

ZACK CHRIST, PE

Education

B.S., Civil Engineering, The University of Arizona, 2006

Professional Licenses

Professional Engineer – Illinois, Kansas, Connecticut, South Carolina, Louisiana, Pennsylvania

OSHA 40-Hour HAZWOPER



Specialty Certifications

C&D Waste Management and Recycling Accreditation, WasteCap Wisconsin, June 2005

Troxler Nuclear Gauge and Radiation Safety Officer Training

Professional Experience

Mr. Christ has 14 years of experience as a civil engineer. He serves as a project manager of landfill design projects, including permit applications to federal, state, and local regulators; and construction quality assurance (CQA) oversight of large landfill construction projects, including staff management and training. He also performs site characterizations and hydrological and geotechnical analyses. Hydrological analyses include computer modeling of storm events and ditch and basin design. Geotechnical analyses include slope stability, geosynthetic design, foundation stability, and settlement (includes seismic analyses). In addition, Mr. Christ assists with the siting, zoning, design, and permitting of solid waste management facilities, including municipal solid waste landfills, CCR landfill, and transfer stations. He assists in evaluating existing facilities for compliance with local, state, and federal regulations; performs site assessments; and develops cost estimates and material quantities for construction and engineering projects. He performs floodplain studies and delineations, and prepares permit applications for construction within a floodway, including computer modeling and floodplain mapping. He has also performed field duties including CQA officer tasks and responsibilities, and field monitoring for numerous applications.

Landfill Engineering

Tazewell County, Illinois, Indian Creek Landfill No. 2 Expansion. Developed an Illinois Environmental Protection Agency (IEPA) permit application for a vertical and horizontal expansion of approximately 16.25 million ascy at a municipal solid waste (MSW) landfill. Performed geotechnical calculations and analyses using Microsoft Excel and XSTABL. Assisted in performing a HELP model evaluation, and the preparation of AutoCAD drawings and permit application narrative.

Kendall County, Illinois, Fox Moraine Landfill. Prepared siting hearing including the production of PowerPoint presentations for a Greenfield landfill of approximately 40 million ascy. Assisted in the calculation and modeling of a noise study and geotechnical analyses including slope stability, bearing capacity, and geosynthetic strain.

Lake County, Illinois, C&D Landfill Expansion – Bruce Ditch Relocation. Developed an Illinois Department of Natural Resources (IDNR) permit application for construction in a floodway, a U.S. Army Corps of Engineers (USACE) 404/401 joint permit application, and a Federal Emergency

Management Agency (FEMA) Conditional Letter of Map Revision application for the relocation of Bruce Ditch. The permit application included floodplain/floodway review, HEC-1, HEC-RAS, and Check-RAS software modeling, and Flood Insurance Study evaluation and data interpretation. The applications also included the generation of existing and revised floodway mapping using HEC-RAS modeling results and AutoCAD software.

Fairfield, Illinois, Wayne County Landfill Pre-Divestiture Review. Produced and developed a comprehensive pre-divestiture review, which consisted of a site review and assessment including site reconnaissance; review of the original permit application and supplemental attachments, all accompanying regulatory permits, all existing agreements and contracts, Spill Prevention Control and Countermeasure (SPCC) plan, Storm Water Pollution Prevention Plan (SWPPP), gas monitoring reports, groundwater monitoring reports, remaining capacity reports, and violation history; landfill operations personnel interviews; IEPA correspondence; and Environmental Data Resources Inc. report review.

Brundidge, Alabama, Brundidge Landfill Pre-Divestiture Review. Produced and developed a comprehensive pre-divestiture review, which consisted of a site review and assessment including site reconnaissance; review of the original permit application, all accompanying regulatory permits, all existing agreements and contracts, SPCC plan, SWPPP, gas monitoring reports, groundwater monitoring reports, remaining capacity reports, and violation history; landfill operations personnel interviews; ADEM correspondence; and Environmental Data Resources Inc. report review.

