One Titan
Titan International, Inc.
Mr. Michael Troyanovich
Corporate Secretary and General Council
201 Spruce Street
Quincy, Illinois 62301

Re: NOTICE OF DISAPPROVAL
Administrative Order, Docket No. 86-F0011
Dico's Performance Evaluation Report No. 29, Groundwater Extraction and Treatment System, Des Moines TCE Site, Des Moines Iowa

Dear Mr. Troyanovich:

The U.S. Environmental Protection Agency (EPA) received Dico's revised Performance Evaluation Report No. 29 (Report) on October 13, 2015. The EPA has reviewed the report and disapproves the document due to the conclusion that the system has reached the stage where the groundwater pump-and-treat system can be eliminated. As outlined in the 1986 Administrative Order, one of the purposes of the groundwater treatment system is to control groundwater movement to prevent potential contaminant impacts to the North Galley. Dico has not submitted data that demonstrates that shutting down the system and pursuing an alternative remedial action can accomplish the goals of the remedial action, as outlined in paragraph 34 of the 1986 Administrative Order. Until such data is presented and approved, the EPA will continue to disapprove reports that include conclusions stating that the groundwater pump-and-treat system can be eliminated. The EPA has conveyed this position through comments provided on past Performance Evaluation Reports. A copy of this letter will be attached to the Report in the project file to document the EPA's disagreement with Dico's conclusions regarding the groundwater pump-and-treat system at the Des Moines TCE Site (Site).

The EPA also reviewed Dico's comments dated October 12, 2015 the response to EPA's comment letter dated September 16, 2015 on the Performance Evaluation Report No. 29 and disagrees with several of Dico's responses. In an effort to avoid continued disagreement in future reports, the EPA has provided additional information to further outline reasons why the EPA does not agree with certain conclusions reached by Dico as outlined in its response to EPA comments. Please review the attached responses and incorporate changes accordingly in future reports.

In addition, a review of the file shows that the EPA requested a letter or work plan outlining steps Dico intends to take to prevent prolonged system shutdowns due to maintenance or other unplanned occurrences. The EPA has not received the requested letter/work plan. Please submit this letter or work plan within 30 days of receipt of this letter.

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SUPR	CNSL	SUPR
McCoy	Pemberton	Kemp

If you have any questions concerning this matter or comments attached concerning future reports, please contact me at (913) 551-7977.

Sincerely,

Erin S. McCoy, P.G.
Remedial Project Manager
Iowa/Nebraska Remedial Branch
Superfund Division

Enclosure

Cc: Mr. Brian Mills, Consultant, DICO
Mr. Gazi George, Consultant, DICO
Mr. Hylton Jackson, INDR
Mr. Vern Rash, DMWW

Response to Dico's October 12, 2015 Comments

Comment 1, EPA letter dated September 16, 2015: The text indicates that this report, in part, is intended to support Responsible Party claims that the system has been very effective in the past and reached a stage where it can be eliminated and replaced with natural attenuation. TCE concentrations, while variable, do not indicate declining influent concentrations. Influent TCE concentrations in 2014 ranged from 220 µg/L to 800 µg/L, averaging 455 µg/L. Over the past five years, influent TCE concentrations have averaged from 284.2 µg/L to 486.7 µg/L. Influent concentrations at extraction wells ERW-6 or ERW-07 averaged 526 µg/L in April and 470 µg/L during the October sampling events. As groundwater is drawn to the recovery wells from 360º, TCE concentrations at the source of these detections may be much higher. There appears to be a persistent source of impacts to groundwater (residual NAPL/ganglia) at OU1. DICO's groundwater monitoring results demonstrate the hydraulic containment provided by the continued operation of the Pump & Treat system is necessary to restrict plume migration to other areas. As indicated in the Fifth Five-Year Review Report, deteriorating conditions were noted in various areas of the asphalt cap; with continued deterioration, more infiltration shall occur and the potential for soil source material to impact groundwater will increase. Thus, DICO's groundwater monitoring results demonstrate the hydraulic containment provided by the continued operation of the extraction system is necessary to restrict plume migration to other areas, as required by the Administrative Order.

