rules may be too extensive or prohibitive for the real risks involved.		GCRW management appears to be aware of this ongoing issue. Consistent with their emphasis on safety, their position is clear that the safety and health rules that are in place are either required by regulation or are needed to ensure health and safety. As the Safety Vision gains broader acceptance across the organization, workers are likely to gain a better understanding of the need for the safety and health rules.	1	
2.3.15	There is no performance evaluation process for hourly workers that could be used to require and recognize good safety performance. Personal performance appraisals and associated	Low	In June 2003, the Plant Manager circulated a memo to salaried employees requesting feedback on the issue of providing performance feedback to the hourly workers. As of November, 2003, there has been no follow-up either with the salaried employees or with	1	<i>Suggestion for Further Improvement</i> Consider the potential advantages of instituting an annual performance review for hourly employees. If this is considered to have merit, the format

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	safety evaluations for salaried people are sometimes delayed beyond the anniversary date.		<p>the local Union representatives. All parties are open to dialog on this issue, and all parties are aware of the need for this process to be administered carefully to be sure that feedback is positive and constructive.</p> <p>A new employee recognition program has been implemented, but this is an informal program that is not intended as a way of providing specific feedback to individual workers. Additional feedback could also be helpful during the period following any disciplinary action.</p> <p>For salaried employees, the new Plant Manager has committed to conducting the performance evaluations in a timely manner.</p> <p>(See also 2.2.6, above.)</p>		and objectives of the reviews should be discussed with Union representatives.
2.3.16	The regulatory safety and health training program is not revised and upgraded on a routine basis to ensure it maintains participants' interest. The training is perceived by some to be boring, repetitive, and time-consuming. As such the training may not be very effective.	Low	<p>A Training Summit was held at GCRW on October 17, 2003, to review all training requirements for GCRW employees. This was described as an "open season" to examine the training topics, the way that training is delivered, and to review the training for effectiveness and efficiency. The Summit also provided an opportunity to explore alternative training methods, and additional training that may be needed. Computer based training programs are now being considered for those topics that do not require direct interface with an instructor, and simulation training is being considered as and when the DCS is installed.</p> <p>(See also 2.2.5 above.)</p>	1	
2.3.17	The need for cross-training Operators in the procedures for operating other	Medium	A formal cross-training policy was drafted in April, 2003, and in July 2003, the Operations Supervisor	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	areas of the plant has been recognized by workers and management, but there has been no commitment to implement such a cross-training program.		<p>prepared a plan for implementing the program in 2004. The policy requires two individuals qualified as Lead Operators, two individuals qualified as "A" Operators and two individuals qualified as "B" Operators on shift at all times.</p> <p>Operators we interviewed were generally unaware of management's plans for cross-training.</p>		
2.3.18	Workers appear to have a parochial view of operating and maintenance practices. They have very limited exposure to operating and maintenance practices at other similar facilities within General Chemical and/or within the local area.	Low	<p>During 2003, several employees have represented GCRW visiting other similar facilities, and attending process-related meetings in the local area. For example, employees have attended local CAER meetings and workshops, visited General Chemical's Anacortes facility, and plans are being made for reciprocal visits with other process facilities in the area. These visits provide a valuable opportunity for GCRW workers to observe work practices at other process facilities and to discuss safety issues with other plant workers.</p> <p>GCRW's original intent was to select employees for these visits based on the results of performance evaluations, participation in safety programs or other similar criteria. To date, however, only a limited number of GCRW workers have volunteered to participate in these meetings. Other workers should be encouraged to attend these meetings/visits to achieve maximum benefit to GCRW.</p>	1	See 2.2.1
2.3.19	GCRW job descriptions do not explicitly address safety requirements.	High	The job descriptions for salaried employees now include a section on safety expectations. There are no job descriptions for the hourly workers, but the safety requirements are explicitly addressed in GCRW's EHS policies and procedures.	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
2.3.20	Working safely is not yet internalized by the entire work force. There appears to be a limited understanding of the risks involved, and managers indicated that personal protective equipment is not always worn by workers, as required.	High	See 2.3.1, 2.3.13 and 2.3.14.	1	
2.3.21	Workers' concerns about wearing eye goggles have not been adequately addressed. Workers argue that wearing eye goggles could introduce health and safety risks under certain circumstances.	High	See 2.3.13.	1	
2.3.22	It appears that some supervisors may take risks to get the job done, and risk-taking behaviors may be permitted or overlooked by some levels of management. Some workers indicated they might be willing to take some risks and break safety rules to rescue a man down.	High	As discussed in Item 2.3.1, above, the new Plant Manager has made safety a priority at GCRW, and this has helped to clarify the types of behaviors expected of supervisors and workers. Also, during 2003, the Plant Manager and the EHS Manager have met with all supervisors to discuss their roles with respect to safety leadership. Job descriptions and Performance Evaluations for salaried employees include specific sections on safety.	1	
2.3.23	The existing shift structure may result in Operators' taking undue risks because of an unwillingness to request help when it is needed. The short duration of shift changes may also present significant risk in some situations.	Medium	See 2.3.6 and 2.3.10.	1	
2.3.24	Some workers and supervisors	Low	See 2.3.13.	1	

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	consider the safety rules may not be practical for the “real” risks at this plant. They consider there may be too many rules, and some rules are difficult to follow.				
2.3.25	At times, there may not be an adequate number of Operators at the plant to work safely. Some examples of times and work activities that could introduce risk with insufficient people are: (1) during upset conditions; (2) during plant start-up; and (3) when the Operations Department has unfilled positions.	Low	GCRW has established minimum staffing requirements for cold startup, warm startup and hot startup, and a supervisor is always required to be present at startup. Operators indicated that they feel management is there now to help during these times. (This was not always the case in the past.) GCRW had no unfilled Operator positions at the time of the follow-up evaluation, and the hiring process has been enhanced (See 2.3.1). Management appears committed to filling open positions as quickly as possible.	1	<i>Suggestion for Further Improvement</i> Consider the potential advantage of preparing Operator aids such as pocket-books, “rip-and-run” binders, or posted photographs to help Operators work safely when prompt actions are required. For example, for a tank fill operation, the rip-and-run binder could include a photograph of the equipment highlighting the valves to be opened and closed for the specific tank-fill operation. These types of aids could be especially helpful to Operators who may be required to complete these tasks when they are alone at night or in the period immediately following their qualification.
2.3.26	Physical conditions at the plant may restrict peoples’ ability to work safely. (This issue applies more to the limited expenditures in the past on preventive maintenance rather than to human factors issues involved in equipment operation.)	High	During 2003, GCRW has made considerable progress with the Mechanical Integrity program, and resources are also being committed to designing a new Distributed Control System and other programs that demonstrate a commitment to improve the physical conditions at the plant. (See 2.3.6 and the main text of this report.)	1	
2.3.27	Workers are not trained to identify and	High	The GCRW near miss reporting program was	1	<i>Suggestion for Further Improvement</i>

Table 1 General Chemical Richmond Works Follow-up Safety Evaluation Findings (continued)

#	Initial Safety Evaluation Finding	Priority	Assessment of General Chemical Action	Status ¹	Comments and Suggestions for Further Improvement
	report near misses, and there is a lack of awareness of what a near miss is. There are no incentives for reporting near misses. (See also 2.1.10)		revamped in 2003. A new program description was added to the Safety Manual, and an incentive program was also developed to reward employees for their contributions to safety (including near miss reporting, safety suggestions, and safety training). Reporting of near misses has increased significantly with this renewed emphasis on the program (see 2.1.10). Near miss reports are tracked in the monthly Health and Safety Council meetings.		Consider an annual review of the near miss program that includes a formal review the types of near misses being reported, the quality of the root causes that are being generated, and the value of the program in reducing risk and in building a positive safety culture. Consider implementing the proposed Job Observation program to help differentiate unsafe conditions and behaviors from near misses.
2.3.28	There is a sense among many of the workers that accident investigations are used to identify who is to blame, rather than to address the underlying root causes.	Medium	During the follow-up evaluation, most workers expressed positive support for the investigation process used for incidents and near misses. However, some workers still commented that the root cause analyses are not effective in identifying the real causes of incidents, and some workers said there is still a tendency for supervisors to look for someone to blame.	1	See 2.1.15
2.3.29	Many of the workers, supervisors and managers are concerned over job security. The recent bankruptcy announcement by General Chemical could have an adverse impact on employee morale and motivation for working safely.	High	To keep all employees informed of business issues affecting GCRW, the Plant Manager has been conducting quarterly “Communications Meetings” and distributing weekly “Communications Memos”. These communications discuss developments on the status of the General Chemical Chapter 11 filing, market conditions, plant projects, and the other business issues. These communications have helped to minimize workers’ level of uncertainty, but the lack of a long-term contract continues to affect workers’ confidence of long-term job security.	1	

IV. Conclusions

There have been many impressive accomplishments and improvements to the GCRW safety programs during the last year. GCRW has addressed all 54 findings from the initial safety evaluation, and they have made excellent progress in working towards a more positive safety culture. In many ways, GCRW's commitment to this process has been exemplary. Some of the more significant achievements and actions taken by GCRW are listed below.

