Grade 11
TTJ3C Transportation Technology
(College Destination)

Unit 1, Activity 1:
Research Project
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TTJ3C Transportation Technology

Unit 1 Activity 1

Research Transportation Problem Project
Time: 7.5 hours (450 minutes)

Description
Students employ a variety of methods and use multiple sources to research a chosen transportation system, with particular emphasis on the underlying technologies that allow the system to function, e.g., propulsion, guidance, support and control technologies. An emphasis is also placed on the environmental and social impacts of the chosen system as well as any recent technological developments that may have occurred. Students use the information gained during this activity to help complete activities throughout the unit.

Activity Resource Management Doc (ARMdoc) Contents

| Teacher Resource Pack (TRP) | Pre-planning Notes, Expectations by Category, Activity Deliverables, Instructional Aid Sheets, Terminology List, Career Information |
| Student Project Brief (SPB) | Project Brief, Assessment/Evaluation Checklists and Rubrics, Activity Log |
| Safety Resource Pack (SRP) | Safety Information (list of pages to be inserted from the separate Safety Resource Pack) |

This Activity Resource Document (ARMdoc) was produced to supplement the Ontario Ministry of Education’s Grade 11 Course Profiles. These profiles can be found at:

http://www.curriculum.org/occ/profiles/profiles.htm

ARMdocs for several Technological Education profiles can be found at:

http://www.octe.on.ca

The Technological Education policy documents can be found at:

Pre-activity Planning Notes

In Unit 1, (see TTJ3C Transportation Technology (College) Course Profile, page 18), students identify and develop solutions for mass transit problems within their local community. Using a process of analysis and synthesis, students demonstrate skills and knowledge in data gathering and analysis, model and/or prototype building and report generation.

In this activity, students research topics in transportation systems and their interrelation. In the example case given in this ARMdoc, students learn data gathering techniques by examining traffic patterns of vehicle types, much like traffic studies urban planners use to determine loads on road and mass transit systems. Students also examine the consequences of traffic congestion in terms of individuals, society and the environment. Through this or other similar project, students should gain an appreciation of career opportunities within the transportation sector.

The concepts of determining research criteria and data gathering are to be brainstormed by the whole class. The class (or selected teams) are to examine the interrelated web of transportation systems for the movement of goods...such as pipelines, road, rail, air and water systems. Visual diagrams of how a particular package may move through a local town or city network will help students visualize the overall project.

There are four activities identified for Unit 1 in the Grade 11 TTJ3C Transportation Technology profile:

1. Research Project
2. Design a Better Transportation System
3. Build a Better Transportation System
4. Presentation of Projects

These activities allow students to apply a structured design process by first identifying a transportation system situation (i.e. road traffic at an intersection), then identifying possible problems, (i.e. traffic tie ups, long idle times, difficulties accessing mass transit systems by pedestrians). In subsequent activities, students examine possible solutions and present the results of their findings.

The activity described here is adaptable to most local situations, low and high traffic flow. The teacher should pre-select the transportation situation(s) beforehand in order to collect materials and control timelines. Some suggested topics include:

- Traffic flow through a local intersection (used in the Student Design Brief here as an example)
- “Transportation Web” around the local railway station, marina or airport (people or freight)
- Traffic of people, goods and cars around a mall parking lot
- Traffic patterns of students in the school hallway during class change
- Bus, cars and people movement in or out of the school

Students will design, document and organize the project through both individual and group work.
Teachers should acquire the necessary blueprints, maps and assist in the data collection strategy to ensure the highest level of accuracy. City planners, tourism booths and engineering firms all are potential sources for the required resources.