Therefore, the EPA strongly disagrees with DICO's assertion that "…the system… has reached a stage where it can be eliminated and replaced with natural attenuation". The EPA has communicated its position to DICO repeatedly through comments provided on past Performance Evaluation Reports. DICO must correct the report, to read as follows: "This report is intended to document and reflect the operation and performance of the groundwater extraction system over the past year of operation with supporting figures and tables."

DICO Response Letter dated October 12, 2015: DICO objects to USEPA continued attempts to insert statements that are neither supported by science or professional opinion from alternative data. USEPA's statement disregards the results obtained monthly for the past three decades in reports submitted to your attention and the analysis of these results by experts. DICO has repeatedly communicated these views to USEPA without USEPA submitting any alternative or opposing data. DICO maintains its views presented in this item of the report. Based on the information presented DICO continues to believe the current pump and treat system can be eliminated and replaced with natural attenuation as previously presented.

EPA Response: According to the 1989 AOC, Page 6, Paragraph M, one of the purposes of the groundwater pump and treat system is to capture and treat contaminated groundwater on the east side of the Raccoon River, and thereby prevent the contaminants from entering the gallery system. Dico has not provided a work plan to assess other remedial alternatives that could meet this goal. The revised report indicates Monitored Natural Attenuation as an alternative; however, Monitored Natural Attenuation would not prevent migration of contaminated groundwater into the gallery system and DICO has not provided any data (such as groundwater geochemical data to show oxidation/reduction potential) recently to show if the area is either aerobic or anerobic. If Dico would like to conduct a study to provide data supporting their hypothesis, Dico should present a work plan to the EPA for review that outlines the steps needed to evaluate an alternative remedial action. The work plan should also include contingencies outlining what will occur if concentrations increase (i.e. turn the pump and treat system back on) or if the gallery has

the potential to become impacted and data to support why the alternative remedial action is appropriate for the Site. Until a viable alternative is presented and approved, the groundwater pump and treat system shall remain in place to prevent potential impacts to the city water supply.

Comment 2 EPA Letter dated September 16, 2015: The text notes the range of TVOC concentrations for 2014 rather than the TCE range at 220 µg/L – 800 µg/L. Please correct the text accordingly. In addition, the narrative references various contaminant concentrations in mg/L units. The analytical results and graphs in the appendices report results in µg/L units. Please change the narrative to reflect the results in µg/L for consistency. **Please note that the correction for the units are applicable to the entire Report**.

DICO Response, Letter dated October 12, 2015: The concentrations units have been amended to reflect µg/L.

EPA Response: Concur

Comment 3, EPA Letter dated September 16, 2015: The text indicates that hydraulic head measurements suggest a groundwater capture width of roughly 100 feet. As depicted in Figure 11, monitoring wells are about 90 feet to 120 feet from the extraction wells. The use of water levels from the extraction wells, due to well inefficiencies, is not appropriate for estimating the extent of the capture zone. Installation of piezometers within 10 feet to 15 feet of the extraction wells would provide representative water levels under a pumping scenario to adequately evaluate the capture zone. DICO is requested to submit work plans to install the piezometers and provide a scientific basis for the determination of the groundwater capture width. If DICO does not wish to do so, please delete the text suggesting the groundwater capture width from the document and re-submit for EPA approval.

DICO Response, Letter dated October 12, 2015: DICO has no plans and is under no obligation to install piezometers or observations wells to verify groundwater capture widths. This system has been studied for 3 decades with a wealth of information and costs provided by DICO.

