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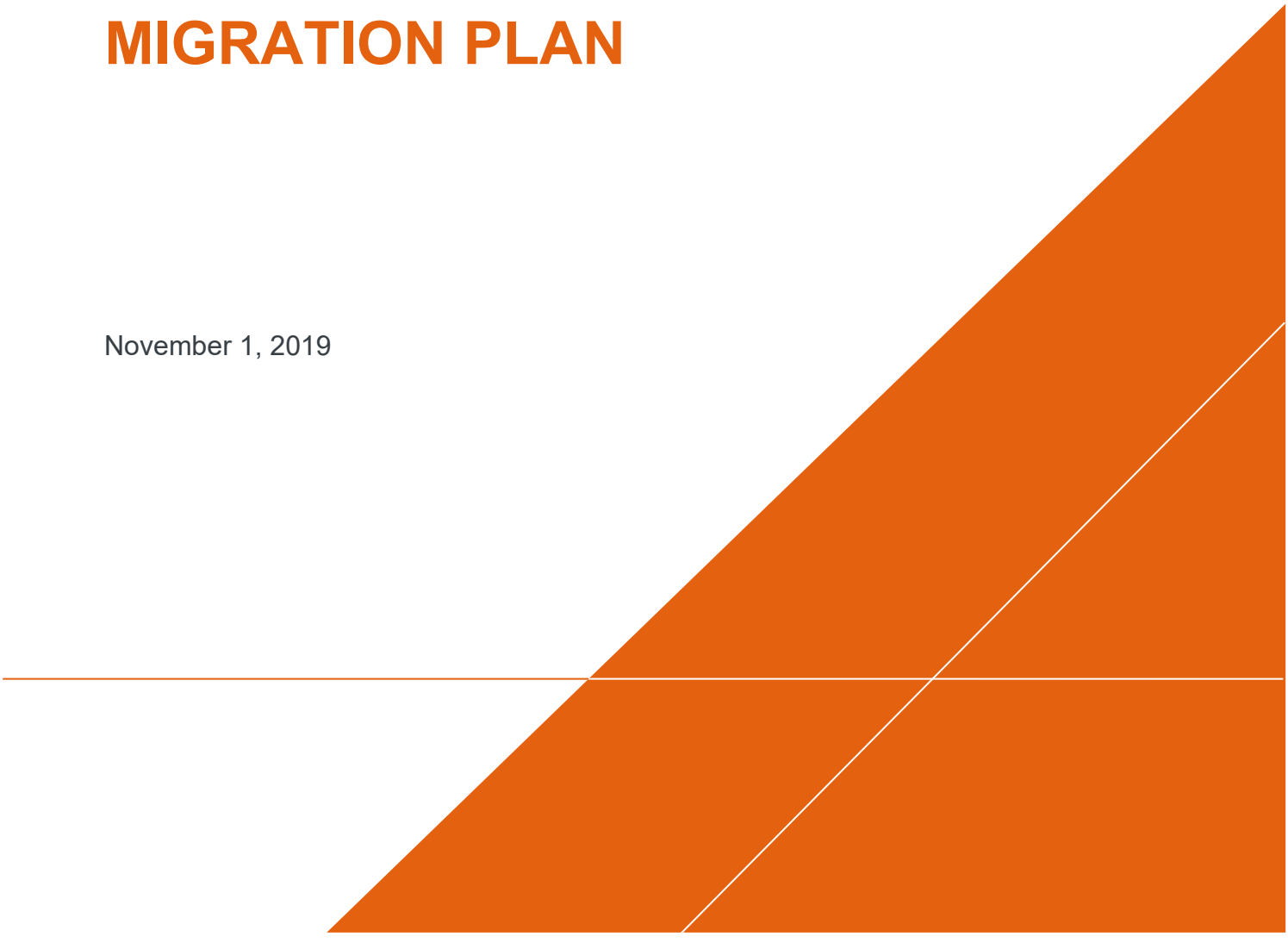
North Carolina DOT

NCDOT OPENROADS DESIGNER MIGRATION PLAN

November 1, 2019



NCDOT OPENROADS DESIGNER MIGRATION PLAN

Nilesh Surti, PE, CPM
Project Development & Design Lead - Carolinas

Krissy Hoffman, PE
Transportation Engineer

Jonathan Langley, PE
Principal Transportation Engineer

Prepared for:

Roger Kluckman
Specialty Functions and Support Services Group Lead
Roadway Design Unit
North Carolina DOT
1000 Birch Ridge Drive
Raleigh, NC 27610

Prepared by:
Arcadis U.S., Inc.
5420 Wade Park Blvd
Suite 350
Raleigh
North Carolina 27607
Tel 919 854 1282
Fax 919 854 5448

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VERSION CONTROL

Revision No	Date Issued	Description	Reviewed by
1	9/3/2019	Revisions to Draft Implementation Plan to incorporate comments received upon review and acceptance by NCDOT and individual units.	
2	10/2/2019	Revisions to Draft Migration Plan to incorporate comments received upon further review of NCDOT Leadership	
3	10/10/2019	Revisions to Draft Migration Plan to incorporate comments on revision 2, upon further review of NCDOT Leadership.	
4	11/01/2019	Revisions to Draft Migration Plan to incorporate comments received upon further review of NCDOT Leadership.	

CONTENTS

APPENDICES

ACRONYMS AND ABBREVIATIONS

2D	Two dimensional
3D	Three dimensional
ATLAS	Advancing Transportation through Linkages Automation and Screening
Bentley	Bentley Systems
CADD	Computer-aided design and drafting
DTM	Digital terrain model
FAQs	Frequently Asked Questions
ITS	Intelligent Transportation Systems
KPI	Key Performance Indicator
MDL	Microstation Development Language
NCDOT	North Carolina Department of Transportation
NCLUG	North Carolina Local Users Group
ORD	OpenRoads Designer
%	percent
PW	ProjectWise
SIG	Special Interest Group
SME	Subject Matter Expert
SUDA	Subsurface Utility Design and Analysis
SUE	Subsurface Utility Engineering
TBD	To Be Determined
VBA	Visual Basic for Applications

EXECUTIVE SUMMARY

The North Carolina Department of Transportation (NCDOT) is in the process of transitioning its computer-aided design and drafting (CADD) operations to OpenRoads Designer (ORD). ORD is a comprehensive, multi-disciplinary three-dimensional (3D) modeling application that advances the delivery of transportation projects from conceptual design through construction. The software blends traditional engineering workflows for plan, profile, and cross sections with 3D parametric modeling.

The overall Migration Plan is comprised of three parts, as described below:

- Part I – NCDOT ORD Readiness Assessment
- Part II – Departmentwide Migration Plan
- Part III – Unit-Specific Migration Recommendations.

1 PART I – NCDOT ORD READINESS ASSESSMENT

The North Carolina Department of Transportation (NCDOT) is in the process of transitioning its computer-aided design and drafting (CADD) operations to OpenRoads Designer (ORD). ORD is a comprehensive, multi-disciplinary three-dimensional (3D) modeling application that advances the delivery of transportation projects from conceptual design through construction. The software blends traditional engineering workflows for plan, profile, and cross sections with 3D parametric modeling.

To determine the best transition plan for each unit, a Readiness Assessment has been conducted. This assessment was conducted in the form of 1-hour interviews with the staff of each applicable NCDOT Unit. During the interview, a series of questions were asked to determine the transition status within a few key categories. The cumulative results of these questions are summarized in this document and will be used to form a migration plan and baseline schedule.

The Readiness Assessment interviews were only conducted with the Units located at the Raleigh area. The Plan will be updated when the 14 NCDOT Divisions and Units not yet identified have reviewed the Migration Plan and presented comments.

1.1 Readiness Assessment Categories

The Readiness Assessment evaluates three primary categories related to NCDOT's ORD transition and migration. Throughout the information gathering portion of the assessment, a rating system has been used to determine each unit's readiness for ORD migration.

HARDWARE & SOFTWARE

It is important to understand what current software applications are being used in order to establish a transition plan. It will also be important to understand what hardware is currently being used to ensure that the existing hardware is compatible with ORD.

WORKFLOW

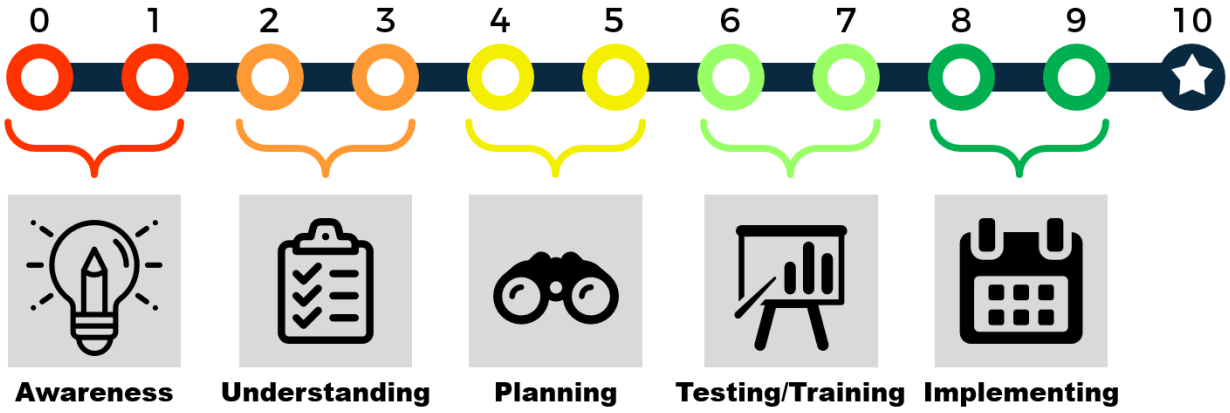
Each unit has specific processes and workflows that are regularly used to get the unit's work done. It is possible that the shift to ORD will require reexamination of some of these processes. This might include activities such as the units' plan preparation process or how they complete quality reviews.

PERSONNEL

The personnel of each unit are evaluated to determine the readiness and preparedness for the transition to ORD. Roles and responsibilities will be identified to allow for a smoother transition.

1.2 Readiness Assessment Questions

The Readiness Assessment questions fall into three categories, which are outlined in detail below. For each question, the facilitators recorded two kinds of information. First, they took notes on the participants' detailed responses. This assisted in understanding the unique factors that apply to each NCDOT Unit. Second, they recorded an evaluation rating based on the following scale. The 10-point scale mirrors the phases in the ORD transition process, shown in the graphic below.



1.2.1 Readiness Assessment Questions Scale

1.2.1.1 *Awareness*

The unit is aware that a software change is coming but is not yet aware of what that will entail from the staff and how it will affect their workflow and processes.

1.2.1.2 *Understanding*

There is some understanding in the unit of how the transition to ORD will affect the staff. They realize that moving from a two-dimensional (2D) to a 3D representation of the roadway will affect each unit differently and understand the degree of change that will be necessary within their unit.

1.2.1.3 *Planning*

The unit management has begun producing a plan for how each particular unit will transition to ORD. Some or all of the staff have been enlisted to help determine the best route to get there and what specifically must be done to ensure the unit is ready for the roll out of the new software.

1.2.1.4 *Testing/Training*

Training has begun for some or all of the staff in the new software and they are actively testing their workflow to determine what still works the same way and what will need to be changed.

1.2.1.5 *Implementation*

The testing and training phase is complete, and the unit is ready to begin the transition to using ORD on projects.

1.2.2 Hardware and Software Questions

1. What is the current software package your unit is using? To what degree has your unit investigated the compatibility with upgrading to ORD?

2. To what degree has your unit verified that the staff's hardware (PCs, laptops, etc.) is compatible with ORD? Minimum hardware requirements are available from Bentley Systems (Bentley).
3. What other stand-alone software applications does your unit use on a regular basis? To what degree has your unit investigated how these other stand-alone applications will integrate with ORD?
4. Does your unit require the use of any of the following types of features that are unique to your unit or the work it does? If so, to what degree has your unit investigated migrating these into ORD?
    a. Libraries,
    b. Cells,
    c. Templates,
    d. Seed files, and
    e. Line styles.
5. Does your unit currently use custom tools, toolbars, or menus within your current CADD setup? If so, to what degree has your unit investigated the need to migrate these into ORD?
6. Does your unit currently rely on the use of other add-on tools installed within your current CADD setup? If so, to what degree has your unit investigated the need to migrate these into ORD?
7. Does your unit's current CADD setup integrate with ProjectWise?

Workflow Questions

1. To what degree has your unit begun pilot testing for your current workflows?
2. To what degree is your unit prepared for using 3D-centric design and associated workflows?
3. To what degree has your unit investigated migrating plan preparation and delivery processes that are specific to your unit to ORD?
4. To what degree has your unit investigated migrating electronic data specifications and guidelines that are specific to your unit to ORD?
5. Does your unit use any electronic file compliance requirements? If so, to what degree has your unit investigated migration of these requirements into ORD?
6. Does your unit regularly interface with CADD files developed by other units or outside organizations? How does your unit interface with these files? To what degree has your unit investigated current Bentley workflows within ORD or other Bentley applications?

Personnel Questions

1. How many staff are included within your unit? On a high level, what kind of roles and responsibilities exist within the unit?
2. To what degree would you consider that your unit's staff is open to and accepting of the ORD migration?
3. What kind of exposure and familiarity does your unit's staff have to ORD? To what degree would you say the staff is familiar with ORD and comfortable using it?

4. To what degree has your unit's production staff received ORD training and supporting materials?
5. To what degree has your unit's management been educated about how ORD will operate and what impacts it will have on current workflows?
6. To what degree does your unit's workload accommodate transition activities associated with the ORD migration?
7. Can you please identify a point of contact within your unit for any additional questions/inquiries that may arise as this process progresses?

2 NCDOT UNIT ASSESSMENTS

2.1 Readiness Assessment Overall Results Summary

Over the course of 2 weeks, our team was able to meet with staff in the 14 units at NCDOT to discuss the transition to ORD. The Readiness Assessment Rating for each unit is shown in the table below. The full table with ratings for each question is included in Appendix A. The overall average for NCDOT is 45 percent (%), which puts the overall readiness assessment for NCDOT within the Planning Stage.

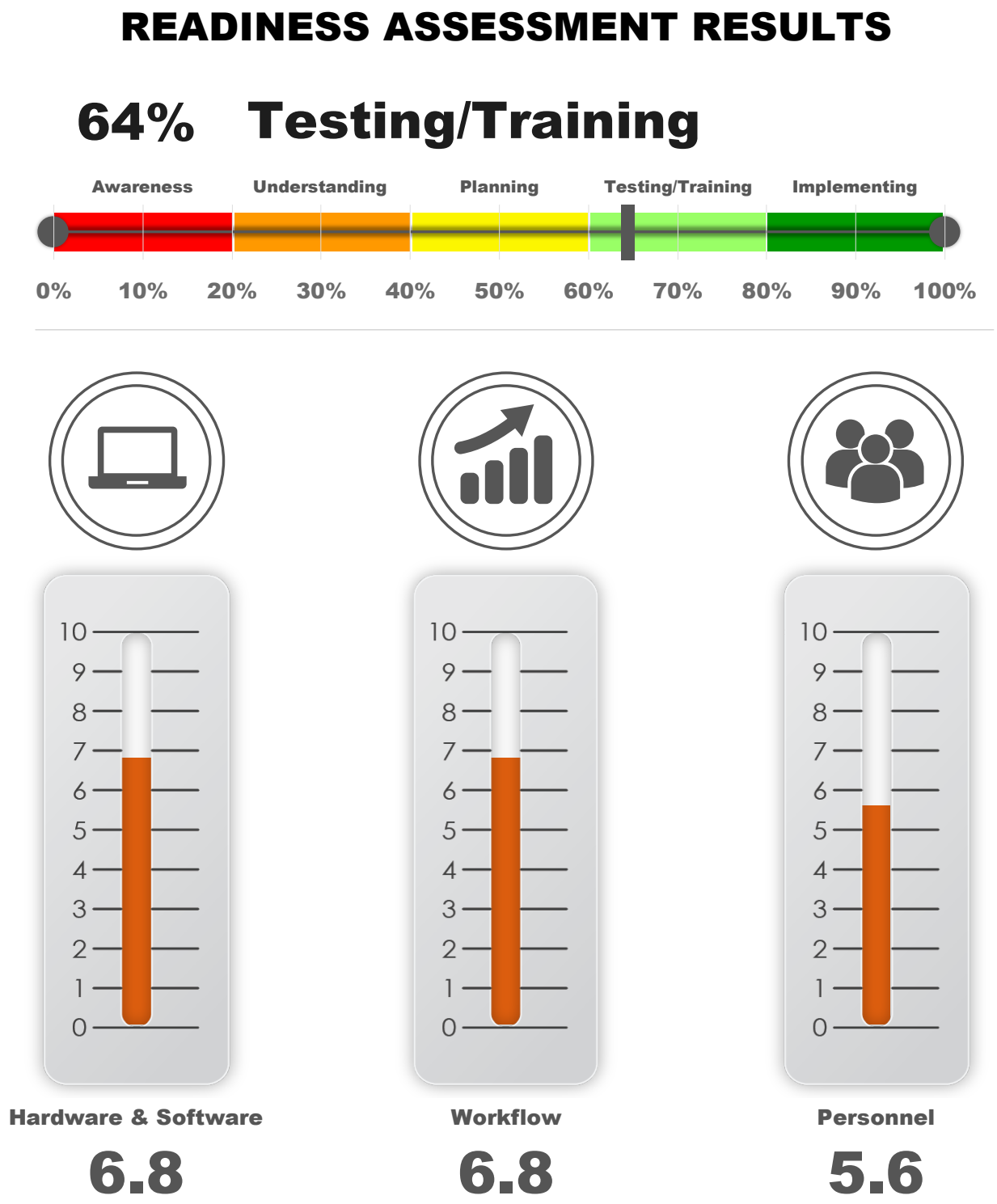
An important trend we noticed when talking to each unit was that their current workloads do not have the margin to support time for training in and testing of the new software. This is something to keep in mind when setting milestone dates and timelines. Some flexibility may need to be built into the schedule.

For most units, personnel received the lowest rating. Due to the past reduction in staff, not many personnel are able to use the software or attend training yet. The table on the following page provides the overall assessment ratings for each unit.

The following sections within this document provide a more in-depth description of each unit's rating. In addition to the overall rating, breakdowns are presented for each of the three major categories: Hardware and Software, Workflows, and Personnel. A table with the detailed breakdown of the ratings for each question is provided within the appendix.

Unit	Readiness Assessment Rating	Assessment Phase
Hydraulics	64%	Testing/Training
Roadway Design	74%	Testing/Training
Feasibility Studies	46%	Planning
Structures Management	41%	Planning
Utilities	34%	Understanding
ITS and Signals	42%	Planning
Geotechnical Engineering	33%	Understanding
Location and Surveys	53%	Planning
Photogrammetry	23%	Understanding
Signing and Delineation	37%	Understanding
Work Zone Traffic Control	56%	Planning
CADD Services	64%	Testing/Training
Plans and Standards Management	32%	Understanding
Roadside Environmental	30%	Understanding

2.2 Hydraulics Unit



2.2.1 Assessment Insights

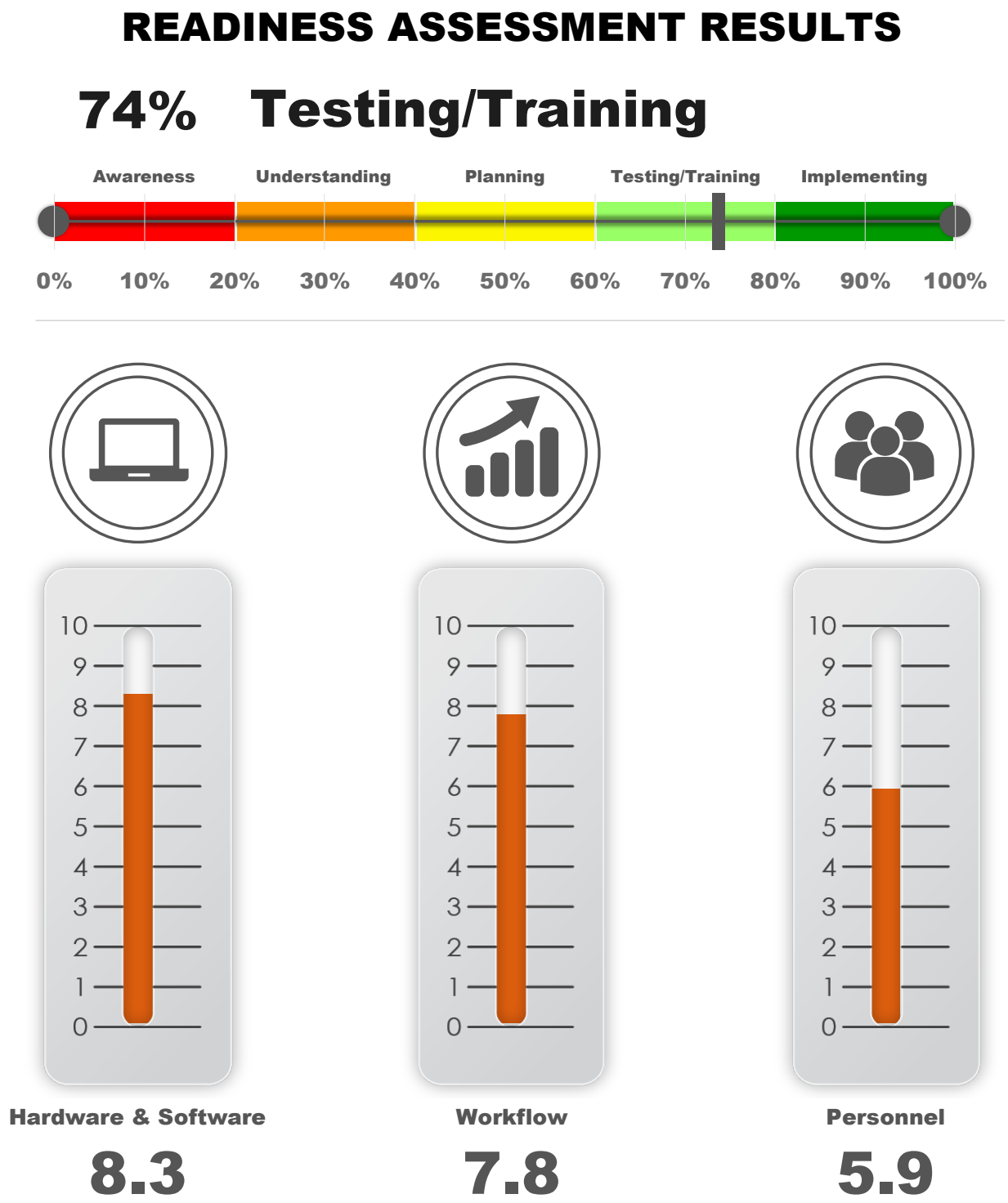
With an overall Readiness Assessment rating of 64%, the Hydraulics Unit is in the Testing/ Training phase of the ORD transition. They have worked both externally with consultants and internally to build their workspace and associated configurations, while also working with Bentley to log defects and issues. This has resulted in software updates and/or enhancements to aid in the migration to ORD.