Zion, Illinois, Zion Landfill Site 2 East Expansion. Developed all geotechnical calculations for the expansion of the Zion Landfill Site 2 East Expansion. The calculations consisted of several analyses including slope stability, bearing capacity, waste and foundation settlement, anchor trench run-out, and geosynthetic stress and strain evaluations. Performed slope stability analyses using XSTABL and performed numerous calculations using Excel spreadsheets. Some analyses included seismic evaluation.

Argos, Indiana, County Line Landfill Expansion. Performed storm water calculations for the sizing and arrangement of the surface water detention basin, outlet structures, and discharge piping for purposes for regulating the amount of discharge to a roadside ditch and off-site conveyance systems. Calculations included using 100-year rainfall data to develop hydrographs within Hydroflow Hydrographs to model discharge from the detention basin to the roadside ditch and off-site surface water conveyance systems. Determined flow rates and sizes of discharge piping using FlowMaster. Modeling within HEC-HMS was used to determine site and detention basin discharge rates.

Brook, Indiana, Newton County Landfill Expansion. Developed all geotechnical calculations for vertical and horizontal expansion. The calculations consisted of several analyses including slope stability, bearing capacity, waste and foundation settlement, anchor trench run-out, and geosynthetic stress and strain evaluations. Performed slope stability analyses using SLIDE 5.0 and performed numerous calculations using Excel spreadsheets. Some analyses included seismic evaluation.

Cook County, Illinois, Closure of Congress Development Landfill. Assisted in developing a leachate management plan for the closure and post-closure for the landfill. The development included the production of leachate generation rate estimates and calculations and the leachate extraction well schedule, as well as figures and construction drawings using AutoCAD software. Created construction drawing sets including a permanent LEL monitoring device, revised storm water management plans, and a leachate extraction system. Developed costs estimates for various construction projects including labor and materials and annual financial assurance closure/post-closure care cost estimates submitted to IEPA. Assisted in the redesign of the site's storm water management plan, including culvert design and installation, and storm water ditch and detention

basin design. The redesign of the storm water management plan included computer modeling of several storm events using HEC-HMS. The redesign of the storm water management plan included:

- Using AutoCAD software to design and generate contours for all perimeter ditches and the detention pond, develop a watershed delineation for the entire facility, and design the inlet culverts to the detention pond and outlet structure to the local sewer system.
- Determining rainfall totals and distributions for various storm events to be used in future storm water modeling and calculations.
- Determining weighted curve numbers for existing and proposed site conditions using USDA soil surveys and Technical Release 55.
- Determining site and detention basin discharge rates for various required storm events using HEC-HMS software.
- Preparing and submitting permit applications containing all storm water design drawings and calculations to the IEPA and the Metropolitan Water Reclamation District of Greater Chicago.
- Performing field technician duties including leachate piezometer monitoring and groundwater monitoring and serving as a CQA officer for the oversight of various construction projects at the CDC landfill. These included:
 - Installation of final cover, including geocomposite, LLDPE geomembrane, Geosynthetic Clay Liner (GCL) and final cover soil,
 - Installation of gas and leachate extraction system comprised of HDPE piping and concrete leachate access vaults.
 - Installation of gas and leachate extraction wells, and pressure probes within the waste mass.
 - Installation of a storm water culvert.

Streator, Illinois, Streator Area Landfill #3 Horizontal Expansion. Developed all geotechnical calculations for the horizontal expansion. The calculations consisted of slope stability. Performed slope stability analyses using numerous calculations and by using Excel spreadsheets. Some analyses included seismic evaluation. Assisted in performing a HELP model evaluation for the site.

Clinton, Illinois, Clinton Landfill #3 Chemical Waste Unit (TSCA). Developed and assisted with geotechnical calculations for the TSCA application. The calculations consisted of several analyses including slope stability, bearing capacity, waste and foundation settlement, and geosynthetic stress and strain evaluations. Performed slope stability analyses using SLIDE 5.0 and performed numerous calculations using Excel spreadsheets. Some analyses included seismic evaluation. Performed a HELP model evaluation which included leachate recirculation. Performed base grades design using AutoCAD for the Chemical Waste Unit.