EPA Response: While DICO is under no obligation to install piezometers, data is not presented in the report to support the statement that "hydraulic head measurements collected quarterly during 2014 suggest a groundwater capture width of roughly 100 feet" due to lack of hydraulic head measurements closer to the extraction wells, which are necessary to show the vertical profile of the capture zone. Therefore, either data needs to be provided and/or referenced to support the statement or the statement should not be included in future reports. Also, there are several modifications that need to be made to Figures 11 unless additional data is provided. Please review the EPA 2003 document number 600/R-08/003 (A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems). Examples of modifications are listed below and are supported by the above reference document:

- The equipotential line around the extraction wells needs to be modified based on data supporting 100 feet captures zone. If no data is presented, the lines should be removed or dashed, indicating an interpretation.
- Several equipotential lines are not labeled.
- Data needs to be presented to support interpretation outside of the monitoring well network or the lines should be removed due to lack of data or dashed indicating an interpretation.

Comment 4, EPA Letter dated September 16, 2015: There appears to be a discrepancy in the section and Figure 11. The text indicates that recovery wells ERW 5 – 7 induce recharge from the Raccoon

River to the alluvial aquifer. The increase in hydrostatic pressure from the spillway flash boards, as indicated in Paragraph 2, also induces recharge on the east side of the river. The apparent groundwater low in the area of piezometer P-2 follows the hydraulic gradient depicted on each of the Figure 11 groundwater flow maps. The equipotential lines that depict a depression in this area are not based on static water level data. The January Groundwater Flow Map, Figure 11, depicts well NW-12 with a cone of depression. Please review and revise this figure.

DICO Response, Letter dated October 12, 2015: It is true that water level data was not generated during static (or non-stressed) conditions. This does not apply to the piezometer P-2, which exists near or within a parking area off site. Instead of the following hydraulic head contours, a more accurate characterization should be generates or causes hydraulic head to dissipate in this direction, e.g., artificial instead of natural. With the observed effect of this feature over time, it seems clear to be a function of engineered storm water drainage; although this cannot be confirmed since it occurs off site. Contour(s) surrounding NW-12 are not hachured (or indicative of groundwater low) but instead an area of groundwater high. This groundwater high confirms the absence of influence as a result of pumping. A review into the monthly water level data was completed and no discrepancies were noted to occur on these forms or the calculated elevations. Therefore, no revisions to Figure 11 have occurred.

EPA Response: Dico's response does not adequately address EPA's September 16, 2015 comment 4. In future reports, DICO should only interpret areas where data is available. For example, the equipotential line around well NW-14 should not be a circle since there was no data available to the north, northwest or west of the well. The same is true for well P-2 since data is not presented to the north, northeast or east of the well. Please review the above EPA Response to EPA's Comment #3.

Comment 5, EPA Letter dated September 16, 2015: The EPA concurs that the river will lose water to the aquifer due to the spillway flashboards increasing hydrostatic pressure. This is borne out by the river stage being consistently above the groundwater elevations at OU1. However, the Feasibility Study report from 1986 shows a significant difference in hydraulic conductivity exists between the river bed and alluvial sediments. This hydraulic conductivity difference may affect the rate of recharge to the aquifer. If the southern gallery is used, despite the closure of the valves, groundwater is apparently pulled through the northern gallery. Should an extraction well(s) closure scenario be evaluated, additional piezometers would be needed to determine groundwater flow paths affected by induced recharge due to the hydrostatic pressure and use of the southern gallery. Therefore, by losing water to the groundwater system, the likelihood of contaminants migrating toward the river is not completely eliminated. Please correct the statement accordingly.

DICO Response, Letter dated October 12, 2015: It is not uncommon for river bed sediments to have hydraulic conductivities smaller than, but not significantly different, from alluvial sediments. If there is a greater than two order of magnitude difference, it would only substantiate Kx/Ky>>Kz, suggesting 2-D flow beyond the immediate influence of the flashboard. Moreover, for this type of hydrogeologic setting, it is unlikely the difference between horizontal and vertical hydraulic conductivity controls the amount of recharge to the aquifer, since USEPA has apparently established the river bed operates as an aquitard. DICO reiterates since the flashboard is expected to remain into the foreseeable future, it is unlikely the flow field (inside the meander) would reverse itself as USEPA contends.

