



Digital Integration to Improve Accuracy and Timeliness of Result Delivery via e-CoCs

Seamless, timely, and accurate data upload into your database or EDMS (Environmental Data Management System) is a crucial component of supporting our industry clients, providing faster access to electronic data.

ALS currently utilizes three powerful e-CoC solutions to automate entry of lab testing requests, ensuring correct sample names, project codes, purchase order numbers, and test codes, improving overall data quality and avoiding delays due to undetected errors. These processes can also allow sample containers to arrive to clients fully pre-labelled to save time in the field.

ALS Canada has been providing Electronic Data Deliverables (EDDs) of laboratory data for over 20 years, but since 2019, with the ALS Canada transition to GEL - the ALS Global Environmental Laboratory Information Management System - we have offered seamless digital database-to-database integration, from electronic Chain of Custody (e-CoC) input to EDD output. Our e-CoC solutions improve data quality in at least six key dimensions, encompassing accuracy, completeness, timeliness, uniqueness, validity, and consistency - with or without access to an EDMS.

Option 1: Complete EDMS to Lab Database Integration

In [EnviroMail 45](#), we highlighted how ALS had collaborated with EarthSoft to improve environmental data management processes for clients that use EQUiST™. Figure 2 illustrates the typical digital touchpoints that are required in order to implement a complete seamless integration of laboratory data into an EDMS such as EQUiST™, ESdat, or EnviroSys. All of the six data quality dimensions highlighted in Figure 1 are substantially improved using this form of integration.

The process starts with an e-quote from ALS which contains all necessary data, such as ALS method codes, method references, analyte names, analyte detection limits, CAS numbers, and prices, to create an e-CoC. This data is mapped to fields in the client EDMS. Then the client

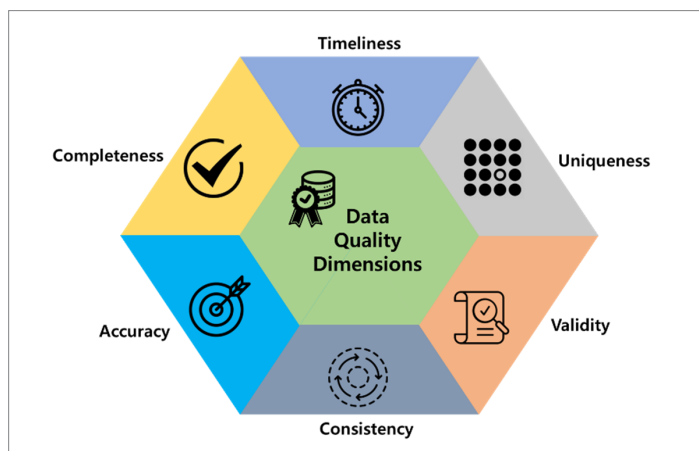


Figure 1. Six Key Data Quality Dimensions¹

schedules a sample collection event, which generates an XML file that can be loaded into a field app or to ALS Solutions, and samples are collected. Often the field app is connected to a field or office printer so sample container labels can be printed beforehand or in the field rather than handwritten, which can be a cause of transcription errors due to ambiguous characters such as i,l,I, and 1. Samples

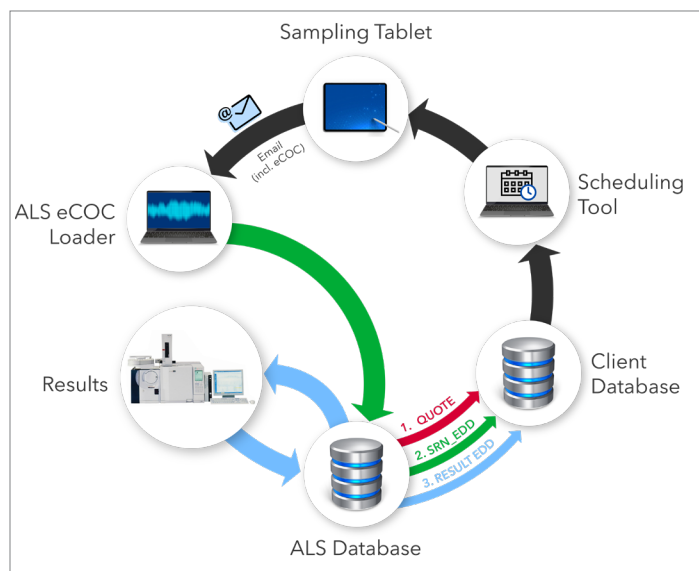


Figure 2. e-CoC Digital Touchpoints

are then transported from the field to the laboratory along with an updated e-CoC XML file containing sampling dates, times, and final analysis requirements. The printed CoC should generally accompany the sample shipment and is used to complete the Chain of Custody between the client and the laboratory. Once samples are received and verified by the laboratory, the workorder is logged-in using the e-CoC file, which is compared to the printed CoC in case last minute changes were made during sample collection. Next, an electronic Sample Receipt Notification (e-SRN) is emailed to the client's environmental database to confirm receipt and to highlight any issues with the submission.

As laboratory test results are authorized, they become available online in real-time through ALS Solutions, or for polling by an ALS Application Programming Interface (API). For submissions initiated by e-CoC, once all results have been authorized, the EDD and PDF reports are sent automatically to the environmental database. An EDD status log indicates whether the EDD upload file was loaded successfully into the client's environmental database or whether all the results pulled from the API have loaded correctly.

