SITE CHARACTERIZATION

Case 1: Pre-Acquisition Investigations of Multiple Manufacturing Facilities, Mid-Atlantic

An asset acquisition encompassing four manufacturing locations in two states was on a fast track to close a deal within a prescribed timeframe. **EXCALIBUR** was selected to perform baseline environmental site characterization activities to assist the managing counsel with understanding environmental liabilities associated with historical site high-pressure laminate manufacturing and other historical operations at each location and in most instances, spanning over 50 years. Given the plethora of environmental, construction, and demolition information, along with changes to manufacturing processes, **EXCALIBUR** closely collaborated with location management and EH&S personnel to conduct site inspections and interviews to identify areas of concern most likely to have been impacted by operations. Upfront field sampling plans for the customer clearly described areas of concern and incorporated existing soil, groundwater, and vapor data, as well as existing groundwater monitoring wells to eliminate expensive duplicative analyses and demonstrated Excalibur's sound business driven approach across all disciplines to maximize allotted time and reduce expenditures. Furthermore, **EXCALIBUR** clearly described the analytical program for each area to further reduce characterization tasks and to communicate expedited schedules mandated by the managing counsel. Although properties had undergone Phase I and Phase II assessments by previous property owners, gaps in the environmental information were identified that led **EXCALIBUR** to design a targeted and comprehensive analytical program with heightened quality assurance / quality control (QA/QC) measures to allay potential state regulatory involvement related to property transfer requirements. Throughout the program, details and findings were updated to carefully describe conditions encountered to support the acquisition decisions

dominating the purchase agreements. Based on the conclusions derived from **EXCALIBUR's** understanding of the site's conditions, estimated remedial measures and their costs were generated to finalize sale agreements incorporating environmental conditions that either substantiated the final sales amount for a location or were used to reduce a property's value by the equivalent costs for site remediation and closure to address impacts exceeding allowed regulatory levels.

Case 2: Luzerne County Redevelopment Authority – Ashley Rail yard, Brownfields Investigation

EXCALIBUR's client, the Luzerne County Redevelopment Authority, hired **EXCALIBUR** to complete an environmental investigation of an 80-acre Brownfields site that had been used for rail yard operations closely tied to historical coal mining operations. The redevelopment authority sought an ACT 2 Relief of Liability as a Specialized Industrialized Area so that a 14-acre parcel could be developed and restored to productive use. **EXCALIBUR** initiated the process by orchestrating a high level meeting between the redevelopment authority and top officials at the PADEP regional office. Having garnered favorable reaction from the PADEP to the planned land reuse, **EXCALIBUR** subsequently conducted extensive research on the history of the property in order to develop a credible site characterization work plan. Through its research, **EXCALIBUR** discovered key historical facts including that the Ashley Rail Yard was used by several railroad companies for railway operations from the early 1900s through the 1960s and that these railway operations were mainly supporting coal mining / distribution operations and, in particular, those operations associated with the adjacent Huber Breaker Company coal crushing plant. Ashley Rail Yard operations were believed to have included train maintenance, fueling, loading and switching. Ten (10) areas of concern containing potentially significant levels of PCBs, PAHs, petroleum hydrocarbons, lead and other contaminants were identified on the property by

EXCALIBUR. **EXCALIBUR**'s work plan was approved by PADEP without modification and **EXCALIBUR** has initiated its implementation with radio frequency electro magnetic or ground penetrating radar (GPR) geophysical testing to locate historical features which could not be identified on historical maps and plans. Installation of soil borings, monitoring wells and sediments sampling are to follow based on results of the non-intrusive investigation.