A. Safety Management Systems

- The number of incident investigations conducted at the plant has increased substantially, largely due to the increased effort on reporting near misses.
- GCRW is in the process of upgrading and expanding the Maximo system, which is used to track work orders at the facility. When fully implemented, the expanded Maximo system will allow GCRW to better track maintenance activities and will serve as the data base system for the mechanical integrity program.
- While mechanical integrity was not part of the initial safety evaluation scope, it is important to note that GCRW has made significant progress on updating their mechanical integrity program.

B. Human Factors

- GCRW is in the process of completing the design of a new DCS. They conducted a CTA that involved extensive input from the Operators to identify needed alarms and their priority. The CTA also was used to develop a control room layout as well as preliminary operating screens for the DCS.
- As part of the training improvement program, a training summit was held that included both salary and hourly staff. The summit was used to identify the needed training programs, the essential elements of the training programs, and a rating of the effectiveness of the existing training programs.
- GCRW is in the process of evaluating a number of computer based training programs and they are committed to implementing a number of computer based training programs within the near future.
- The Operators' shift structure was modified so that all of the Operators work with the same team on a 12-hour shift. This has improved the level of team work on each of the shifts. Operators appear to be more willing to ask for and provide help to other Operators on their shift as well as with other shift teams.

C. Safety Culture

There has been a very positive change in safety culture. The change was very evident from the onsite interviews and from the various program documents that were shared with the evaluation team. Some of the initiatives that have contributed to this change are as follows:

- A safety visioning process which involved a wide cross section of employees.
- A revamped near miss reporting program.
- A new safety suggestion program.
- A new employee safety rewards program.
- A new employee recognition program.
- Improvements to way in which Health and Safety Council meetings are used to communicate safety issues.
- Visits offsite that allow workers to share experiences with other workers in the local area and at other General Chemical locations.
- A training summit to review all training needs and training delivery alternatives.
- Pilot testing of the complete version of the Maximo maintenance management system, and the appointment of a new maintenance planner.

In these initiatives, the common themes have been an open invitation to all employees to participate in the development process, to consider workers' opinions, and to emphasize collaboration between hourly and salaried employees.

D. Summary

There are still a number of challenges facing GCRW before the values expressed in their own Safety Vision are met. Some of these challenges are summarized below:

- There is an imperative need to “win over” all employees to the new Safety Vision, and to have a higher level of participation in the GCRW safety initiatives. Some workers still have resistance to this change, and are reluctant to get involved. This reluctance is not uncommon when a major change like this is instituted at a facility, and it takes time for all staff to become aligned with the new initiative.
- For some workers, there is a lingering distrust of management. This perspective is understandable, given the style of management and the inconsistent leadership in the past.
- Even though workers are being given opportunities to share their ideas on safety (e.g., safety suggestion program and communications meetings), there is a perception among some workers that management does not listen to them. Some are unwilling to risk being blamed (e.g., for near misses), some doubt that management will really act on their safety suggestions if the solutions are expected to be complex or costly, and some lack confidence that their ideas are worthy of consideration.

- Some workers still perceive that disciplinary action is not always based on actual events. They sense that managers do not listen to their positions, and disciplinary actions are not always based on fact. There is some uncertainty with workers about the steps in the disciplinary process, and the time steps involved for follow-up.
- In Operations, there are some limited personality conflicts that continue to adversely affect the morale of the group and the ability of Operations to function well as one team.
- Some workers argue that the Maintenance Department is understaffed to complete the high volume of work orders that is currently being generated.
- Even though there is help available, some Operators with minimal experience expressed a lack of confidence when working at night on non-routine tasks. They understand that working safely is the priority, but they are also aware of the need to complete their tasks in a timely manner.

While these issues reflect some resistance to the cultural change that is taking place, this is not unexpected. For many years the workers at GCRW were subject to indecisive and unsupportive management. Justifiably, this has resulted in skepticism and a lack of trust for management. It is natural to expect that this will influence workers' opinions until they develop more confidence in the new operating philosophy and an acceptance that their contributions are truly valued.

The results section of this report includes a number of suggestions for further improvement. If implemented, these suggestions will likely help to address the issues discussed above. (The suggestions are summarized in Table 2.) It should be noted, however, that MRS considers that GCRW has met their commitments in addressing the findings of the initial Safety Evaluation (January, 2003), so the suggestions for further improvement are for GCRW's consideration only. They are not required to be implemented as part of this follow-up evaluation.

Whether or not the suggestions for further improvement are implemented, there will be a need for GCRW to demonstrate an on-going commitment to their safety initiatives to sustain the positive advances in safety culture. The ultimate success of this effort will be reflected in the extent to which the safety culture continues to improve over time, and the extent to which GCRW can achieve their goal "to prevent all injuries, accidents and incidents and to generate a positive impact in the community".

Table 2 **Summary of Suggestions for Further Improvement**

1. Consider modifying the PHA procedure to include that incidents be identified in the specific deviation line items that address the incident.
2. Consider modifying Section IX.F of the Injury and Illness Prevention Program to include a requirement that the incident investigation team leader be trained in incident investigation techniques and how to identify root causes.
3. Consider a more formal use of the Power Analysis-Linear Problem Solving Technique, which is the incident investigation technique that the Supervisors have received training on. The more formal approach would involve the use of the Power Analysis Investigation Report forms as a means of documenting the incident investigation analysis. An alternative technique based on a simplified checklist may be more suitable for minor incidents and near misses.
4. Consider conducting a field trip with the Operators to a facility that has a DCS so that Operators can see what a DCS looks like. This type of field visit would also provide an opportunity for the General Chemical Operators to discuss the benefits of a DCS with the Operators at the other facility.
5. Consider having the Safety Vision Team reconvene at regular intervals (perhaps quarterly) to help employees stay focused on the values expressed in the Safety Vision statement.
6. Consider implementing a mechanism that would require all workers to become involved in the group meetings and committees working on safety-related initiatives. The mechanism should provide a way to consider the merits of teams consisting of hourly workers, teams of salaried employees, and teams with both. The ad hoc approach to forming teams – voluntary participation – has worked well through the initial stages of the change process. However, the change process will move faster if others are encouraged to participate.
7. The hourly workers who have participated in the Safety Vision process have expressed a willingness to meet with their fellow workers to explore their reluctance to being more involved in the safety activities. Management should support and encourage these individuals and provide any help that may be needed.
8. Consider requiring all employees to join a team to explore ways for improving the pace at which the Safety Vision guiding principles are being accepted by the GCRW workers.
9. Consider an annual review of the safety suggestion program to ensure that the method of implementation and the feedback it generates are optimized to meet the objectives of the program. Issues to consider include: (1) how to encourage employees to *write down* their suggestions; (2) how to reward employees that take action through Work Orders (rather than safety suggestions); (3) who the suggestions are assigned to, and the potential for “conflict of interest”; and (4) to assess resources and GCRW’s ability to address the suggestions in a timely manner.