Hydraulics plans to utilize the same workflow with ORD as they have with Geopak and has begun finding ways to replicate what they do now with similar tools in ORD, or to work around when a particular tool is not available. For example, they currently build drainage summary sheets and plan to use Flex Tables in ORD to generate the same summary sheets. All of their feature definitions have been updated and annotations are set up for labelling; in their testing so far, annotations and labelling are working. With all the work the Hydraulics Unit staff has done, they would like to have presentations on how to improve the workflow and/or to ease the transition with the new tools.

The process of working with Bentley on any technical issues has been providing beneficial results. They continue to attend monthly calls organized by the CADD Services Unit. It is possible to log issues to Bentley, and Bentley will reply if an issue has been addressed and if/when it will come out in a future release. One issue they have asked Bentley to address is the lack of backwards compatibility. The absence of backwards compatibility would make it difficult to keep up with the changes when new releases come out every 3 months.

Overall, the unit is open to the new software and the consultants they work with are also ready to make the transition. Approximately 40 to 50% of the unit's 36 employees will be using the software. As we saw in many interviews, Hydraulics has a heavy workload and finding the time to train the necessary staff will be very difficult.

2.3 Roadway Design Unit



2.3.1 Assessment Insights

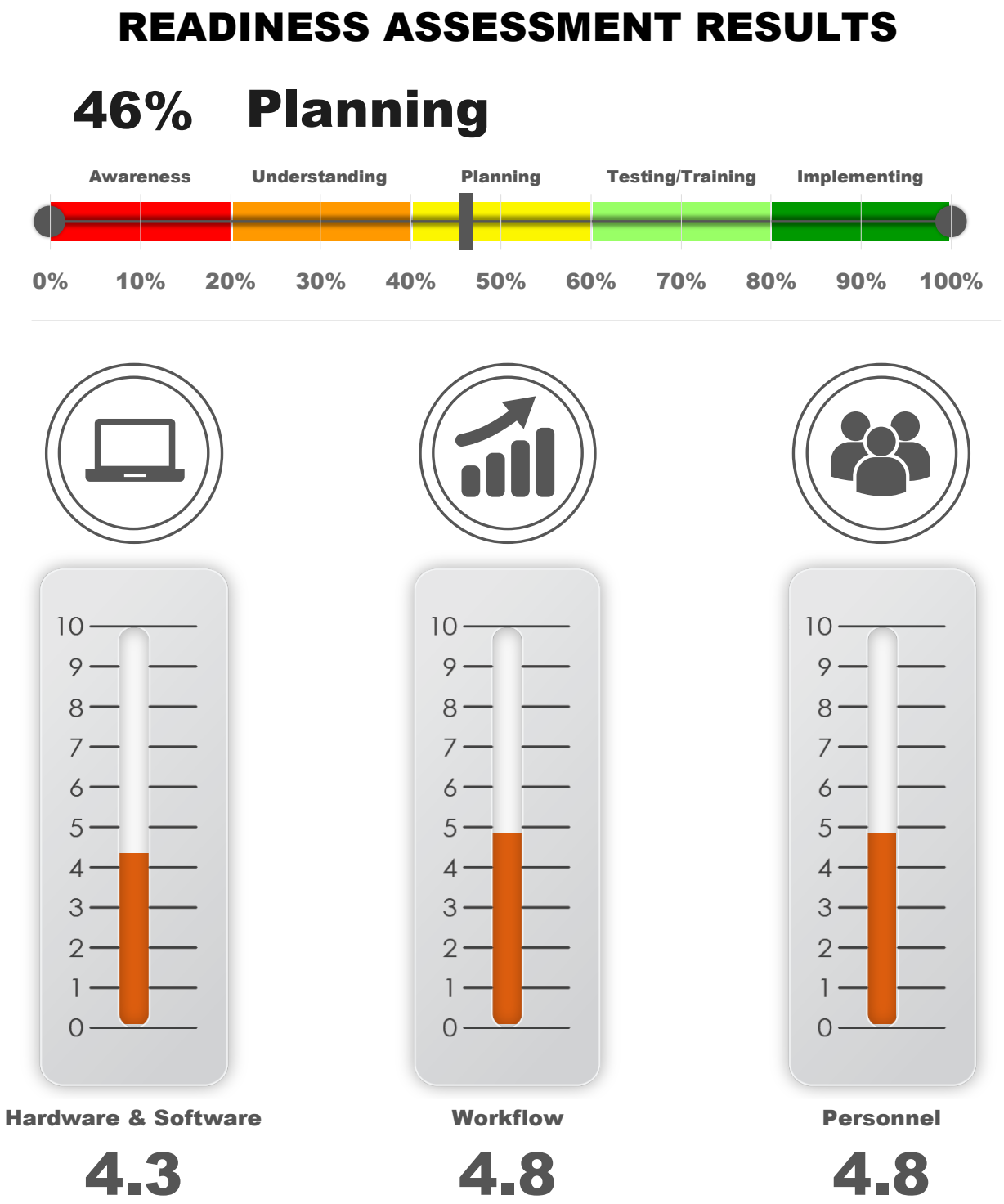
With an overall Readiness Assessment rating of 74%, the Roadway Design Unit is well into the Testing/Training phase of the ORD transition. In large part, this is the result of thorough and intentional development of their ORD workspace and associated configurations. Individuals within the unit have taken responsibility for the development of these elements and have coordinated with staff at Bentley to ensure accuracy. The unit has made a conscious effort to do away with customized tools and Microstation Development Language (MDL) applications. This focus on using the “out of the box” software setup has simplified the unit’s transition process.

The Roadway Design Unit has also initiated a series of eight pilot projects to begin testing the workspace, configurations, and workflow. These pilot projects are currently at the hydraulics stage of project development. To maximize the benefits of the pilot projects, the Roadway Design Unit has encouraged participants in the pilot projects to work out of a combined team space at NCDOT. This enables the team members to quickly apply lessons they actively learn from each other.

The unit has begun its training efforts and has plans to continue in the coming months. The first session was a “Quick Start” training and focused on familiarity with the new application interface. Future training efforts will move into demonstrations of geometric design. It was also noted that consultants have received approximately six times the amount of training as internal NCDOT staff.

One of the most notable challenges for the Roadway Design Unit relates to staff workload commitments and availability. During the interview, it was noted that the number of staff in the unit has decreased from approximately 150 to about 27 in the past 5 years. Additionally, the schedule-driven nature of the project work requires the remaining staff to prioritize project milestones. As the need for additional training increases it will be important for staff to make the time to prepare to begin the migration to ORD.

2.4 Feasibility Studies Unit



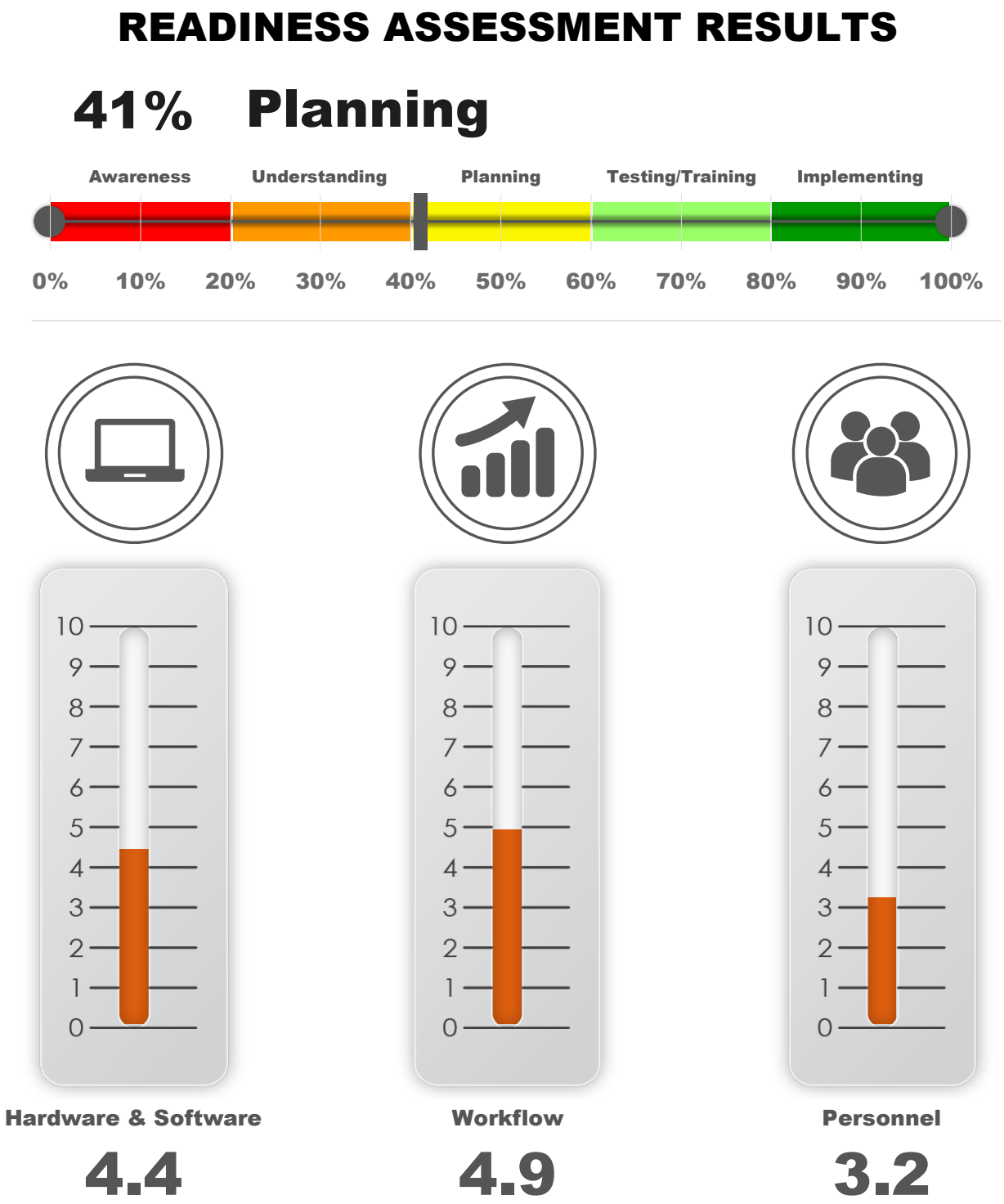
2.4.1 Assessment Insights

With an overall Readiness Assessment rating of 46%, the Feasibility Studies Unit is in the Planning phase of the ORD transition. This is likely because their deliverables are related to funding documents – including a report and cost estimate – and are not largely CADD driven. In order to have an accurate cost estimate, they need accurate quantities and look a lot at constructability and the items that have the highest risk of cost changes. When working in CADD files, they will use Roadway's workspace, so they do not have as much to prepare or convert as some units.

The Feasibility Studies Unit does its work first and does not require large amounts of interaction with other units during the study phase. They may communicate with other units about mapping limits, or traffic concepts, but they generally do not need to share CADD files.

The unit is currently going through training in Bentley ConceptStation and would like to be able to export data from ConceptStation to ORD when applicable. They, and the consultants who also perform the studies, will all need to be using the same workflow and many of the units' employees will be "starting from scratch" with the new software. Like previous units discussed, they have a heavy workload and their consultants are either at or close to their capacity, so finding time for training could be a challenge.

2.5 Structures Management Unit



2.5.1 Assessment Insights

With an overall Readiness Assessment rating of 41%, the Structures Management Unit is just entering the Planning phase of the ORD transition. They have not advanced beyond this phase primarily because they do most of their design work in other software programs and use Bentley products mostly for plans production and drafting. When reviewing consultants' plans, they may receive .dgn files or .pdf files.

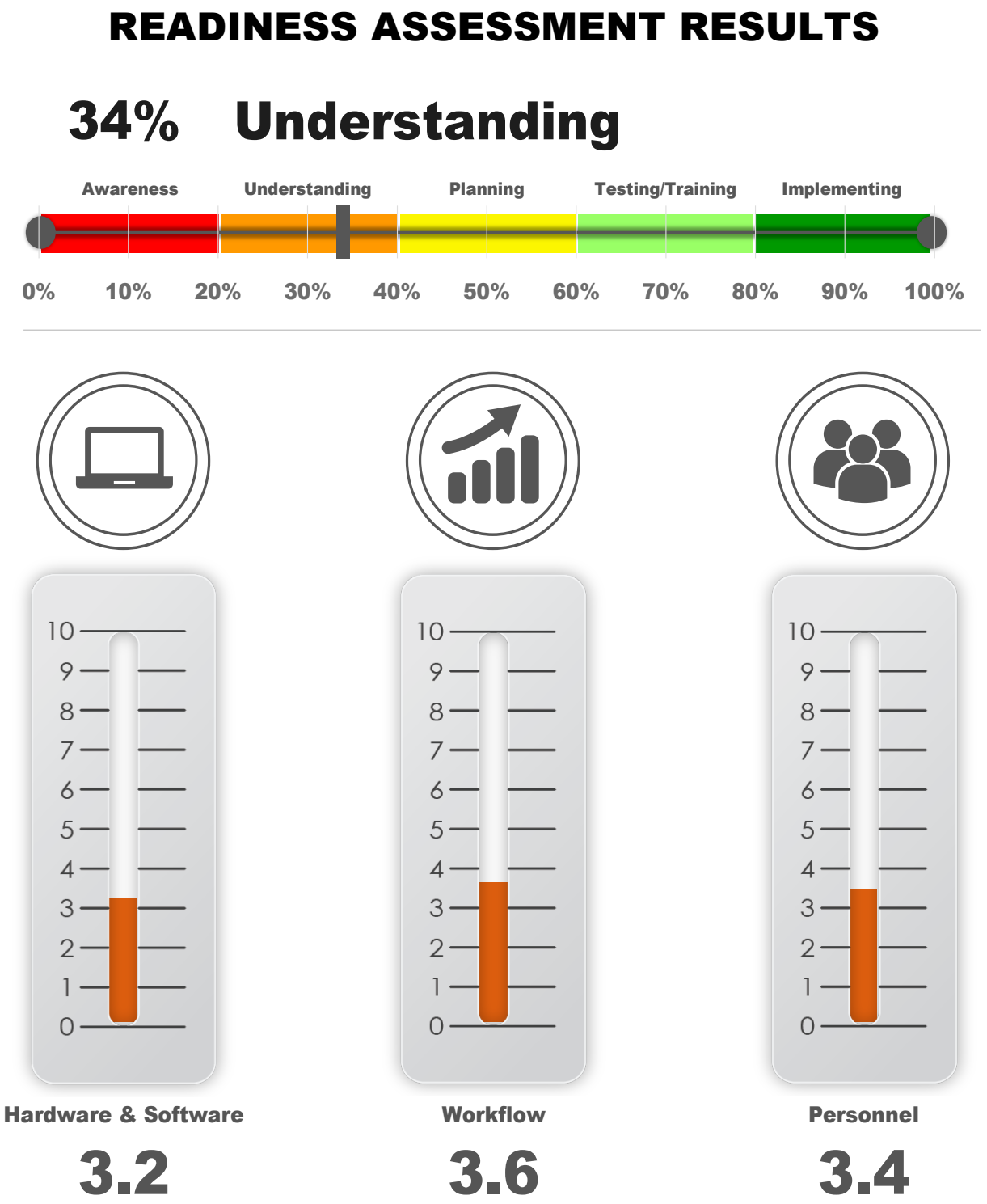
At this time, they have attended a presentation about OpenBridge Modeler and discussed working in a 3D space but would like a lot more information and are not comfortable with how labeling of the 3D objects could be done. To make it worthwhile for them to produce a 3D model, they want to know that contractors and fabricators can use the models of the bridge.

They have started working with the CADD Services Unit because their cells are all 1:1 scale and do not include annotation, they have been told, "All will easily translate." They used to use MDL applications, but no longer do, which will also make the transition easier. The Structures Management Unit regularly exchanges files with the Hydraulics, Roadway Design, and other units, but they sometimes may be paper files instead of .dgn files.

At this time the unit has 80 employees, not counting inspectors, and 50 to 60 of those employees will be using design files. It was noted that approximately half of these individuals are unaware of how the ORD migration will impact them, which may result in some reluctance and the need for additional education.

The Structures Management Unit's workflow is not anticipated to change significantly. They anticipate that they will use ORD strictly for 2D drafting and they would like training on where tools and features are located within the new software. Other training needs are not anticipated at this time. If the unit decides to use 3D tools, the unit will need more training, and it will extend the time required for transition. Training for the unit would need to include how to utilize data coming from other units, for example, a 3D model of the road from the Roadway Design Unit. The unit has had little to no involvement in the current pilot projects and requested that they be included as the pilot projects advance.

2.6 Utilities Unit



2.6.1 Assessment Insights

With an overall Readiness Assessment rating of 34%, the Utilities Unit is well into the Understanding phase of the ORD transition. During the interview, it was noted that the Utilities Unit serves two functions – permitting new utility installations within the NCDOT right-of-way, and the relocation of utilities. These relocation plans may be completed by the utility owner or a consultant and may not be performed using Microstation. Plans can also be submitted as marked-up .pdf files and not CADD files. Because of this, there has been discussion about requiring companies to provide 3D plans and the unit would like to come up with requirements to ensure that any plans submitted in CADD are also in the correct coordinate system.

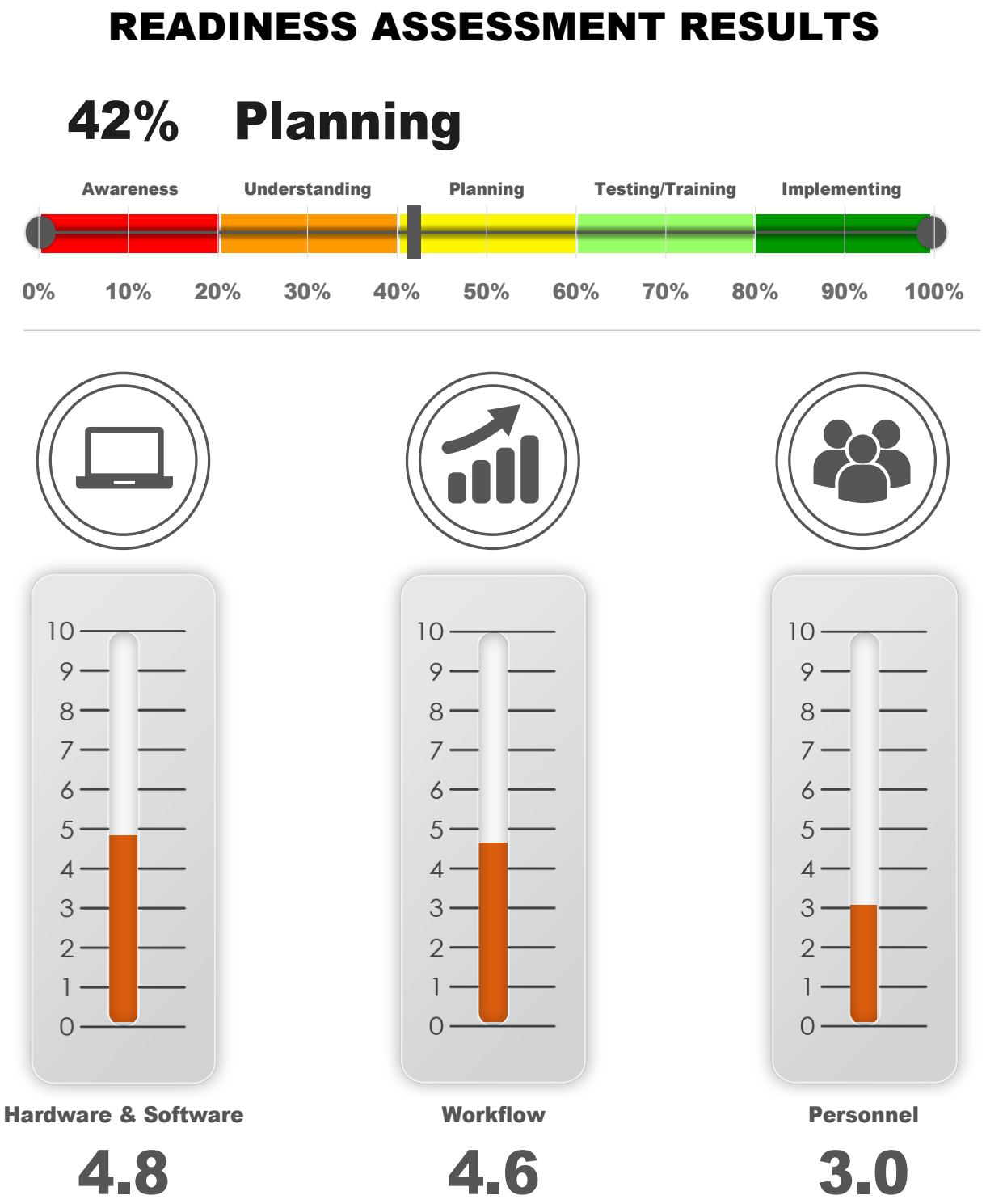
The Utilities Unit has an extensive database of line styles and cells because it needs a different one for every type of pipe and size of each type. The unit has hired a consultant, Robert Garrett, to design the workspace. If it is possible to simplify this process using ORD, they would like to do so. Included with the scope to design their workspace is: training, videos, and a workbook with documentation of how to put it together so they can maintain it and update it themselves.

The unit has investigated ORD and used it to open existing files, but there were bugs with the attributes, so they have not yet been able to test out the workspace or software. They plan to have each cell in 2D plan view, 2D profile view, and 3D. The unit noted that it is anticipated that they will be working with Subsurface Utility Design and Analysis (SUDA). This will be accomplished by using Subsurface Utility Engineering (SUE). This will enable clash detection with other utilities and drainage pipes and structures when they are all modeled in 3D.

While transitioning to the new software, the unit would like to also institute a more formal process for plans submittal from the utility companies/consultants. Right now, most of the work is done by consultants so they have fewer design experts in-house and mostly review the plans done by the consultants.

There are 21 employees who work on utilities relocation and all will use CADD to some degree, but some will just be using it to review and not design. They are ready for the change and will need to train the entire staff. As with most other units, they have indicated a heavy workload, which will impact their availability for testing and training.

2.7 ITS and Signals Unit



2.7.1 Assessment Insights

With an overall Readiness Assessment rating of 42%, the ITS and Traffic Signals Unit is in the Planning phase of the ORD transition.