EPA Response: While the flashboards may stay in place for the foreseeable future, this is not guaranteed. Therefore, Dico needs to assess all possible scenarios if Dico wants to evaluate the possibility of turning off the pump & treat system. Also, the 1986 Feasibility Report indicates that under a scenario where the south gallery is pumping (valve no. 3 closed, north gallery not in use, flashboards up/down), drawdown in the north gallery occurs and it is unclear to what extent groundwater east of the river is induced west. The EPA believes that piezometers are needed to determine groundwater flow paths affected by induced recharge and use of the southern gallery.

Comment 6, EPA Letter dated September 16, 2015: Please delete the word "minimal" in the last sentence of the paragraph and replace it with the actual concentration results from sampling manhole MH-1N.

DICO Response, Letter dated October 12, 2015: DICO maintains its opinion.

EPA Response: Minimal is a subjective term and does not allow for different people in different situations to replicate a situation. Therefore, the term must not be used unless in conjunction with actual data.

Comment 7, EPA Letter dated September 16, 2015: Influent TCE concentrations have been consistently detected above cleanup levels. See comment #1. There appears to be a persistent source of impacts to groundwater. Source material may remain beneath the former degreaser vats and former drum cleaning area in the vadose zone/capillary fringe (creating a smear zone) and/or within the fractured bedrock. Monitored Natural Attenuation (MNA) will not be effective unless source(s) control is a component of this remedy. The EPA does not recommend the shut-down and decommissioning of the existing Pump & Treat system until it can be demonstrated by DICO that MNA will be effective in reducing contaminant impacts to groundwater in a reasonable timeframe and all sources of groundwater contamination have been addressed. Please also refer to the EPA's response dated October 23, 2010 to EME's July 15, 2010 correspondence.

DICO Response, Letter dated October 12, 2015: DICO requests USEPA provide documentation of impacts occurring in fractured bedrock. Under optimal conditions that are already suspected to exist, it has long been documented that chlorinated solvents, included TCE, are susceptible to anaerobic bioremediation. Verifying these conditions, in addition to a demonstration that statistical methods support MNA would be a rather straightforward procedure but would require system shutdown and equilibration.

EPA Response: Source material may remain in the vadose zone/capillary fringe beneath the former degreaser vats and drum cleaning areas and/or within the fractured bedrock. A 1993 Remedial Investigation Report indicates that the potential presence of TCE DNAPL in the bedrock is supported by the concentration of a dissolved groundwater sample from bedrock well RI-2 of 14 ppm. This well was screened across the bedrock interface (portion in the alluvium) that may have diluted this concentration. While pooled DNAPL was not detected, the 14 ppm sample result is presumptive evidence (i.e., a concentration in excess of 1% of the solubility limit of 1100 ppm) of its occurrence in/on the bedrock.

In addition, Dico has not provided any data in the Performance Evaluation Report #29 to indicate that MNA conditions conducive to degradation of Site chemicals of concern are present at the

Site. Are conditions in the interval where contamination is present aerobic or anaerobic? If conditions on Site are conducive to degradation, some breakdown chemicals should already be present. However, data provided in the above referenced report (Table 4) only shows one well sampled in April 2014 with vinyl chloride concentrations. This could indicate that even if degradation is occurring, it is not occurring strongly enough to completely degrade Site chemicals of concerns. If Dico would like to conduct a study to provide data supporting its hypothesis, Dico should present a work plan to the EPA for review that outlines the steps needed to evaluate an alternative. The work plan should also include contingencies outlining what will occur if concentrations increase (i.e. turn the pump and treat system back on), if the gallery has or potentially will become impacted by Site contaminated groundwater, and data to support an alternative remedial action for the Site. Until a viable alternative is presented and approved, the groundwater pump and treat system shall remain in place to prevent potential impacts to the city water supply.

