COLORADO
Oil & Gas Conservation Commission
Department of Natural Resources

COGCC OPERATOR GUIDANCE

RULE 913 SITE INVESTIGATION, REMEDIATION, AND CLOSURE

Document Control:

Created Date:	October 6, 2020
Last Updated Date:	March 8, 2021
Last Updated By:	Rick Allison
Document Owner:	Rick Allison

Rule Citation

This Rule 913 applies to the investigation, Remediation, and reporting required for Spills and Releases, Remediation projects, and decommissioning of Oil and Gas Facilities. All site investigation, Remediation, and closure operations will be conducted in accordance with the Commission's Rules, including the Commission's 1000 Series Rules.

Purpose of Rule

Rule 913 governs site investigation, Remediation, and site closure. Operator will obtain Director approval of a Form 27, Site Investigation and Remediation Workplan (Form 27) prior to commencing work. Prior Director approval is necessary to ensure Operator's proposed Site Investigation and/or Remediation Workplan will provide the necessary information to demonstrate compliance with the closure requirements of Rule 913.h. However, this does not prevent Operator from performing necessary emergency and initial response actions in the event of a Spill or Release. Operator will report such initial actions on a Form 19, Spill Release Report (Form 19).

The following activities are subject to Rule 913 site investigation, Remediation, and/or reporting requirements as listed in Rule 913.c; the Operator will prepare and obtain the Director's approval of a Form 27 prior to conducting the following:

1) Pit or Cuttings Trench closure;
2) Buried or partially buried vessel closure, which will be only by removal;
3) Remediation of Spills and Releases pursuant to Rule 912;
4) Land Treatment of Oily Waste pursuant to Rule 905.e;
5) Closure of Centralized E&P Waste Management Facilities pursuant to Rule 907.h;
6) Remediation of impacted Groundwater pursuant to Rule 915.e.(4).D, and the contaminant concentrations in Table 915-5;

7) Investigation and Remediation of natural gas in soil or Groundwater;
8) When requested by the Director due to any potential risk to soil, Groundwater, or surface water; and
9) Decommissioning of Oil and Gas Facilities.

Additional information can be found in the following COGCC Guidance documents:

304.c.(11) - Waste Management Plan
905.g. - Drill Cuttings
911.a.(4) - Facility Closure
912.b. - Spill/Release Reporting
913.b.(5)B i-v -Remediation Standards
915 - Concentrations and Sampling for Soil and Groundwater
915.a. - Pathway to Groundwater
915.e.(2) - Soil Sampling and Analysis

Rule 913 Guidance

Site Investigations at Oil and Gas Facilities are undertaken for a variety of reasons including, but not limited to, the following:

- To document the Remediation of soil or Groundwater where Spills and Releases were reported;
- To document that there is no residual contamination left at Locations during Facility closure;
- To document that the storage or treatment of Exploration and Production Waste ("E&P Waste") such as produced water, drilling fluids, drill cuttings, Oily Waste, or Other E&P Waste has not resulted in impacts to soil or groundwater at an Oil and Gas Location.

This guidance is intended to provide the minimum information necessary for the Director to evaluate Operator's proposed Site Investigation and Remediation Workplans and to help the Operator comply with site investigation, Remediation, and reporting requirements of Rule 913.

Rule 913.b General Site Investigation and Remediation Requirements

Rule 913 b.(1) Prior Approval: Director approval is necessary prior to undertaking proposed site investigation or Remediation actions, except when immediate actions are required on the part of the Operator to protect public health, safety, and welfare when responding to a Spill or emergency. In these immediate action scenarios, Operator will

maintain ongoing verbal and email communications with the Director represented by COGCC Environmental Protection Specialists ("EPS"). Operator will report immediate actions taken on the Form 19 and/or Form 27 as appropriate.

Prior approval of a Form 27 for those activities listed under Rule 913.c is required so that COGCC EPS can determine if the proposed investigation or Remediation is adequate. It also allows COGCC staff to plan field inspections to observe and document site investigation or Remediation activity and provides notice to other COGCC staff members who may be inspecting a Location for another reason and were not aware that remedial activities were being performed.