Table 2 **Summary of Suggestions for Further Improvement (continued)**

10. Consider an annual review of the near miss program that includes a formal review the types of near misses being reported, the quality of the root causes that are being generated, and the value of the program in reducing risk and in building a positive safety culture. Consider implementing the proposed Job Observation program to help differentiate unsafe conditions and behaviors from near misses.
 11. Consider an annual review of the safety incentive program to make sure rewards are serving to align behavior with the guiding principles of the Safety Vision, and to make the program as equitable as possible to all employees.
 12. Consider the potential benefits of providing team-building and motivational training to certain Operators and/or maintenance workers. Management may wish to offer or require this training when behaviors are identified that are counter productive to teamwork and trust.
 13. Management should consider providing structured feedback throughout the follow-up period for workers who have been disciplined. This type of follow-up will help to demonstrate management’s intent to achieve a positive outcome for both parties.
 14. Consider the potential advantages of instituting an annual performance review for hourly employees. If this is considered to have merit, the format and objectives of the reviews should be discussed with Union representatives.
 15. To help address the “obstacles to safe behavior”, consider using a qualified independent third party (such as an Industrial Hygienist) to conduct a review of Personal Protective Equipment, and consider making radios available to those working alone in the plant.
 16. Consider the potential advantage of preparing Operator aids such as pocket-books, “rip-and-run” binders, or posted photographs to help Operators work safely when prompt actions are required. For example, for a tank fill operation, the rip-and-run binder could include a photograph of the equipment highlighting the valves to be opened and closed for the specific tank-fill operation. These types of aids could be especially helpful to Operators who may be required to complete these tasks when they are alone at night or in the period immediately following their qualification.
-

Appendix A Scope of Work for Follow-up Safety Evaluation (prepared by Contra Costa County Health Care Services and the Oversight Committee)

General Chemical - Richmond Works
Follow-up Evaluation to the Management Systems and Safety Evaluation
Statement of Scope

Objective

The objectives of the follow-up evaluation are to:

1. Determine the actions that are being taken by General Chemical Richmond Works are addressing the findings and recommendations from the Safety Evaluation Report, dated January 6, 2003.
2. Determine the changes in the overall Safety Culture at the Richmond Works plant and if any trends in the Safety Culture can be determined.

Background

Because of incidents that have occurred at the General Chemical - Richmond Works plant, communities adjacent to the plant, the Richmond City Council, the Contra Costa County Board of Supervisors, and Health Services are concerned about the safe operation of the plant. Among these incidents are a July 26, 1993 release of oleum, May 1, 2001 release of sulfur dioxide, and a November 29, 2001 release of sulfur trioxide and sulfur dioxide.

In response to the two 2001 incidents, the Richmond City Council together with Contra Costa Health Services arranged for a third-party evaluation to be performed on this plant. This evaluation was not an investigation of the incidents, but an overall review of the Management Systems that were in place at the plant for process safety and a Safety Evaluation of the plant.

A third-party Safety Evaluation was completed and the final report for this evaluation was issued on January 7, 2003. Oral reports by the third-party consultants were given to the Contra Costa County Board of Supervisors and the Richmond City Council on January 14, 2003.

Scope of Work

The evaluation will be conducted at the General Chemical - Richmond Works plant.

1. Evaluate the action plan that was developed by General Chemical to address the findings and recommendations from the third-party safety evaluation and quarterly reports.
 - a. Review and give comments on the action plan that was developed to address the findings and recommendations of the third-party safety evaluation (See *Safety Evaluation of the General-Richmond Works Facility*, dated January 6, 2003, by MRS)
 - b. Review quarterly reports to the Richmond City Council on the progress of addressing the findings and recommendations from the safety evaluation and how the progress compares to the action plan to address these items. Quarterly reports are tentatively

scheduled on April 15, July 15, and October 14. The reports will be written and presented by General Chemical.

2. Follow-up Evaluation

- a.** A Safety Climate (Culture) Survey from the United Kingdom Health & Safety Executive will be reapplied to the employees and selected contractors that work for or who have managerial responsibilities for the General Chemical Richmond Works plant
- b.** Perform an onsite evaluation of the General Chemical Richmond Works Plant to determine that the action plan is being implemented and that the findings and recommendations are being addressed from the third-party safety evaluation
- c.** Public Participation – the evaluation will include time for public comments on the draft report and presentations to the Contra Costa County Board of Supervisors and the Richmond City Council.

The contractor will prepare a plan for evaluation and will submit this plan to the Project Manager from Contra Costa Health Services for review.

Appendix B MRS Comment Letters on General Chemical Action Plan and Quarterly Progress Reports

June 5, 2003

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services
1330 Arnold Drive
Suite 252
Martinez, CA 94553

Re: Comments on General Chemical Safety Evaluation Action Plan and Quarterly Progress
Report dated April 4, 2003

Dear Randy:

MRS has reviewed General Chemical's Action Plan dated January 23, 2003 and the First Quarter 2003 Progress Update report dated April 4, 2003.

General Chemical should be applauded for their determination to move ahead in dealing with the Safety Evaluation recommendations, and the Action Plan includes many positive and constructive approaches to achieving that end. The Action Plan in general does a thorough job of addressing the findings and recommendations in the Final Safety Evaluation Report.

The First Quarter report includes more detailed information about the approach that has been taken by General Chemical for implementing the Action Plan. The Progress Update Report demonstrates that General Chemical has already made considerable progress in moving forward with the Action Plan.

We have the following comments on the Action Plan and the Progress Update Report.

General Comments

1. Tracking the Action Items using a range of statistical measures provides a helpful overview of progress. The Progress Update Report does a good job of this, and it documents the emphasis placed by General Chemical on the high-priority items such as the need for developing a Safety Vision (Recommendation 2.3.1). One obvious limitation to this approach is that some findings carry greater weight than others, and that is not accounted for in the simple statistical techniques. However, this is not a serious concern given that the Progress Update Report provides a separate discussion of progress on each item.
2. General Chemical's proposed approach for tracking completion of the action items is outlined in the first page of Section 5 of the Progress Update Report. The discussion regarding the completion of recommendations acknowledges that these recommendations are never really "complete". General Chemical is proposing to use the term "implemented" to indicate that an Action Item schedule milestone has been met, and we consider this to be an

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Accidental Release Prevention Specialist
Contra Costa County Health Services

appropriate way of designating progress. When we review the Action Items in the Follow-Up Evaluation, we will evaluate the *process* used to implement each item, and we will comment on how effective it appears to be based on the results of our interviews and review of documents.

3. Sections 7-11 of the Update Report provide details of some of the key program initiatives implemented in the first quarter. Including these in the Progress Update Report is helpful in that it provides a good indication of the activities that are under way.
4. The Update Report refers to a number of documents generated by General Chemical as part of the implementation process that are not included in the Progress Update Report (e.g., the visioning document, and the training program for ergonomics and human factors). To help make the MRS Follow Up Evaluation as efficient and effective as possible, we recommend that General Chemical maintain files with copies of these documents, together with a referencing system that will allow us to track the documents to the recommendations. This archiving system might also include copies of the old and new pages where revisions are made to safety program documents.
5. For the high priority recommendations that are deferred to Year 2004 (such as the Distributed Control System, DCS), it would be helpful to document progress on the budgeting and administrative processes to provide assurance that progress is being made and on schedule.

Safety Management Systems

In this section (and the following two sections), the numbering system used matches the numbering in the Safety Evaluation Report and the corresponding Action Items in General Chemicals Action Plan.

- 2.1.4 There is no indication in this action item of what may trigger a review other than an annual update. It would be expected that the procedure would call for a review every time there is an emergency of a certain level (e.g., Level 2 or 3), or after drills if weaknesses are identified. There is no reference in the Action Item to communicating the changes with employees. The recommendation states the need for possible changes to the ERP following certain MOCs, while the Action Item says that changes to the procedures can trigger an MOC. In reality, it works both ways, an MOC can trigger a change to the ERP or a change to the ERP can trigger an MOC. The General Chemical action item should recognize this. The policy that is written should clearly reflect this, and provide clear guidance to employees for implementation.
- 2.1.5 It appears that the response to this recommendation was simply to add a section to the ERP. The underlying implications of this finding are very important. The assessment

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uncovered a general sentiment among employees that they would take any actions they personally thought appropriate if the need for a rescue ever arises. The need to train/counsel workers in this policy is absolutely critical. Not only is this a potential compliance issue (e.g., HAZWOPER), but liability could also be very high.

Human Factors

2.2.7 Developing strong employee participation and “program ownership” are fundamental cornerstones for improving safety culture. The real issue in this finding is building team work among the members of a shift. While the action item addresses the recommendation, it is not certain that this change to the union contract can be made, so other efforts to build teamwork are encouraged. We are pleased to see a number of references in the Progress Update Report to team building and “empowering” workers. We believe that leadership and motivational training are other approaches that would help to achieve this.

Safety Culture

2.3.1 It is likely the actions proposed for General Chemical for this important recommendation will provide a foundation for developing a more positive safety culture at GCRW. It is assuring to see that General Chemical has already drafted a new safety vision statement. The wording and content of the new vision statement seem to be appropriate, and we are pleased to read that there was a broad level of employee involvement in this process.