**Expectations by Category (from Course Profile)**

**Knowledge**
TF2.01 – describe the importance of transportation systems to maintaining our quality of life

**Inquiry**
TFV.03 – identify the impact of the movement of people and goods on vehicle systems and modes of transportation (highway, rail, air, water, pipeline)

**Communication**
TF2.02 – explain how people and goods are moved by highway, air, rail, water, and pipeline transportation systems

**Application**
IC1.01 – describe the consequences of transportation technology for individuals and for society (e.g., by conducting a survey to document how an efficient mass-transit system affects the travel time for a commuter, or by investigating the demographics of commuting and identifying whether the current mass-transit system in their region could handle the anticipated population growth over the next five years)
IC1.02 – describe the possible impact of transportation technology on the environment

**Assessment/Evaluation**
Students will be assessed and evaluated on the following deliverables. See the Student Project Brief for assessment/evaluation instruments.

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Notes</th>
<th>Suggested Time (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Project Outline (Copying of board web illustration)</td>
<td>Individual</td>
<td>1</td>
</tr>
<tr>
<td>2 Review content, method of recording data &amp; report format</td>
<td>Individual</td>
<td>1</td>
</tr>
<tr>
<td>3 Participation in area investigation and data gathering</td>
<td>Team</td>
<td>2</td>
</tr>
<tr>
<td>4 Project Research Report for thoroughness</td>
<td>Individual</td>
<td>3</td>
</tr>
<tr>
<td>5 Job Log Sheet content &amp; completion</td>
<td>Individual</td>
<td>.5</td>
</tr>
</tbody>
</table>
**Terminology List**

**Job Log Sheet:** form used to document student activity and time spent on projects

**Mass Transit:** transportation systems involving groups of travelers, (as opposed to personal transportation). Examples are buses, trains, airplanes.

**Research:** conducting scientific investigation or inquiry

**Statistics:** the analysis of samples of numerical data

**S.U.V.** Sport Utility Vehicle; (Explorer, Blazer, Cherokee etc.)

**Traffic Flow:** the time based movement of items, (i.e. cars, people, freight)

**Traffic Patterns:** diagrammatic interpretation of flow of traffic around a given location and time

**Transportation system** the grouping of individual vehicles, goods, personnel, movement devices and support structures that as a whole make a complete arrangement for transporting goods and/or people. Examples include the systems of bus, rail systems or airlines

**Transportation Web** a collection of transportation systems that interact together for the transport of people and/or goods. Examples include urban transportation (buses, trains, subways, cars, trucks), or airports (planes, taxis, trucks, buses, cars, etc.)

**Urban Planner:** individuals involved in designing the layout and operation of urban and suburban environments.

**Vehicle Demographics:** information gathered concerning the characteristics of transportation vehicles
Reference Resource

In chapter 73, the subject of air pollution is discussed from how it is created, identifying the specific pollutants to the devices and technology used to reduce emissions. Pertinent questions are found at the back of the chapter.

Policy handbook and advocacy for bicycle mass transit systems and urban transportation systems. How to engineer bicycle systems.

Student focused description of electrical vehicle and other sustainable transportation systems, including environmental issues

Websites

Windsor Bicycle Use Master Plan Study http://www.windsorbump.com/
This website contains a wealth of data, resources and a complete layout demonstrating the components of a traffic study, proposal and final report. Subject city is Windsor, Ontario. The final report is in Adobe Acrobat. The final two pages list a source compilation for study resources.

Society of Automotive Engineers - http://www.sae.org/index.htm
An international society that describes major issues such as sustainability and alternative fuel systems as well as upcoming conferences and workshops

Transport Canada - http://www.tc.gc.ca
Description of Canada’s transportation systems, the government’s vision for Canada’s future transportation networks, and

Ontario Ministry of Transportation - http://www.mto.gov.on.ca/
Descriptions of latest developments in road and mass transit transportation issues
Transportation Research Project Outline

Research Component Content
Create a form to record data
Gather data and include the following:
Time of day
Types of vehicles
Number of vehicles
Environmental/ Health Considerations
Research Report on findings (due: __________)

Model of Situation
Design model appropriate to situation
Determine and gather tools and materials
Construct model of problem area (due: __________)