Case 3: Coal Tar Site Investigation Leading to Contamination Cap Remedy, Cleveland, OH

As part of **EXCALIBUR's** assignment to reduce environmental liabilities for a large multinational chemical manufacturer, our engineering team of professionals worked closely with Ohio EPA to remove RCRA Corrective Action obligations for a former chemical manufacturing plant encompassing 11-acres that operated in central Ohio from the late 1930s until the its demolition in 2000. Multiple site investigations determined soil and groundwater had been impacted with polynuclear hydrocarbons (PAHs) and benzene exceeding OEPA screening values with potential cancer risks for the outdoor and construction workers based on incidental ingestion and dermal contact with potentially carcinogenic PAHs in soil, and a potential cancer risk for the future indoor worker based on inhalation of benzene (vapor intrusion from groundwater). Exhaustive regulatory negotiations within the economically depressed region of Ohio resulted in the consideration and eventual design of an isolation barrier to limit exposure by cutting off the exposure route. Design considerations included capping the property to its boundaries that had tens of feet of topographical relief and railway access points. Design criteria included a two-foot thick isolation layer across most of the site that required the implementation of an operation and maintenance plan consistent with the use of the property along with site modifications to secure the property boundaries, with an additional safe guard establishing institutional controls. The institutional controls

portion of the site remedy included placing deed restrictions in the form of Environmental Covenants (ECs) to prevent future activities including restricting withdrawal of groundwater, limiting the use to anything other than industrial, and no excavation or digging within the property boundaries. Barrier selection criteria also included the ability to minimize or eliminate contact with impacted soils, function with minimum maintenance, promote drainage and minimize erosion or abrasion of the final cover, accommodate settling and subsidence so that the integrity of the final cover would be maintained, and accommodate the beneficial reuse of the property as a storage area with vehicle access maintained. Isolation barrier material used in the design consisted of steel slag (slag) material sufficient to support expected loads from future industrial land use without sustaining damage with a minimum of 2 feet of material installed in the areas designated for the isolation barrier.

Case 4: Ecological Risk Assessment & River Sediment Sampling, Coal Tar Superfund Site, Ohio

EXCALIBUR was hired by the PRP for a ~4-acre coal tar Superfund site in Ohio to complete an Ecological Risk Assessment to evaluate the likelihood of adverse effects of sediment-associated contaminants (residual PAHs) to the aquatic communities found in the nearby river. The site had been used for 25 years as a coal tar refinery that had impacted groundwater with free-phase and dissolved coal tar. Initial response actions under the USEPA ROD included excavation and off-site thermal treatment of surface soil and river sediments and construction of a RCRA Subtitle D cap over on-site wastes, and hydraulic control and management of perched groundwater. **EXCALIBUR** was retained to collect river-bed sediment samples from eleven locations upstream (background), at outfall location, and downstream from the site outfall to evaluate potential ecological impacts. This included assembling and employing the complete

range of specialized equipment and instruments needed to map, record, collect and preserve a sufficient number of sediment samples from a boat in a dynamic, moving river system. Subsequently **EXCALIBUR** conducted all detailed macroinvertebrate population and diversity analyses, and sediment toxicity and chemical analyses to complete the important ecological risk assessment and regulatory report filing. Sediments were analyzed for PAHs, organic carbon, grain size distribution, macroinvertebrate population density/ diversity, and toxicity. The results of the Hazard Quotient (HQ) calculations for the sediment samples indicated that while some PAHs exceeded ecological risk benchmarks, samples collected adjacent to the site were only slightly greater than upstream samples and indications of negligible probability for adverse effects from PAHs at this location. The corresponding comparative results of the macroinvertebrate survey did not appear to indicate adverse impacts but more likely the physical nature of the habitat (slow moving, impounded, deep water) and differences in substrate conditions. The sediment toxicity testing indicated that ecological survival was not adversely affected by sediment of the river in comparison to control sediments or adverse impacts as a result of coal tar site-associated constituents, and more likely reflects on the physical nature of the substrate and sediment sampling challenges. As a result of **EXCALIBUR**'s river sediment sampling and ecological risk assessment efforts, we were able to show that the PAHs in sediments in the river adjacent to the site are not causing adverse effects to the diversity or abundance of aquatic invertebrate communities in the river relative to background locations.

Case 5: Big John Superfund Site River Bed Sediment Sampling

For the Big John Superfund site in West Virginia, **EXCALIBUR** conducted sampling of river bed sediments adjacent to the site. The sampling plan called for collecting river bed samples at specific geographic coordinate locations. A GPS system was used by **EXCALIBUR** to direct the sampling boat to the exact locations specified in the plan.