We have the following specific comments and questions relating to the proposed activities on this Action Item:

- Will the Safety Vision Team have a representative or champion from senior management within General Chemical? Having such a person involved could help significantly in demonstrating top level commitment to this process, and in helping GCRW secure resources as needed.
- Will the Safety Vision Team continue to convene on a regular basis? If so, this would provide workers an important focal point for proceeding with the culture change initiatives. We strongly encourage this, as the new safety vision is implemented and integrated into the General Chemical work process.
- The proposed changes to the 3P program are appropriate. However, as stated in the recommendation, there is a need to give this team an open agenda to develop new solutions from the ground up, and not to be constrained by top-down direction. This

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provides another opportunity for improving the level of employee participation and program ownership by workers.

Our expectation is that, for this action item, the actions taken will begin an ongoing process that evolves over time. As frequently stated, cultural transformation often takes years, rather than months, to achieve. The success of the action items will be the extent to which the culture improves over time.

- 2.3.3 Safety suggestion boxes are a good idea, but they do not demonstrate an ability to act quickly over safety concerns. The key will be how the Safety Council deals with these suggestions and how the responses are communicated back to the workers.
- 2.3.6 We consider that leadership and motivational training for hourly workers is very important, as noted in Comment 2.2.7 above. This type of training is intended to help inspire workers to develop a greater sense of purpose. MRS would recommend that all employees be given the opportunity to attend the leadership and team building training provide to the supervisors.
- 2.3.9 This MRS recommendation calls for worker involvement and union buy-in as part of the process of developing a new disciplinary policy. The Progress Update Report indicates that Union representatives have offered preliminary input for consideration, and we advocate their continued involvement as the policy is finalized and implemented.
- 2.3.15 Regarding the performance evaluations for the salaried employees, the main issue identified in the Safety Evaluation was that they were not being completed in a timely manner. The General Chemical Action Item for this finding gives no indication that actions will be taken to improve the timeliness of these performance evaluations.

Should you have any questions about these comments or wish to discuss them further please give myself or Ivor John a call.

Best Regards,



John F. Peirson Jr.
Principal

July 25, 2003

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services
1330 Arnold Drive
Suite 252
Martinez, CA 94553

Re: Comments on General Chemical Safety Evaluation Second Quarterly Progress Report dated July 7, 2003

Dear Randy:

Marine Research Specialists (MRS) has reviewed General Chemical's Second Quarter 2003 Progress Update Report (Progress Report) dated July 7, 2003. The Second Quarter Progress Update Report includes a detailed summary of the continuing efforts under way at the General Chemical Richmond Works (GCRW) facility for implementing the recommendations from the MRS Safety Evaluation, which was finalized in January 2003. General Chemical should be commended for the work they have accomplished in addressing the findings of the Safety Evaluation. Clearly, General Chemical is taking the findings and recommendations very seriously and is working hard at addressing and implementing each of the actions.

We have the following comments on the Second Quarter Progress Update Report.

A. General Comments

1. In the Executive Summary (Tab 1), General Chemical highlights progress on the near miss program, safety suggestions, policy actions being implemented, changes to the operator shift schedule, and the Training Summit. It appears that GCRW is making good progress on these and other important action items in response to the Safety Evaluation. In reviewing the various internal memoranda used to communicate changes and progress to the safety programs, MRS is encouraged to see a strong emphasis on employee involvement and the use of consistent messages to emphasize the new Safety Vision and a management commitment towards improving the safety culture.
2. We have previously requested that GCRW maintain sufficient documentation to provide an adequate audit trail that will allow MRS to verify the actions taken as each item is implemented. In this respect, we consider the use of internal memos by GCRW to be a very effective way of documenting the actions that are being taken. The use of memos to staff bearing consistent safety messages is also likely to be an effective strategy for building the desired safety culture.

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services

3. MRS feels that the level of detail provided in the progress report is adequate to serve as an update on the general progress being made on the key action items. However, with the limited amount of information included in the Progress Report, MRS is not able to make judgments about whether the action items are “implemented”, and therefore “closed” in terms of the Safety Evaluation process. Also, there are several action items that may have been “implemented” appropriately, though they are not highlighted with any documentation in the Progress Report (e.g., Items 2.1.10, 2.1.14, and 2.3.19). MRS will make independent determinations on the status implementation during the onsite follow-up evaluation, when we review a much broader range of documents and as we interview a cross section of employees.

B. Specific Comments

The specific comments present below are provided for General Chemical’s consideration as they move forward with implementing the various action items. In this section the numbering system used matches the numbering in the Safety Evaluation Report and the corresponding Action Items in General Chemical’s Action Plan.

1. Safety Management Systems

- 2.1.1 There is insufficient information in the Progress Report to determine exactly what steps GCRW is taking to address this recommendation (relating to the inclusion of past incidents in the Process Hazards Analyses). When MRS conducts the follow-up evaluation, we will be interested in understanding what steps GCRW has taken to address the issue of past incidents in the PHAs.
- 2.1.5 The GCRW response to our previous comment should address our concern on this issue (rescue). During the onsite follow-up evaluation, MRS will review the revised text in the ERP and interview employees on this topic.
- 2.1.10 The Progress Report indicates that the near miss program is generating a high number of reports, which suggests a successful roll out. MRS will be interested to find out how GCRW is analyzing and addressing the issues raised in the near miss reports that are being submitted. We are pleased to see that GCRW is actively investigating how to make resources available to address the high volume of safety issues being raised through these reports and the employee suggestion box (Tab 5, Leading Indicators).
- 2.2.1 The GCRW letter dated June 19 indicated that the DCS and CTA would be discussed in more detail in the Progress Report. However, the report indicates

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services

only that the appropriation requests have been submitted to Corporate (Tab 4). It is not clear what steps and time delays are involved before the DCS and CTA projects are approved and implemented.

- 2.2.5 GCRW has conducted two Training Summit meetings to investigate ways to enhance the training programs with employee involvement. At this early stage it may also be appropriate to make inquiries outside of GCRW (e.g., at Corporate or to a training expert) to be sure GCRW is aware of the options available for improving the training programs. It is not clear that the Training Summit addressed the issue of leadership and motivational training (Items 2.2.7 and 2.3.16) as committed to in the June 19, 2003, letter.

2. Human Factors

- 2.2.7 The documentation GCRW provided on this item indicates that the change in shift structure has been successfully implemented. MRS will be interested to verify that this change has indeed “generated a new sense of team work” (GCRW letter, June 19th).

3. Safety Culture

- 2.3.1 We are satisfied that the Safety Vision implementation process is receiving top level management attention, based on the information provided by GCRW in their letter dated June 19th. In our review of the Progress Report, MRS did not find any reference to the issue of Safety Vision follow-up meetings as promised in the June 19th letter. From the Progress Report (Item 2.3.19), it is clear that GCRW is taking steps to improve the performance appraisals, but it is not clear from the information provided whether the financial and human resource systems are being reviewed to verify that they are fully in line with the new Safety Vision and its goals. (last bullet of MRS Recommendation 2.3.1).
- 2.3.2 Broadening the scope of the Safety Vision and 3P process to encompass the relationship with the ACC Responsible Care Program would appear to be a very appropriate development (memo from Larry Landry to GCRW employees, June 30, 2003, Tab 7).
- 2.3.3 We did not see Safety Suggestion Boxes discussed or highlighted in the Progress Report. When we conduct the follow-up evaluation, MRS will be interested in what administrative controls have been implemented to ensure this element is working correctly (GCRW letter, June 19th).

Mr. Randall Sawyer
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Contra Costa County Health Services

- 2.3.6 The main intent of this finding was not to provide workers with the ability to recognize hazards (as stated in Larry Landry's memo to Jeff Jakoncuk, June 20, 2003), but rather to increase their ability to relate to one another and work as a team. (See Item 2.2.7 for further discussion of this issue.)
- 2.3.9 It is not clear that employees had input on the new Disciplinary Policy prior to its implementation (as indicated in GCRW letter dated June 19th), though it is evident in the memo from Larry Landry (June 20th) that the Union representatives were involved. However, it should be noted that the as of June 30, 2003, the draft policy had not been formally rolled out to all employees. Depending upon how this rollout is conducted, it could serve as a vehicle for gaining input from the employees. It may be prudent to wait to close this finding until all employees have seen the new policy and it is formally implemented.
- 2.3.15 The Progress Report does include a memo on Performance Reviews (Tab 10), but the memo is not clear on how the timeliness will be improved or what will constitute the workers reviews. It is not clear whether any feedback has been received from employees. It may be premature to close this finding without feedback from employees.
- 2.3.19 If this Action Item is to be implemented using policies, procedures, and rules, then GCRW should consider incorporating these policies, procedures, and rules by reference in the Employee Job Descriptions.