This unit is responsible for designing signal plans and ITS interconnection plans. The work can be completed in-house or by consultants. The work usually starts when roadway plans are at 80 to 90% and the right-of-way plans are complete. They often wait to begin their design until the Hydraulics Unit has finished ditch design to avoid redesign of the signal pole locations. It was noted that it is not unusual to require limited coordination with the Hydraulics and Utilities units, but most of the design is done after other units have completed their work.

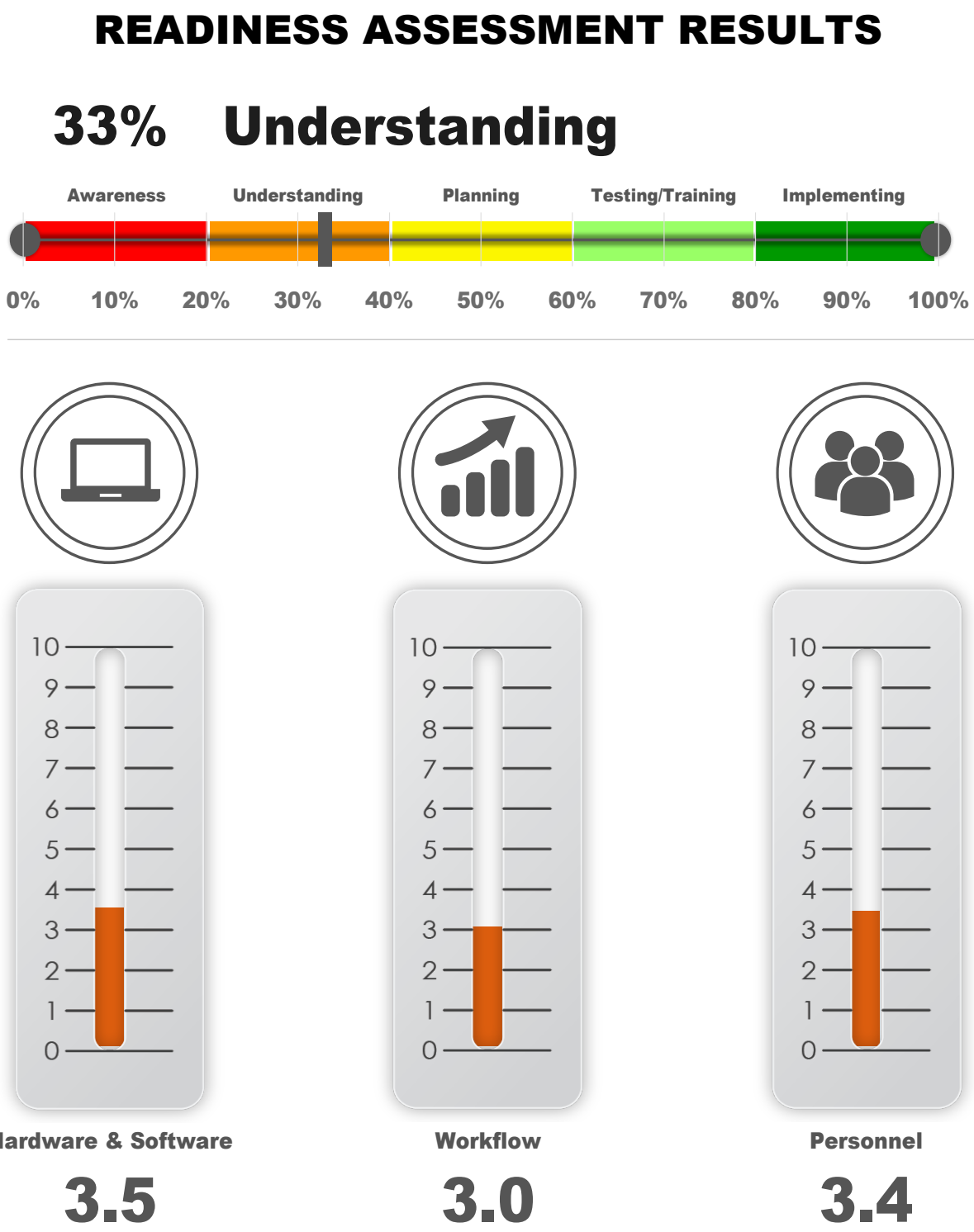
Geopak is used in their current workflow to determine location stations, offsets, elevations, and labeling. They also use AutoTurn. The unit indicated that they would like to learn to use ORD to help with cutting special cross sections and identifying pole locations. Within their current workflow, they request that the Roadway Design Unit cut the additional cross sections for them.

Part of their planning process includes attempting to predict any issues that may come up during the transition process and determining a solution now to avoid the issue. The CADD Services Unit is looking at converting their seed files and their MDL applications. Roger Garrett, an NCDOT employee in the Work Zone Traffic Control Unit, is also helping with their workspace. They also have someone working on their program that allows them to insert notes into plan sheets that are already formatted correctly. Their electrical details are all 2D and not connected at all to the geometry. They are interested in using the 3D capabilities of ORD to help simplify their process.

As of the Readiness Assessment interview, the unit has not been involved in any pilot projects but is interested in participating to help them see the differences in workflow and tools.

At this stage most of the unit does not have experience with ORD, but staff is aware the transition is coming. The unit will require some basic training as well as unit-specific training to help with the transition.

2.8 Geotechnical Engineering Unit



2.8.1 Assessment Insights

With an overall Readiness Assessment rating of 33%, the Geotechnical Engineering Unit is in the Understanding phase of the ORD transition. It was indicated that the staff is excited about the possibilities available in the 3D modeling aspects of ORD, but it will take some training and workflow changes to adopt these features.

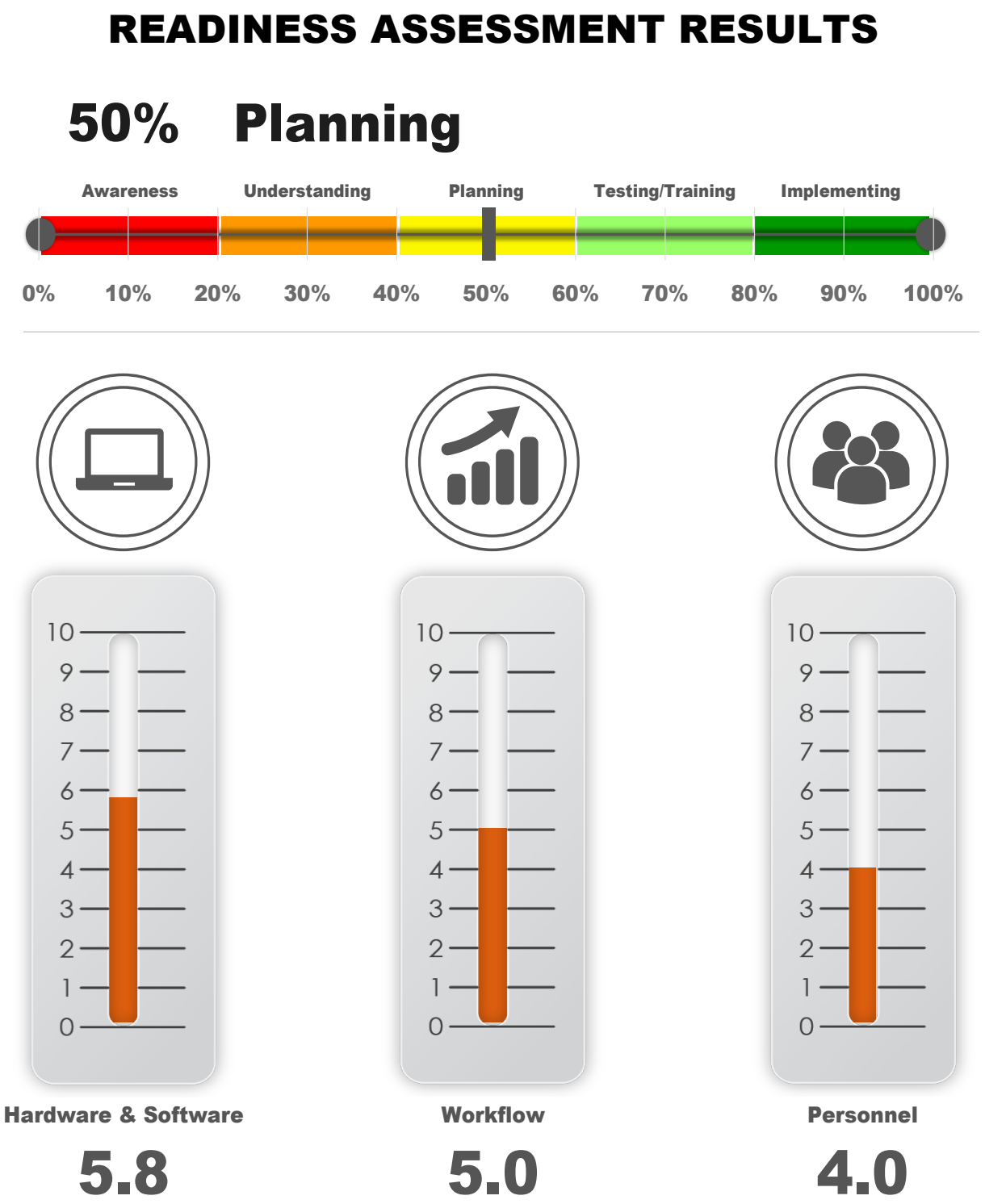
The Geotechnical Engineering Unit uses gINT software, which is also a Bentley product, and works with ORD. They are very interested in the 3D prospects but want to make sure they are producing a product that still delivers the same information. Their deliverables include a written report, plan/profile sheets, and cross sections. After inventorying what soil is there and including that in the deliverables, their secondary product is recommendations. Most of their work is done for the Roadway Design and Structures Management units. For work with the Roadway Design Unit, they use roadway sheets, but, for the Structures Management Unit, more manipulation of the plans is required to change the scale. When working with the other units, they are not using live files, but a “snapshot” they copy to their own server. If changes occur later, they must get design revisions. One option may be to change from a “snapshot” to a “live” workflow.

Their work starts early in the design process – sometimes even during planning – which has the potential to lead to complications. For example, trying to cover all areas before the slope-stakes are finalized can result in more fieldwork and months of additional time.

The unit has only performed limited testing of ORD because their unit-specific cells were not ready. They needed cells to be resized and to reduce the number of levels. They were able to successfully post the test borings in plan view, but they indicated the process was challenging and “clunky.” When they researched this in fall 2018, they discovered that ORD did not have all of the capabilities they are familiar with within Geopak. The unit worked with Bentley and the CADD Services and Roadway Design units but is unsure of the current status for developing the tools they need.

The Geotechnical Engineering Unit has what they call “cookbooks” that contain all of their policies. Consultants use these to know how to produce their plans. These will need to be updated. They have one for roadway design projects and plan to do one for structural projects as well. The unit will require training, and they indicated that their heavy workload will make it challenging to find the time for this training. They would like to be included in the pilot projects and to learn more about how meshes could be applied for transitioning soil types between borings.

2.9 Location and Surveys Unit



2.9.1 Assessment Insights

With an overall Readiness Assessment rating of 50%, the Location and Surveys Unit is in the Planning phase of the ORD transition. They have done some testing but are still trying to work out a logical process for their property boundary workflows. The unit has been developing potential procedures, but they indicated that these still require further testing.

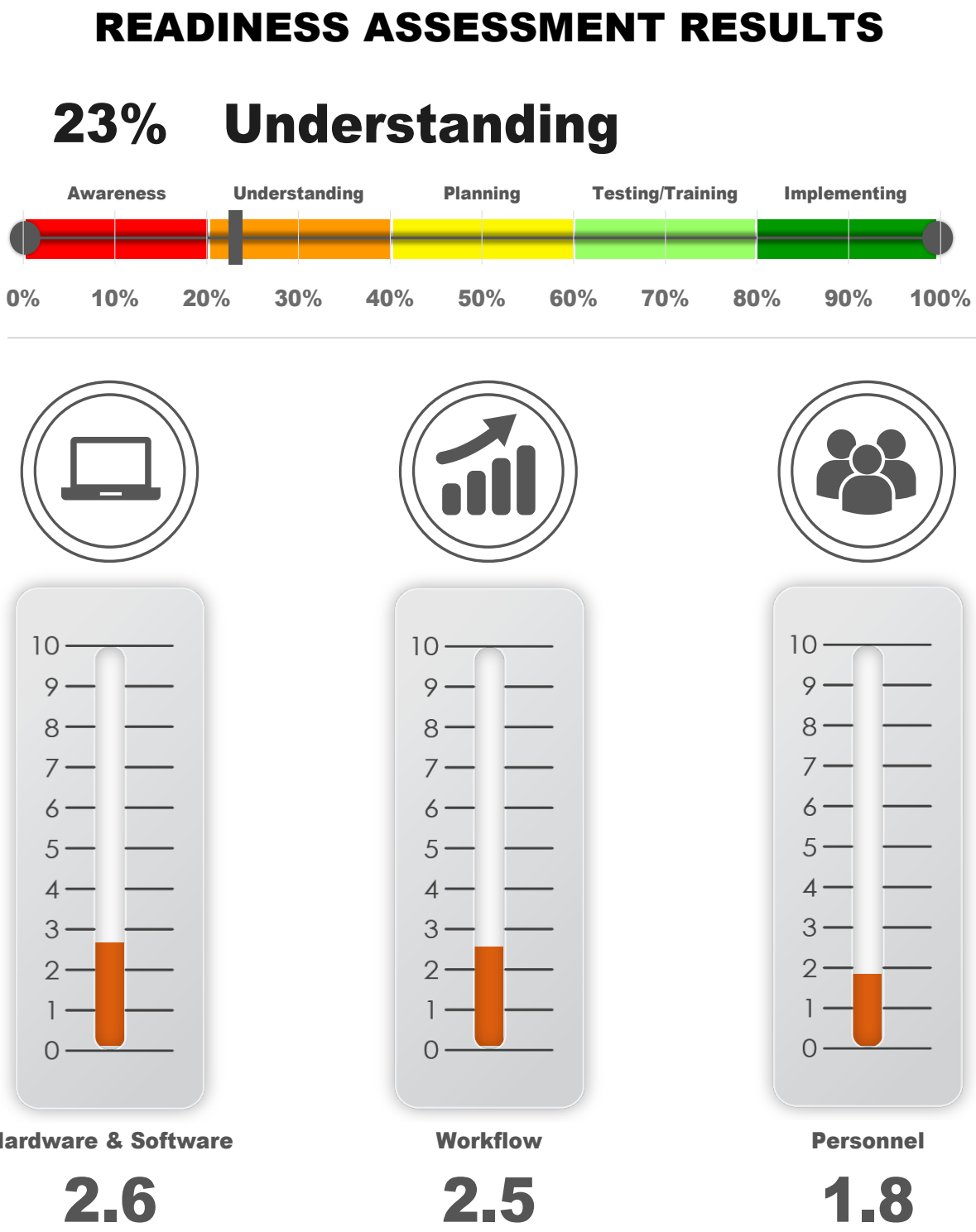
The Location and Surveys Unit is responsible for all pre-construction surveys for NCDOT. They set the project control, develop digital terrain model (DTM) data from various sources, collect hydraulic information, breaklines, subsurface utilities, property information, and more. They work to help with right-of-way acquisition and plans. They may also be tasked to help during construction, so they can be involved from beginning to end of a project. Their deliverables include plan sheets, a full survey CADD file (2D), a 3D file with the existing DTM, and .TIN file. Their sheets mimic the roadway sheets with the topographic information in gray scale and the right-of-way and property information in black. They have tested printing these sheets in ORD and there were no issues. The unit has tested the workflow for processing their survey data within ORD and found they are able to complete the processing successfully. All of their cells, seed files, etc., have been converted for ORD.

ORD can do things that they use MDLs to do, but not all of them. It was indicated that the unit is very concerned about the possibility of not having the NC Map utilities that are currently built for Microstation V8i. It was noted that the current add-on tools function as a palette, which is used throughout their entire process and enables them to draw and place cells much more efficiently. These tools are used both in-house and by consultants, and they would prefer to maintain this workflow within ORD due to the increases in efficiency they afford.

The Location and Surveys Unit also uses other external software: ArcMap and TopoDOT. It was mentioned that they have yet to find a feasible property boundaries workflow. In trying to draw a parcel, the unit indicated that they had problems with storing points as a parcel and drawing arcs as part of a parcel. Bentley worked with them to help draw the arcs, but the unit feels that this isn't working correctly yet. They are also looking for more information from Bentley about survey tools that are being further developed for future software releases. The unit indicated that they would also like to be included in the ongoing pilot projects.

In previous software transitions, it was indicated that the Location and Surveys Unit was the leader for the transition since they are often the first unit to develop CADD-based files within the overall design workflow. For the current transition, the Roadway Design Unit has led many of the transition activities. It was noted that the survey data can be prepared within ORD using the same workflow that is currently used by the Roadway Design Unit. It was noted that they feel good about the status of the development of the MDLs they will need for the ORD roll out.

2.10 Photogrammetry Unit



2.10.1 Assessment Insights

With an overall Readiness Assessment rating of 23%, the Photogrammetry Unit is in the Understanding phase of the ORD transition. This is primarily due to the incompatibility between the software they are currently using, Hexagon, and ORD. The Photogrammetry Unit uses the Hexagon ImageStation software to "compute refined aerial photography orientation to support real time stereo maintenance of overlapping aerial imagery for 3D graphic planimetric feature and DTM collection using Microstation V8i (SS4) with the NCMap MDL". The software company, Hexagon, is still using 32-bit and is not sure when they will transition to a 64-bit package, which is what ORD is, and they must be compatible. The unit also uses Microstation Power Geopak V8i (SS4) for a variety of other functions including flight planning, texting files, creating model layouts, and localizing GRID coordinate data.

During the interview, Photogrammetry staff described moving to ORD as a "huge paradigm shift" that would require their unit to transition to new software to allow them to perform the same task they do with Hexagon. The Photogrammetry Unit is a small unit with a high IT demand. The IT employee within CADD Services who supported NCMap MDL recently resigned, and no IT or unit personnel has been assigned for updating the NCMap MDL software.

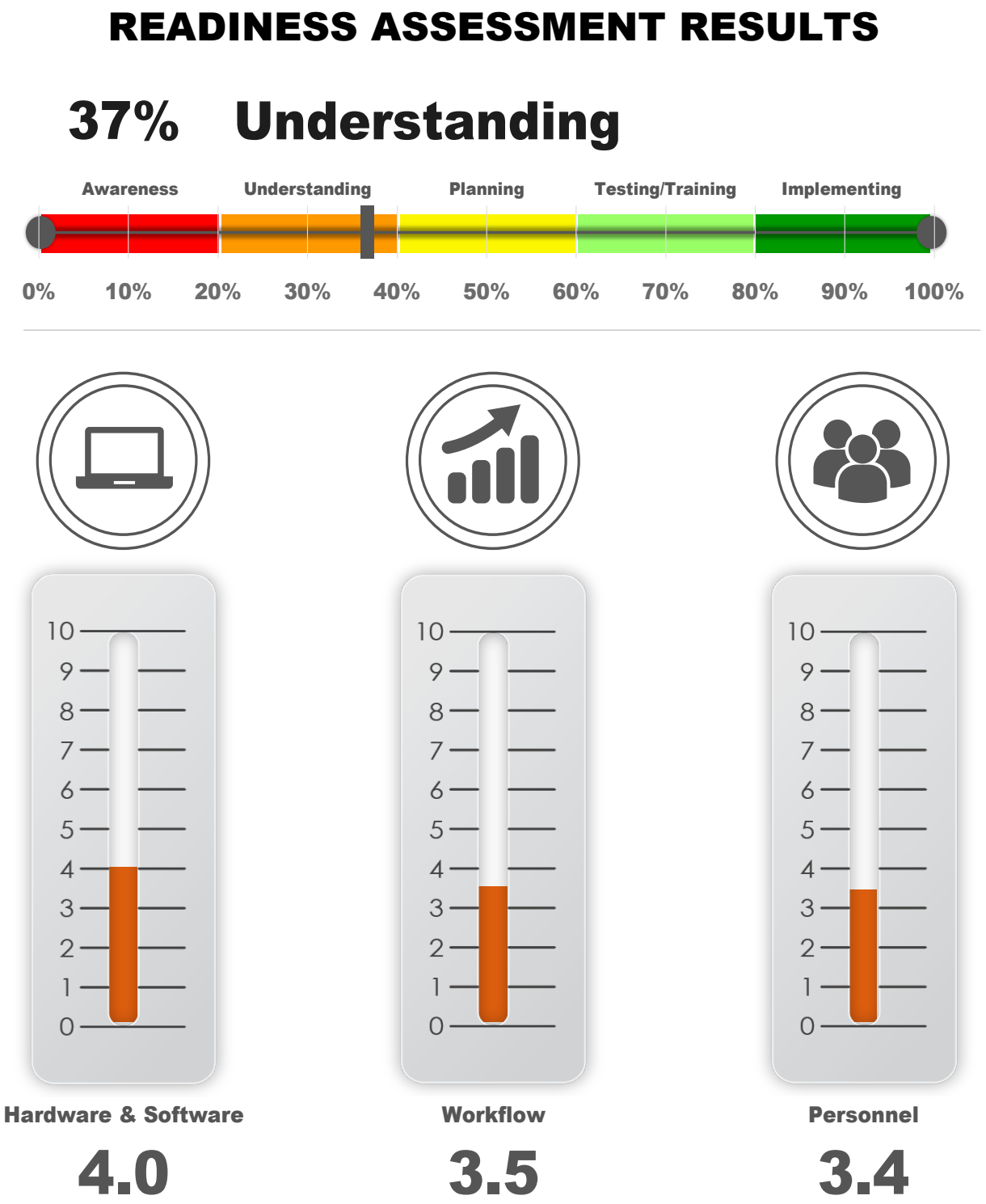
The deliverable is digital mapping. Roadway Design has told Photogrammetry they can use the current deliverables with ORD. The Photogrammetry Unit works closely with the Location and Surveys Unit and generates 2D maps in a design file and a 3D DTM. They collect data from photos and compile the data to produce these files. Their workflow involves requesting ground survey control panels to control the mapping limits and then flying the project. They triangulate the photos and tie images together using aerial triangulation. With the imagery tied to the ground, they can map everything they see in the photos. All of this is done in a Microstation file. They also use the NC Map tool when digitizing to ensure they are using the correct levels, colors, etc.

During the interview, it was mentioned that the Photogrammetry Unit was the first unit at NCDOT to begin using CADD. The software has evolved over 25 years and now there is no more support for the MDL apps – including NC Map. It was noted that they are extremely concerned that these tools may not be supported in ORD. Furthermore, it was indicated that a lot of experience and knowledge has been lost over the years as staff has left the unit. It was stressed that training will be necessary to ensure they understand ORD and any new workflows. It was noted that consultants did about half of their work last year and they anticipate the same trend moving forward. For this reason, their consultants would need to be trained as well.