Complications included maintaining the boats position in the swift current and minimal sediment in certain location due to river scouring. Additional complications arose when the boat propeller blade failed and needed to be replaced. Despite the set backs and complications, discrete river bed samples were successfully retrieved and packaged for laboratory analysis within the 1 week allowed in the schedule and within project budget.

Case 6 – Petroleum Retail Facility, Uniontown, PA

EXCALIBUR was enlisted by an insurance client to complete forensics on an environmental project that had gone awry and to get the project back on track. Almost $0.5M and half the claim limit had been spent on the petroleum contaminated site in western Pennsylvania and yet the site we not yet fully characterized. **EXCALIBUR**'s client was concerned with the rate of expenditures and the ability to complete the cleanup cost effectively. A review of the case quickly led **EXCALIBUR** to conclude that the interim remedial measures underway by the consultant (short-term, limited spot vacuum extraction events) were technically ineffective and were largely responsible for the mounting and unsustainable costs. Cost projections run by **EXCALIBUR** also led **EXCALIBUR** to conclude that the insurance claim ceiling would be exceeded if the stated cleanup goals were not changed to more relaxed, regulatory compliant risk-based, site-specific cleanup standards. **EXCALIBUR** furthermore determined that the claimant's best hope of completing the site cleanup without exceeding the claim limit would come from competitively bidding the clean-up on a fixed-price to closure basis. Based on these conclusions, **EXCALIBUR** was retained by its insurance client to close site characterization data gaps and evaluate remedial alternatives such that **EXCALIBUR** would be able to conduct competitive bidding of the cleanup and closure. **EXCALIBUR** subsequently expedited cost effective necessary and appropriate site characterization efforts that included: investigating / locating below-grade utilities; mapping the site via professional survey and developing a scaled site plan; advancing 3

on site and 1 off site overburden / bedrock borings; installing 3 on site and one off site bedrock groundwater monitoring wells; completing 14 overburden soil borings / laboratory analyses; installing 5 overburden wells and 4 overburden soil vapor sampling points; collecting / analyzing groundwater samples from the new and existing on and off site wells; performing aquifer characterization testing (24-hour pump test and slug tests); geotechnical testing; biofeasibility / biostimulation testing using compound-specific isotope analysis (CSIA) of nutrient-amended and non-nutrient amended Biotrap samplers; completing contaminant fate and transport modeling and calibration of groundwater contaminant transport; performing soil gas sampling and completing a soil vapor intrusion assessment; completing a technical and financial remedial alternatives evaluation; and documenting the findings in an updated Site Characterization Report. Equipped with a report that fully characterized the site, **EXCALIBUR** then turned its attention to handling all aspects of competitively bidding the cleanup and facilitating the execution of a fixed-price to closure contract with the winning bidder. This entailed **EXCALIBUR** developing a competitive bid package, letting the bid to interested bidders, conducting a pre-bid meeting on site, completing a detailed cost and technical review of bids and analysis for review by **EXCALIBUR**'s client and the claimant, and managing the negotiations for and signing of the contract. The site cleanup was successfully completed by the selected contractor under the contract with amendments for under $200,000 with PADEP approving closure in 2014. **EXCALIBUR** was commended for it efforts that saved its insurance client over $250,000 and helped the insured avoid what would have been financially devastating out-of-pocket expenditures.

Case 7 – Car Wash facility, Westchester, PA

EXCALIBUR was asked to help rescue a cleanup project at a highly contaminated ~1-acre car wash facility site in a mixed commercial / residential area when the environmental insurer determined that the cleanup was headed in the wrong direction.