Rule 913 b.(2) Sampling and Analyses: Sampling and analysis of soil and Groundwater forms the basis of making determinations about the compliance of a Location with the Cleanup Concentrations listed in Table 915-1. Operator will propose the location and number of soil and/or Groundwater samples to be collected and a proposed list of contaminants of concern on the Form 27, Initial Site Investigation and Remediation Workplan (Form 27 - Initial). Refer to the Rule 915 Concentrations and Sampling for Soil and Groundwater Guidance Document for additional information regarding which analytes and laboratory methods are appropriate based on the site specific knowledge of the type of product released, or type of waste stored or handled at the site subject to investigation.

Rule 913.b.(3) Investigation Derived Waste ("IDW") may include but is not limited to the following:

- Soil cuttings generated from the installation of soil borings or monitoring wells;
- Groundwater generated from monitoring well development or purging prior to sampling;
- Decontamination fluids generated by cleaning sampling equipment;
- Plastic sheeting or stormwater control devices used in contact with produced fluids or E&P Waste;
- Disposable sampling equipment such as bailers, tubing, soil sample liners, aluminum foil, and used sample containers;
- Used, spent, or contaminated personal protective equipment ("PPE") such as disposable coveralls, gloves or boot covers.

Generally IDW that is generated during site assessment activity at an Oil and Gas Location will have the same properties as the E&P Waste that is being investigated. As a result, IDW should be properly disposed of in accordance with Rules 905 and 906. For

example, if an Operator is advancing soil borings through Oily Waste or suspected Oily Waste, the resulting cuttings will be managed as Oily Waste pursuant to Rule 905.e. If Groundwater suspected to be or contaminated with hydrocarbons is being purged from a monitoring well, the Groundwater should be properly contained and also disposed of in accordance with Rules 905 and 906. It is never appropriate to dump contaminated soil cuttings or purge water on the ground.

In some cases, if soil borings are being advanced upgradient of known contamination or for the purpose of collecting background samples, it may be appropriate to place the cuttings on the ground or return them to the source if doing so does not endanger human health or the environment or violate federal or state regulations. In some cases, if monitoring well purge water is known to be generated from areas where no contamination is present, it may also be placed on the ground. In these cases, the Operator should have analytical data to verify that no contaminants of concern were present.

At no time should monitoring well purge water be placed back into the well from which it came. The monitoring well is a direct conduit to Groundwater and at no time should any fluids including decontamination fluids or purge water be intentionally placed into a monitoring well. Operators are required to comply with Rule 14 - Minimum Construction Standards for Monitoring and Observation Wells, Monitoring and Observation Holes, and Test Holes of the Colorado Division of Water Resources (“DWR”) (2 CCR 402-2). All soil borings and monitoring wells, when unattended, must be properly sealed, capped, or covered to ensure protection of the Groundwater resource. All monitoring wells will also be properly permitted, maintained, and abandoned pursuant to DWR rules.

In some cases, COGCC may request the Operator to characterize IDW to determine whether it is considered E&P Waste, solid waste, or another type of waste. Operator can classify environmental media as E&P Waste by default if it is known through process knowledge to have been contaminated by a Spill or Release of produced fluids or E&P Waste, in which case a specific waste characterization will not be required.

Other IDW such as disposable PPE, disposable sampling equipment, or trash will be considered solid waste, unless it should be classified as hazardous waste under RCRA. In either case suchIDW will be handled pursuant to Rule 906.

Rule 913.b.(4) Pit Evacuation: Pits can neither be investigated nor closed while they contain E&P Waste such as produced water, pit bottoms, sludge, or Oily Waste.

Operator will remove all E&P Waste from the Pit and properly treat or dispose pursuant to Rule 905. Operator will contact the Area EPS to discuss the feasibility of allowing remaining produced water to evaporate and/or percolate on a site-specific basis. Precipitation and seasonal climate patterns often inhibit evaporation or add stormwater to the Pit, adding to lengthy project delays. Operator will remove and dispose of Pit liners pursuant to Rule 906 prior to site investigation and Pit closure.