Should you have any questions about these comments or wish to discuss them further please give myself or Ivor John a call.

Best Regards,



John F. Peirson Jr.
Principal

October 22, 2003

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services
1330 Arnold Drive
Suite 252
Martinez, CA 94553

Re: Comments on General Chemical Safety Evaluation Third Quarter Progress Report dated
September 30, 2003

Dear Randy:

Marine Research Specialists (MRS) has reviewed General Chemical's Third Quarter 2003 Progress Update Report (Third Progress Report) dated September 30, 2003. The quarterly Progress Update Reports continue to provide detailed summaries of the continuing efforts under way at the General Chemical Richmond Works (GCRW) for improving safety performance through implementation of the recommendations from the MRS Safety Evaluation report finalized in January 2003.

We have the following comments on GCRW's Third Progress Report and the overall progress made to date. The numbering system matches the numbering used in the MRS Safety Evaluation Report and the corresponding Action Items in General Chemical's Action Plan.

- 2.1.10 We note that the near miss reporting and safety suggestion programs are and raising new challenges for GCRW regarding the prioritization of resources.
- 2.3.27 This is to be expected following the roll-out and promotion of successful programs like these. The decisions that are made by GCRW management in response to these challenges are likely to be critical during this "break-through" period. It is very important for management to follow-through with responses and action on every near miss report and every safety suggestion. Demonstrating this commitment will be one of the most valuable ways for management to build credibility and trust with employees.

Concerning the need for resources, we notice that there was an increasing backlog of work orders through August (Tab 5, "2003 Leading indicators – EHS Work Orders). To avoid an increasing backlog, GCRW will need to allocate sufficient resources for at least a few months to resolve more work orders than there are new ones generated.

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services

- 2.2.1 The Third Progress Report provides a good update on progress with the
and Distributed Control System (DCS) and the Cognitive Task Analysis (CTA)
2.2.4 recommendations. It is reassuring to see the commitment of substantial
resources to these two tasks, and also to the Mechanical Integrity project
(including the new maintenance software initiative) which is under way at
GCRW. Again, the funding of these important programs helps to demonstrate
the commitment to safety by senior executives as well as plant management.
- 2.2.5 We are encouraged to see the continuing effort at GCRW to enhance the
operator training program. The Third Progress Report includes information on
the training modules that are being developed, and details of the cross training
program. It is not clear from the report, however, whether GCRW is
considering the use of computer-based simulation training or other similar
technologies for delivering the training.
- 2.3.1 The Third Progress Report includes a summary of the items discussed at the
Safety Vision Team follow-up meeting held on September 29, 2003. As time
passes, it is important to maintain momentum for the safety change initiatives.
The meeting appears to have identified some barriers, and some excellent
ideas for helping to surmount these barriers. For example, “resistance to
change” (last page of Tab 6, Item 18) is very normal when an ambitious
change program is initiated in an established organization, even if the change
has obvious benefits. GCRW recognizes this as a challenge, and we believe
this is another area where management needs to make sound supportive
decisions to build trust with valued employees who may be naturally resistant
to the change effort. Identifying and celebrating “victories” (Item 17) is one
approach for building support for the ongoing program. We would encourage
GCRW to continue these meetings until there is unanimous support for the
Safety Vision and the operational philosophy that it represents.
- 2.3.18 The plans being made for reciprocal visits with the ChevronTexaco refinery
appear to be an excellent approach for exposing the GCRW workers to work
practices at other process facilities. Not only will there be an opportunity to
observe the work practices at the refinery, but also there will be a chance to
gain feedback from the ChevronTexaco staff who visit GCRW. The idea of
basing these visits around a topical agenda is a very constructive idea.

Mr. Randall Sawyer
Accidental Release Prevention Specialist
Contra Costa County Health Services

General We would like to reiterate the importance of our General Comments 2 and 3 included in our previous comment letter (July 31 2003). These comments emphasize the need for GCRW to maintain good documentation regarding the progress on each of the recommendations, and the basis for determining when a recommendation is considered "implemented". We appreciate (as General Chemical states in the Progress Report) that it is often impossible to say that a recommendation is "complete." However, it is still important to carefully define the milestone at which point the recommendation is determined to be "implemented".

In summary, it appears from the Third Progress Report that GCRW is making good progress with the implementation of the Safety Evaluation recommendations. In the forthcoming onsite component of the follow-up evaluation, we will have an opportunity to discuss progress in more detail with management and hourly workers. This will also help to address the issues we have raised in our comment letters during the last nine months.

Should you have any questions about these comments or wish to discuss them further please call me at (805) 289-3923 or Ivor John at (805) 730-1338.

Best Regards,



John F. Peirson Jr.
Principal

Appendix C Findings and Recommendations from the Initial Safety Evaluation

#	Finding	Recommendation	Priority
Safety Management Systems			
2.1.1	The PHAs do not include sufficient documentation to show how past incidents were addressed in the PHA.	Modify the RMP/Cal ARP Procedures covering PHAs to include a requirement that each PHA contain a list of the past incidents addressed in the PHA, and that the PHA documentation specifically identify where each incident was addressed.	Medium
2.1.2	There is no written procedure that covers the development, revisions, and certification of operating procedures.	Develop a written procedure that covers the development, revisions, and certification of operating procedures. This procedure should address who is responsible for the development and revisions to operating procedures, who is responsible for approving any new or revised operating procedures, and who is responsible for the annual certification of the operating procedures.	Medium
2.1.3	A review of the Emergency Response Manual showed that the list of contacts was out of date.	Update the contact list in the Emergency Response Manual, and implement a policy that requires updating whenever there is a change in staff that affects the contact list.	High
2.1.4	The Emergency Response Manual does not contain a written procedure for reviewing and updating the manual, and for specifying how any changes are communicated to the employees.	Add a section to the Emergency Response Manual that details the procedures for reviewing and updating the Emergency Response Manual. The section should discuss the frequency of the review, the person who is responsible for reviewing and updating the manual, and the process that will be used to communicate the changes with the employees. It should be noted that certain changes to the Emergency Response Manual would also be required through the MOC process.	High
2.1.5	The Emergency Response Manual does not contain a written policy regarding the rescuing of workers.	Develop a written policy that covers the rescuing of workers. This policy should cover different scenarios such a fire, hazardous material release, chemical spills, etc.	High
2.1.6	Some of the Operators are unclear as to what is the proper procedure for agency notifications in the event of an emergency.	Develop a flowchart that shows the required notifications and the order of contact for various emergency situations such as fire, chemical release, man down, etc.	High
2.1.7	Evacuation drills have not been conducted to test the Emergency Action Plan.	Modify the Emergency Response Plan to include a requirement for evacuation drills. These drills should be conducted on an annual basis.	Low
2.1.8	Changes in policies and procedures that affect operations and	Add a section to the MOC procedure that clearly states that any changes in	Medium