More than 6 years had gone by, over $330,000 had been spent, an NOV had been issued by the state for non-compliance, free phase product was consistently present on groundwater beneath the site and there was negligible remedial progress. While a free product recovery trench had been installed along the property boundary, scant product recovery had occurred and source material was left unaddressed. Additionally, the consultant had spent over $100,000 on an inadequate remedial action plan which took over 3.5 years to produce all the while incurring mounting monitoring and reporting and site maintenance costs. **EXCALIBUR**'s insurance client sought **EXCALIBUR** to assess the problem project, determine knowns and unknowns, fill data gaps and develop a comprehensive yet concise characterization document that could be used to secure bids for finalizing and implementing a remedial action plan. At the outset, **EXCALIBUR**'s project team of professional geologists and engineers quickly identified missing pieces in the site conceptual model which precluded sufficient site understanding to devise an appropriate and cost effective remedial action for the site. To streamline data collection efforts to shorten schedule and reduce costs, **EXCALIBUR** identified remedial design data which could be collected concurrently with missing site characterization information. Additionally, **EXCALIBUR**'s team quickly concluded that the widespread free product smeared in low permeability soil presented a technical and financial barrier to closure via the generic regulatory standards and that a site-specific, risk-based standard was the only practical goal for the site. **EXCALIBUR**'s team subsequently moved ahead with filling the data gaps by: completing background research on key missing information on the facility and surrounding areas; using geophysical techniques to identify / map buried features; sampling soil in poorly characterized suspected source areas; installing, gauging and sampling overburden and bedrock wells where there was insufficient knowledge of site hydrology or groundwater quality; installing and sampling soil gas probes to assess vapor intrusion risk; completing a door-to-door groundwater use survey; hydraulic testing of overburden and deeper bedrock groundwater zones (slug testing); modeling

groundwater flow and contaminant fate & transport; analyzing current and future potential human exposure pathways; completing a human health risk assessment; and evaluating truly viable and cost effective remedial alternatives. **EXCALIBUR**'s Site Characterization Report Plus (SCRP) report provided a comprehensive understanding of the site conditions and mapped out practical and cost effective remedial options from which competitive cleanup bids could be solicited. The regulatory agency remarked that **EXCALIBUR**'s SCRP was the most well-conceived and thorough investigatory program / report they had ever received. Fortuitously, the site was to undergo redevelopment shortly after the SCRP was produced and this information could be made known to bidders. The selected bidder was, therefore, able to more cost effectively implement one of the leading remedial alternatives recommended by **EXCALIBUR** (free product source / clay removal). The winning fixed price bid to take the highly contaminated site all the way through the cleanup process to a risk-based site-specific closure as outlined by **EXCALIBUR** in the SCRP was just $340,000. The bidder successfully implemented the plan and the regulatory agency approved the Remedial Action Completion Report for this site and granted a Relief of Liability for soil and groundwater. Even accounting for a subsequent modest fixed-price cost increase for circumstances which could not have been reasonably anticipated by any party, the cleanup mapped out by **EXCALIBUR** was completed years ahead of what was expected under the prior pathway and saved **EXCALIBUR**'s insurance client about $200,000 of potential liabilities while simultaneously protecting the insured against unnecessary out of pocket expenditures.

Case 8 – Bus Servicing / Repair Facility, Atlasburg, PA

A gasoline spill at a bus servicing / repair facility in rural Atlasburg, PA which contaminated groundwater with free product and threatened a nearby potable well led to various environmental responses by the owner and his consultant. While some progress had been made, red flags were raised when the site still had not been appropriately characterized **5 years after the release** occurred and nearly $300,000 had been spent. The delay in addressing the spill was a serious concern of the site regulatory agency. The owner's insurer and holder of most of the environmental liability, was also uneasy about mounting costs. But there were even more technical issues of concern to the interested parties including: (a) the highly contaminated soils excavated from the UST field had been pushed back into the excavation without treatment; (b) costly short-term extraction events being performed produced no documentation of recovered free product or contaminant mass / performance; (c) the extent of the dissolved groundwater plume and unsaturated soil impacts had not been defined before the site remedial action plan was developed; (d) an adequate evaluation of remedial alternatives had not be completed before prescribing total fluids & dual-phase extraction as the best remedial option; (e) pilot testing data supporting the design did not exist. **EXCALIBUR** was retained by the environmental insurance entity to redirect the cleanup onto an accelerated and more cost effective path. A review of the case quickly led **EXCALIBUR** to conclude that the consultant's prescribed remedial approach would lead to an inefficient and protracted cleanup. Furthermore, **EXCALIBUR'**s cost-to-closure projections indicated that the insurer's reserves would be completely consumed and the owner would incur significant out-of-pocket expenses if the stated cleanup goals were not changed to more relaxed, regulatory compliant risk-based, site-specific cleanup standards. **EXCALIBUR** deduced that the claimant's best hope of completing the site cleanup without exceeding the claim limit would come from