Problem Solving Proposals
Advantages of documenting process of design
Documenting strategies to solve problem
Report and present proposal (due: __________)

Manufacturing Transportation Solutions Model
Create a model that describes solutions to problem
Fabricate and detail model/presentation materials (due: __________)

Marketing and Presenting your Ideas
Create brochures, ads or commercials etc., to sell your idea to potential clients or investors
Invite clients, investors and/or guests
Set up display
Present sales pitch
Complete design report and hand in (due: __________)
Transportation Research Project: Key Concepts

Within this project, the ten concepts of technological education should be considered:

**Structure:** The essential physical or conceptual parts of a product, process, or system, including the way in which the parts are constructed or organized.

**Material:** The substance or information from which the structure is made.

**Fabrication:** The act or process of forming and assembling materials and structures.

**Mechanism:** The parts of a structure that allow it to work or function.

**Power and energy:** The resource that enables a mechanism to perform work.

**Controls:** The means by which a mechanism is activated and regulated.

**Systems:** Combinations of interrelated parts (structures and/or mechanisms) that make up a whole and that may be connected with other systems.

**Function:** The use for which a product, process, or system is developed.

**Aesthetics:** The aspects of a product, process, or system that make it pleasing to the human senses.

**Ergonomics:** The interface of human and product: aspects of how people use/handle products effectively and/or efficiently.
Research Report Layout

Report Due: ________________
All reports are to be word processed or typed.

Components:

1) Title Page:
Should include the project name, teacher's name, course code, your name and the date.

2) Table of Contents:
Will include all topics covered in report.

3) Research Description:
This will begin with a statement explaining the purpose of the research. For example: to gather data which will assist in identifying specific traffic problems and patterns.

4) Data Collection Process:
Describe the procedure used to collect all statistics. For example: students recorded vehicle number and type by using two groups at the intersection of [street] and [street]

5) Research Observations:
Your comments on what you have investigated, what you have noticed.

6) Research Conclusion:
Your ideas of solutions based on your research. Be sure to explain why you believe yours is the best possible solution.

7) Credits:
Names of people responsible for various tasks in the project.

8) Data Collection Form:
Your completed form used to collect the information.

9) Job Log Sheet:
Each individual in the team lists their activities and amount of time used to complete specific stages of the solution development
Sample Project Template: Traffic Study

Project Name
Research Report
TTJ 3C
Presented to

By:
Date:
Table of Contents

Research Description
Data Collection Process
Research Observations
Research Conclusion
Credits
Data Collection Form
Job Log Sheets
Research Description

The traffic around ________________ High School is congested at certain times of the school day, causing potential safety problems and delays. The purpose of the research is to gather data to help identify the traffic problems and patterns at peak volume times and suggest solutions to the problem.

Data Collection Format

The data was collected by us using a form to track vehicles by both number and type. Two groups stood at the intersection of ________________ street and ________________ street to monitor traffic in both directions. A copy of the form used can be found at the back of the report.
Research Observations

Through the data gathering process, we discovered the following results.

<table>
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<tr>
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<table>
<thead>
<tr>
<th>AM Survey Results</th>
<th>PM Survey Results</th>
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<tbody>
<tr>
<td><strong>Incoming</strong></td>
<td><strong>Incoming</strong></td>
</tr>
<tr>
<td>X (number) of buses</td>
<td>X (number) of buses</td>
</tr>
<tr>
<td>x (number) of cars</td>
<td>x (number) of cars</td>
</tr>
<tr>
<td>x (number) of SUVs &amp; Vans</td>
<td>x (number) of SUVs &amp; Vans</td>
</tr>
<tr>
<td><strong>Outgoing</strong></td>
<td><strong>Outgoing</strong></td>
</tr>
<tr>
<td>X (number) of buses</td>
<td>X (number) of buses</td>
</tr>
<tr>
<td>x (number) of cars</td>
<td>x (number) of cars</td>
</tr>
<tr>
<td>x (number) of SUVs &amp; Vans</td>
<td>x (number) of SUVs &amp; Vans</td>
</tr>
<tr>
<td><strong>Total Concentration of Vehicles During Survey</strong></td>
<td><strong>Total Concentration of Vehicles During Survey</strong></td>
</tr>
<tr>
<td>X (number) of vehicles</td>
<td>X (number) of vehicles</td>
</tr>
</tbody>
</table>
Research Conclusion