ALS can also provide seamless integration with an EDMS developed internally (not commercially available) using a generic e-CoC loader in GEL. For clients without access to a full-featured EDMS, options 2 and 3 below may be used to take full advantage of the benefits of e-CoCs.

Option 2: e-CoCs in ALS Solutions using Planned Events

The second option for e-CoCs is beneficial for projects that require on-going monitoring of the same sample locations with the same analyses on a regular sampling frequency. These types of recurring sampling episodes are easily configured in GEL using Planned Events. A Planned Event consists of a series of Sampling Points stored in GEL that match the sample names and extra sample information that ALS needs for an EDD to load into an EDMS. A Planned Event could be weekly, monthly, or quarterly, and often contains different Analysis Groups (test packages). When creating a new e-CoC in ALS Solutions, a dropdown list of all the existing Sampling Points are presented, along with their pre-configured testing requirements, known as Quote Analysis Groups (QAGs). A key benefit of this option is that the completed e-CoC can be emailed to the ALS Project Manager to create a bottle order, which permits pre-labelling with Sampling Point names either by ALS or in the field using one of the printer options in ALS Solutions. This saves time and ensures the correct bottle kits are available for each Sampling Point. Because of their repetitive nature,

Planned Events are the simplest way to take advantage of the benefits of digital integration using e-CoCs.

Option 3 : e-CoC Creation using ALS Solutions without Planned Events

The third option for e-CoCs can also be generated from ALS Solutions in a process explained below and depicted in Figure 3. All of the six key data quality dimensions from Figure 1 are improved using ALS Solutions e-CoC integration; however, the program is not an app and requires a connection to the internet. Sampling Plans can also be created in ALS Solutions along with Work Order and Sample Templates to improve consistency.

With this option, an e-CoC is created after receiving an ALS Quote by email for an upcoming sample collection event, starting with the creation of a new Sample Registration in ALS Solutions. Sample Names can be imported to the e-CoC by copying and pasting from Excel or by creating Sample and Workorder Templates in ALS Solutions. Analyses are selected from the list of QAGs and Sale Items in the ALS Quote. Sample bottle labels and a hardcopy CoC can then be printed for the sample collection event. After sample collection, sampling dates and times are added to Sample Registration in ALS Solutions. The Sample Registration is submitted and an e-CoC XML is transmitted to the ALS database (GEL) along with notification of the ALS Client Services team that samples have been submitted. Once samples are received and verified by the laboratory, the workorder is logged in using the e-CoC file, which is compared to the printed CoC in case last minute changes were made during sample collection, and a Sample Receipt

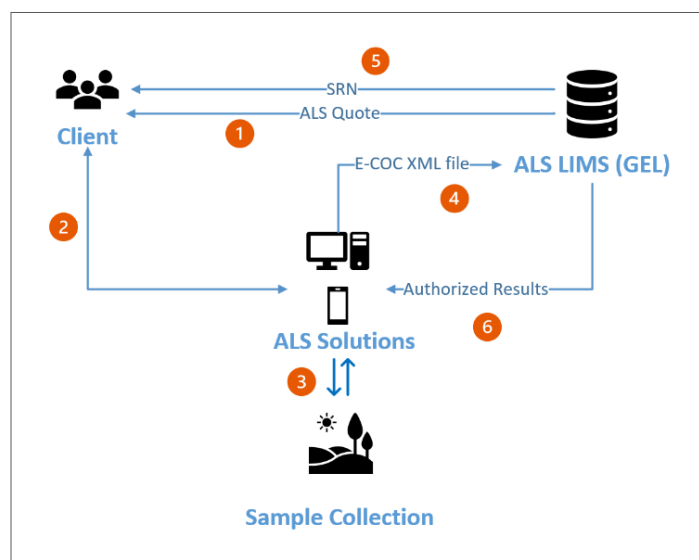


Figure 3. e-CoC Created using ALS Solutions

Notification (SRN) is emailed to the client. Real-time results are available online in ALS Solutions once authorized.

ALS Solutions offers multiple digital integration solutions for clients with or without an EDMS. All of these e-CoC solutions greatly improve the six key data quality dimensions (accuracy, completeness, timeliness, uniqueness, validity, and consistency) to ensure optimal data integrity and timely data upload for your environmental projects. Please refer to Table 1 to find the most suitable e-CoC solution for your environmental management needs.

e-CoC Option	Accuracy	Completeness	Timeliness	Uniqueness	Validity	Consistency
	Sample Names & Information	Extra Sample Info Required for EDD	Improved Speed of Result Delivery	Unique e-CoC Order #	Analyses Selected from ALS QAGs	Recurring Sampling Events are Managed
#1 EDMS Integration	EDMS Generated	EDMS Stored	Yes	EDMS Generated	GEL e-Quote and QAGs loaded into EDMS	Scheduling available in EDMS
#2 Planned Events	Planned Events and Sampling Points in GEL	GEL Stored	Yes	ALS Solutions Generated	GEL quotes and QAGs available in ALS Solutions, linked to specific Sampling Points	Scheduling available in ALS Solutions
#3 Generated in ALS Solutions	Sampling Plans and WO Templates in ALS Solutions	Not Stored - need to be added to e-CoC as text	Yes	ALS Solutions Generated	GEL QAGs can be set-up in Sampling Plans in ALS Solutions	Scheduling available in ALS Solutions

Table 1. Comparison of e-CoC Options

Please contact your ALS Project Manager for more information and support with any of these digital integration options.

¹ Figure 1 source: Appl. Sci. 2021, 11(19), 9270.