competitively bidding the clean-up on a fixed-price to closure basis. On this basis, **EXCALIBUR** moved to close site characterization data gaps, complete an objective evaluation of practical and cost effective applicable remedial alternatives and prepare a competitive bid package. Necessary and appropriate activities **EXCALIBUR** completed to close these data gaps included: investigating / locating below-grade utilities; mapping the site via professional survey and developing a scaled site plan; advancing nine shallow soil borings; advancing one on site overburden soil boring and two on site overburden / bedrock borings; collecting and analyzing soil and groundwater samples; installing one on site shallow overburden and two on site bedrock groundwater monitoring wells; investigating the condition of a private water supply well on an adjoining property to the site; performing feasibility testing that included a dewatering test of the former tank cavity, aquifer characterization testing (24-hour and short term2-hour pump tests), and reinjection testing; geotechnical testing; geochemical testing (various metals & general chemistry); biofeasibility / biostimulation testing using compound-specific isotope analysis (CSIA) of nutrient-amended and non-nutrient amended Biotrap samplers; completing a technical and financial remedial alternatives evaluation; and documenting the findings in a Supplemental Report. Equipped with a report that fully characterized the site, **EXCALIBUR** then handled all aspects of competitively bidding the cleanup and facilitating the execution of a fixed-price to closure contract with the winning bidder. This entailed **EXCALIBUR** developing a competitive bid package, releasing the bid to interested bidders, conducting a pre-bid meeting on site, completing a detailed cost and technical review of bids and analysis for review by **EXCALIBUR**'s client and the claimant, and managing the negotiations for and signing of the contract. The fixed price closure cost for the site amounted to less than $250,000. The competitive bid / contracting effort is estimated to have **saved over $400,000 in the insured's reserves** and helped the insured avoid potentially significant out-of-pocket expenditures.

Case 9 – Petroleum Retail Facility, Windgap, PA

EXCALIBUR was tasked by an insurance client to complete a detailed site characterization of a catastrophic diesel fuel release exceeding several thousand gallons that crossed several commercial and city owned properties. Our efforts detailed on-site and off-site physical, chemical, hydrogeologic, and biological processes affecting the distribution and migration of dissolved and light non-aqueous phase liquids (LNAPL). Claim expenditures were near their $1M policy limits with no end point in sight. **EXCALIBUR's** characterization results were used to develop a fate and transport model for groundwater and surface water to assist with our risk evaluation that identified exposure pathways eventually used to assess and select cost-effective remedial alternatives for implementation to not only reduce subsurface petroleum contamination and to remove exposure pathways but to keep the remaining site remediation costs within the policy limits. Alternative investigation tasks used high resolution gas chromatography to ascertain the type and age of the petroleum constituents most susceptible to biodegradation, collected real time geochemical parameters that indicated naturally occurring petroleum degrading anaerobic and aerobic microbes within the petroleum dissolved plume, installation of multiple well clusters to determine vertical groundwater gradients within the saturated subsurface affecting plume migration, and the use of existing remediation infrastructure to assess cost effective remedial alternatives. Complicating the analysis was a history of multiple gasoline releases, the discharge of contaminated surface water to an on-site septic field that exasperated plume definition, and strong downward vertical gradients indicating the site and surrounding properties was a groundwater recharge area. Excalibur's activities determined that a combination of institutional controls, intrinsic remediation, use of mobile separate-phase collection vessels to remove LNAPL, source area reduction via enhanced bioremediation, and progress through long-term groundwater monitoring of the multi-zone monitoring well network would address regulatory requirements while

simultaneously meeting claim cost restrictions by reducing the cost of the antiquaited pump and treat remediation scenario by almost $250,000.