A high number of vehicles dropping off students in the front parking lot cause congestion and hazardous conditions. Passengers exiting the buses have to be careful of incoming and exiting cars and SUVs. Traffic is generally stalled while cars and SUVs await buses and passenger flow. Many SUVs were observed arriving at same time as the buses, but lesser numbers left at the observation time in the afternoon indicating many of these vehicles belong to teachers or other school employees.

The concentration of buses idling while waiting for students in the afternoon create a high level of pollution and noise, which cause complaints of eye irritation.

Possible solutions involve creating a school bus only lane in the front of the school and the utilization of the side or back door for parents to drop off/pick up students. Teachers or school employees should be asked to arrive by the side parking lot or arrive at a staggered time.

Buses should remain at the side road until just before school ends, or be asked to shut off their engines while awaiting passengers.

Other conclusions and observations…

Credits

The following people collected the data for the project.
### TRP: Teacher Resource Pack

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<th>Date:</th>
<th>Vehicle Demographics Data Collection</th>
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<tbody>
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<td>Outgoing Vehicles</td>
<td>Incoming Vehicles</td>
</tr>
<tr>
<td><strong>Vehicle Type</strong></td>
<td><strong>Instructions:</strong> Place a line through number in sequence as vehicle type goes by. One direction per chart. Check time, Air Quality and put your names at bottom of page(s).</td>
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<td>Buses</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
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<td></td>
<td>17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32</td>
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<td>33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48</td>
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<td>49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64</td>
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<td>65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80</td>
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<td><strong>Total</strong></td>
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<tr>
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<td><strong>Total</strong></td>
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<tr>
<td>SUVs &amp; Vans</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
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<td>17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32</td>
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<td>65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80</td>
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<tr>
<td><strong>Total</strong></td>
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<td>Trucks</td>
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<tr>
<td><strong>Total</strong></td>
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<td>Para Transit</td>
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<td>49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Air Quality</th>
<th>Good</th>
<th>Bad</th>
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</table>

Compiled by:
# Job Log Sheet

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<table>
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</tbody>
</table>

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ARMdoc: arm_tjj3c_u1a1.doc

TRP 15-16
Career Information

Career Information Sites:

Human Resources Development Canada: National Occupational Classification Database-
   http://www.hrdc-drhc.gc.ca/noc

HRDC NOC Search Engine-

Ontario Prospects: geared to young people and students

Job Futures 2000: what's hot, what's not
   http://www.hrdc-drhc.gc.ca/JobFutures

Job Profiles: real people profile their jobs
   http://www.jobprofiles.org/index.htm

Canada WorkInfoNet: national and regional market info
   http://www.workinfonet.ca

The following activity related careers are described in the Human Resources Development Canada (HRDC) National Occupational Classification (NOC) database. Use the search engine link above to learn the main duties performed by practitioners of each trade, the education requirements for the position, and related occupations.

0713 Transportation Managers
0721 Facility Operation Managers
1215 Supervisors, Recording, Distributing and Scheduling Occupations
1476 Transportation Route and Crew Schedulers
2153 Urban and Land Use Planners
**Student Project Brief**

TTJ3C Transportation Technology

**Unit 1 Activity 1**

*Research Transportation Problem Project*

**Contents:**

1. Project Brief Handout
2. Design Scenario Handout
3. Design Report Format
4. Evaluation Rubrics/Checklists
5. Activity Log

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# Student Project Brief Handout