It was clearly communicated that the unit would prefer to maintain its current workflows and software applications, Hexagon software and the NCMap MDL application, as much as possible. This will depend on the availability of a 64-bit software application that can meet their needs, whether Hexagon updates their software to 64-bit, or another alternative is found. In an email dated August 28th, it was communicated by Hexagon that they are presenting new features in ImageStation including 64-bit processing. Photogrammetry will continue to communicate with them regarding the timeline and their Bentley CONNECT support questions.

The Photogrammetry Unit will also need to use the CONNECT software for the other functions listed above and also for computing construction earthwork pay quantities for unclassified excavation on select NCDOT projects. This includes processing ground elevation surfaces and graphic alignment files for pre-construction and construction projects.

2.11 Signing and Delineation Unit



2.11.1 Assessment Insights

With an overall Readiness Assessment rating of 37%, the Signing and Delineation Unit is well into the Understanding phase of the ORD transition.

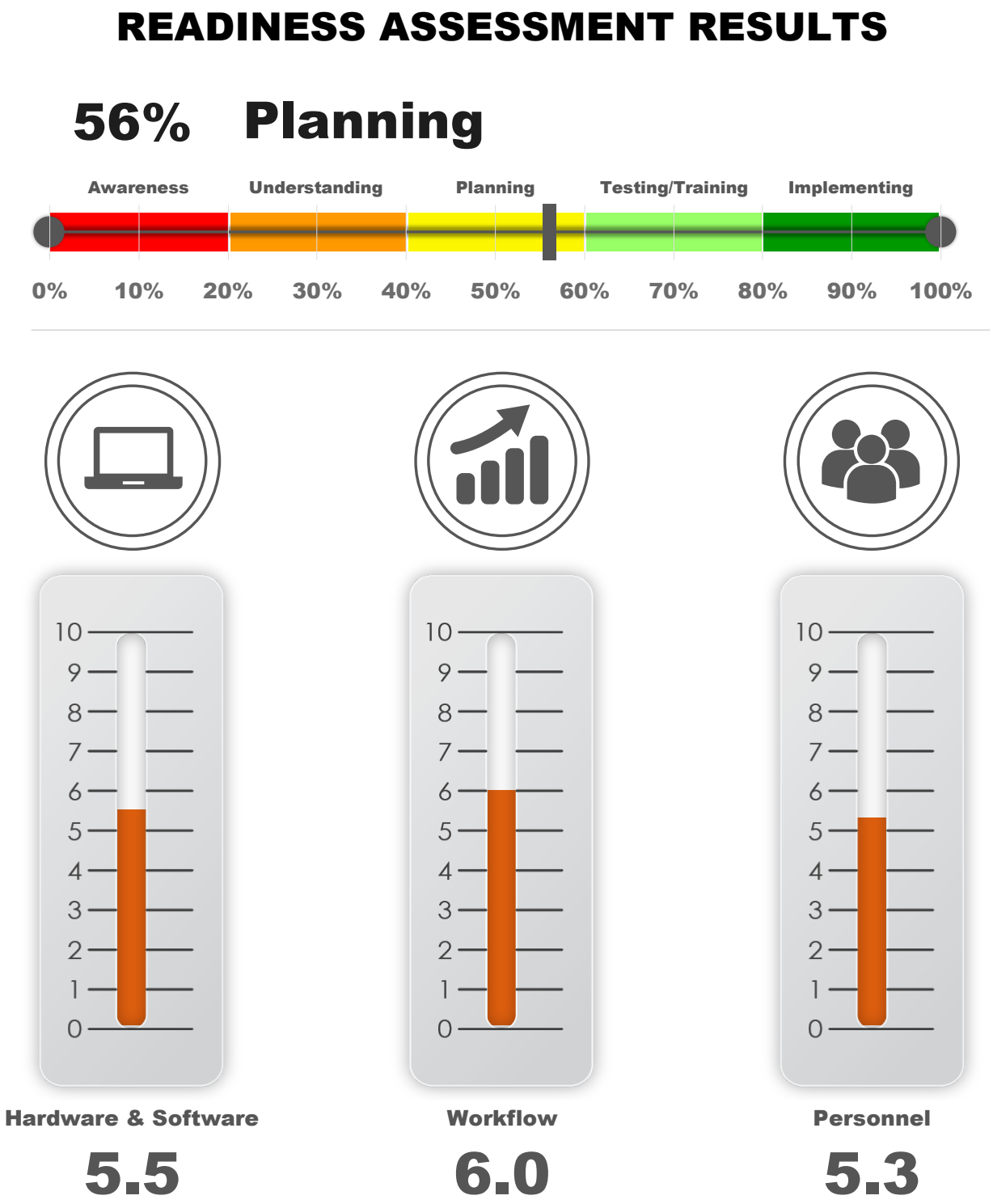
The Signing and Delineation Unit produces signing and pavement marking plans. They currently use GuideSign for signs. Bentley just purchased another sign software called SignCAD, so that may result in the need to transition to the Bentley-compatible software for designing signs.

The workspace – cells, linestyles, etc. – is now being updated by Roger Garrett, an NCDOT employee in the Work Zone Traffic Control Unit. So far, this process has been progressing without any notable concerns.

Depending on the type of project, the unit's workflow can require collaboration with various other units. On a major interstate job, they may need to coordinate with the ITS and Signals, Roadway Design, Hydraulics, and Utilities units. They prefer to start their workflow before the right-of-way process is complete, between 30% and 60% plans. They tend to have more work with the newer alternative intersection designs and complete streets because they require more signs. It was indicated that it is common practice to reference roadway files into their plan sheets.

The staff has not been trained yet, but most are aware of the changes coming. They will need to be able to view/review plans done by divisions and/or consultants. They have not used ProjectWise, which is currently being tested by other units. The unit indicated that they would like to be included in the ProjectWise testing process as early as possible.

2.12 Work Zone Traffic Control Unit



2.12.1 Assessment Insights

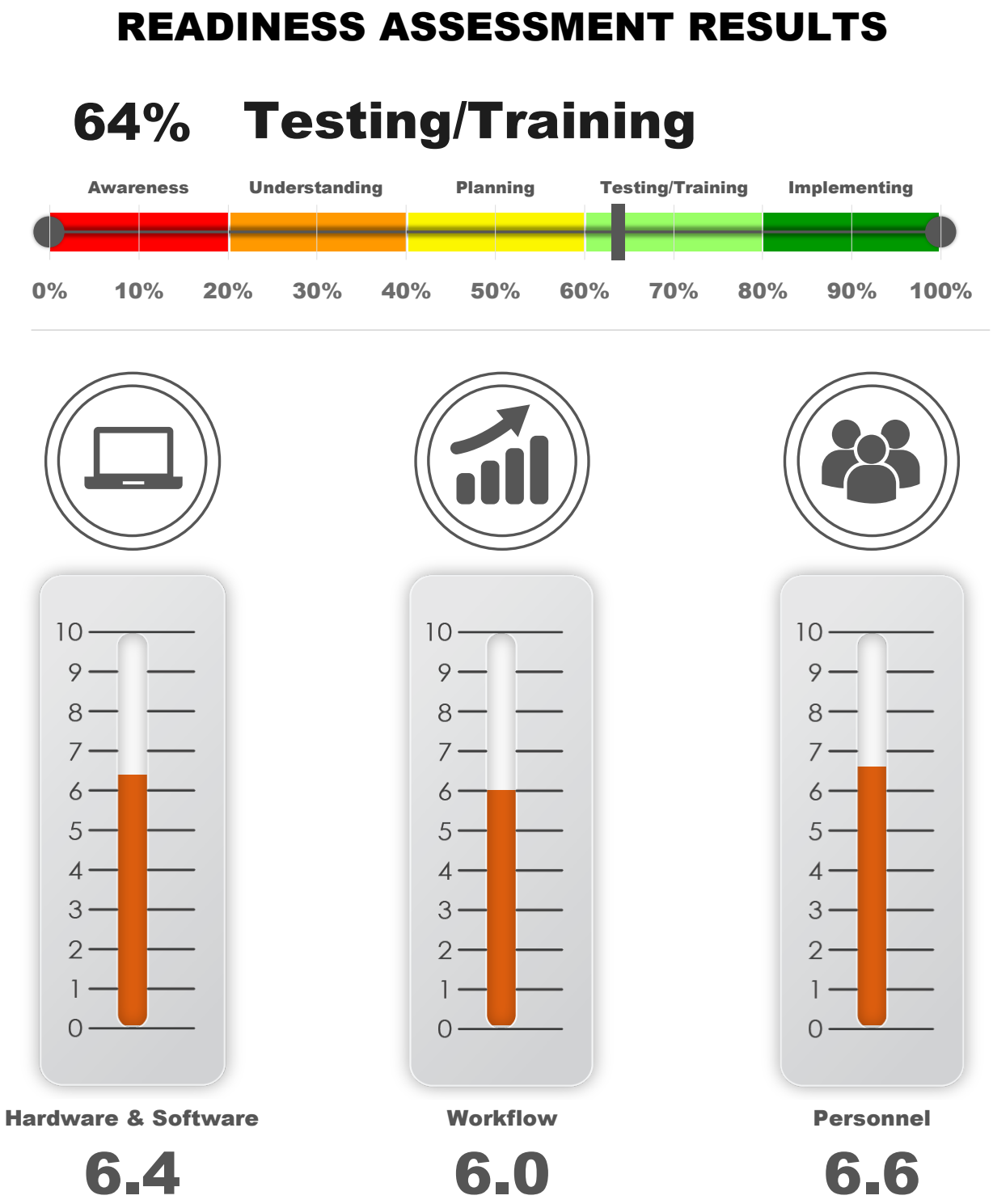
With an overall Readiness Assessment rating of 56%, the Work Zone Traffic Control Unit is well into the Planning phase of the ORD transition.

The Work Zone Traffic Control Unit delivers traffic management plans – staging and traffic operations – for NCDOT projects. They receive CADD files from the Roadway Design Unit and use those to break the construction into phases. Most of the work is done by consultants. In early stages they look at the profile, but it is primarily done in 2D. They cut cross sections, but typically use cross sections already cut by the Roadway Design Unit and do not cut new ones at different stations. This means that their need for using ORD tools related to creating cross sections will be limited.

The workflow begins when the Roadway Design and Hydraulics units finish their work and send their plans to the Work Zone Traffic Control Unit. Then, when the unit has finished its work on the plan, it is sent back to the Roadway Design and Hydraulics units. The Work Zone Traffic Control Unit begins design when 30% plans are approved. They can phase the line and grade but so not see the drainage until 60% plans. The deliverables include: title, legend, notes, phasing, off-site detours, signs, shoring information, and actual traffic control details. The plans can be divided into areas and then each phase. Some units can copy and use the plan sheets produced by the Roadway Design Unit. The Work Zone Traffic Control Unit may need to include more information, so they make new custom sheets.

Unit employee Roger Garrett is currently working on the workspace. The unit would like to be able to continue to use what they use now when they transition to ORD. Most of their work is done in 2D and Microstation, which should make the transition easier. They have successfully produced plan sheets in ORD, and the staff has all viewed an introductory webinar from the CADD Services Unit, which included basic information about the software. Unit-specific training may also be needed. Currently, they are very busy, and their workload could affect a training schedule.

2.13 CADD Services Unit



2.13.1 Assessment Insights

With an overall Readiness Assessment rating of 64%, the CADD Services Unit is in the Testing/Training phase of the ORD transition. This refers to their work in assisting other units to do testing and training because they do not actually produce any plans using the software.

One of the CADD Services Unit's roles is implementing software transitions throughout NCDOT. They play a lead or coordinating role. In previous transitions, each unit was assigned a CADD coordinator, but staff with this kind of role and experience no longer exists. During the interview, it was noted that they feel it is a major obstacle that they have no authority to direct the units. As they described it, each unit is managing its own transition, with help from CADD Services, Bentley, etc. For this transition, the CADD Services Unit is leading the coordination with Bentley, including the monthly calls and tracking the issues. It was noted that Bentley cannot fix what they do not know is wrong, so all units need to test the software on their workflow. The CADD Services Unit indicated that there may be issues that have not been found yet. Of the issues already logged, so far none are considered to be adoption/transition blockers.

One issue in the timing of the transition is how quickly Bentley can respond to issues. Bentley is performing quarterly releases of their updates. These updates alternate between minor and major releases, so some issues may not get resolved for 6 months depending on when in the cycle they are found.

The CADD Services Unit observed that the transition to ORD will result in their current Visual Basic for Applications (VBAs) and MDL apps being unusable, which are the result of years of work. Many units affected by these apps are already testing alternative workflows to accommodate this change. It was indicated that CADD Services prefers NCDOT to move away from making custom tools and for each unit to attempt to use the "out of the box" tools within ORD and adapt their processes. They believe that the transition must happen but suggested that it may need to occur in stages.

It is imperative that all third-party software be tested. CADD Services tested that each third-party software opens within ORD, but the units must also test that each third-party software actually works. For units that intend to use their old workflow and software, like the Photogrammetry Unit, it was suggested that they need to test that other units will still be able to import the Photogrammetry Unit's files as expected within ORD.

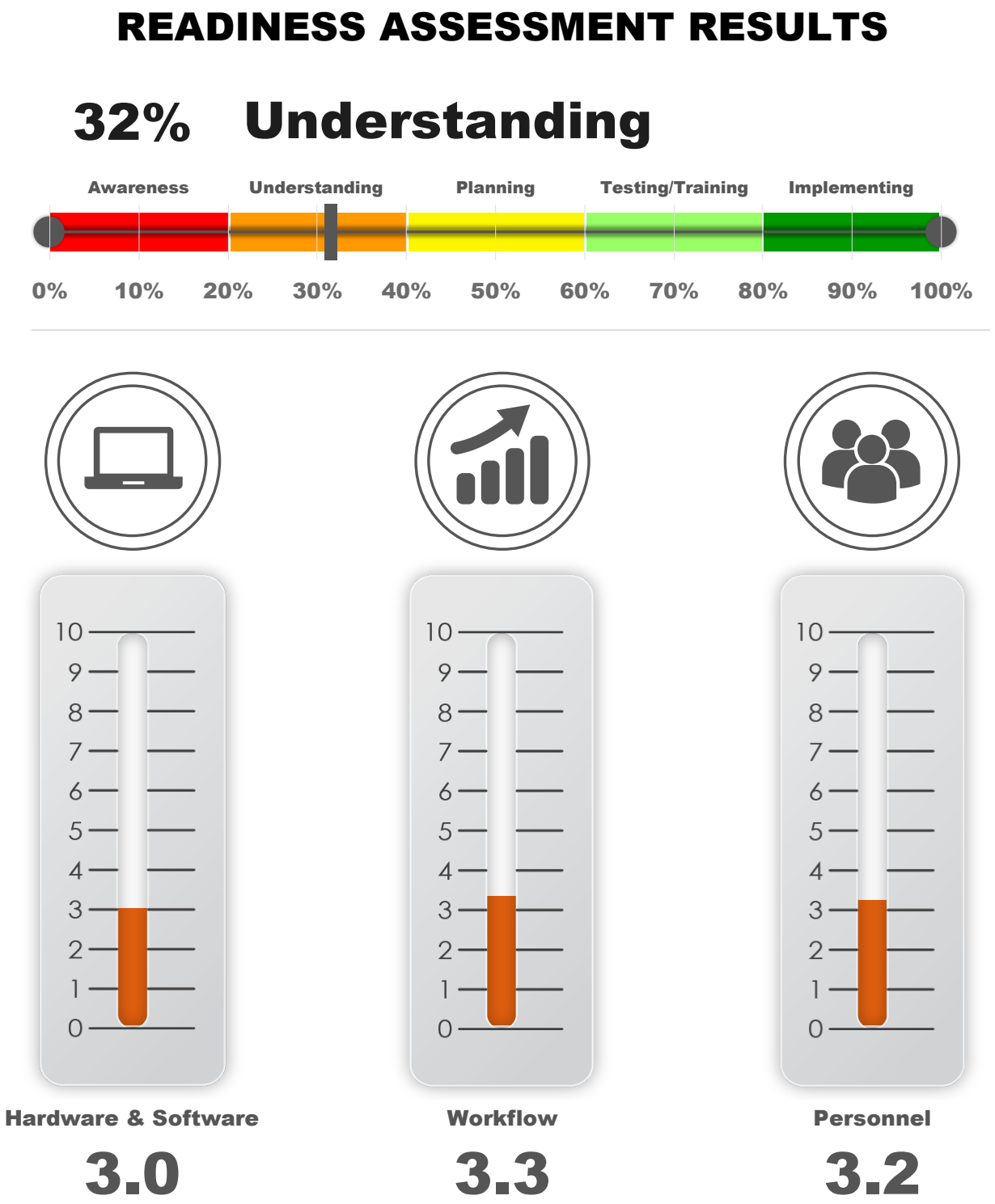
A possible issue they see is that CADD Services can facilitate but cannot make a unit change its workflow even if it will help many other units. This will take someone who does have this authority.

It will be important to continuously test ORD with each new release because it is not uncommon for software vendors to re-introduce problems in newer versions. Full regression testing on each release through all units is necessary. For every new release, they must re-test the *entire* workflow and do it for all disciplines. This is because it has been observed that a new release from Bentley that fixes one issue can unintentionally "unfix" an issue that had already been resolved in previous releases.

Many questions were raised to review during this process, including:

- Can files made in older versions be opened in the new software?
- What if a project is in the construction phase and there are changes? Do we pay consultants money to change to new software?
- We can't roll everyone to the newest ProjectWise yet; must we have one or the other?

2.14 Plans and Standards Management Unit



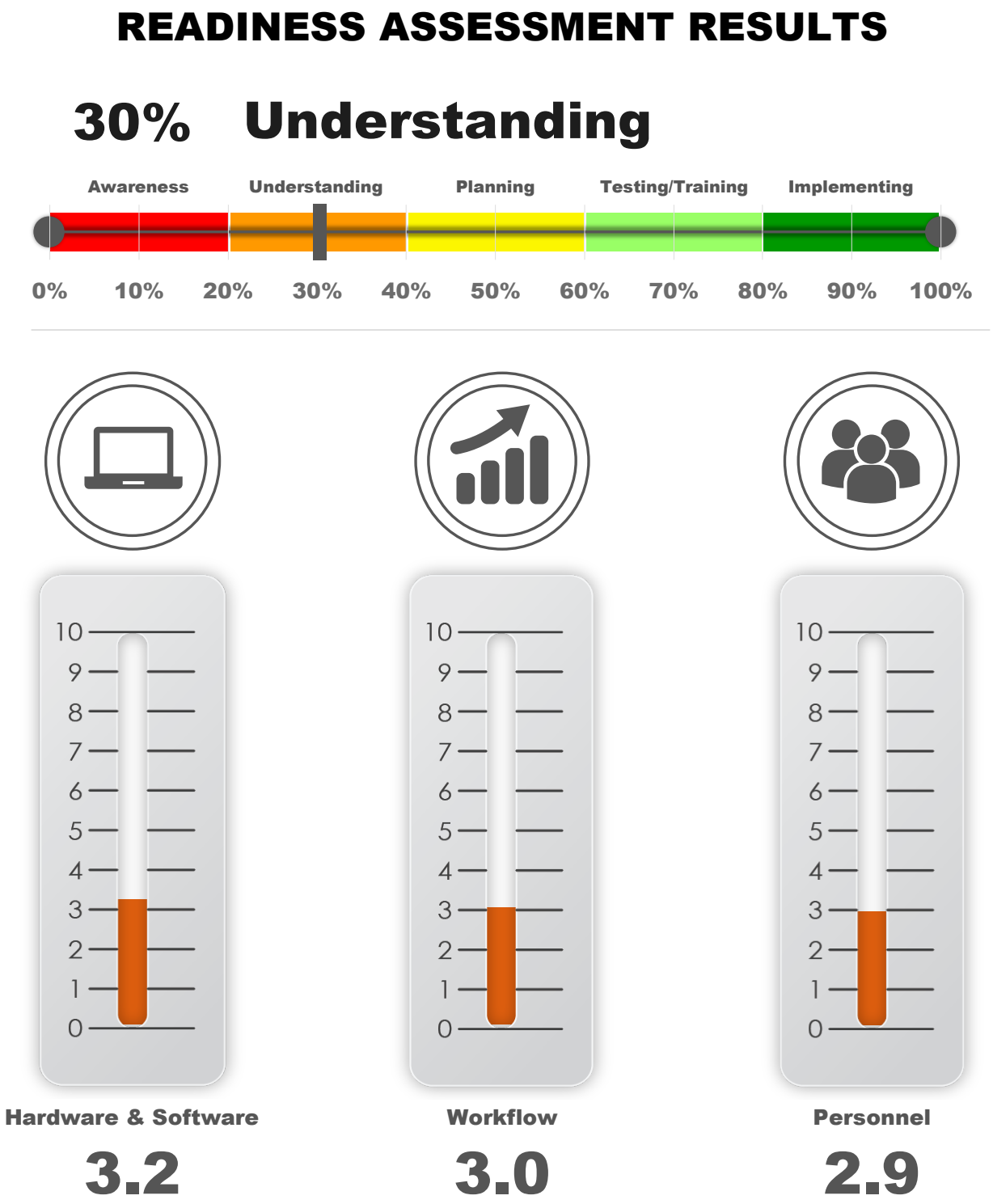
2.14.1 Assessment Insights

With an overall Readiness Assessment rating of 37%, the Plans and Standards Management Unit is in the Understanding phase of the ORD transition.

The Plans and Standards Management Unit maintains a set of standard drawings and occasionally adds to or deletes from that set. They then use MicroStation to develop details that will be inserted into the plan set. They do most of this work for the Roadway Design and Hydraulics units and sometimes the Work Zone Traffic Control Unit. They will use the Roadway Design Unit's workspace. They must always have up-to-date workspaces from the units whose plans they use to ensure they print out correctly.

These standard plans are updated every 6 years, and the next update will be published in 2024. They do not use Geopak or do any type of modeling. They will be using the new software for the drafting tools. The unit has not had any training yet and only has two employees. They have time right now for training due to a lighter workload, but that can change at any time.

2.15 Roadside Environmental Unit



2.15.1 Assessment Insights

With an overall Readiness Assessment rating of 30%, the Roadside Environmental Unit is in the Understanding phase of the ORD transition.

The Roadside Environmental Unit prepares erosion control plans, calculations, and spreadsheets and is required for all projects. They review 400+ plan sets per year and review calculations and plans in the form of PDF files. Occasionally they may request design files during the process and do collect the final plans in CADD form. They have their own unique cells, linestyles, libraries, etc., which they share with the consultants producing the plans.