Rule 913.b.(5) Remediation: The soil and Groundwater standards for achieving Facility closure or Spill or Release Remediation closure are listed in Table 915-1 and in WQCC Regulation 41 numeric and narrative water quality standards. Groundwater Remediation is required to achieve the standards in Table 915-1 for produced water and liquid hydrocarbon Releases. Where site specific, process knowledge, or results of the site investigation indicate additional constituents from WQCC Regulation 41 are present as a result of Oil and Gas Operations, Operator will conduct Remediation to achieve compliance with WQCC Regulation 41 pursuant to the approved Form 27.

The Director will not generally dictate the type of Remediation an Operator chooses to implement on a Location, but will evaluate proposed Remediation plans for adequacy in terms of the time required and the likelihood of the proposed Remediation plan to successfully remove or reduce contamination at Oil and Gas Locations to below those levels listed in Table 915-1. Operators should consider the impact of performing the Remediation project on the surrounding land use and the public and incorporate site-specific mitigation measures to avoid adverse impacts to public health, safety, welfare, the environment, and wildlife resources.

Remediation projects often require additional permitting at the local government level (e.g. access, grading permits, traffic control plans), at the state level (Air Pollution Control Division, Water Quality Control Division), and/or at the Federal level (U.S. Army Corps. of Engineers, U.S. Environmental Protection Agency). The Director's review of the Remediation assumes the Operator has obtained those permits prior to proposing the Remediation plan to the Director. Alternatively, Operator will identify required permits along with the schedule for obtaining permits prior to Remediation.

Refer to the Rule 913.b.(5).B.i-v Remediation Standards Guidance Document for additional guidance for Remediation standards in Rule 913.(5)B.

Rule 913.b.(6) Reclamation: Remediation activities conducted at all oil and gas Remediation projects sites, regardless whether conducted on or off an active Oil and Gas Location, are subject to the 1000 Series Reclamation Rules. Operator will

commence Reclamation activities immediately upon closure of the Remediation. This does not preclude Operator from conducting Reclamation concurrently with Remediation where possible.

Rule 913.c Site Investigation and Remediation Workplan

Operator will prepare and submit for Director approval proposed site investigation and Remediation activities on a Form 27.

Site Investigation Phase

For Oil and Gas Facility decommissioning activities Operator will propose a Site Investigation Plan to characterize the vertical and horizontal extent of impacts to soil and potentially Groundwater. Site investigation plans will be site specific and appropriate to both the type of Facility being decommissioned and the type of waste or product handled at the Facility. COGCC has provided additional guidance under Rule 911.a.(4) Facility Closure Guidance Document for certain site investigation plans for facility closure including:

- Wellhead closure;
- Buried or partially buried vessel closure;
- Tank Battery closure and;
- Flowline closure.

Operator will include a description of the soil and/or Groundwater sampling necessary to perform the site investigation. The Site investigation plan should include a site diagram showing the Facility layout and proposed soil sample collection locations in areas most likely to have been contaminated by Oil and Gas Operations. Site diagrams will include pertinent historical infrastructure information and/or historical to current aerial photographs as necessary to determine the degree of investigation necessary to ensure compliance with Table 915-1.

Site Investigation of Spills and Releases

After the initial phase of emergency response for Spills and Releases where a Form 27 is required under Rule 912.b, Operator will propose a site investigation plan to adequately characterize the remaining impacts with Form 27 submittal.

Operator will conduct a desktop review and evaluate all potential receptors when designing soil and Groundwater sampling programs to evaluate whether receptors have been impacted or are threatened to be impacted. Sensitive receptors include, but are not limited to water wells, intermittent and perennial surface water features, springs,

building units, subsurface utility corridors, canals, and impoundments. If receptors are identified to be present within ¼ mile of the site boundary, Operator will include a receptor survey identifying potential receptors on a scaled drawing. The receptor survey will be field verified, including receptors that are initially identified either on topographic maps, in aerial photographs, in COGIS, on the DWR website, or through some other remote means. For identified receptors not verified in the field, the Operator will provide a summary of the efforts made to locate and/or verify the absence of the mapped receptor.