#	Finding	Recommendation	Priority
	safety have not always been handled through the MOC process.	policies or procedures that affect operations must be handled through the MOC process.	
2.1.9	Changes in key personnel assignments or responsibilities have not gone through the MOC process as required by the facility's Management of Change Procedures dated June 7, 2002.	Assure that any changes to key personnel assignments or responsibilities are handled through the MOC process as required by the facility's MOC procedures dated June 7, 2002.	Medium
2.1.10	A review of incident and near-miss reports for the years 2000, 2001, and 2002 indicate that near misses are being under reported. For example in the year 2001, only 4 of the 29 reported incidents were near misses and this reporting is much lower than would normally be expected for this type of facility.	Provide additional training to the workers on the importance of reporting near misses. Develop a near-miss reporting program that provides incentives for staff to report near misses. See also 2.3.27 and 2.3.28.	High
2.1.11	Incident investigation recommendations do not appear to be closed out in a timely manner. A review of 2002 incident investigation recommendations showed that 18 of 53 have not been closed out by the target completion date. A number of these items showed target completion dates in March 2002.	Use the monthly safety meetings to review all outstanding recommendations, paying particular attention to progress on meeting the completion date. Assure that documentation is submitted in a timely manner when an action item is completed. Update the target completion dates as needed, based upon revised information, and assure that if target completion dates are changed, that the reason for the change is documented.	Medium
2.1.12	Documentation showing that recommendations from incident investigations had been closed out was not consistently tracked. Of the 32 closed incident recommendations reviewed for the period of 2001 and 2002, twelve did not have documentation verifying that the recommendation had been closed.	Develop a written procedure that details the required documentation process for closing out action items for incident investigations, audits, PHAs, etc.	Medium
2.1.13	There is no systematic application of incident investigation action items to like equipment/systems throughout the facility.	Revise the Incident Investigation procedure to include a requirement for the Health and Safety Committee to make recommendations for applying incident investigation action items across all like equipment/systems at the facility.	Medium
2.1.14	There is no documented training course for incident investigation team leaders.	Develop an incident investigator training course, and require that this be taken before an individual may conduct an incident investigation.	Medium

#	Finding	Recommendation	Priority
2.1.15	The incident investigation procedure does not indicate who is qualified to conduct incident investigations, and incident investigators do not receive training in the incident investigation technique and how to identify root causes.	Develop a training course for incident investigation team leaders with an emphasis on GCRW's procedure for root cause analysis. The training course should also cover who is responsible for developing recommendations for applying incident investigation action items across all like equipment/systems at the facility.	Low
2.1.16	The work order form generated by the Maximo system does not show who requested the work to be performed.	Modify the work order form generated by the Maximo system to include the person who requested the work be performed.	Low
2.1.17	<p>In reviewing the Contractor Program documents, the following issues were identified:</p> <ul style="list-style-type: none"> • The date of the job-specific training for each contract employee is not always the same as the date provided on the top of the sign-in form. • The job-specific training form includes a number of information items that are not required, and are often left blank on the completed forms. These items include the AR No., Job No., Req No., PO No., Owners Representative and Title. 	<p>Modify the job-specific training sign-in form to include a date for each signer, which would allow each contractor to sign the form and provide the date that they received the job specific training.</p> <p>Review the job specific training form to make sure that only the required fields are included in the form.</p>	Low
2.1.18	Several safety management programs lack adequate document control to ensure that they are developed, implemented, revised and distributed in an effective manner.	Establish a Document Control Procedure for managing the development review certification and distribution of safety program documents including the plant rules, plant policies, training system, job descriptions, etc. This procedure should assure that all safety management system documents are current, consistent, and accurate.	Medium
Human Factors			
2.2.1	The majority of displays in the control room are comprised of very old technology whose interpretability is non-intuitive, particularly for inexperienced Operators and for all Operators under upset or stressful conditions. There is a high degree of inconsistency among display formats, and a lack of displays that provide a quick, overall, "at-a-glance" summary of the state of plant processes. The mimic displays that are available for the CP plant are good, particularly at providing at-a-glance summaries of CP processes. However, similar displays are not available for other processes throughout the facility.	It is recommended that General Chemical hire a qualified human factors consultant to perform a cognitive task analysis (CTA) of control room functions as they relate to display design and use. The output of a CTA is important in identifying human performance bottlenecks (e.g., limits in the interpretability of displays under routine and/or upset conditions) that exist with the current system. Additionally, a CTA can provide general design and implementation guidelines for improved displays based on the results of the CTA itself, as well as general guidance from the human factors display knowledge base. The potential benefit of implementing a Distributed Control System (DCS) should also be considered in the CTA.	Medium

#	Finding	Recommendation	Priority
2.2.2	Senior management and training personnel have not had sufficient training or background in human factors and ergonomics. Their lack of training in these areas prevents them from being able to adequately train plant personnel in these areas and prevents them from being sufficiently aware of human factors and ergonomic safety issues throughout the facility.	It is recommended that the new permanent Plant Manager, the Operations Superintendent, and the EHS Manager receive general background training in the areas of human factors engineering and ergonomics. Short courses on these topics are generally offered by (1) human factors and ergonomics consultants, (2) local universities, and (3) workshop presenters at human factors and ergonomics conferences (e.g., National Ergonomics Conference).	Low
2.2.3	Human factors and human performance issues are not adequately covered as part of training for plant personnel. The majority of plant personnel have had no exposure to concepts related to causes of human error, human performance risk factors for injury, etc.	It is recommended that a segment on human factors and human performance be added to the safety training curriculum. Additionally, the safety walkthrough that accompanies safety training sessions should also incorporate the identification of human factors and human performance risk factors.	Low
2.2.4	Control room alarms lack sufficient discriminability and are not sufficiently prioritized. For instance, when Operators are outside the control room and hear an alarm it is generally not possible to identify its source without returning to the control room or communicating with someone in the control room. Additionally, once alarms are acknowledged they will not repeatedly sound even if Operators fail to address the underlying condition. This could cause an Operator to forget about an alarm condition should he/she become preoccupied with another existing situation.	As part of the CTA recommended in (2.2.1) above, an analysis of the current design and operation of control room alarms should be conducted. This analysis should address current problems with alarm discriminability and prioritization, and should result in a set of guidelines and recommendations for an improved, reconfigured alarm system.	High
2.2.5	The current approach to training relies heavily on classroom-style instruction and testing, as well as on-the-job training. However, simulations and drills are not used to full advantage as training methods. While minimal use of these techniques has recently been introduced in the facility, they are not sufficiently employed. Additionally, there appears to be a lack of awareness among managers of modern training technologies such as desktop computer-based simulation tools.	Simulations and drills should become a more central element of GCRW's approach to safety training. Drills should focus on emergency procedures and emergency response, enabling personnel to practice and refine essential skills and behaviors needed to adequately cope with emergency conditions. Drills often have the added benefit of illuminating shortcomings in current emergency procedures so that better procedures can then be adopted. Simulations (e.g., desktop, PC-based simulations) should be used to provide Operators with the opportunity to familiarize themselves with plant process characteristics as they vary due to the presence of various upset and non-routine conditions.	Medium

#	Finding	Recommendation	Priority
2.2.6	There is insufficient emphasis placed on reward and positive reinforcement as a means of increasing good safety behaviors and practices. While discipline for unsafe practices appears to be well enforced, there is no formal arrangement for plant personnel to be rewarded (e.g., with letters of commendation, awards, informal positive statements from management, etc.) for good safety decisions and practices.	General Chemical should investigate methods for increasing the use of reward and positive reinforcement to promote effective safety behaviors among plant personnel. The reward does not necessarily need to be money (General Chemical already includes a monetary reward as part of its 3-P program), but could involve letters of recognition, “Safe Employee of the Month/Quarter/Year” awards, and even informal “attaboys” from plant management in the presence of other plant personnel.	Medium
2.2.7	There is little or no “team concept” among plant Operators, perhaps primarily due to the fact that the current shift structure prevents the formation of cohesive teams (i.e., Operators do not work with the same individuals on a consistent basis). This prevents Operators from forming the type of teamwork bonds that promote a sense of caring and awareness of other team members’ strengths, weaknesses, habits, etc.	As part of the next union collective bargaining effort, GCRW should seek a change in the current shift structure to enable the same people to work together on the same team more consistently. See also 2.3.6	High
Safety Culture			
2.3.1	Managers and workers at GCRW do not have a clear vision for the facility health and safety program. Safety slogans and safety messages do not provide a persuasive and compelling vision of the safety objectives for the plant, and there is no consistent communication of a safety vision.	It is recommended that GCRW develop a new vision for the safety program and a strategy for attaining the vision. This visioning process should incorporate the following elements: <ul style="list-style-type: none"> • Establish a team to guide the initiative. The team should include: senior managers who are fully committed to implementing the vision with sufficient authority and influence to provide resources and develop policy; plant management; first line supervisors; representatives from GCRW Operations and Maintenance; and represented labor. All team members should be recognized as leaders, having respect from their colleagues and workers for their ability to successfully implement new ideas. • Develop a compelling safety vision statement, and a concise strategy for how the vision will be accomplished. The guiding team should consider existing programs within General Chemical and their potential for contributing towards the new vision, but the team should also have the freedom to develop completely new ideas that will likely appeal to the GCRW workers, and provide the inspiration for gaining broad-based support. The strategy should lay out a logic for achieving the vision, including preliminary plans, budgets and schedules. Offsite meetings 	High