They are currently working with the CADD Services Unit to get their cell library transferred to ORD. The text and formatting from Microstation V8i did not transfer as anticipated. CADD Services is assisting with developing the new library. The Roadside Environmental Unit is very busy and indicated that they do not have extra time to work on this. The only other software they use is Microsoft Excel and Adobe Acrobat, no other CADD packages. They currently use Geopak drainage but indicated that it is not essential to their workflow. When used, Geopak allows them to view the Hydraulics Unit's drainage model.

The unit has not received training on ORD yet and has not had time yet to perform testing. Right now, they have five employees working on approximately 400 projects. They are not currently involved in the pilot projects. They can see the 3D tools being beneficial in the future, but at this time they do not have the time to learn new software and change their workflow. Interaction with other units is mostly with the Hydraulics Unit as well as the consultants designing the plans they review.

3 PART II - DEPARTMENTWIDE MIGRATION PLAN

3.1 Purpose

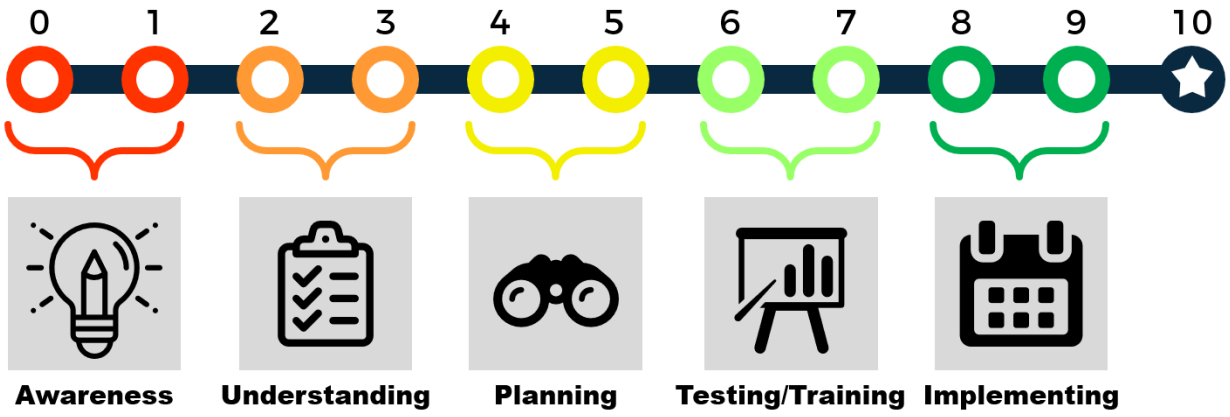
Part II of this document provides an overview of the departmentwide migration activities for NCDOT's migration to ORD CONNECT Edition. When the migration is complete, ORD will be NCDOT's primary transportation design software application. This functionality is currently being performed using MicroStation V8i and Geopak.

The overall Migration Plan is comprised of three parts, as described below:

- Part I – NCDOT ORD Readiness Assessment
- Part II – Departmentwide Migration Plan
- Part III – Unit-Specific Migration Recommendations

This section of the document focuses on the departmentwide migration plan, including the proposed migration milestone activities and associated target dates, where applicable. Each chapter further describes the key components required to meet the milestones. This includes discussion on the recommended communications strategies, required ORD testing process for all units, NCDOT staff training approaches, and the migration process itself.

The recommendations within this section of the document build upon the results from Part I: NCDOT ORD Readiness Assessment. Information that was gathered from the readiness interviews was used to formulate and refine the process described within the remainder of the document. As described in the Readiness Assessment portion of the document, the scale on the figure below was used to identify the five phases of the transition process.



The recommendations within this section are formulated to advance the overall department through the remaining phases of the transition in order to reach full migration. Additional, unit-specific recommendations are provided in Part III.

3.2 Vision and Migration Phases

3.2.1 Vision

The primary vision of the Migration Plan is:

To efficiently achieve migration of all applicable NCDOT projects and staff to OpenRoads Designer workflows through effective communications, engagement with users, and strategic training approaches.

To successfully achieve full migration, various factors must be considered and accounted for, including the testing and selection of a stable version of ORD. Additionally, a functional workspace will need to be finalized that accommodates the needs of each unit. Training will be required that addresses both the general needs and specialized instruction for tasks that are unique to individual units. In addition to training, it is recommended that written documentation and guidance be prepared on general ORD topics.

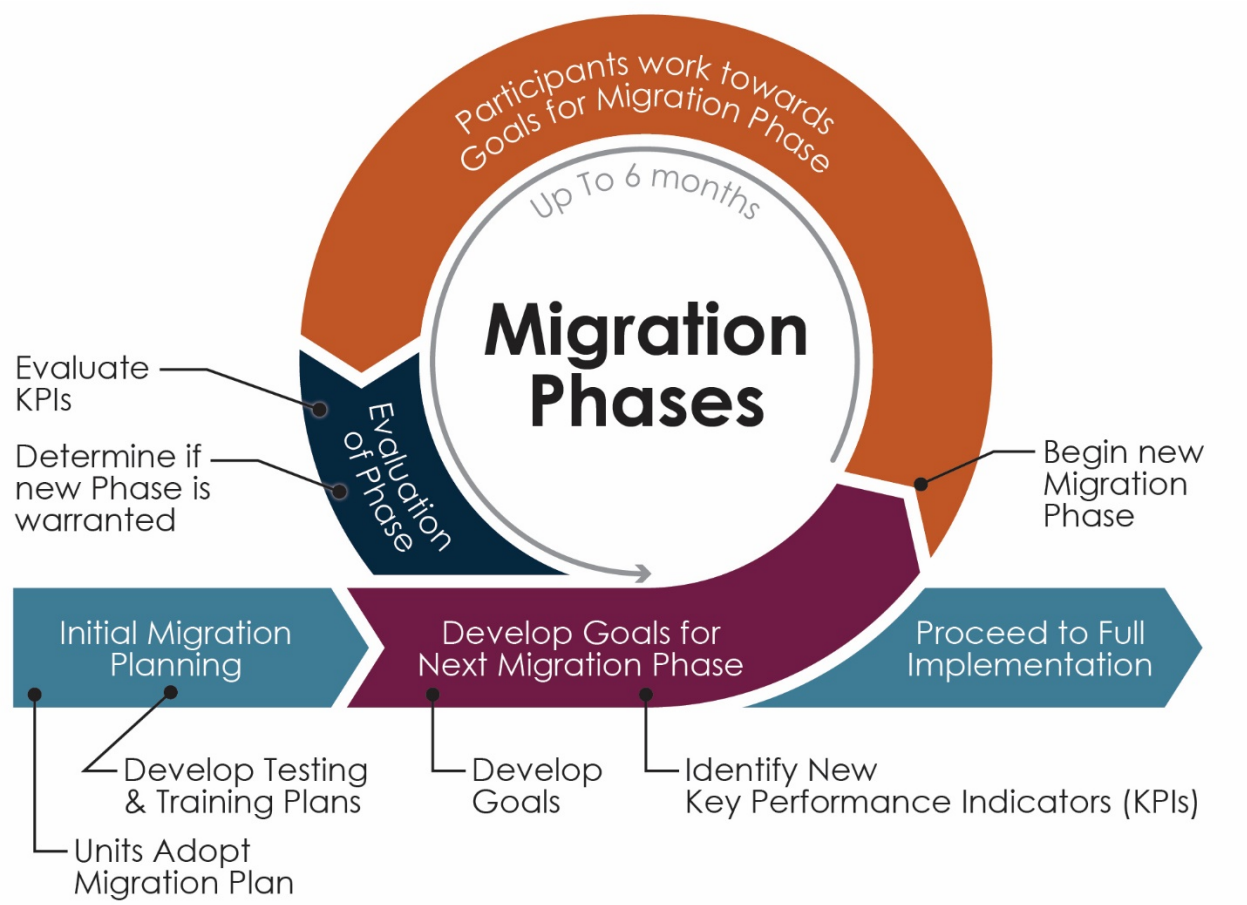
3.2.2 Migration Phases

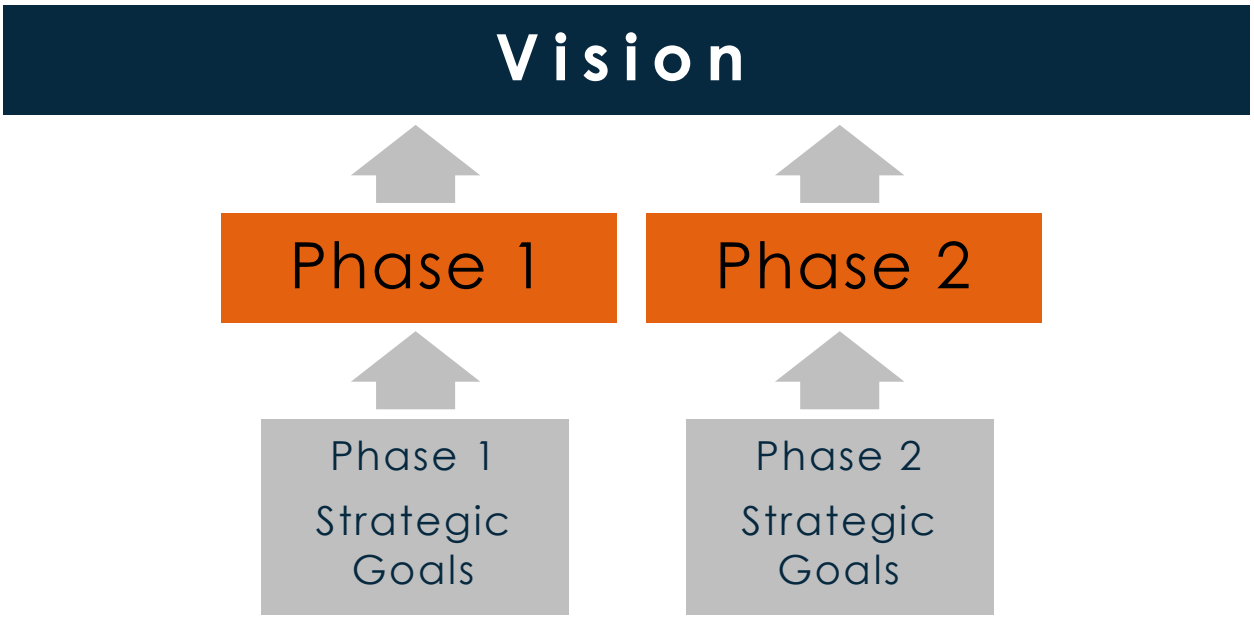
There will be a total of two (2) Phases with each Phase of the ORD Migration Plan lasting up to six (6) months. Each Phase will have its own distinct migration goals that advance NCDOT significantly closer to the Vision and full implementation of ORD. Goals for each migration phase will be developed in advance of the phase as described within this section. The following figure illustrates how the Vision, Phases, and their Goals relate to each other.

Migration will occur in phases lasting up to six months each

Key components are described in additional detail in the subsequent chapters of this Migration Plan. A section number reference is provided in the table to direct readers to the appropriate location to learn more about each of these milestones. These milestones will act as a gauge for the Units to track their progress through their migration to ORD.

The following figure illustrates the initial activities of the Migration Plan followed by the cyclical migration phases which are described also above.





NCDOT has chosen to adopt a migration approach to ORD Implementation, which means that the transition to implementing ORD will be complete by no later than December 31, 2020. NCDOT projects and staff will begin strategically adopting ORD in accordance with the goals set within each migration phase; as testing, piloting, and training allows. This means that certain Units or projects may advance to implementation before others as a result of their migration readiness. For example, it may be decided to implement ORD for smaller bridge projects sooner than larger corridor projects. These decisions will be the responsibility of the ORD Implementation Team and NCDOT Leadership

> The transition to implementing ORD will be complete no later than December 31, 2020.

The ORD Migration Phases will be managed by the ORD Implementation Manager and the ORD Implementation Team. They will coordinate directly with NCDOT leadership in order to accomplish the following for each migration phase:

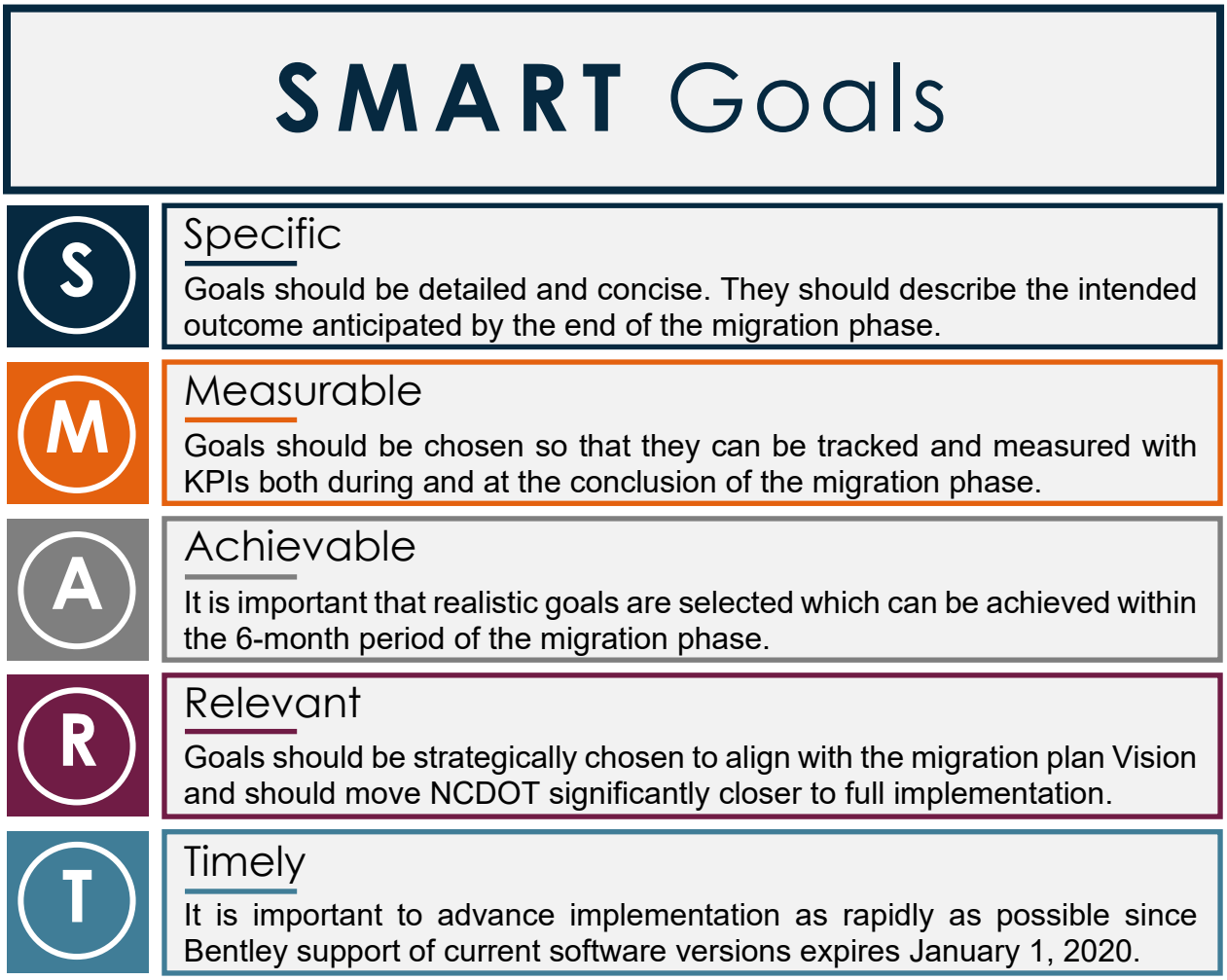
- Review goals recommendation from the ORD Working Group
- Determine strategic goals for each migration phase that with notably advance NCDOT towards the Vision while also remaining realistic and feasible
- Identify Key Performance Indicators (KPIs) for each migration phase for tracking progress
- Actively review migration progress during each phase and track against the identified KPIs
- Advise NCDOT leadership, units, and districts on how to mitigate challenges encountered during each migration phase

- Determine whether subsequent migration phases will be needed or determine whether the ORD Migration has fully achieved the Vision

3.2.3 Migration Goals

Migration Goals will be identified for each phase of ORD migration. These goals should be chosen carefully to strategically advance NCDOT towards the Vision identified above. Migration activities across the entire organization should align with achieving these strategic goals.

Migration Goals should be intentionally chosen to be SMART Goals. This means that goals should follow the following guidelines:



It is recommended that NCDOT strive to find the appropriate balance between being Achievable and Relevant. Goals should be chosen to significantly advance projects and challenge staff towards full implementation while still remaining realistic. While setting ambitious goals may be challenging for some staff, this will be necessary to reach full implementation within a reasonable timeframe.

In order to be Measurable, Goals should be set with KPIs in mind. This will allow for the ORD Implementation Team to actively track the progress of the goals within each migration phase. It is recommended that these KPIs be set using specific categories, which may include but are not limited to:

- Testing
- Piloting
- Training
- Number of Projects Migrated
- Size, Scope, or Type of Projects Migrated
- Software/Workspace Development
- Communications
- Department-wide goals
- Unit-specific or Division-specific goals

It will be the responsibility of each participant in the working group to represent their Unit or Division by proposing goals that are specific to their group and which will significantly advance them towards full implementation. Submission of these proposed goals will follow the migration phase schedule noted below.

3.3 Migration of 3D Design Workflows

As NCDOT adopts the use of ORD, it is recommended that NCDOT units strive to take full advantage of the 3D design functionality within the application. ORD is a comprehensive, multi-disciplinary 3D modeling application that advances the delivery of transportation projects from conceptual design through construction. The software blends traditional engineering workflows for plan, profile, and cross sections with 3D parametric modeling.

While the transition to 3D modeling will be beneficial for certain units, it will not be advantageous for all units to adopt the 3D approach at this time. For example, disciplines such as the Hydraulics, Roadway Design, and Utilities Units would recognize immediate benefits from adopting 3D design methodologies. For most units that continue to use 2D processes within ORD, the transition process will be less complicated. Although, continuing to produce 2D plans in ORD as a current deliverable may be considered a short-term goal.

> It is recommended that NCDOT strives to take full advantage of the 3D design functionality of ORD.

It is important to differentiate between units that will strive to adopt 3D processes early in the migration process compared to units that aspire to adopt 3D design at some point in the future. Throughout the process of the readiness interviews, multiple units expressed interest in long-term goals to begin testing 3D workflows with the intention of upgrading their processes at some point in the future. The primary focus of this migration plan is to facilitate the transition to the workflows that will be used during the migration to ORD.

3.4 ORD Implementation Manager and Team

An ORD Implementation Manager will be identified to coordinate the various aspects of this ORD Migration Plan. This manager will be supported by an ORD Implementation Team, which will assist in the development of migration materials and provide subject matter expertise.

The ORD Implementation Manager will be responsible for coordinating the schedule to achieve the milestones detailed within this document. The Implementation Manager will also be responsible for communicating the progress of the migration with NCDOT leadership and assisting them with inquiries and requests as they develop.

The ORD Implementation Team will be comprised of consultant and NCDOT subject matter experts (SMEs) who will be responsible for supporting the ORD Implementation Manager. The roles of the SMEs can range from limited part-time to full-time based on needs. They will assist on an as-needed basis with activities such as developing ORD migration materials and testing ORD workspaces.

4 NCDOT ORD MIGRATION SCHEDULE

4.1 Key Department Milestones

The following departmentwide migration schedule has been developed to align efforts across the entire NCDOT organization. These milestones have been reviewed and approved by senior NCDOT leadership who have indicated that successful completion of this implementation is a department priority.

At the time of the publication of this document, it is anticipated that the ORD migration can be completed within two (2) phases. It is recommended that NCDOT complete full migration in no more than three (3) phases overall. As shown in the milestone table below, a soft rollout of NCDOT ORD is anticipated to occur at the beginning of Phase 2. Additional information regarding the soft rollout is available in Section 10.1.

For convenience, the colors shown in the following table align with the colors shown in the Migration Phases figure described in Section 3.2.2. NCDOT should plan to be fully migrated to ORD by the end of Q4 2020. It may be necessary for certain Units to require additional phases after Phase 2 and full implementation in order to further develop ORD capabilities for 3D modeling. This would occur in Q1 and Q2 of 2021 to allow extra time to test and pilot the software for 3D applications.

Milestone Goal	Milestone Date	Section
All units adopt ORD Migration Plan.	Friday, August 16, 2019	
All units have submitted information required to create their unit-specific training plan	Friday, December 13, 2019	
All units have submitted information required to create the unit-specific testing and piloting plan	Friday, December 13, 2019	
All units have begun their training plan	Monday, January 13, 2020	
All units have begun their testing and piloting plan	Monday, January 13, 2020	
NCDOT ORD Working Group has submitted recommendation for Phase 1 goals to ORD Implementation Team	Friday, January 17, 2020	
ORD Implementation Team identifies and publishes Phase 1 Goals to ORD Working Group	Friday, January 24, 2020	
ORD Migration Phase 1 Begins	Monday, January 27, 2020	
NCDOT ORD Working Group has submitted recommendation for Phase 2 goals to ORD Implementation Team	Friday, June 26, 2020	
ORD Implementation Team Publishes Results from Phase 1	Friday, July 10, 2020	
ORD Implementation Team identifies and publishes Phase 2 Goals to ORD Working Group	Friday, July 10, 2020	
ORD Soft Rollout (anticipated)	Friday, July 24, 2020	
ORD Migration Phase 2 Begins	Friday, July 24, 2020	
NCDOT ORD Working Group has submitted recommendation for Phase 2 goals to ORD Implementation Team	Friday, December 18, 2020	
Full Implementation: ORD Implementation Team Publishes Results from Phase 2	**Thursday, December 31, 2020**	

5 REGULAR COMMUNICATION AND INFORMATION DISSEMINATION

5.1 ORD Migration Working Group

Consistent communication and collaboration are imperative to the success of this Migration Plan. This includes communication with NCDOT staff at all levels of the organization. Therefore, it is recommended that an ORD Migration Working Group be formed.

Consistent communication and collaboration are imperative to the success of this Migration Plan.