<table>
<thead>
<tr>
<th>Title:</th>
<th>Mass Transit Problem Report</th>
</tr>
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<tbody>
<tr>
<td>Activity:</td>
<td>Research and analyze a mass transit traffic situation</td>
</tr>
<tr>
<td>Course:</td>
<td>TTJ3C Transportation Technology</td>
</tr>
<tr>
<td>Time Req'd:</td>
<td>7.5 hours</td>
</tr>
</tbody>
</table>

## Rationale

Urban planners investigate traffic flow and traffic patterns to design efficient and safe mass transit systems to serve the population. In this project you will investigate a local traffic situation around your school, collect traffic data and analyze the data to determine the characteristics of the traffic and develop possible recommendations to improve people and vehicle traffic flow. You must identify the causes of traffic congestion at our school during peak traffic volume hours, and investigate possible ways to improve safety and efficiency. Through this project you should gain an understanding of research and data analysis methods, as well as an appreciation of how our cities are designed for people and vehicle movement.

## The Assignment

You will complete a study of the traffic flow around the school at peak volume times, collecting and analyzing data and reporting your findings on the current transportation situation. If you identify a problem with the traffic flow, you will suggest ways that might improve the situation.

## Learning Experience: You will:

1. Gain an understanding of the whole project through a board illustration and overhead presentations.
2. Perform a field survey of the affected area and document the components of the research report.
3. Develop a report containing all pertinent information as well as a short conclusion as to what you see as the main cause of the problem.

## Tools and Materials

Spreadsheet designs and general word processing skills will be required to document findings and present reports.

## Notes
### EVALUATION

<table>
<thead>
<tr>
<th>No.</th>
<th>Deliverable</th>
<th>Time Limit (periods)</th>
<th>% Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Portfolio/rough copies of notes and board notes</td>
<td>2.5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Research Report</td>
<td>4</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Job Log Sheets</td>
<td>1</td>
<td>25</td>
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</tr>
<tr>
<td></td>
<td><strong>TOTALS</strong></td>
<td><strong>7.5 hrs.</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

### NOTES

Be sure to read rubric for Research Report and address all components including the concepts of technological education as per the handout given earlier.

You must get the Field Investigation Safety Passport signed before conducting your field research.

Be aware of all safety issues when conducting field research. ASK YOUR TEACHER IF YOU ARE UNSURE OF WHAT IS REQUIRED

### PROJECT PROCEDURE

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | Situation Analysis (Individual) (approximately two periods)  
      | Establish teams  
      | Brainstorm on board, developing web of all components of project |
| 2    | Develop field survey of area and analyse data gathering requirements and research logistics  
      | Develop data collection charts and formats |
| 3    | Set up teams to record data in both AM and PM  
      | Get other classroom teacher’s permission for early dismissal to record PM data  
      | Collect data using data collection chart |
| 4    | Analyze data using spreadsheets, graphs, tables as required |
| 5    | Discuss and brainstorm research findings presentation format  
      | Complete Research Reports and hand in for marking along with completed weekly Job Log sheets |
Research Report Layout

Report Due: ____________

All reports are to be word processed

Components:

1. **Title Page** - Includes the project name, teacher's name, course code, your name and the date.

2. **Table of Contents** - Includes all topics covered in report.

3. **Research Description** - This will begin with a statement explaining the purpose of the research. For example: to gather data which will assist in identifying specific traffic problems and patterns.

4. **Data Collection Process** - Describe the procedure used to collect all statistics. For example: students recorded vehicle number and type by using two groups at the intersection of ....... street and ....... street.

5. **Research Observations** - This is where you will summarize the findings of the research. See the example provided.

6. **Research Conclusion** - Your thoughts and ideas of what you see as the problem at hand. Be sure to explain why you believe this to be the cause and what you see as potential solutions to the situation.

7. **Credits** - Names of people responsible for gathering the data for you.

8. **Data Collection Form** - Your copy of the form used to collect the information.