#	Finding	Recommendation	Priority
		<p>could help to provide an environment conducive to this type of creative process.</p> <ul style="list-style-type: none"> • Establish a framework for communicating the vision with all employees at GCRW. This framework needs to be simple, effective, and include strategies for addressing the resistance to change that is likely to be encountered. The new vision and strategy should address the risk-taking behaviors and “obstacles to safety” that are evident in the existing culture. Through the application of a clear vision statement and consistent communication of the values inherent in the vision, the new initiative should help the organization address these barriers, and to address the obstacles evident in the existing culture. This may be achieved using a wide range of communications approaches (persuasive communication, role modeling, expectancy, coercion, rewards, structural rearrangement, etc.). These “methods of influence” can be very effective in dealing with the “multiple realities” that exist in any organization, and recognizing that every person has a valid opinion that needs to be considered. • Identify needs for training and ways to empower the work force to increase performance standards and to allow them to actively participate in the new safety initiatives. During the change process, there is likely to be a need for training to provide workers with new skills and attitudes for assuming the responsibilities and behaviors that are called for in the new vision. Of particular importance with respect to GCRW is the need for workers to develop team skills, team goals and a sense of purpose as one unit. Managers and supervisors would likely benefit from leadership training and skills development. • Establish a sense of urgency by emphasizing the critical importance of this initiative for moving beyond the current realm of problem solving and “fire fighting,” and establishing self-directed teams responsible for implementing broad-based safety programs. • Review human resource and financial systems and to make sure they are fully aligned with the new vision. This should involve goal setting for individuals and groups; review and revision of the performance appraisals, job descriptions, and how staff are being hired; review of how resources are allocated and what reward systems are in place. The required skill sets for new hires should be considered to be sure that attitude and leadership capabilities are considered as well as technical 	

#	Finding	Recommendation	Priority
		<p>skills.</p> <p>As the safety initiative progresses, the intent is to establish a culture that is fully committed to safety at every level of the organization, with every participant working towards the same vision of safety. As peoples' level of trust grows over time, so also will the level of participation. This approach should allow employees to identify better ways for achieving superior safety performance.</p>	
2.3.2	<p>There is little awareness among workers of the full scope of the General Chemical 3P Program, and the importance of 3P participation has not been effectively conveyed to workers. Operators and maintenance personnel are aware that they can receive a \$50 quarterly bonus if no recordable injuries occur during that time period, but are almost unanimously unaware of any other features of the program.</p>	<p>General Chemical should promote greater awareness of its 3-P safety program. This can be accomplished by disseminating printed material to plant personnel describing the attributes of the program, and/or by featuring the program as a key element of monthly safety training sessions. See also See 2.3.1.</p>	Medium
2.3.3	<p>Management has not demonstrated to workers a convincing ability to act quickly over health and safety concerns and suggestions.</p>	<p>See 2.3.1</p>	High
2.3.4	<p>Workers perceive that some supervisors and managers appear to be uncertain as to what is needed to ensure safety and health.</p>	<p>See 2.3.1</p>	High
2.3.5	<p>Some managers perceive that supervisors may not be devoting sufficient effort to health and safety, and some workers think supervisors may not be good at detecting unsafe behaviors.</p>	<p>See 2.3.1</p>	High
2.3.6	<p>Among the workers, there appeared to be an attitude of "resigned acceptance" as to the level of safety performance that is possible at GCRW. Workmates' influence and peer pressure within the Operations Department do not appear to be conducive to team building and working as a group towards a shared vision of safety. The influence of fellow workers (including first line supervision) in the Maintenance</p>	<p>Consider giving workers training to help them learn the new behaviors, skills and attitudes needed to increase their personal effectiveness. Conduct leadership training for workers and line supervisors. See also 2.3.1 and 2.2.7</p>	High

#	Finding	Recommendation	Priority
	<p>Department appears to foster an attitude in which workers are reluctant to accept much responsibility for raising safety performance standards.</p> <p>The changes at management level and the limited expenditures on preventive maintenance at GCRW in the past have likely contributed to this attitude among the workers.</p> <p>(Note: the Safety Evaluation team was made aware of a program that is now being implemented to enhance preventative maintenance at this plant.)</p>		
2.3.7	<p>Safety metrics have not been developed and adopted for leading indicators of safety performance. The lagging indicators used by management do not convey information to reflect recent progress being made with regard to the safety program.</p>	<p>Develop a set of leading indicators for safety metrics to complement the lagging indicators currently used. Examples of leading metrics include safety and training activity hours per person; numbers of audits/inspections, safety meetings, training courses, tool-box meetings, safety suggestions, near misses reported, etc. Offsite injuries (of workers) are also used by some companies as an indicator of cultural attitudes to safety. Targets should be set for all of these metrics, and progress should be measured against the targets. At-risk behaviors can also be measured and tracked against targets.</p>	High
2.3.8	<p>Safety performance metrics and safety performance progress are not shared widely with hourly workers.</p>	<p>Develop a list of leading and lagging safety performance indicators that will be shared with employees on a regular basis (e.g., monthly). The statistics should be presented in a suitable format (e.g. using charts and graphs) to present trends and progress, and distributed to all GCRW employees. See also 2.3.7</p>	High
2.3.9	<p>Some workers appeared to be apprehensive about making mistakes for fear of being disciplined by management or ostracized by their fellow workers.</p>	<p>Develop a disciplinary policy and include this as an item for negotiation in the next union contract renewal. The policy development should have worker input, and all workers should be given an orientation of the new policy to make it clear when and how discipline will be used depending on the severity of the misdemeanor. Ensure that this procedure is coordinated with the existing grievance procedure in the union contract. See also 2.2.6.</p>	Medium
2.3.10	<p>Communication among the Operators as a group is probably less than optimal because of the shift structure being used at the plant. Also, it was commented that communications at</p>	<p>See 2.3.1 and 2.2.7</p>	High

#	Finding	Recommendation	Priority
	shift change in the recent past have been brief, with only limited exchange of information regarding the status of plant operations.		
2.3.11	Plant managers receive no formal training on community relations and public outreach to help with the communication of safety and environmental issues.	Develop a training program to provide the GCRW Plant Manager (and other key managers, as appropriate) with the skills necessary for effective communication on environmental and safety issues with outside parties, including the public.	Medium
2.3.12	Participation in the safety program has not been fully embraced by workers, so the potential from employee involvement is not being fully realized.	See 2.3.1	High
2.3.13	Workers are not always involved in developing and reviewing safety rules that affect their work, especially with respect to personal protective equipment, clothing, and work permits.	See 2.3.1 and 2.3.21	High
2.3.14	Some workers perceive that the safety and health rules may be too extensive or prohibitive for the real risks involved.	See 2.3.1 and 2.3.21	
2.3.15	There is no performance evaluation process for hourly workers that could be used to require and recognize good safety performance. Personal performance appraisals and associated safety evaluations for salaried people are sometimes delayed beyond the anniversary date.	Consider developing an incentive-based system for providing hourly workers with rewards for positive contributions to safety (see Finding #2.2.6). For each salaried employee, ensure that the evaluation of safety performance (including a session to provide feedback to the employee) is conducted on the anniversary date to provide feedback on safety issues in a timely manner.	Low
2.3.16	The regulatory safety and health training program is not revised and upgraded on a routine basis to ensure it maintains participants' interest. The training is perceived by some to be boring, repetitive, and time-consuming. As such the training may not be very effective.	Conduct a training effectiveness review of the regulatory Health and Safety training courses using a team of workers and managers, and consider alternative approaches for providing this training, including "e-training" options (provided by a third party or through the Company intranet). Using e-training has the potential of increasing interest level. It would allow individuals to schedule training and to proceed with the training at their own pace. It also offers potential cost savings. (Note. This method may not be suitable for all training courses, especially if site-specific or Company-specific requirements apply. Also, it does not allow for employees to ask questions directly to an instructor.)	Low