The purpose of the ORD Migration Working Group would be to accomplish the following:

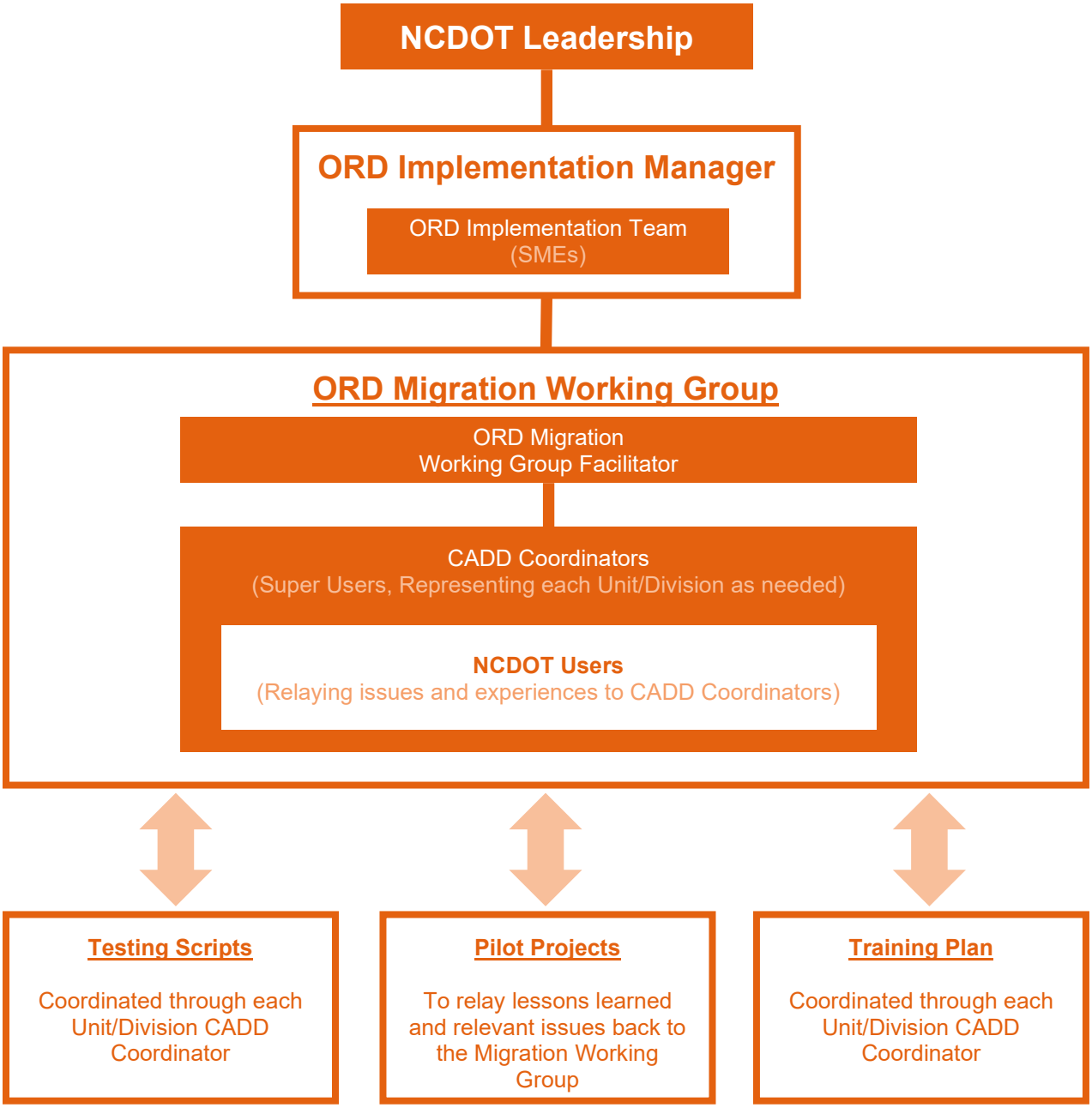
- To act as representatives for their unit and its needs for the Working Group
- To update all units on the status of each milestone goal
- To ensure that all units are aware of the schedule and deadlines
- To provide a regular forum to discuss and resolve ORD adoption challenges
- To foster collaboration between NCDOT units during testing of departmentwide workflows
- To test and select a stable version of ORD and its associated configurations for adoption
- To assist in the development and review of ORD documentation
- To serve as a conduit to communicate important migration messages to their units

This Working Group is not intended to replace the monthly meetings that are being held between NCDOT and Bentley. It will be important to also maintain those meetings with Bentley in order to raise and resolve any issues with the software that are identified within the ORD Migration Working Group.

When using ORD to build 3D models, one unit may use other units' files or information to build their model; so therefore, communicating plan changes and updates is crucial to maintaining the integrity of these models and the design.

Also, there will be a monthly ORD newsletter posted on the NCDOT homepage. This will allow for both internal and external personnel to access the newsletter. The ORD newsletter will also be included in the Integrated Project Delivery (IPD) newsletter.

Below is a figure that illustrates how various roles, groups, and activities relate to each other as described throughout this Migration Plan.



5.2 ORD CADD Coordinators

It is recommended that the Working Group be comprised of representatives from each of the NCDOT units and divisions. These ORD CADD Coordinators will be the liaison between their unit/division and the Working Group. They will be responsible for collecting the comments and insights from their unit and relaying them to the larger Working Group.

The following list of key ORD contacts has been identified throughout the process of completing the ORD Readiness Assessment interviews:

Unit / Division	NCDOT Staff	Email Address
CADD Services	Ellen Dickson Tim Merrill	ehdickson@ncdot.gov tkmerrill@ncdot.gov
Geotechnical Engineering	Kevin Miller Jaime Love Christina Bruinsma cc: Jonathan Pilipchuk	kbmiller@ncdot.gov jllove2@ncdot.gov cmbruinsma@ncdot.gov jpilipchuck@ncdot.gov
Feasibility Studies	Sonya Tankersley Shane York Lamin Jah	stankersley@ncdot.gov sdyork@ncdot.gov ljah@ncdot.gov
Hydraulics	Brook Anderson	beanderson@ncdot.gov
ITS and Signals	Nick Zinser	rnzinser@ncdot.gov
Location and Surveys	Emory Kincaid Donnie Stallings	ekincatid@ncdot.gov dstallings2@ncdot.gov
Plans and Standards Management	Joel Howerton Kyle Kempf	jhowerton@ncdot.gov kkempf@ncdot.gov
Photogrammetry	Gena Neal Don Early Richard Greene Faith Driver	genaneal@ncdot.gov dearly@ncdot.gov rggreene@ncdot.gov fsdriver@ncdot.gov
Roadside Environmental	Jeffrey Walston	jdwalston@ncdot.gov
Roadway Design	Roger Kluckman Jason Moore Oak Thammavong	rkluckman@ncdot.gov ajmoore@ncdot.gov sothammavong@ncdot.gov
Signing and Delineation	Walter Johnson cc: Renee Roach	walterjohnson@ncdot.gov rroach@ncdot.gov
Structures Management	James Hawk cc: Nick Pierce cc: Gichuru Muchane	jdhawk@ncdot.gov napierce@ncdot.gov gmuchane@ncdot.gov
Utilities	Bo Hemphill Byron Sanders	bohemphill@ncdot.gov bsanders@ncdot.gov
Work Zone Traffic Control	Roger Garrett Justin Beaver	rmgarrett@ncdot.gov jdbeaver1@ncdot.gov
Rail Division	Matthew Simmons Brad Smythe	mbsimmons@ncdot.gov bsmythe@ncdot.gov
Landscape Design & Development Section	Jeff Lackey Bob Kopestsky	jefflackey@ncdot.gov bkopetsky@ncdot.gov
Central Construction Unit	Bryan Edwards	bledwards1@ncdot.gov

Division 1	Barry Hobbs Scott Fenwick	wbhobb@ncdot.gov sfenwick@ncdot.gov
Division 2	Casey Whitley	ckwhitley@ncdot.gov
Division 3	David Leonard	dbleonard@ncdot.gov
Division 4	Dennis Ethridge	drethridge@ncdot.gov
Division 5	Reid Davidson Thomas Meadows	srdavidson@ncdot.gov trmeadows@ncdot.gov
Division 6	John Gauthier	jbgauthier@ncdot.gov
Division 7	Jennifer Sour Chad Reimakoski	jsour@ncdot.gov jcreimakoski@ncdot.gov
Division 8	Michael Trotter	mtrotter@ncdot.gov
Division 9	Jeremy Keaton	jlkeaton@ncdot.gov
Division 10	Donald Harward	jdharward@ncdot.gov
Division 11	Desiree Hagwood Greg Kirby	dlhagwood@ncdot.gov gkirby@ncdot.gov
Division 12	Bryan Sowell	bksowell@ncdot.gov
Division 13	Eddie Douglas	eadouglas@ncdgot.gov
Division 14	Barry Mosteller	bdmosteller@ncdot.gov

5.3 Working Group Facilitation

It is recommended that the role of Working Group Facilitator be assigned to the ORD Implementation Manager. The Working Group Facilitator will organize the Working Group discussions and activities. The Working Group Facilitator will be responsible for leading and coordinating the Working Group meetings, facilitating important training materials, and tracking the progress of migration. It is recommended that this facilitator also be responsible for preparing regular summary updates to be transmitted to key NCDOT leadership.

The Working Group Facilitator will be selected and appointed by NCDOT senior leadership.

5.4 Working Group Meeting Frequency

It is recommended that the Working Group meetings be held once a month during the initial phases of the migration process. It may become necessary to adopt a more frequent meeting schedule as the ORD migration progresses. The Working Group Facilitator, in coordination with NCDOT leadership, will be able to specify if the Working Group Meeting frequency needs to be adjusted. This approach will allow for constant and frequent discussion between the Working Group Facilitator and the CADD coordinators at NCDOT as issues and problems arise with the transition.

It is recommended that a Working Group Kickoff Meeting be scheduled as soon as possible and after the Migration Plan is adopted by each unit.

When necessary, the Working Group Facilitator may also call special meetings to discuss pertinent issues outside the regular cycle if circumstances require this.

5.5 Collecting and Documenting NCDOT User Feedback

A tracking log will be employed to document any issues that arise as NCDOT users work through their ORD testing and training. This tracking log will be used to ensure that all challenges are adequately resolved prior to selection of a stable version of ORD.

It is recommended that a digital tool be deployed to collect this input from users. This could be accomplished through an online form or dedicated email inbox.

The tracking log will be maintained by the ORD Working Group Facilitator, with the support of the CADD Coordinators. Any significant issues will be discussed by the ORD Working Group.

When potential issues are identified relating to the ORD software application, these items will be assigned a special designation to be addressed during Bentley's monthly coordination call and in their tracking log. As Bentley resolves these issues and reports back to NCDOT, the status of the issue will be updated in the tracking log.

5.6 Communication Plan

The ORD Implementation Manager and Implementation Team will prepare an ORD Migration Communications Plan upon acceptance of the ORD Migration Plan. During the Readiness Assessment, multiple Units communicated the importance of clear and consistent communication to their adoption of ORD. For this reason, the ORD Implementation Team and NCDOT leadership recommends that a Communications Plan be prepared. The ORD Implementation Manager and Team will coordinate with the NCDOT Communications Office to develop and refine an ORD Communication Plan to be used throughout the migration process. NCDOT Communications Office will be able to review or edit the ORD Communication Plan before publishing them.

The purpose of the ORD Migration Communications Plan will be to disseminate migration updates to both internal and external audiences. Internally to NCDOT, the plan will outline communications procedures both to update NCDOT leadership on progress and to communicate progress updates to the wide audience of NCDOT users. Additionally, the Communications Plan will also define methods for providing periodic updates to ORD users external to NCDOT.

Internal, external, and two-way forms of communication will be included. The following list is potential methods of communication, but are not limited to:

- A monthly digital newsletter,
- Progress reports to senior management,
- Fact Sheets,
- Memos,

- Presentations, and
- Coordination meetings.

5.7 External Communications and Working Group

NCDOT recognizes that Private Engineering Firms (PEFs) are following the Department's lead in making the ORD migration and it is recommended that external users' migration also be considered. The purpose of this document is primarily to advise NCDOT leadership and staff regarding the ORD migration process, however it is acknowledged that PEFs may also require guidance and have questions throughout the transition.

It is recommended that NCDOT use the forthcoming communications plan to outline strategies for collaborating with PEFs throughout the migration phases. Just as open and consistent internal communications will be critical to the success of the ORD migration, external communications between NCDOT and the PEFs will also be important. It is recommended that NCDOT assist in the facilitation of a voluntary External ORD Working Group. The primary purpose of this group would be for each organization to exchange lessons learned and progress updates. Furthermore, when the PEFs have questions about the migration, this may be a beneficial forum for NCDOT to publicly distribute answers. Furthermore, it is recommended that NCDOT publish regular external progress updates via an ORD Newsletter within the IPD Newsletter, as detailed in Section 5.1.

These topics will be further expanded within the forthcoming ORD Communications Plan, as described in Section 5.6.

6 ACCEPTANCE OF MIGRATION PLAN

6.1 Top-Down Leadership Support

It is recommended that the importance of the ORD migration is regularly and consistently communicated from senior leadership within NCDOT. Encouragement from these leaders will demonstrate the importance of the transition to ORD for the entire organization. Their authority will play a critical role in the transition process.

It is also recommended that accountability be encouraged at each level throughout the organization. It will be vital that each individual take ownership of his or her part within the transition process. This approach will require flexibility and problem solving to ensure that project deadlines are met while still prioritizing the ORD migration.

It is recommended that accountability be encouraged at each level throughout the organization

6.2 Individual Unit Acceptances

It is recommended that each NCDOT unit be responsible for accepting the Migration Plan to transition to ORD, including both Part II – Departmentwide Migration Plan and their chapters in Part III – Unit-Specific Migration Recommendations.

Prior to their acceptance, each unit will review the general and unit-specific recommendations. If questions or concerns arise, these should be addressed with the ORD Implementation Manager and NCDOT leadership.

In addition to the recommendations in Part III, each unit will be committing to assist in the development of certain transition materials. For example, each unit will participate in the development of the ORD Testing Scripts they will use for testing their workflows. This is described in more detail in subsequent sections of Part II.

7 UNIT-BY-UNIT ORD TESTING

7.1 Develop "Testing Scripts"

Each NCDOT unit will be responsible for producing a "Testing Script" to be used to test the ORD workspace. The script is a step-by-step process that will be used for each unit to ensure that the newest version of the software will enable them to successfully produce their plans. Testing the software using the scripts will be an iterative process that will require testing in each unit and coordination with other units until full migration is achieved. Every time Bentley releases a new version of ORD, the script will need to be repeated to test the new version. If the workflow of a unit changes, it will become necessary to revise the script to reflect any changes to the workflow.

7.2 Frequency of ORD Releases

Bentley is currently following a schedule for releasing quarterly updates to ORD. Each of their releases alternates between a minor and a major release. A minor release may include stabilizing items, or small issues that do not change how the software works. A major release would be more substantial. The next minor release is anticipated in July 2019. The next major release is scheduled for October 2019. It is anticipated that Bentley will maintain this release frequency; however, the timing is not completely certain and is outside the control of NCDOT.

It is important that each unit adopt a continual testing method to be adaptive to change as new ORD versions are released.

7.3 Full Regression Testing

It is imperative that the NCDOT units test full scripts while in the testing/training phase of the Migration Plan. It is not uncommon for software vendors to re-introduce problems in newer versions that were previously marked as resolved in previous updates. Full regression testing legacy

To illustrate this methodology, consider an example in which a unit is using a Testing Script with 50 steps. In previous versions they did not experience any issues until step 26. After logging this issue with Bentley, it is resolved in a new release of ORD. It is important that this Testing Script be retested beginning at the first step to ensure no new issues were introduced in the early steps of the process.

> It is critical that units use full regression testing.

7.4 Selection of ORD Version for Rollout

When each unit has successfully performed testing of a particular version of ORD for their entire Test Script without resulting in major issues, this version will be considered eligible for ORD Rollout. The ORD Implementation Manager, in coordination with the ORD Working Group and NCDOT leadership, will make the decision to adopt a functional version of ORD for rollout.

It is important to note that it is possible that different versions of ORD will need to be adopted for the Soft Rollout and for the Full Migration phase. This is because new issues may be identified during the wider testing for the Soft Rollout. Any issues identified during this period will be tracked and resolved using the same methods described earlier in this section. This topic is further described in Section 10, ORD Rollout Process.

8 TRAINING APPROACH AND PROGRAM

The ORD Implementation Team will be responsible for developing an ORD Training Plan for use during the migration process. This will include strategies for both General Training and Focused Training requirements. Training needs will be identified through coordination with each unit, including the list of staff to be trained and what format of training will be required. The Training Plan will also determine which topics will use ORD Implementation Team instructors and which will use NCDOT SMEs. This Training Plan will consist of the names of the employees who will receive training, whether General or Focused Training is needed, and the type(s) of training formats needed.

8.1 General Training

General Training will be offered to NCDOT employees departmentwide for staff that is anticipated to use ORD. General Training sessions will ensure that all applicable staff possesses basic knowledge to navigate and operate ORD. The staff participating in this General Training will have differing levels of exposure to ORD. For this reason, it is recommended that the training be structured in such a way to be accessible for any level of experience.

Upon completing the General Training, NCDOT staff should have a general familiarity with the software's interface and basic functionality. Multiple modules of the General Training may be proposed depending on the levels of information to be presented.

It will also be important for users to have opportunities to immediately apply the lessons they have learned within the training. This has been found to aid in the retention of information. For this reason, it is recommended that training activities include interactive components or assignments that the trainee can perform to test their comprehension.

It is anticipated that the General Training will be led by a combination of experienced NCDOT staff and members of the ORD Implementation Team. During the Readiness Assessment interviews, it was learned that certain units have already begun developing and deploying their own training. It is recommended that these training sessions continue and be integrated into the overall General Training strategy. Training that is required in addition to what is already being offered will be developed and presented by the ORD Implementation Team.

It is recommended that General Training begin promptly after the adoption of the ORD Migration Plan.

8.2 Focused Training

In addition to the General Training described above, it will be possible for units to request Focused Training. Focused Training is only applicable to single units or limited portions of NCDOT staff. As a part of accepting the Migration Plan, each unit will have the opportunity to identify topics for which they would like to receive additional training. These topics would be related to their unit-specific workflows or Testing Scripts. Examples of Focused Training could include, but not be limited to:

- Training on tools that are unique to a specific unit
- Training for reviewers or project managers whose use will be limited to quality assurance/quality control activities.

Where possible, it is recommended that units with similar Focused Training needs be grouped together. For example: The Hydraulics and Utilities units would be using the SUDA, or SUE, tools to model existing and proposed stormwater pipes and utilities so that Focused Training would include both units.

It is also recommended that Focused Training be used as an opportunity to identify specialized ORD experts within those units. After the ORD rollout, these individuals will have the responsibility to pass this information along to future additions to their teams.

Instructors for the Focused Training will be selected based on the topics that are presented. These topics will be identified when each unit accepts the ORD Migration Plan. It is anticipated that these instructors will be a combination of members of the ORD Implementation Team as well as NCDOT staff.

Focused Training will begin after the General Training has been offered and when the Focused Training materials have been developed.

8.3 Training Formats

Various formats for training should be considered, including but not limited to Classroom Training, webinars, videos, and written tutorials. The sections below describe these training options in more detail. In addition to training provided by the ORD Implementation Team and NCDOT staff, additional resources available for trainees are also described below.

8.3.1 Classroom Training

Classroom Training is a live, instructor-led training format. It provides trainees direct access to the instructor during the lesson and has the potential for immediate, constructive feedback. For the ORD Migration Training, it is recommended that Classroom Training be facilitated by instructors from the ORD Implementation Team and NCDOT staff.

For the ORD Migration Training, it is recommended that Classroom Training be conducted in a computer lab style setting. This enables trainees to work through lessons alongside their instructors. In addition to the live instruction, it is recommended that the Classroom Training lessons be accompanied by workshop activities or assignments.

Classroom Training generally includes the data set for a test project loaded on computers. Each attendee can work through several stages of plans production. This type of training is helpful because the software is being used and experts are there to guide users and answer questions in real-time, but it is also the most expensive type of training.

The following table summarizes some of the benefits and challenges that may be associated with the Classroom Training format for ORD Migration Training:

Benefits	Challenges
Trainees receive direct feedback from the instructor(s).	Limited size of training lab can create challenges when large groups require training.
Workshop style environment facilitates learning.	Challenging to reschedule individuals' training if schedules conflict with live training.
	Inability to re-watch live training at a later date.

For the reasons listed above, the Classroom Training format is recommended for use with specialized training topics such as the Focused Training described above. This format is also recommended for smaller groups of trainees.

In addition to the Classroom Training described above, the following additional alternatives could be considered. Some of these alternatives would result in an additional cost to the Department:

- Bentley on-site general classroom training
- Private CAD training firms (e.g., EnvisionCAD)
- The North Carolina Local Users Group (NCLUG) offers training at its summer and winter conferences that are sponsored by NCDOT and Bentley.

8.3.2 Webinar Training

A webinar is a live instructor-led training session presented online. Webinar software enables the sharing of slides, the demonstration of software, and interactive participation through chat boxes and Q&A features. Webinars give attendees the opportunity to learn, as you would at Classroom Training, with the flexibility of joining in from any location with internet access. Furthermore, webinars can be easily recorded for future users to watch on-demand.

In addition to chat boxes and other Q&A features, the ORD Implementation Team can prepare survey and poll questions to ask throughout the session. This keeps participants interested and engaged, and also provides data to the Team and Department.

The following table summarizes some of the benefits and challenges that may be associated with the Webinar Training format for ORD Migration Training:

Benefits	Challenges
Participants can join from anywhere that has internet access.	Technical difficulties – e.g., adequate internet speed is required to allow participants to view the presentation without distortion or lag time.
The webinar can be recorded for future use.	Limited interaction with presenter and other participants.
Interactive data and content keep attendees engaged.	The presenter has no control over the participants' environments.
Reduced cost compared to Classroom Training.	Recorded videos need to be updated if software updates occur after presentation.

For the reasons listed above, the Webinar Training format is recommended for use with training that will need to be viewed by large audiences. This format is well suited for many of the General Training topics because participants will be attending from all NCDOT units. Furthermore, this type of training can be recorded and posted to the Connect NCDOT website for future use after the rollout is completed.

In addition to the Webinar Training described above, the following additional alternatives could be considered.

- Bentley Special Interest Group (SIG) webinars
- Private CAD training firms' webinars (e.g., EnvisionCAD)
- Several other DOTs provide software training via webinar format.

8.3.3 Video-Based Training

Video-Based Training provides both video and audio demonstrations of ORD. There are multiple sources for videos for training and support. Videos are helpful as training tools when schedules conflict and hosting a classroom training is impossible to arrange or cost prohibitive. The ORD Implementation Team will provide videos for General and/or Focused Training. These videos can walk the viewer through steps to use tools to produce models, prepare plans, etc. The sources listed below also have a variety of videos with formal training and/or tips and tricks for using ORD.

The following table summarizes some of the benefits and challenges that may be associated with the Video-Based Training format for ORD Migration Training:

Benefits	Challenges
Participants can join from anywhere that has internet access, and at any time.	Lack of interaction with presenter and peers removes the collaborative effects of group learning.
Supports on-demand learning; a video can be watched when that information is needed.	The presenter has no control over the participants' environments.
Reduces training time.	No feedback from the presenter.
Videos can be brief and streamlined to present a topic very efficiently.	Can be more challenging to update video if changes to software or workflow occur.
Videos are an efficient way to brush up on processes that have been forgotten.	