During the desktop review Operator will also evaluate any potential impacts to public health, safety, welfare, and the environment. This includes proximate land use as well as distance to Building Units, School properties, School Facilities, Designated Outdoor Activity Areas, and High Priority Habitat. If Remediation activities have the potential to impact public land use, Operator will propose mitigation efforts such as traffic control plans, site security, noise, dust mitigation plans, and work timing. Operator should review Rule 913.b.(5)Bi-v-Remediation Standards Guidance Document for additional information on High Priority Habitats and Remediation standards.

Operator will propose a list of contaminants of concern from Table 915-1 based on site process knowledge and E&P Waste Characterization data available for the Facility. If Operator lacks E&P Waste Characterization data, Operator will profile the impacted material by collecting one or more samples of the most impacted material available and analyze the samples for the contaminants of concern in Table 915-1. Operator may propose a target list of contaminants of concern based on the characterization analytical data.

The Director may require analysis for additional constituents listed in Table 915-1 or in WQCC Regulation 41 based on E&P Waste characterization and/or the potential for threat to Groundwater or receptors. In some cases where natural gas has been released into the subsurface, the Director may require the collection of soil gas samples or Groundwater samples to be analyzed for gas phase constituents when appropriate.

Operator will collect soil samples from excavated areas and from soil borings to characterize the vertical and horizontal extent of impacts to soil in the subsurface. The Rule 915.e.(2) Soil Sample Collection Guidance Document provides detailed information on when and where to collect soil samples.

When contaminated soil reaches the high water table or is in contact with Groundwater, Groundwater characterization is required. Operator will install a

sufficient number of monitoring wells to both characterize the extent of impacts to Groundwater and to determine the Groundwater gradient. Groundwater monitoring wells will be installed in source areas, and immediately downgradient and cross-gradient of source areas at a distance appropriate to determine the contaminant plume geometry. At least one monitoring well will be installed upgradient of the source. Additional monitoring wells may be required upgradient and cross-gradient of the contaminant plume to completely define the extent of impacts and to demonstrate the Point(s) of Compliance ("POC") with Table 915-1 and WQCC Regulation 41. If at any time during the site investigation or Remediation of a Spill or Release, contaminant plume migration causes a monitoring well designated as a POC to become impacted, Operator will install additional monitoring wells to re-establish POC. In these instances, additional source removal or more aggressive Remediation may be required by COGCC to prevent any additional downgradient migration of contaminants. Once the aerial extent of Groundwater contamination has been defined and the monitoring well network, including POC wells, has been approved in a Form 27, that monitoring well network must be maintained and sampled at the frequency stipulated in the approved plan. Changes to the monitoring well network must be approved by COGCC.

Operator will follow the Colorado DWR Water Well Construction Rules (2CCR-402-2) for monitoring well permitting, construction, maintenance, and abandonment.

When reporting results of the site investigation, Operator will include scaled maps that show the locations of surface soil samples, soil boring locations, excavation sample locations, surface water sample locations, soil gas sample locations, and monitoring well locations as applicable relative to the existing or former layout of the Oil and Gas Facilities and potential or known sources of contamination. Operator will provide surveyed Groundwater elevation data and potentiometric surface map(s) to show the direction of Groundwater flow and hydraulic gradient at the site. Operator will include tables with Groundwater gauging data including results of oil water interface measurements in cases where free product is found on Groundwater. Operator will include boring logs for all soil borings advanced at the site and well construction diagrams for all monitoring wells constructed at the site. All soil borings must be logged in accordance with the Unified Soil Classification System ("USCS") and will include at a minimum: lithologic description, PID readings (or other field screening results), sample collection depths, moisture content, depth to uppermost saturated interval if contacted, and well construction details. Operator will present analytical results for soil and Groundwater samples in a summary table compared to the Table 915-1 soil and Groundwater concentrations and the Regulation 41 Groundwater

concentrations. Operator will provide laboratory analytical reports that include laboratory quality assurance and control data for all sample results.

Note, environmental site assessments must be performed by qualified personnel trained in appropriate environmental sample collection methods, USCS logging, and chain-of-custody sample protocols. Typically these include geologists, soil scientists, environmental scientists, or other disciplines where education or training included site characterization methods.

If the degree of impact necessitates a phased approach to site investigation, Operator will report results of the initial site investigation and additional proposed site investigation to the Director on a Form 27 Supplemental Report for each phase of the site investigation. Operator will include a proposed schedule for completing the next phase of site investigation.