Morris, Illinois, Morris Community Landfill, Parcel B. Performed field technician duties including gas extraction well monitoring using Dräger tubes and a GEM 2000.

Rockford, Illinois, Winnebago Landfill West Expansion Unit. Developed and assisted with geotechnical calculations for the horizontal expansion. The calculations consisted of several analyses including slope stability, bearing capacity, and foundation settlement. Performed slope stability analyses using XSTABL and performed numerous calculations using Excel spreadsheets. Some analyses included seismic evaluation. Assisted in the development of a detailed storm water management plan and analysis for the proposed facility. Analyses included:

- Determining weighted curve numbers for existing and proposed site conditions using USDA soil surveys and Technical Release 55.

- Determining site and detention basin discharge rates for both existing and proposed conditions using HEC-1 software.
- Sizing all perimeter and downslope ditches, and terrace berms using Flowmaster software.
- Sizing a detention pond and its inlet and outlet structures to adequately store and convey runoff from the 100-year, 24-hour storm event.

Boyd County, Kentucky, Big Run Landfill; McDowell County, West Virginia, Copper Ridge Landfill; Virginia, Lorton Landfill. Developed and assisted with landfill cell development and closure cost estimates and construction material quantities for all three sites. Utilized Microsoft Excel for the estimates at all three sites.

Rockford, Illinois, Winnebago Landfill South Unit. Served as a CQA officer for the oversight of final cover and GCCS construction projects. The projects included:

- Installation of final cover, including low-permeability compacted soil, LLDPE geomembrane, geocomposite, and final cover soil.
- Installation of landfill gas extraction system comprised of HDPE piping and vertical landfill gas extraction wells.
- Installation of a storm water control features, including terrace berms, downchutes, energy dissipaters, and perimeter storm water ditches.
- Development of annual financial assurance closure/post-closure care cost estimates submitted to IEPA.

Rockford, Illinois, Winnebago Landfill East Expansion Unit. Assisted in the development of a storm water management plan and analysis for a proposed landfill expansion. The results of the analysis were used to determine the proposed landfill location and geometry. Development of the storm water management plan included:

- Performing a site visit to determine and/or verify site conditions, and catalogue and quantify existing drainage features for future use in storm water calculations and modeling.
- Determining rainfall totals and distributions for various storm events to be used in future storm water modeling and calculations.
- Using AutoCAD software and existing topography information to design and generate contours for all perimeter ditches and the detention pond, develop a watershed delineation for the entire facility, and design a diversion ditch to redirect existing storm water flow around the landfill footprint.
- Determining weighted curve numbers for existing and proposed site conditions using USDA soil surveys and Technical Release 55.
- Determining site and detention basin discharge rates for various required storm events using HEC-HMS software.
- Sizing all perimeter ditches and diversion ditches using Flowmaster software.

Rockford, Illinois, Winnebago Landfill North Expansion Unit. Served as a project manager for the oversight of final cover, new waste cell, and GCCS construction projects. Organized material testing of geosynthetics and soils (proctors, hydraulic conductivity, soil type, grain size, shear strength parameters, interface friction testing), and developing a complete set of construction drawings and specifications. The projects included:

- Installation of final cover including low-permeability compacted soil, LLDPE geomembrane, geocomposite, and final cover soil.

- Installation of new cell liner system including geocomposite, LLDPE geomembrane, Geosynthetic Clay Liner (GCL), and final cover soil;
- Installation of landfill gas extraction system comprised of HDPE piping and vertical landfill gas extraction wells.
- Installation of storm water control features including terrace berms, downchutes, energy dissipaters, diversion ditches, and perimeter storm water ditches.
- Development of annual financial assurance closure/post-closure care cost estimates submitted to IEPA.