For the reasons listed above, the Video-Based Training format is recommended for training consultants and new employees when live training is cost-prohibitive for a small group or people located throughout the state.

In addition to the Video-Based Training described above, the following additional alternatives could be considered:

- Bentley Learn Server has several learning paths consisting of videos

- CAD Training YouTube channels, (e.g., CivilTSG)
- Private CAD Training from videos (e.g., EnvisionCAD).

Links to the videos discussed in this section are included in Appendix B.

8.3.4 Written Tutorials

Written tutorials are typically web-based or PDF documents that trainees can use to read through the steps required to complete various processes. This format often combines a step-by-step written process with screen captures from the software to illustrate the lessons. In many cases, these written tutorials will also accompany the live classroom format training. This allows trainees to follow along and then to review the materials later while completing assignments.

Effective training documents provide a common source of information for all users. Proper training documentation will ensure consistency in the presentation of content. It can also ensure that all training information is together in one place. The ORD Implementation Team will provide training documentation as required by the type of training presented.

Types of training documents may include:

- Handouts for individual training sessions
- Self-paced guides
- Reference Manuals
- Quick Start Guides.

The following table summarizes some of the benefits and challenges that may be associated with the Written Tutorials format for ORD Migration Training:

Benefits	Challenges
Editing is quick and easy when changes must be made.	More difficult to keep the participant interested and engaged.
Supports on-demand learning; a tutorial can be read when it is needed.	Lack of interaction with presenter and peers removes the collaborative effects of group learning.
Allows participant to access training anywhere and at any time.	
Easy to update if change to software or workflow occur	

For the reasons listed above, the Written Tutorial Training format is recommended to be developed in coordination with Classroom and Webinar Format training. It is also recommended that these written tutorials be posted to the Connect NCDOT website for users to download and refer to as they complete assignments.

8.3.5 Training Recommendations

It is recommended that the ORD Implementation Team prepare a Training Plan to detail both the General and Focused Training needs of the Department. It is also recommended that NCDOT support and continue any training initiatives that are currently being deployed by NCDOT staff. These existing training efforts will be captured within the Training Plan to be developed.

The Training Plan will use the feedback provided by each unit as they accept the ORD Migration Plan. The ORD Implementation Team will detail a schedule for the training, as well as what format each topic will use and who is recommended to the instructor. This will include recommendations for which training topics warrant the development of tutorial videos.

8.4 Monitoring Training Progress

In order to track the milestone goal of training 80% of all applicable NCDOT staff, it will be important to maintain records of training participants. It is recommended that attendees be recorded for all classroom and webinar format trainings. Additionally, it is recommended that each unit's CADD Coordinator maintain documentation for staff that completes any required training videos for their unit. In order to achieve the milestone goal, 80% of a unit's staff will be expected to complete both General and Focused Training assigned to their unit in accordance with the ORD Migration Training Plan.

9 ORD WORKSPACE REFINEMENT

9.1 Transition of Legacy Workspaces

NCDOT has developed a robust and highly functional legacy workspace for use with MicroStation V8i and Geopak. This legacy workspace is the product of years of development and refinement by CADD Services and other NCDOT superusers. The legacy workspace can be divided into two categories:

- Native workspace configurations and libraries
- Add-on tools (e.g., MDL and VBA applications).

Many users, both within NCDOT and as consultants, have become reliant on using these legacy workspace configurations to develop their deliverables. These specific tools and their uses are described in *Part I: Readiness Assessment*.

The workspace, configurations, and operations within ORD are fundamentally different in multiple ways:

- MicroStation CONNECT and ORD CONNECT are only available for 64-bit operating systems.
- Previous workspace configurations cannot be used in CONNECT and must be recreated.
- MDL applications will not work and must be recompiled.
- VBA applications will function but may require modification.
- Task menus have been replaced with a ribbon-style interface.
- Addition of workspaces and worksets. Workspaces allow for separating client standards and projects. Workset replaces the project configuration. Each workspace will have its own set of worksets.
- Geometric data are no longer stored in a GPK file, but are stored in the DGN file.
- ORD blends engineering workflows for plan, profile, and cross sections with 3D parametric modeling to enable the model-centric creation of all design deliverables.
- Plan sheet settings and annotations are dynamically updated as the model changes.
- In addition to traditional plan sheets, ORD allows the production of digital files that can be used for automated machine control.

> It is recommended that specially developed add-on tools be phased out

CADD Services and Bentley have recommended that the use of specially developed add-on tools be phased out and minimized as much as possible. It is recommended that this strategy be formally adopted within the ORD Migration Plan. Rather than use specially designed add-on tools, it is recommended that users adapt their workflows to take advantage of the native tools and features within the adopted version of ORD. In large part, this is recommended due to the significant level of effort required by CADD Services and NCDOT superusers to develop and maintain the unique systems.

As a part of their acceptance of the ORD Migration Plan, each unit will be given the opportunity to provide a list requesting the transition of add-on tools being used within the legacy workspace. The units will need to complete a request form provided by the ORD Implementation Manager. Within this form, the unit will be requested to provide information such as the name of the tool, a brief description of how they use this tool, and a designation for how critical the tool is to their current workflow.

> Not all add-on tools will be transitioned into the ORD workspace

It is important to note that not all add-on tools will be transitioned into the ORD workspace. Submission of a request for an add-on tool does not immediately guarantee that this tool will be transferred. Upon review of the request, the ORD Implementation Manager will work with NCDOT leadership and CADD Services to determine the feasibility of transitioning requested add-on tools.

In the case that an add-on tool will not be transitioned, the ORD Implementation Team will work with the unit's CADD Coordinator to develop the most effective alternative workflow to accomplish their tasks.

In line with the ORD Migration vision, it is the intention of the ORD Implementation Team to aid each unit with the adoption of the new workspace without significant losses of productivity.

9.2 Bentley Involvement

Bentley's involvement will be an integral part of the transition to ORD. As mentioned above, Bentley's assistance with troubleshooting software issues will allow for a smoother transition. Bentley will also play a role as changes are made with each software release. It is imperative that close collaboration be maintained with Bentley representatives who are assisting with the ORD updates. In some cases, it is possible that adoption of a stable version of ORD for NCDOT will be dependent on Bentley accurately providing a critical update to ORD.

It is recommended that the ORD Implementation Manager be included in the regularly scheduled Bentley coordination meetings.

9.3 Finalization and Acceptance

A significant amount of development has already been completed for the new ORD workspaces. This has been accomplished by CADD Services and NCDOT superusers. Additional details regarding the developments that have already been completed are available in *Part I: Readiness Assessment*.

In order to be fully prepared for the ORD Rollout, it is imperative that each unit thoroughly test their workspace to ensure that it is correctly configured for their needs. This includes verifying components of the workspace including, but not limited to, the following:

- Linestyles
- Features
- Templates
- Levels

- Symbology
- Cells (2D and 3D)
- Tool menus and interface configurations
- DGNLIBs
- Seed files.

Since much of this configuration has already been completed, testing and documentation for these workspaces should begin immediately upon the acceptance of the ORD Migration Plan. Each unit's CADD Coordinator will be responsible for providing regular updates and requests to the ORD Implementation Manager.

The ORD Implementation Manager will be responsible for:

- Coordinating any requests from each unit's CADD Coordinators
- Assisting in the development of alternative workflows, if necessary
- Ensuring that workspace updates are communicated to the entire Working Group
- Acting as liaison between the Working Group and CADD Services
- Oversight of development and testing of workspace configurations by the ORD Implementation Team to assist CADD Services, if needed.

At the end of the transition process, each unit will be expected to adopt a finalized workspace and configuration files that enable them to perform their daily tasks and produce their final deliverables. Each unit will acknowledge that all their specific needs are met and will accept their new workspaces.

10 ORD MIGRATION PROCESS

It is recommended that the NCDOT Rollout Process be completed in two phases: a Soft Rollout and a Full Migration. These two phases are defined and described in the following sections of the Migration Plan.

10.1 Soft Rollout

NCDOT will be facilitating a Soft Rollout for the Migration to ORD. The Soft Rollout will be a period of time when the voluntary choice may be made to begin using ORD on NCDOT design projects. The Soft Rollout will be the first time that NCDOT's ORD workspace and configurations will be available for use outside the NCDOT ORD Pilot Projects. Mandatory migration to using ORD will not be required as a part of the Soft Rollout.

> The Soft Rollout will be a voluntary choice to begin using ORD

Beginning on Friday, July 24, 2020, NCDOT Project Managers will have the option to opt-in to using ORD for design activities on their projects. For projects with consultant designers, it is necessary for the NCDOT Project Managers to thoroughly discuss the implications of transitioning to ORD prior to making a decision. This is crucial to ensure that both NCDOT and consultant staff are aware of any potential impacts to the scope, schedule, and budget of the project. NCDOT workspaces and configurations will become available for download and installation on this date on the Connect NCDOT website.

In order to opt-in to using ORD during the Soft Rollout period, it will be requested that NCDOT Project Managers complete and submit a brief online form. This form will serve to notify the ORD Implementation Manager of the project's inclusion in the Soft Rollout. Throughout the course of the Soft Rollout, the ORD Implementation Manager will track the progress of these projects and collect feedback for preparations for the Full Migration Phase.

> Participants are strongly encouraged to provide feedback to the ORD Implementation Team

Participants in the Soft Rollout are strongly encouraged to participate in providing feedback to the ORD Implementation Team. It is anticipated that feedback and questions will be able to be submitted to the ORD Implementation Team via tools such as online forms or a dedicated email inbox. Additionally, regularly scheduled working groups will be organized for designers and managers on projects that have migrated to ORD during the Soft Rollout.

It will also be possible for designers to begin their own self-guided hands-on testing and training during the Soft Rollout period. Even if a designer does not opt-in with a project during the Soft Rollout, it is encouraged that they download and install the NCDOT ORD workspace and use the Soft Rollout as an opportunity to become familiar with the new tools and workflows.

The overall duration of the Soft Rollout period will be dependent on the goals set for each migration phase. It will begin on July 24, 2020.

During the Soft Rollout period, feedback will be collected and additional testing and training will be completed. If major issues are identified, the ORD Implementation Manager will oversee revisions to the NCDOT ORD workspace, configurations, and tools, as necessary. Additionally, if it becomes necessary to consider adoption of newer ORD versions, the ORD Implementation Manager will coordinate any required testing using the same processes described in the previous sections of this document.

It is recommended that any projects that are beginning design during the Soft Rollout period, or slightly before it, would proceed in adopting ORD. This is especially true of projects that have not yet completed a 30% Plan Review. This is also recommended for projects that are anticipated to have long or extended design lives.

Prior to the completion of the Soft Rollout period, the ORD Implementation Manager will work with NCDOT leadership and CADD Services to select the final ORD version for Full Migration. The ORD Implementation Manager will also ensure that all documentation and training materials are revised accordingly, if needed.

10.2 Full Migration

Full Migration to ORD will be achieved when the Vision within this ORD Migration Plan is fulfilled. The Vision focuses on the ability of staff and projects to incorporate ORD into standard workflow. The Vision will be considered substantially completed when the significant majority of NCDOT staff and projects are capable of using ORD as intended.

> Full Migration to ORD will be achieved when the Vision within the ORD Migration plan is fulfilled.

It is the responsibility of the ORD Implementation Team, in coordination with NCDOT Leadership, to determine when Full Migration has been achieved. This team will monitor and evaluate the migration process against the Migration Goals that will be set as a part of each subsequent Migration Phase. At the conclusion of each Migration Phase, the ORD Implementation Team will have the opportunity to either certify the migration as substantially completed or to initiate a new Migration Phase. In order to certify the migration as completed, all goals must be addressed, and significant issues must be resolved. It is also recommended that each Unit or Division has completed all tasks on their unit-specific checklist, as introduced in Part III of this document. At this time, the ORD Implementation Team will also specify NCDOT's official workspace configuration, ORD version, and associated documentation.

ORD Migration is anticipated to be a gradual process and is to be complete by no later than December 31, 2020. It will involve the strategic development of software, procedures, training, and workflows to accommodate the inclusion of projects with increased complexity. However, there will still be intermittent milestone dates established when Goals are created during the Migration Phases. It is expected that multiple Migration Phases will be required in order to reach Full Migration. It will be the responsibility of the ORD Implementation Team to clearly communicate the progress and successes of the ORD Migration with leadership, NCDOT staff, and the industry.

> ORD Migration is not to be complete by no later than December 31, 2020.

Upon certification of Full Migration, it is anticipated that continued ORD development will be required. In order to take full advantage of ORD features, which are constantly being developed and expanded, additional initiatives may be required. For example, if a particular Unit were to be fully migrated while using a 2D workflow, they may want to continue to investigate their processes to work towards a 3D modeling workflow. These additional initiatives will be coordinated with NCDOT Leadership at the time of Full Migration.

Throughout the process of the Full Migration, relevant materials will be made available on the NCDOT website. This may include information such as quick-start documentation, training materials, and frequently asked questions (FAQs). The ORD Implementation Team will work in coordination with CADD Services to develop these materials. The FAQs will address questions such as how the adoption of ORD will impact schedules and manhour estimates.

10.3 ORD Waiver Process

An ORD Waiver Process will be implemented for projects that will not or cannot be migrated to ORD. As the Migration Phases progress, the waiver documentation and process will be published to determine which projects will be migrated to ORD and which projects will become legacy projects. This process will be managed by the ORD Implementation Team.

For projects which are deemed eligible for the waiver process, it will be required to submit a waiver requesting the ability to continue using the legacy workflows within MicroStation V8i and Geopak. These waivers will be reviewed for approval by the ORD Implementation Manager and NCDOT leadership. A waiver will not be required for any project that will be adopting ORD after the NCDOT has fully migrated.

> Waivers may be implemented for projects that will not or cannot be migrated to ORD

ORD Migration Waivers will be developed by the ORD Implementation Team and will be accepted by NCDOT leadership. It is anticipated that these waivers will include information related to the project's description, its schedule, and justification for why migration would not be recommended.

Submittal of the waiver will be the responsibility of the NCDOT Project Manager. If consultants are supporting the department with design services, it may be necessary for the project manager to coordinate with the consultants while developing justifications within the waiver.

10.4 Legacy Projects

Legacy projects are those that have already been completed or have been previously shelved. In some cases, legacy projects have been developed through detailed design or in some cases to completion. It is understood that re-activating projects in these situations can be challenging and sometimes require special consideration. It is recommended that both NCDOT units and consultants maintain limited ability to continue to access the

> It may be possible to complete work on legacy projects without updating to ORD

legacy MicroStation V8i and Geopak systems for projects like these. Existing software and workspaces will need to be retained to meet the needs of the unit until legacy projects no longer exist.

In these cases, if only minor updates and edits are required for a project, it may be possible to complete work on the legacy project without updating to ORD. If significant redesign will be required with a reactivated legacy project, it is recommended that the effort be made to transfer the project design into ORD. Decisions for legacy projects will be made on a case-by-case basis. These decisions will be at the discretion of NCDOT leadership (and the ORD Implementation Manager, if applicable).

10.5 Future Role of ProjectWise (PW) and ATLAS

NCDOT is currently in the process of testing ProjectWise and ATLAS for migration. This ProjectWise and ATLAS migration is not directly associated with the ORD Migration Plan. It should be noted that many parallel benefits exist for using ProjectWise, ATLAS and ORD together. It is recommended that the ORD Implementation Team coordinate with the ProjectWise migration team to ensure that complementary goals are aligned.

10.6 Minimum Computer Hardware Requirements Needed for ORD

There are minimum computer hardware requirements needed to have ORD operate on the User's machine. According to Bentley, computers will need to be using Windows 7 (64 bit) or better as the operating system. The processor will need to be 1.0 GHz or greater and can operate with a minimum of 8 GB of memory, but 16 GB is recommended. The hard disk space needed to install the software is 5.6 GB, but will need a total of 9 GB to operate efficiently. For the best visualize resolution, the screen resolution will need to be 1600 x 1200 or higher. These specifications can be found on Bentley's website attached below.

https://docs.bentley.com/LiveContent/web/OpenRail%20Designer%20Readme-v4/en/GUID-64E3BD8B-A625-40D4-A60E-DEF9F85B60B8.html

After testing, NCDOT has determined that 32 GB is the minimum recommendation. They also recommend Windows 10 to provide uniformity in support.

NCDOT's current workstation has an Intel I7-6700 Processor 65W, 3.4 GHz, 8 MB and 4 Cores. It has 32 GB (2 x 16 GB) DDR4 – 2400 space for memory and a Radeon Pro WX 4100 4GB Graphics (4x Mini DisplayPort 1.4) for resolution. It also includes 4 mini DisplayPort to DisplayPort Adapters with 512 GB SATA SED 1st SSD. All of these specifications will allow for the Users to operate ORD with at least the minimum or better hardware included.

11 PART III - UNIT-SPECIFIC MIGRATION RECOMMENDATIONS

In addition to the recommendations provided within Part II of the ORD Migration Plan, Part III of this document outlines recommendations that are specific or unique to each unit. The required levels of ORD proficiency will vary between units. Depending on the tasks a unit must complete to create its deliverables, it will be necessary for some units to acquire a higher level of aptitude than others. For this reason, the unit-specific recommendations provided in Part III of this document will vary in detail.

The specific recommendations for each unit are laid out in a checklist format in the sections below. These checklists are outlined in terms of the transition phase described in previous sections of this document. This structure will allow each unit to progress through each of the remaining migration phases. Additionally, the checklist will assist the ORD Implementation Manager in tracking the transition progress.

Some of the units below will fall into the category of Expedited Adopters. These are units that have not yet made significant efforts to implement ORD; however, due to the relative simplicity of their ORD workflow, it will be possible for them to quickly progress through the remaining migration phases. These units may have shorter checklists in this document and may be able to develop less detailed Testing Scripts.

Also, some units have been diligent in the past toward self-progressing to transition to ORD. These previous transition activities have been taken into consideration and, therefore, the steps in their checklists will be different from the other units.

As a part of each unit's acceptance of the ORD Migration Plan, it will be necessary for the units to review their checklists in the following sections. If a unit believes that modifications should be made to its plan, it is important that they promptly coordinate these changes with the ORD Implementation Manager.

As the migration progresses, it may become necessary to modify the recommendations included in the sections below. In this case, it will be the responsibility of the ORD Implementation Manager to collaborate with each unit's CADD Coordinator to revise the checklists. Changes will be made at the discretion of the ORD Implementation Manager, with acceptance from NCDOT leadership.

The recommendations within Part III are intended to be a starting point to be developed as each unit or division works toward full implementation. The ORD Implementation Team will update and refine the recommendations throughout the migration phases as necessary. This will include the addition of division-specific recommendations, which will be developed by the ORD Implementation Team and each of the Divisions. The ORD Implementation Manager and Team will coordinate with the NCDOT Divisions to ensure that Division staff are involved in the ORD Migration and that Division needs are being addressed.

12 NCDOT UNIT-SPECIFIC RECOMMENDATIONS

12.1 Hydraulics Unit

12.1.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 64%, the Hydraulics Unit is in the Testing/Training phase of the ORD transition. The Hydraulics Unit should continue to test its workspace and configurations both internally and externally. While testing, the CADD Coordinator should select the staff who will be trained to use the ORD software so at least 80% of the staff working in ORD will be trained. Finally, the CADD Coordinator for each unit will identify projects to implement the transition plan for the Soft Rollout and Migration process.

After our Readiness Assessment interview with Hydraulics Unit staff, it was determined that they can transition to the software and use a workflow very similar to the one they are currently using. The ORD Implementation Team recommends they continue to coordinate with the Roadway Design Unit to determine the role of each unit in modelling ditches. Currently, they provide drainage ditch information to the Roadway Design Unit to update their cross sections. With ORD, the Roadway Design Unit can model the road to the end of the shoulder and the Hydraulics Unit could model the ditches if both units agree that this would result in a better-quality design and, ultimately, set of plans.

The long-term goal will be to utilize the 3D modelling features to the full extent. This will allow staff to build a model of all storm sewer structures and pipes, which will aid in clash detection with the Utilities Unit, the Structures Management Unit, etc., when they are also modelled in 3D.

Below is a checklist to take the Hydraulics Unit from the Testing/Training phase to Full Migration.

Prerequisite Recommendations Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.

Testing/Training Checklist

- ☐ Develop, test, and validate workflow for ORD approach for generating drainage summary sheets.
- ☐ Finalize development of 3D cells.
- ☐ If SUDA is to be used, verify that fully functional workflow has been developed and tested using Testing Script.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of the preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of the preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with identification of projects requesting waivers to maintain legacy workflows.

12.2 Roadway Design Unit

12.2.1 Recommendations and Checklist

The Roadway Design Unit has taken responsibility for the development of many of the workspace configurations that will be rolled out with the ORD migration. Because they are at the center of the development, it will be important for them to coordinate with each of the other units. Because the other units will likely rely on the Roadway Design Unit to assist with aspects of their development, it is recommended that they anticipate this kind of coordination.

It will also be important for the Roadway Design Unit to begin increasing emphasis on training the remainder of ORD users within the unit. It is recommended that this ORD training be arranged to include both instruction and hands-on workshop exercises. This assignment-based type of training can provide the users with the opportunity to use their newly acquired skills in lieu of having an active project where they can apply their skills.

The Readiness Assessment interview indicated that the pilot projects are progressing productively. As these pilot projects continue and grow closer to their conclusion, it is recommended that the Roadway Design Unit maintain the inclusion of each of the other units to participate in the pilot projects as well. This will allow the other units to both gain experience using their ORD workflows and encourage the kind of open communication that will ensure the best interdepartmental workflows are established before the ORD Full Migration. It is also recommended that the Roadway Design Unit develop a format for recording and sharing their lessons learned with other units.

It is recommended that additional efforts focus on ensuring that NCDOT hardware configurations are optimized for the ORD transition. For example, it was noted during the Readiness Assessment interview that potential conflicts between ORD and older versions of MicroStation can exist when installed on the same computer. Based on the interview, there are approximately 10 staff who will be most focused on the design and plan production.

Below is a checklist to take the Roadway Design Unit from the Testing/Training phase to Full Migration.

Prerequisite Recommendations Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a succession plan for supporting ORD when key staff are promoted or move on from NCDOT.

Testing/Training Checklist

- ☐ Coordinate ongoing training efforts with the ORD Implementation Manager, to be integrated into the Training Plan.

- ☐ Coordinate with the ORD Implementation Team, NCDOT units, and CADD Services to finalize development of ORD workspace, configuration, etc.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of the preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.3 Feasibility Studies Unit

12.3.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 46%, the Feasibility Studies Unit is in the Planning phase of the ORD transition. The Feasibility Studies Unit will need to identify its CADD Coordinator. The Feasibility Studies Unit will use the Roadway Design Unit workspace, so they will need to coordinate with the Roadway Design Unit on any revisions to their workspace and workflow. They will need to be included in the Roadway Unit specific training. They have also just started using Bentley's planning level 3D software, ConceptStation. They will need to include the exporting of data from the ConceptStation models to ORD to their modified workflow.