Upon completion of the site investigation, Operator will report all site investigation data to the Director and propose a Remediation plan on a Form 27 Supplemental Report. Operator will propose a Remediation and reporting schedule adequate to achieve compliance with Table 915-1 soil and Groundwater concentrations and WQCC Regulation 41 Standards for Groundwater in a reasonable time period.

Remediation Phase

Operator will propose a Remediation workplan appropriate to achieve compliance with the Concentration Levels in Table 915-1 and WQCC Regulation 41. In general, COGCC does not endorse or select Remediation methods, but COGCC will evaluate the appropriateness of Operator's proposed Remediation workplan based on the degree of impacts discovered during site investigation, proximity or impact to receptors, and the technical feasibility of the proposed Remediation method to achieve compliance with Table 915-1 in a reasonable time. All sites require active Remediation until the contaminants are cleaned up. Aggressive remedial actions will be required at:

- Sites with immediate public health risks such as impacted or threatened water wells or surface water;
- Sites that pose a hazard to the public such as natural gas in soil or Groundwater, or soil vapor threats to buildings or utility corridors;
- Sites that have been decommissioned and prolonged Remediation unnecessarily delays final surface Reclamation;
- Sites with contamination that prevents surface owner use of the land.

COGCC's mandate is to achieve compliance with the Concentration Levels in Table 915-1 and WQCC Regulation 41 as quickly as technically possible. In some cases, after source removal has been completed and the extent of impacts is defined, monitored natural attenuation may be appropriate, primarily for residual Groundwater impacts, where the attenuation rate has been evaluated and determined that Groundwater cleanup standards can be achieved in a reasonable amount of time (generally in three to five years). COGCC will evaluate all proposed Remediation workplans on a site-specific basis.

The following resources provide additional guidance on Remediation technologies:

- EPA Clean-Up Information (Clu-In) https://clu-in.org/remediation/
- Interstate Technology & Regulatory Council https://www.itrcweb.org/Guidance

Operator will propose the Remediation workplan on a Form 27 Supplemental. If possible, Remediation workplan proposals will accompany the final site assessment report. In cases where pilot testing or additional design is necessary, Operator will propose a timeline for conducting the necessary pilot testing and design work, and submittal of the proposed Remediation workplan.

All proposed Remediation workplans will include the following:

- Site maps depicting locations of Remediation activity including excavations, locations of extraction or injection Wells, treatment buildings, and existing and proposed monitoring wells relative to impacts discovered during the site investigation;
- Receptor survey from the Site Investigation Report showing how receptors may be impacted or will benefit from the proposed Remediation;
- Waste Management for handling investigation and Remediation derived wastes;
- Remediation Monitoring Program and schedule including necessary Operations and Maintenance, Groundwater monitoring, soil vapor monitoring, or soil confirmation sampling;
- Design basis for proposed Remediation plan;
- Required permits or approvals from other governmental agencies or Surface Owners that will impact the implementation of the Remediation plan. Actual permits/approvals are not required to be submitted to COGCC, but their need and impacts should be acknowledged and evaluated for the potential to impact the success of the Remediation.

Documentation and Closure

A frequently overlooked aspect of the Remediation is closure documentation. Historically, Spills or Releases have been properly Remediated and Facility closures were performed adequately in the field, but the documentation provided to COGCC did not always demonstrate that the cleanup resulted in compliance with the rules. In some cases, the work was performed and no closure documentation was provided.

Rule 913.d. Implementation Schedule. Each Form 27 will include a specific implementation schedule to complete investigation and Remediation. Any change from the approved implementation schedule will be requested at least 14 days in advance, and the Operator may not make the change without the Director's approval.

In the case of a discovered Spill or Release, Operator will begin investigating the extent of impacts as part of the initial response. Operator will report the known extent of impact with the proposed Site Investigation Plan if further investigation is warranted, or as a Site Investigation Report if the full extent of impacts were documented during the initial Spill or Release response.

Rule 913.e requires that Operators provide quarterly update reports via Supplemental Form 27 to document progress of site investigation and Remediation. This provides continuity in the reporting and progress of the Remediation until the time it can be closed. In certain situations, the EPS may request more frequent updates, and in other situations, the Operator may request an alternate reporting schedule that will be reviewed by the EPS.