Rochelle, Illinois, Rochelle Landfill No. 2 and Horizontal Expansion. Served as a project manager for the oversight of final cover, multiple new waste cells, and GCCS construction projects. Organized material testing of geosynthetics and soils (proctors, hydraulic conductivity, soil type, grain size, shear strength parameters, interface friction testing). The projects included:

- Installation of final cover including low-permeability compacted soil, LLDPE geomembrane, geocomposite, and final cover soil.
- Installation of new cell liner system including geocomposite, LLDPE geomembrane, Geosynthetic Clay Liner (GCL), and final cover soil.
- Installation of landfill gas extraction system comprised of HDPE piping and vertical landfill gas extraction wells.
- Installation of storm water control features.
- Development of annual financial assurance closure/post-closure care cost estimates submitted to IEPA.

Rockford, Illinois, Winnebago Landfill West Expansion Unit. Served as a project manager for the oversight of 28 acres of new waste cells. Organized material testing of geosynthetics and soils (proctors, hydraulic conductivity, soil type, grain size, shear strength parameters, interface friction testing), and developed a complete set of construction drawings and specifications. The projects included:

- Installation of new cell liner system at a new expansion unit including geocomposite, LLDPE geomembrane, Geosynthetic Clay Liner (GCL), and final cover soil.
- Installation of landfill gas extraction system comprised of HDPE piping and vertical landfill gas extraction wells.
- Installation of storm water control features including terrace berms, downchutes, energy dissipaters, diversion ditches, perimeter storm water ditches, detention pond, and culverts.
- Development of annual financial assurance closure/post-closure care cost estimates submitted to IEPA.

Webb County, Texas, Pescadito Landfill – Floodplain CLOMR. Finalized a FEMA Conditional Letter of Map Revision application for construction in a floodway for a landfill expansion. The application permitted the construction of dams that re-routed flow and relocated the position of the existing floodplain and a bridge section within the San Juanito Creek. It also permitted modified flow profiles from the resulting development of upstream property and included floodplain/floodway review, HEC-RAS software modeling, and Flood Insurance Study evaluation and data interpretation. Included the generation of existing and revised floodway mapping using HEC-RAS modeling results and AutoCAD software in concert with ArcGIS software.

Ft. Lauderdale, Florida, South Broward Residue Landfill. Assisted in the development of bi-annual financial assurance closure/post-closure care cost estimates submitted to Florida Department of Environmental Protection.

Lawrence, Kansas, Westar – Lawrence Energy Center CCR Landfill CQA. Served as a project manager for the oversight of multiple CQA coal combustion residuals (CCR) new cell base liner, containment berm, and final cover construction projects. The new cell base liner construction met the new current federal and state CCR Rule. Organized material testing of soils (proctors, hydraulic conductivity, soil type, grain size, shear strength parameters). Re-developed the existing CQA plan and specifications to match the current design requirements of the containment berms and final cover system. The projects also consisted of providing engineering cost estimates and construction contractor bid process packages and assistance.

Lawrence, Kansas, Westar – Lawrence Energy Center CCR Landfill Redesign. Served as a project technician on the Kansas Department of Health and Environmental permit application for the redesign of the Lawrence Energy Center CCR Landfill to meet current federal CCR landfill regulations. Organized material testing of soils and CCR ash materials (proctors, soil type, grain size, shear strength parameters) and geosynthetics during the design phase of the permit application development. The geosynthetics testing included numerous direct shear interface tests for soil-geosynthetic and geosynthetic-geosynthetic material combinations for both final cover and bottom liner systems. The materials consisted of in-situ soil samples, multiple CCR ash types, GCLs, geocomposites, and geomembrane. The existing CQA plan re-developed specifications to match design requirements of the redesigned final cover and bottom liner systems to include geosynthetics and their interfaces.

Newburgh, New York, Danskammer – CCR Landfill Premature Closure. Prepared a cost estimate analysis for permitted and proposed alternate closure designs for a CCR landfill. Managed the preparation of a permit application to the New York State Department of Environmental Conservation (DEC) to close the CCR landfill using an alternate final cover design consisting of ClosureTurf®. Management included directing engineering staff to prepare a revised storm water management plan using hydrologic and hydraulic calculations, post closure care cost estimates, and geotechnical slope stability calculations; and directing CAD staff to create revised final landfill contours and site operational features.