Case 10 – Gasoline Retail Facility, Glassport, PA

Almost six years had gone by since contamination discovery and over $250,000 spent on site investigation and interim remedial measures when **EXCALIBUR** was asked by an insurance client to get the cleanup of an automotive repair facility in Glassport, PA back on track. Gasoline spill(s) at the facility had contaminated groundwater on- and off-site in a mixed residential / commercial / industrial area. By the time **EXCALIBUR** became involved, the insured's consultant had installed 27 on- and off-site monitoring wells and had completed interim remedial measures for 18 months but still had not fully characterized the site or written a Site Characterization Report required under PADEP regulations. Meanwhile, third party litigation liability concerns lurked with off-site properties remaining contaminated. **EXCALIBUR's** insurance client's concerns were only heightened by the insured's consultant's interim dual-phase vacuum extraction events conducted once every three months for 18 months when the consultant admitted that the attention only appeared to result in "…slightly reduced contaminant concentrations in on-site wells…" and conversely higher concentrations in off-site wells. Excessive soil impacts remained beneath a large portion of the property while dissolved-phase contaminant concentrations significantly above the SHS extended over 200 feet beyond the property boundary. The insured's attorney noted that the insured was "….completely dissatisfied…" with his consultant and "…the propriety of its billing…" and was "…anxious that another consultant be retained…". In response to concerns of the parties involved, **EXCALIBUR** was retained to secure through competitive bidding a consultant who would cost effectively close the site to PADEP standards under a fixed price. This required **EXCALIBUR** to fill the many key site

characterization data gaps, to prepare and let a bid package and facilitate contracting between the insured and the successful bidder. For this to be a success, **EXCALIBUR** early on needed to evaluate the problem, assess "knowns" and "unknowns", identify and fill data gaps in historical site characterization work, and develop a comprehensive yet concise characterization document that could be used to secure bids for finalizing and implementing a PADEP-approvable Remedial Action Plan (RAP). Initially, **EXCALIBUR's** project team of professional geologists and engineers identified missing pieces in the site conceptual model which precluded sufficient site understanding to develop a truly appropriate and cost effective remedial action for the site. To streamline data collection efforts, **EXCALIBUR's** project team identified remedial design data (organic content in soil, hardness of groundwater, etc.) which could be collected concurrently with missing site contamination characterization information. **EXCALIBUR's** team subsequently systematically filled the identified data gaps in: completing historical background research on key missing information on the facility and surrounding areas; using geophysical techniques to identify / map buried features which led to discovering an orphan UST; sampling soil in poorly characterized suspected source areas; installing, gauging and sampling a deep overburden monitoring well to assess vertical extent of the contaminant plume and vertical gradient; performing quarterly gauging and sampling of existing shallow overburden monitoring wells; installing and sampling soil gas probes to assess vapor intrusion risk; completing a door-to-door groundwater use survey; conducting hydraulic testing of shallow and deeper overburden groundwater zones (slug testing); modeling groundwater flow and contaminant fate & transport; developing a soil to groundwater leaching model; completing surface water contaminant loading and concentration modeling; conducting a sensitive receptor survey; and evaluating viable and cost effective remedial alternatives including biofeasibility / biostimulation field testing using compound-specific isotope analysis (CSIA). **EXCALIBUR's** Site Characterization Report Plus (SCRP) compendium of historical and new site characterization information, including practical

and cost effective remedial options, was approved by the PADEP without modification, achieving a key milestone missed during the first 6 years of investigation. **EXCALIBUR** subsequently turned its attention to fulfilling its client's and the insured's goal of securing a remediation contractor to cost effectively cleanup and take the site to closure. This entailed handling all aspects of preparing a competitive bid package including a draft template fixed price to closure contract with terms and conditions, developing a list of competitive bidders, distributing the bid package, holding an on-site pre-bid meeting, responding to bidder questions, receiving and evaluating bids, presenting bids and its evaluation of bids to **EXCALIBUR's** insurance client and the insured, and facilitating execution of a mutually acceptable contract. Four years after signing the fixed price contract and to the complete satisfaction of **EXCALIBUR's** client, the insured, and the insured's attorney, the site remedial action completion report (RACR) was successfully submitted by the successful bidder to complete the PADEP-approved cleanup/ closure for less than the $250,000+ original spent by the insured's original consultant for an incomplete site characterization.