Comment 8, EPA Letter dated September 16, 2015: DICO Report 29 indicates "the recovery wells have effectively limited the off-site migration of the dissolved phase constituents", recommending "natural attenuation as appropriate remedial option". This has been identified as the solution to the existing "practically and financially non-feasible" onsite groundwater treatment system. DICO has not provided any groundwater modeling, pump test data or other technical information to support this conclusion. In addition, the City of Des Moines is still contemplating use of the northern gallery for drinking water source.

As indicated in the Fifth Five-Year Review Report and as detailed in the EPA's response dated October 23, 2010, there may be potential opportunities for optimization, which could, among other alternative remedies, include implementation of an alternative hydraulic containment or source area treatment technologies. The use of monitored natural attenuation may be considered one of the alternatives of achieving remediation objectives. According to OSWER's Directive 9200.4-17P "Use of Monitored Natural Attenuation at Superfund Site, RCRA Corrective Action, and Underground Storage Tank Sites", the EPA expects source control and long-term monitoring should be components of that remedy. The Fifth Five-Year Review Report inferred that inhibiting infiltration at the site through adequate asphalt maintenance may decrease potential impacts to groundwater. Institutional Controls implementation should also be a component of a proposed MNA remedy.

Supporting information shall be required to demonstrate the efficacy of MNA. The demonstration would need to include a quantitative understanding of source mass through further site characterization, post Pump & Treat demonstration of continued plume stability, post- Pump & Treat groundwater flow pathway evaluation, and a determination that evaluates natural attenuation processes (e.g. – hydrogeological, geochemical and biological variables) are occurring at an acceptable rate to meet site remedial goals in a reasonably timely manner. Additional documents for review in consideration of an MNA approach include the following: EPA/600/R-98/128 "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents", September 1998; EPA/600/R-04/027 "Performance Monitoring of MNA Remedies for VOCs in Ground Water", April 2004; "Site Characterization for MNA of VOCs in Ground Water", November 2009; and, EPA/600/R-11/204 "An Approach for Evaluating the Progress of Natural Attenuation in Groundwater", December 2011.

DICO Response, Letter dated October 12, 2015: Based on the reference provided by USEPA, the Feasibility Study conducted in 1986 would appear to provide the modeling results, thus contradicting USEPA's statement. If not, to conduct an assessment using statistical or other methods

to demonstrate MNA as an appropriate process capable of managing residual concentrations should not be too exhaustive of a task. Again, this would require a shutdown of the system to afford hydraulic and geochemical measurements of the natural response of the aquifer.

EPA Response: If Dico would like to conduct a study to provide data supporting its hypothesis, Dico should present a work plan to the EPA for review and approval that outlines the steps needed to evaluate an alternative remedial action. The work plan should also provide data to justify the need for the additional work and should include contingencies outlining what will occur if concentrations increase (i.e. turn the pump and treat system back on) or if the galley has the potential to become impacted by Site contaminated groundwater. Until a viable alternative is presented and approved, the groundwater pump and treat system shall remain in place to prevent potential impacts to the city water supply. Data is needed to support why an alternative remedial action is appropriate for the Site. Until a viable alternative is presented and approved, the groundwater pump and treat system shall remain in place to prevent potential impacts to the city water supply.

However, the EPA does not concur that the pump and treat system needs to be shut down to perform an initial evaluation to determine if aerobic or anaerobic conditions are present at the Site. The potential for anaerobic conditions can be evaluated initially by providing current geochemical data such as oxygen reduction potential, dissolved oxygen, Fe2/Fe3 ratio, etc. This should be evaluated prior to turning off the system to avoid any potential impact to the city water supply.