#	Finding	Recommendation	Priority
2.3.17	The need for cross-training Operators in the procedures for operating other areas of the plant has been recognized by workers and management, but there has been no commitment to implement such a cross-training program.	GCRW management should develop a plan for Operator cross-training and review the plan with the union during the next round of contract negotiations. As soon as a mutually acceptable plan has been developed, it should be implemented within the Operations Department.	Medium
2.3.18	Workers appear to have a parochial view of operating and maintenance practices. They have very limited exposure to operating and maintenance practices at other similar facilities within General Chemical and/or within the local area.	GCRW should consider establishing relationships with other facilities within General Chemical and/or with companies in the local area that would allow GCRW plant workers to visit other plants to gain a perspective of how others conduct operations and maintenance. This may be offered as a rotation (e.g., one person per month) or as an incentive program based on individual contributions to the safety program. As workers identify best practices at other facilities, the best practices could be offered for consideration at GCRW.	Low
2.3.19	GCRW job descriptions do not explicitly address safety requirements.	See 2.3.1	High
2.3.20	Working safely is not yet internalized by the entire work force. There appears to be a limited understanding of the risks involved, and managers indicated that personal protective equipment is not always worn by workers, as required.	See 2.3.1 and 2.3.21	High
2.3.21	Worker's concerns about wearing eye goggles have not been adequately addressed. Workers argue that wearing eye goggles could introduce health and safety risks under certain circumstances.	Conduct a round of safety meetings at GCRW specifically to address workers' concerns with Personal Protective Equipment (PPE) such as goggles and clothing. Following these meetings, revise the PPE policy, as necessary, to address legitimate concerns, and develop consensus among workers that the policy will be adhered to.	High
2.3.22	It appears that some supervisors may take risks to get the job done, and risk-taking behaviors may be permitted or overlooked by some levels of management. Some workers indicated they might be willing to take some risks and break safety rules to rescue a man down.	Conduct a meeting for all supervisors to emphasize the importance of strict adherence to safety and health policies, procedures, rules and instructions. Supervisors' ability to comply with this requirement should be included in the supervisors' job descriptions and as a safety performance objective in the annual performance reviews. Also see 2.3.24	High
2.3.23	The existing shift structure may result in Operators' taking	GCRW managers and supervisors should review the current policy	Medium

#	Finding	Recommendation	Priority
	undue risks because of an unwillingness to request help when it is needed. The short duration of shift changes may also present significant risk in some situations.	requirements for shift change to verify the policies provide adequate coverage for the likely risks, especially when the plant is going through a startup. Also see 2.2.7 and 2.3.17.	
2.3.24	Some workers and supervisors consider the safety rules may not be practical for the “real” risks at this plant. They consider there may be too many rules, and some rules are difficult to follow.	Use the Health and Safety Committee or a similar forum to conduct a review of the applicable safety rules and identify why workers may perceive they are not practical. For safety rules that are deemed to be overly restrictive, review the rules and the associated training to determine if there are ways to help workers comply with the rule requirements, and minimize the time needed to implement the rules.	Low
2.3.25	At times, there may not be an adequate number of Operators at the plant to work safely. Some examples of times and work activities that could introduce risk with insufficient people are: (1) during upset conditions; (2) during plant start-up; and (3) when the Operations Department has unfilled positions.	GCRW plant management should ensure that all open Operator positions are filled as quickly as possible with qualified individuals in order to avoid experiencing undue risks because of staff shortages. Also see 2.3.23	Low
2.3.26	Physical conditions at the plant may restrict peoples’ ability to work safely. (This issue applies more to the limited expenditures in the past on preventive maintenance rather than to human factors issues involved in equipment operation.)	GCRW is implementing improvements to the mechanical integrity program that should address the underlying issues associated with this finding.	High
2.3.27	Workers are not trained to identify and report near misses, and there is a lack of awareness of what a near miss is. There are no incentives for reporting near misses. (See also 2.1.10)	Consider implementing a “near-miss campaign” that focuses attention on identifying near misses over a limited period of time. The campaign could include initial orientation for workers to help them identify near misses, a competitive element (e.g., reporting by groups, shifts, facility demographics, etc.), and a rewards component. After the campaign, analysis of the near misses could be used to highlight how the near misses helped to eliminate risks in the work place. The intent of the campaign would be to raise awareness of near misses, and help to increase the motivation of all workers to report near misses. Consider a follow-up program that provides incentives for reporting near misses on a routine basis.	High
2.3.28	There is a sense among many of the workers that accident investigations are used to identify who is to blame, rather than to address the underlying root causes.	Management should consider promoting a moratorium on near misses, making it clear to workers that there would be no retribution or discipline for workers who report near misses. Also see 2.3.1 and 2.3.27	Medium

#	Finding	Recommendation	Priority
2.3.29	Many of the workers, supervisors and managers are concerned over job security. The recent bankruptcy announcement by General Chemical could have an adverse impact on employee morale and motivation for working safely.	GCRW management should communicate routine updates to all employees on the financial status of the Company and the likely outcome as it pertains to GCRW. These communications should continue regularly until the General Chemical bankruptcy proceedings are resolved.	High

Appendix D Initial Safety Evaluation Scope of Work

**General Chemical - Richmond Works
Management Systems and Safety Evaluation
Statement of Scope**

Objective

The objectives of this Management Systems for Process Safety and Safety Evaluation are to complete a thorough evaluation of the current management practices and safety culture at the General Chemical - Richmond Works plant.

Background

Because of incidents that have occurred at the General Chemical - Richmond Works plant, communities adjacent to the plant, the Richmond City Council, the Contra Costa County Board of Supervisors, and Health Services are concerned about the safe operation of the plant. Among these incidents are a July 26, 1993 release of oleum, May 1, 2001 release of sulfur dioxide, and a November 29, 2001 release of sulfur trioxide and sulfur dioxide.

In response to the two 2001 incidents, the Richmond City Council together with Contra Costa Health Services is arranging for a third-party evaluation to be performed on this plant. This evaluation is not an investigation of the incidents, but an overall review of the Management Systems that are in place at the plant for process safety and a Safety Evaluation of the plant.

Requirements

The Management Systems and Safety Evaluation will evaluate the plant's human factors and systems concerning the management practices and safety culture at the plant.

Scope of Work

The evaluation will be conducted at the General Chemical - Richmond Works plant.

- 1** Evaluate how the plant's management safety systems, safety culture, and human factors are incorporated in the training of operating, maintenance, other staff, management personnel, and contractors. Address the management systems for: Operating Procedures, Training, Management of Change, Pre Start-Up Safety Reviews, Incident Investigation, Hot Work, Contractors, Emergency Response Program, Compliance Audits, Employee Participation, and Process Hazard Analysis. This evaluation should include, but not be limited to the items listed

below:

- d.** How is management intent, as expressed in internal policies, carried out at field level?
 - e.** How are procedures developed? What does General Chemical – Richmond Works plant do when work falls outside of the written procedures?
 - f.** How is bottom-up input provided for, and on what range of subject matter? How are disagreements resolved?
 - g.** What systems are in place to ensure that management policies and/or procedures are carried out? Do these systems include audits?
 - h.** What accountability exists at each level of the organization? Who is accountable for what and to whom?
- 3.** Public Participation – the evaluation will include public participation. A public meeting will be held prior to the beginning of the onsite evaluation, in which the contractor will explain the plan on how the contractor will perform the evaluation. A second meeting will be held after the draft report is issued to explain the results of the evaluation. The meetings will be an opportunity for the contractor to listen to the public’s concerns and consider incorporating them in the evaluation. The contractor shall attend and present reports at the following meetings:
 - a.** An initial meeting before starting the evaluation;
 - b.** A public meeting to discuss the draft findings of the evaluation;
 - c.** A meeting of the Richmond City Council;
 - d.** A meeting of the Board of Supervisors, to present the final report.
- 4.** A follow-up evaluation will be done, if determined to be necessary by the successful bidder or the Oversight Committee, to include the following:
 - a.** Review the General Chemical – Richmond Works plant’s action plan to help ensure that the action plan is addressing the recommendations and findings from the safety evaluation.
 - b.** Onsite follow-up evaluation to determine that the action plan implemented is actually addressing the recommendations from the safety evaluation. This evaluation is expected to occur approximately six months after the final report is completed.
 - c.** Follow-up evaluation may include a public meeting presenting the draft report of the follow-up onsite evaluation, a public comment period, and a final report to the Richmond City Council and the Board of Supervisors.

The contractor will prepare a plan for evaluation and will submit this plan to the Project Manager from Contra Costa Health Services for review. Included in Appendix A are examples of items to be considered in this evaluation. The contractor should use this list to assist in the evaluation of General Chemical – Richmond Works plant’s current programs for addressing management systems, safety practices, and the safety culture of the General Chemical - Richmond Works plant.