Below is a checklist to take the Feasibility Studies Unit from the Planning phase to Full Migration.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop a comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Develop and test cost estimation workflow.
- ☐ Develop and test workflow for exporting ConceptStation designs into ORD.
- ☐ Test Legacy Tools for compatibility with ORD and identify which add-on tools will be needed.
- ☐ Test level symbology within ORD and when printing from ORD.
- ☐ Create Feasibility Studies Unit Disclaimer cell.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.4 Structures Management Unit

12.4.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 41%, the Structures Management Unit is just entering the Planning phase of the ORD transition. They do most of their design work in other software programs and use Bentley products mostly for plans production and drafting.

The Structures Management Unit's workflow is not anticipated to change significantly. They are planning to use ORD strictly for 2D drafting. We recommend that they participate in pilot projects, in addition to their Testing Scripts, and that, even though they do not plan to use the 3D workflow yet, they learn how to access information from other units' 3D models (e.g., Roadway Design Unit models). Long term, we recommend they investigate the 3D bridge modeling software OpenBridge to determine if it will be helpful to their workflow. The ORD Implementation Team can help with this process and present sample workflows to aid in this investigation.

Below is a checklist to take the Structures Management Unit from the Planning phase to Full Migration.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Coordinate with CADD Services to finalize and test updates to the Structures Management Unit cell library.
- ☐ Develop and test workflows for utilizing 3D models from other units to complete their 2D layouts.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of the preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.5 Utilities Unit

12.5.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 34%, the Utilities Unit is well into the Understanding phase of the ORD transition. The unit plans to utilize the 3D components of the software, but, if workflow prevents it, the 3D modeling portion of the future workflow can be postponed until after the Full Migration. They can continue to produce their plans using the 2D workflow since they are confident they can meet scheduled production dates, and they will add in the 3D modeling of the utility designs after migration is complete.

Below is a checklist to take the Utilities Unit from Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Develop a more formal process for digital plans submittal from the utility companies / consultants.
- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Coordinate with CADD Services to finalize and test updates to the Utilities Unit linestyles and cell library.
- ☐ Create the Testing Script to be tested during migration.
- ☐ If SUDA is to be used, verify that fully functional workflow has been developed and tested using Testing Script.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.6 ITS and Signals Unit

12.6.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 42%, the ITS and Signals Unit is within the Planning phase of the ORD transition. The ITS and Signals Unit-specific main focus is to coordinate with the ORD Implementation Team to develop a workflow for cutting special cross sections for placement of poles.

Below is a checklist to take the ITS and Signals Unit from the Planning phase to Full Migration.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Coordinate with the ORD Implementation Team to develop a workflow for cutting special cross sections for placement of poles.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.

- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.7 Geotechnical Engineering Unit

12.7.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 33%, the Geotechnical Engineering Unit is in the Understanding phase of the ORD transition. The unit first needs to review and accept the Migration Plan. Then the unit will identify a CADD Coordinator to represent the unit during the Planning phase. Next, the unit will need to develop and test workflows to keep from working in "snapshots" and investigate whether the missing capabilities of Geopak have been incorporated into the ORD software. While working on these steps, the unit will be updating its "cookbooks" for outside consultants to use.

Below is a checklist to take the Geotechnical Engineering Unit from the Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Develop and test a workflow that utilizes live/active reference files rather than "snapshot" files. Determine if this workflow will be adopted.
- ☐ Investigate whether the missing capabilities from Geopak have been incorporated into ORD. Coordinate with the ORD Implementation Manager to develop final workflow.
- ☐ Update Geotechnical Engineering Unit "cookbooks."
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.

- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.8 Location and Surveys Unit

12.8.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 53%, the Location and Surveys Unit is in the Planning phase of the ORD transition. The unit first needs to review and accept the Migration Plan. Then the unit will identify a CADD Coordinator to represent the unit during the Planning phase. Next, the unit will need to identify and test workflows that were once completed with MDLs but will no longer be used in ORD software. Also, the unit will develop and test workflow for placing property boundaries.

Below is a checklist to take the Location and Surveys Unit from the Planning phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Identify which MDL workflows do not have ORD workflows. Coordinate with the ORD Implementation Manager to develop new workflows.
- ☐ Develop and test workflow for placing property boundaries.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Test the compatibility of ORD with older projects previously surveyed and mapped in legacy software.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.9 Photogrammetry Unit

12.9.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 23%, the Photogrammetry Unit is in the Understanding phase of the ORD transition. The unit first needs to review and accept the Migration Plan. Then the unit will identify a CADD Coordinator to represent the unit during the Planning phase. The Photogrammetry Unit will need to be diligent when coordinating and testing with the possibility of continuing to use legacy software and investigating the compatibilities to input their output into ORD software.

Below is a checklist to take the Photogrammetry Unit from the Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Coordinate with the ORD Implementation Manager and NCDOT leadership to determine viability of continuing to use legacy workflows until they can begin migrating to ORD.

If and when Hexagon confirms they will support Bentley CONNECT and ORD,

- ☐ Coordinate with ORD Implementation Manager and NCDOT leadership to determine a specific plan to revise workflows to work within those environments. This may include using MicroStation CONNECT for some functions and ORD for other functions.

If Hexagon does not commit to upgrading the ImageStation software to a 64-bit platform or supporting Bentley CONNECT software:

- ☐ Coordinate with ORD Implementation Manager and NCDOT leadership to do the following to support the migration to use of ORD and Microstation CONNECT:
    - Survey other state DOTs on their status and plans to implement Bentley Connect and ORD with their software to compute refined aerial photography orientation to support real time stereo maintenance of overlapping aerial imagery for 3-D graphic planimetric feature & DTM collection.
    - Create a list of potential alternative software applications, with associated costs for adopting new software.

- Survey the 12 PEFs with LSAs with the NCDOT Photogrammetry Unit on their status and plans to implement Bentley Connect and ORD with their software to compute refined aerial photography orientation to support real time stereo maintenance of overlapping aerial imagery for 3-D graphic planimetric feature & DTM collection.
- Provide details regarding compatibility of hardware and equipment with potential software choices.
- Investigate possibility of adopting Bentley SelectSeries 10 applications.

☐ Create a comprehensive list of MDLs and tools that are required to complete deliverables. Note which of these MDLs and tools will not be available in ORD. Coordinate with the ORD Implementation Manager to develop new workflows, as needed.

☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.

☐ Participate regularly with ORD Working Group activities.

☐ Develop Testing Script and submit to the ORD Implementation Manager.

☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.

☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.

☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.

☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

☐ Investigate the compatibility of using deliverables developed within the legacy software applications as an input for other units within their new ORD workflows.

☐ Create the Testing Script to be tested during migration.

☐ Successfully complete Testing Script for three test projects.

☐ Provide support in developing any unit-specific migration documentation.

☐ Requirement to create training plan and set date for training 80% of eligible staff.

☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.

☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.

☐ Participate regularly with ORD Working Group activities.

- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.10 Signing and Delineation Unit

12.10.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 37%, the Signing and Delineation Unit is well into the Understanding phase of the ORD transition. The unit first needs to review and accept the Migration Plan. Then the unit will identify a CADD Coordinator to represent the unit during the Planning phase. Finally, the unit will investigate and test the possibility of using SignCAD rather than GuideSign as their workflow.

Below is a checklist to take the Signing and Delineation Unit from the Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Investigate the possibility of using SignCAD rather than GuideSign within the proposed workflow. Notify the ORD Implementation Manager of preferred workflow approach.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.

- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.11 Work Zone Traffic Control Unit

12.11.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 56%, the Work Zone Traffic Control Unit is well into the Planning phase of the ORD transition. First, the unit will identify a CADD Coordinator to represent the unit during the Planning phase. Finally, the unit will test its Testing Script on multiple projects and train at least 80% of the applicable employees.

Below is a checklist to take the Work Zone Traffic Control Unit from the Planning phase to Full Migration.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.

- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.12 CADD Services Unit

12.12.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 64%, the CADD Services Unit is in the Testing/Training phase of the ORD transition. CADD Services needs to continue to coordinate and support all of the units during their transition. This will need to be done in conjunction with coordinating with the ORD Implementation Manager. Since the CADD Services Unit is undergoing some interdepartmental turnover, it is recommended that they also assign new ORD subject matter experts to support the department's needs.

Below is a checklist to take the CADD Services Unit from the Testing/Training phase to Full Migration.

Testing/Training Checklist

- ☐ Continue coordination and support for development of workspaces and configurations for all units.
- ☐ Coordinate directly with the ORD Implementation Manager regarding all of the transition activities.
- ☐ Continue coordination with Bentley to resolve any software issues that arise.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Provide assistance and support to the ORD Implementation Team for training NCDOT staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.13 Plans and Standards Management Unit

12.13.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 32%, the Plans and Standards Management Unit is in the Understanding phase of the ORD transition. The unit first needs to review and accept the Migration Plan. Then the unit will identify a CADD Coordinator to represent the unit during the Planning phase. Finally, the Plans and Standards Management Unit needs to test creating and revising a construction standard sheet for multiple units to verify proposed workflow.

Below is a checklist to take the Plans and Standards Management Unit from the Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Identify a Roadway Design, Hydraulics, and Work Zone Traffic Control unit construction standard sheet:
    - To revise a minimum of two
    - To create from scratch one
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.

- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration.
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.14 Roadside Environmental Unit

12.14.1 Recommendations and Checklist

With an overall Readiness Assessment rating of 30%, the Roadside Environmental Unit is in the Understanding phase of the ORD transition. To begin the transition to ORD, the Roadside Environmental Unit will need to review and accept the Migration Plan to have full understanding of the importance and significance of the transition to ORD. Then the Unit will need to identify its CADD Coordinator and, when they can, fit testing and training into their very busy schedule. Since the unit receives plans from almost every other unit, they will need to test their script with each and every other unit. The CADD Services Unit will also have a vital role for them. The Roadside Environmental Unit will need the assistance of the CADD Services Unit in making ORD compatible with the configurations and settings the unit relies on pre-ORD.

Below is a checklist to take the Roadside Environmental from the Understanding phase to Full Migration.

Understanding Phase Checklist

- ☐ Review and accept the Migration Plan.

Planning Phase Checklist

- ☐ Identify a CADD Coordinator and submit name to the ORD Implementation Manager.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Develop Testing Script and submit to the ORD Implementation Manager.
- ☐ Develop comprehensive list of staff requiring training and submit to the ORD Implementation Manager.
- ☐ Identify a list of the units that require frequent coordination with this unit and submit coordination approach to cross-testing workflows to ensure compatibility.
- ☐ Develop a request for any Focused Training and submit to the ORD Implementation Manager.
- ☐ Coordinate with the ORD Implementation Manager to determine strategy for designating time for staff training, given heavy workloads within the unit.

Testing/Training Checklist

- ☐ Verify that all unique cells, linestyles, libraries, etc., have been transferred from legacy application(s) to ORD.
- ☐ Create the Testing Script to be tested during migration.
- ☐ Successfully complete Testing Script for three test projects.
- ☐ Provide support in developing any unit-specific migration documentation.
- ☐ Requirement to create training plan and set date for training 80% of eligible staff.
- ☐ Provide acceptance of preferred version of ORD for Soft Rollout.

Migration Checklist

- ☐ Coordinate with the ORD Implementation Manager to identify projects for Soft Rollout.
- ☐ Early in the Soft Rollout period, assist the ORD Implementation Manager with compiling a list of projects within the unit that will qualify for transition from legacy workflows to ORD.
- ☐ Participate regularly with ORD Working Group activities.
- ☐ Successfully complete Testing Script for any new versions of ORD being considered for Full Migration.
- ☐ Provide support in revising any unit-specific migration documentation.
- ☐ Participate in the documentation of Lessons Learned during the Soft Rollout, to be published for the Full Migration.
- ☐ Provide acceptance of preferred version of ORD for Full Migration
- ☐ Assist the ORD Implementation Manager with the identification of projects requesting waivers to maintain legacy workflows.

12.15 ORD Implementation Manager and Team

12.15.1 Recommendations and Checklist

It is recommended for the ORD Implementation Manager and Team to be the direct liaison between NCDOT leadership and the Units. This will allow for a single point of contact for either NCDOT leadership or the Units when issues or queries may arise throughout the migration process.

Below is a checklist to for the ORD Implementation Manager and Team to Full Migration.

ORD Implementation Manager and Team Checklist

- ☐ Identify and develop migration material for the Units and Divisions.
- ☐ Provide subject matter expertise for the Units and Divisions.
- ☐ Coordinate and oversee the schedule and progress of the Units and Divisions Migration to ORD.
- ☐ Maintain open communication with NCDOT leadership of the progression to Full Migration.
- ☐ Aid the Units and Divisions in developing their ORD Training Plans and oversee the progress of the Department Wide ORD training.

APPENDIX A

Readiness Assessment Rating Table

Readiness Assessment Rating Table

NCDOT Units

	Hydraulics	Roadway Design	Feasibility Studies	Structure Management	Utilities	ITS & Signals	Geotech	Survey	Photogrammetry	Signing	Traffic Control	CADD Services	Plans and Standards	(Erosion Control Plans)
Hardware & Software														
1. What is the current software package your unit is using? To what degree has your unit investigated the compatibility with upgrading to ORD?	7.0	9.0	5.0	3.0	3.0	5.0	4.0	6.0	3.0	4.0	6.0	7.0	3.0	2.0
2. To what degree has your unit verified that the staff's hardware (PCs, laptops, etc.) are compatible with ORD? Minimum hardware requirements are available from Bentley.	6.0	7.5	6.0	2.0	3.0	6.0	3.0	6.0	3.0	6.0	6.0	7.0	4.0	4.0
3. What other stand-alone software applications does your unit use on a regular basis? To what degree has your unit investigated how these other stand-along applications will integrate with ORD?	6.0	n/a	6.0	n/a	n/a	n/a	3.0	6.0	3.0	4.0	n/a	6.0	n/a	n/a
4. Does your unit require the use of any of the following types of features that are unique to your unit or the work it does? If so, to what degree has your unit investigated migrating these into ORD?	7.0	10.0	3.0	7.0	4.0	5.0	5.0	7.0	2.0	4.0	7.0	6.0	3.0	5.0
5. Does your unit currently use custom tools, toolbars, or menus within your current CADD setup? If so, to what degree has your unit investigated the need to migrate these into ORD?	n/a	8.0	3.0	7.0	3.0	5.0	3.0	6.0	2.0	4.0	n/a	7.0	n/a	n/a
6. Does your unit currently rely on the use of other add-on tools installed within your current CADD setup? If so, to what degree has your unit investigated the need to migrate these into ORD?	n/a	9.0	n/a	n/a	n/a	5.0	3.0	4.5	2.0	3.0	n/a	6.0	n/a	3.0
7. Does your unit's current CADD setup integrate with ProjectWise?	8.0	6.0	3.0	3.0	3.0	3.0	n/a	5.0	3.0	3.0	3.0	6.0	2.0	2.0
Totals:	**6.8**	**8.3**	**4.3**	**4.4**	**3.2**	**4.8**	**3.5**	**5.8**	**2.6**	**4.0**	**5.5**	**6.4**	**3.0**	**3.2**
Workflow														
1. To what degree has your unit begun pilot testing for your current workflows?	8.0	8.0	5.5	5.5	3.0	4.5	3.0	6.0	2.0	5.0	7.0	6.0	3.0	2.0
2. To what degree is your unit prepared for using 3D-centric design and associated workflows?	7.0	7.0	4.0	3.0	3.0	3.0	3.0	5.0	2.0	3.0	5.0	6.0	n/a	2.0
3. To what degree has your unit investigated migrating plan preparation and delivery processes that are specific to your unit to ORD?	6.0	9.0	5.0	7.0	5.0	4.5	3.0	5.0	n/a	3.0	7.0	6.0	3.0	3.0
4. To what degree has your unit investigated migrating electronic data specifications and guidelines that are specific to your unit to ORD?	7.0	9.0	n/a	n/a	4.0	6.0	3.0	5.0	2.0	3.0	6.0	n/a	3.0	5.0
5. Does your unit use any electronic file compliance requirements? If so, to what degree has your unit investigated migration of these requirements into ORD?	7.0	n/a	n/a	n/a	n/a	n/a	3.0	5.0	n/a	3.0	n/a	n/a	n/a	n/a
6. Does your unit regularly interface with CADD files developed by other units or outside organizations? How does your unit interface with these files? To what degree has your unit investigated current Bentley workflows within ORD or other Bentley applications?	6.0	6.0	n/a	4.0	3.0	5.0	3.0	4.0	4.0	4.0	5.0	6.0	4.0	3.0
Totals:	**6.8**	**7.8**	**4.8**	**4.9**	**3.6**	**4.6**	**3.0**	**5.0**	**2.5**	**3.5**	**6.0**	**6.0**	**3.3**	**3.0**
Personnel														
1. How many staff are included within your unit? On a high level, what kind of roles and responsibilities exist within the unit?	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2. To what degree would you consider that your unit's staff is open to and accepting of the ORD migration?	7.0	7.0	4.5	2.0	3.0	3.0	4.0	4.0	1.0	3.0	7.0	7.0	4.0	3.0
3. What kind of exposure and familiarity does your unit's staff have to ORD? To what degree would you say they are familiar with ORD and comfortable using it?	6.0	7.0	4.5	2.0	2.0	3.0	3.0	4.0	2.0	3.0	6.0	7.0	2.0	2.0
4. To what degree has your unit's production staff received ORD training and supporting materials?	4.0	6.0	5.0	3.0	4.0	3.0	3.0	4.0	1.0	3.0	5.0	7.0	2.0	2.0
5. To what degree has your unit's management been educated about how ORD will operate and what impacts it will have on current workflows?	7.0	5.5	5.0	5.0	4.0	3.0	4.0	4.0	2.0	4.0	5.5	6.0	4.0	4.5
6. To what degree does your unit's workload accommodate transition activities associated with the ORD migration?	4.0	4.0	5.0	4.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	6.0	4.0	3.0
7. Can you please identify a point of contact within your unit for any additional questions/inquiries that may arise as this process progresses?	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Totals:	**5.6**	**5.9**	**4.8**	**3.2**	**3.4**	**3.0**	**3.4**	**4.0**	**1.8**	**3.4**	**5.3**	**6.6**	**3.2**	**2.9**
Overall Summary:	**64%**	**74%**	**46%**	**41%**	**34%**	**42%**	**33%**	**50%**	**23%**	**37%**	**56%**	**64%**	**32%**	**30%**

APPENDIX B

Training Links

TRAINING LINKS

Video Links

Civil TSG

https://www.youtube.com/user/CivilTSG/videos

Bentley Learn Server

https://learn.bentley.com/app/Public/BrowseLearningPaths?productlineId=26142&CustomLP=False

EnvisionCAD

https://envisioncad.com/software/openroads/

Webinars

Bentley SIG

https://pages.info.bentley.com/webinars/?WType=SIGs&Product=OpenRoads&Lang=All

FDOT Training YouTube Site

https://www.youtube.com/channel/UCqbY8kqZuXp1pyYV6lIQw_A/videos

DOT TRAINING YOUTUBE SITES

Ohio DOT

https://www.youtube.com/channel/UCo-lOt5L4GHSDbSkKWPeWAw/feed

Florida DOT

https://www.youtube.com/channel/UCqbY8kqZuXp1pyYV6lIQw_A/videos

APPENDIX C

Glossary

GLOSSARY

CADD Coordinator	The liaison between an individual unit and the Working Group. The CADD Coordinator is responsible for collecting the comments and insights from their unit and relaying them to the larger Working Group.
Full Regression Testing	A change in ORD version requires that each unit begin on the very first step of the Testing Script to ensure that every part of their workflow is compatible with the current version of ORD.
Legacy Project	A project done using an older version of software that has already been completed or has been previously shelved.
Migration	The act of moving from using the software Geopak and Microstation to using OpenRoads Designer CONNECT.
Migration Milestones	The goals for each Migration Phase that will act as a gauge for the units to track their progress through their migration to ORD.
Migration Phase(s)	The Migration Plan will be split into different phases, or sections. Each phase will last for six months and have its own distinct goals that help advance NCDOT to full implementation of ORD.
Migration Plan	This guidance document details the transition to using ORD. It consists of three parts: 1 – Readiness Assessment, 2 – Departmentwide Migration Plan, and 3 – Unit-specific Migration Recommendations.
Migration Vision	The primary vision of the Migration Plan is to efficiently achieve migration of all applicable NCDOT projects and staff to ORD workflows through effective communications, engagement with users, and strategic training approaches.
OpenRoads Designer (ORD)	A comprehensive, multi-disciplinary three-dimensional (3D) modeling application that advances the delivery of transportation projects from conceptual design through construction. The software blends traditional engineering workflows for plan, profile, and cross sections with 3D parametric modeling.

NCDOT OPENROADS DESIGNER READINESS ASSESSMENT

ORD Implementation Manager	The individual responsible for coordinating all efforts relating to ORD migration, as described within this Migration Plan. This individual reports to and works directly with NCDOT Leadership to achieve the Migration Vision.
ORD Implementation Team	The ORD Implementation Team will be composed of consultant subject matter experts (SMEs) responsible for supporting the ORD Implementation Manager.
ORD Migration Working Group	This group will act as representatives for their unit and its needs. They will keep their unit updated on the status of milestone goals, and the schedule and deadlines. They will meet regularly throughout the migration process.
ORD Waiver	An ORD Waiver Process will be implemented for projects that will not or cannot be migrated to ORD.
Pilot Project	The Roadway Design Unit has initiated a series of eight pilot projects to begin testing the workspace, configurations, and workflow.
Readiness Assessment	The Readiness Assessment evaluates three primary categories related to NCDOT's ORD transition and migration: Hardware & Software, Workflow, and Personnel. Throughout the information-gathering portion of the assessment, a rating system has been used to determine each unit's readiness for ORD migration.
Soft Rollout	The Soft Rollout will be a period of time when the voluntary choice may be made to begin using ORD for NCDOT design projects.
Subject Matter Expert (SME)	An NCDOT employee or consultant with expertise in areas of ORD. Some will serve on the Implementation Team to help facilitate the migration.
Testing Script	The script is a step-by-step process that will be used for each unit to ensure that the newest version of the software will enable them to successfully produce their plans.
Unit-Specific Migration Checklist	A list of steps that each unit should take to help achieve full migration to ORD.

Arcadis U.S., Inc.

5420 Wade Park Blvd

Suite 350

Raleigh, North Carolina 27607

Tel 919 854 1282

Fax 919 854 5448

www.arcadis.com