9. **Daily Job Sheets** – listings of all individual team member's hours spent on project tasks
## Research Report Evaluation

<table>
<thead>
<tr>
<th>Expectations</th>
<th>Knowledge TF2.01</th>
<th>Inquiry TFV.03</th>
<th>Communication TF2.02</th>
<th>Application IC1.01/IC1.02</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Due Date:</strong></td>
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### Knowledge TF2.01 – describe the importance of transportation systems to maintaining our quality of life

- **Level 1**: Describes factors of the importance of transportation systems for maintaining quality lives in limited detail
- **Level 2**: Describes factors of the importance of transportation systems for maintaining quality lives in adequate detail
- **Level 3**: Describes several factors of the importance of transportation systems for maintaining quality lives in considerable detail
- **Level 4**: Describes several factors of the importance of transportation systems for maintaining quality lives in exceptional detail including linking the 10 technological concepts

### Inquiry TFV.03 - identify the impact of the movement of people and goods on vehicle systems and modes of transportation (highway, rail, air, water, pipeline)

- **Level 1**: Identifies and describes major topics in the operation of the transportation system with limited possible solutions
- **Level 2**: Identifies and describes main topics in the operation of the transportation system including adequately detailed possible solutions
- **Level 3**: Effectively identifies and describes the operation of the transportation system including detailed possible solutions
- **Level 4**: Effectively identifies and describes the operation and possible solutions to problems of the transportation system in exceptional detail with linkages to other systems or situations

### Communication TF2.02 – explain how people and goods are moved by highway, air, rail, water, and pipeline transportation systems

- **Level 1**: Defines and identifies most of the major elements with limited clarity and detail
- **Level 2**: Defines and identifies the major elements with adequate clarity and detail
- **Level 3**: Defines the project, identifies the process used, reports all findings, adds a conclusion and all other key material with considerable clarity
- **Level 4**: Defines all key elements with a exceptionally strong sense of purpose and clarity

### Application IC1.01 – describe the consequences of transportation technology for individuals and for society

- **Level 1**: The student: makes connections between people’s transportation habits, environmental issues and possible solutions with limited effectiveness
- **Level 2**: The student: makes connections between people’s transportation habits, environmental issues and possible solutions with moderate effectiveness
- **Level 3**: The student: makes connections between people’s transportation habits, environmental issues and possible solutions with considerable effectiveness
- **Level 4**: The student: makes connections between people’s transportation habits, environmental issues and possible solutions with a high degree of effectiveness

### Overall Level Achieved:

**Level _____**
Research Report Checklist and Comment Sheet

Student Name: ________________________________

Title Page

Table of Contents

Research Description

Data Collection Process

Research Observations or Findings

Research Conclusion

Credits or Sources of Information

Information Gathering Forms etc.

Daily Job Sheets

Overall Comments
<table>
<thead>
<tr>
<th>Date</th>
<th>Hours</th>
<th>Project</th>
<th>Activity Performed</th>
<th>Teacher's Initial</th>
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<tbody>
<tr>
<td>Monday</td>
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Notes:
Safety Resource Pack

TTJ3C Transportation Technology

Unit 1 Activity 1

Research Transportation Problem Project

Note: No safety sheets are required for this project. However, safety procedures for field investigation work must be developed and taught before students are allowed out to conduct field investigations. Teachers need to ensure students understanding of:

1. Traffic safety
2. Site safety (dependent on situation, such as an airport)
3. PPE (Personal Protection Equipment) including proper warning vests, suitable clothes for weather situations

Students need to sign a waiver for any out of classroom field investigation

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FIELD INVESTIGATION SAFETY PASSPORT

I hereby sign that I fully understand and will comply with the safe procedures for conducting outdoor field investigations including:

Traffic safety

Site safety

PPE (Personal Protection Equipment) including proper warning vests, suitable clothes for weather situations

I also understand that if I do not abide with the safety regulations and procedures that I will be removed from the study immediately.

Student: __________________________ Date: ______________

Parent Authorization: __________________________ Date: ______________

Teacher: __________________________ Date: ______________