Rule 913.h specifically requires a notification of completion submitted via Supplemental Form 27 within 30 days after conclusion of site Remediation activities. That Supplemental report, or a series of Supplemental Form 27s leading up to closure, should clearly explain the Remediation actions that were completed including, but not limited to:

- waste disposal documentation;
- confirmation sample results;
- surface restoration;
- monitoring well abandonment;
- remedial equipment removal;
- removal of stormwater controls; and
- in some cases reclamation plans.

Although the Form 27 requires certain minimum information to be provided and certain fields must be filled out to be able to submit the form, Operators are encouraged to attach stand alone reports to the Form 27 that summarize the remedial actions and present the data in easily reviewable formats. The more complete the closure data, the easier it will be for the EPS to approve closure when appropriate, and it will stand as a thorough record to the public that the site was Remediated in accordance with all applicable rules.

Rule 913.i. Failure to provide adequate closure information may result in the Director holding Financial Assurance until all Remediation is completed and adequately documented.

General Notes

Innovative Remediation Technologies: COGCC encourages Operators to propose Remediation methods that consider the cumulative impacts generated by the Remediation itself. Such work plans that propose new or innovative technology will highlight benefits such as reductions in VOC and greenhouse gas emissions, energy consumption, and overall site disturbance when practical. Operator will work closely with the area EPS when proposing new or innovative technologies and will also provide any negative consequences such as delays to overall Remediation duration.

Document Change Log

Change Date	Description of Changes
March 8, 2021	Document Finalized

Table 1 - When a Form 27 is Required

Activity	Form 27 Required	Rule	Guidance Document
Pit closure - all pits	Yes	911.c	911.c - Pit Closure
Cuttings Trench Closure	Yes	911.a	911.c - Pit Closure
Spill Remediation*	Not Always*	912.c	912.b - Spill/Release Reporting; 913 - Site Investiation, Remediation, and Closure
Oily Waste Land Treatment	Yes	905.e.(2)	
CEWMF Closure	Yes	907.h.(2)	907 - Centralized E&P Waste Management Facilities
Groundwater Remediation	Yes	912.c; 913.c.(6)	913 - Site Investiation, Remediation, and Closure
Investigation and Remediation of Natural Gas in Soil or Groundwater	Yes	913.c.(7)	913 - Site Investiation, Remediation, and Closure
Well plugging and abandonment	Yes	911.a	911.a(4) - Facility Closure
Flowline Removal	Yes	911.a	911.a(4) - Facility Closure
Separator or AST Removal**	Yes	911.a	911.a(4) - Facility Closure
Buried or partially buried vessel - all types***	Yes	911.a	911.a(4) - Facility Closure
All Oil and Gas Facilities	Yes	911.a	911.a(4) - Facility Closure
Director request due to reasonable cause	Yes	901.a.(2)	

*If cleanup of a Spill or Release can be achieved during the initial phase of Spill response, and Groundwater or surface waters, or sensitive receptors such as residential areas are not impacted, the cleanup of the Spill or Release can be reported using a Form 19. If the Spill or Release was discovered and reported during Facility closure pursuant to Rule 913.f, the cleanup should be reported using a Form 27 Supplemental Report.

**Refer to the 911.a(4) - Facility Closure Guidance Document for what triggers a required Site Investigation.

***Any vessel or tank constructed of any material that holds liquids and where the bottom of the vessel is below the surface grade by any amount constitutes a partially buried or buried vessel. This commonly includes, but is not limited to, produced water vessels and condensate vessels at compressors.

Reference Material

U.S. Environmental Protection Agency Region 4, 2020, Management of Investigation Derived Waste, ID LSASDPROC-202-R4
https://www.epa.gov/sites/production/files/2015-06/documents/Management-of-IDW.pdf

Colorado Department of Public Health and Environment, 2002, Corrective Action Guidance Document Appendix 3 Management of Remediation Waste
https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/411396

ASTM D2487-17e1, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM International, West Conshohocken, PA, 2017.
http://www.astm.org/cgi-bin/resolver.cgi?D2487